

ITEM 04502.8019 M - CONCRETE PLACEMENT FOR PCC PAVEMENT REPAIRS - FULL DEPTH

DESCRIPTION

This work shall consist of concrete placement for full depth portland cement concrete pavement repairs at various locations as specified in the plans. The Contractor shall use only his submitted and accepted concrete mix design to make the full depth pavement repairs, unless otherwise noted or restricted by the contract plans.

MATERIALS

Materials shall conform to the following specifications:

Portland Cement Concrete - General	501
Portland Cement Concrete Pavement	502
Pre-molded Resilient Joint Filler	705-07
Portland Cement Mortar Bonding Grout	705-22
Membrane Curing Compound	711-05
Non-Chloride Accelerator Admixture	Approved List

This Specification has been Disapproved AND REPLACE BY 04502.8031

The requirements of §501, Portland Cement Concrete - General, shall apply, except as modified in this specification.

§501-2.02 Materials.

A. *Cement:* Type I, II, I/II or Type III Portland cement may be used. Type III cement, if used, shall have 10% minimum C3A content, a Blaine fineness greater than 500 m²/kg, and water soluble alkalies less than 0.4%.

C. *Admixtures:* Use only neutralized vinsol resin based air entraining agents. Water reducers, if used, must be Type A (Normal). Only non-chloride accelerators shall be used and only one type of non-chloride accelerator at any one time.

§501-3.04 Concrete mixing, Transporting and Discharge.

Apply the following addition to sections 3.04C Central Mixed Concrete, 3.04D Transit Mixed Concrete 3.04E Truck Mixed Concrete.

The truck mixer shall be equipped with air pressurized tanks meeting the following requirements:

Air Pressurized Tanks For Accelerator Solution.

- Sufficient capacity to supply the required solution quantity,
- Discharges the required solution quantity into the truck mixer drum in less than one minute,
- A tank output hose, made of clear plastic, leading into the truck mixer drum, and
- A properly working relief valve.

The non-chloride accelerator shall be added to the mix at the project location. The addition of the non-chloride accelerator shall be added only in the presence of the Engineer. For Central Mixed and Transit Mixed Concretes, after the addition of the non-chloride accelerator, the concrete shall be mixed as specified in table 501-9.

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Apply the following additions to 3.04E, Truck Mixed Concrete.

Flow Meters. The Regional Materials Engineer will measure the actual flow rate, inspect, and approve flow meters prior to use. Truck mixers shall be equipped with in line water flow meters meeting the following requirements:

- Resets easily to "0",
- Mounted to allow easy reading,
- Withstands water temperatures up to 90 °C (for hot water additions only),
- Equipped with air strainers capable of removing entrapped air within the system,
- A batching delivery tolerance of 1% by weight or volume,
- A manufacturers certified flow rate capacity of 265 liters per minute (lpm), and
- A minimum actual flow rate of 190 lpm.

Batching and Mixing. Produce maximum concrete batches of 5 m³ per truck. Incremental batch size increases of 0.5 m³ are allowable provided the contractor demonstrates the ability to place larger batches in a trial as detailed in "Trial Placement" below. Larger batches must also meet all time requirements of the specification as determined by the Engineer.

Introduce the required amount of non-chloride accelerator solution into the air pressurized tank at the batch plant. Drain wash water from the truck mixer drum before charging.

Twice daily, or more frequently as ordered by the Engineer, determine the fine and coarse aggregate moisture content. Compute the corresponding water added to the concrete mix from the aggregate moisture in liters per cubic meter (l/m³). Subtract that quantity, as well as the water portion of the non-calcium chloride solution (l/m³), from the design water. Submit these calculations to the NYSDOT plant inspector for approval. Upon approval, write on the delivery ticket, the exact volume of water to be added to the mix at the job site. Upon arrival at the job site, submit the delivery ticket to the Engineer.

Before adding water into the truck mixer, execute twenty dry revolutions at 12 to 18 revolutions per minute (rpm) and reset the flow meter to zero. Add water in one complete uninterrupted operation.

No water is to be removed from the truck mixer for any purpose while water is being added to the drum. Discharge the non-chloride accelerator solution into the truck mixer drum after the required water designated on the delivery ticket has been added. Add the entire non-chloride accelerator solution in one complete, uninterrupted operation in one minute or less. Apply a minimum of 100 revolutions at 12 to 18 rpm before discharging. The maximum mixing period is 10 minutes.

Section 3.04 G Mobile Concrete Mixing Units shall not be allowed for this specification.

Section 3.04 H Small Construction Mixers shall not be allowed for this specification.

Design Requirements. The contractor shall design a mix that will achieve a minimum field compressive strength of 14MPa prior to opening the repaired pavement to traffic and must also meet the following requirements:

- The course aggregate shall meet the requirements of table 501-2, type CA2.
- The design air content (entrapped plus entrained) shall be 6.5%. The field air content shall be a maximum of 8.0% and a minimum of 5.0%.
- The concrete mix design shall have a maximum water/cement ratio (weight) of 0.46.
- The design slump shall be 75 mm. The field slump shall be a maximum of 100 mm and a minimum of 40 mm.
- The **design** and **trial** batch concrete mixes shall have a compressive strength of 15 MPa at the end of the curing period that the Contractor proposes to open the pavement to traffic and a minimum 28 day

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compressive strength of 30 Mpa.

- The Contractor's mix design shall determine the minimum curing period necessary for the mix to achieve the required compressive strength of 15 Mpa (design and trial) and 14 MPa (field) prior to opening the restored pavement to traffic.

Property	Minimum	Desired	Maximum
Slump	40 mm	-	100 mm
Air Content	5.0%	6.5%	8.0%
Compressive Strength (Design & Trial Batch)	15 MPa		
Compressive Strength (Field Batch)	14 MPa		
Compressive Strength (28 Day)	30 MPa		

Design Batch. The proposed concrete mix design shall be mixed and tested by an ACI Certified Technician. The test results shall be submitted to the Regional Materials Engineer for evaluation and acceptance. The testing shall use the following ASTM Standards for:

- C39 Compressive Strength of Molded Concrete Cylinders.
- C143 Slump of Portland Cement Concrete.
- C192 Making and Curing Concrete Test Specimens in the Laboratory
- C231 Air Content of freshly Mixed Concrete by the Pressure Method.

The test results submitted for evaluation shall provide the following information:

- Concrete mix proportions
- Source of all materials, eg. Cement, aggregates and admixtures.
- Tested air content
- Tested slump
- Compressive strength of two sets of cylinders (one set consist of two cylinders), one set cured for the number of hours the mix is designed for (Based on the curing period used by the Contractor to achieve the 15 MPa compressive strength) and the other set cured for 28 days.

Failure on the part of the Contractor to submit sufficient data to permit the Regional Materials Engineer to render an informed evaluation will result in the disapproval of the mix design. Submittal of the mix design and test results to the Regional Materials Engineer are for informational purposes only. The submittal and acceptance of the concrete mix design does not relieve the Contractor of the responsibility of achieving the above specified design criteria. If at any time the concrete mix does not achieve the specified design criteria the Regional Materials Engineer or the Engineer in Charge can terminate concrete placement operations and the Contractor shall follow the above procedures to provide an acceptable mix. The Contractor shall only use an accepted mix design at the locations indicated on the contract plans.

Trial Batch: A minimum of one week prior to the commencement of repair operations, The Contractor shall prepare a trial batch for each of the accepted mixes to be used on the project. The trial batch shall demonstrate the mixes ability to achieve the specified properties to the Regional Materials Engineer's satisfaction. The trial batch shall use the same (1) materials, (2) mixing, transporting, and discharging methods, (3) placement and finishing methods and (4) curing methods as those to be used on the project.

Field Batch: After receiving the Regional Material Engineer's approval of the trial batch the Contractor may begin concrete pavement repair work. Changes other than minor fluctuations in admixture dosage rates will require a new mix design. The Engineer may halt paving and order additional trial batches whenever the

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specified properties are not achieved. Failure of accepted mix designs to achieve the specified properties shall result in the disapproval of the mix and the contractor shall provide a new mix design following the above procedures.

CONSTRUCTION REQUIREMENTS

The requirements of §502, Portland Cement Concrete Pavement shall apply, except as modified in this specification.

§502-3 Construction Requirements

3.02 Equipment:

A. Vibrators. Hand held internal type vibrators having a maximum diameter of 25 mm and are capable of operating through a frequency range of 6000 - 9000 vibrations per minute shall be used to thoroughly consolidate the concrete, leaving the concrete free from honeycomb, for the full width and depth of the concrete placement.

3.06 Placing and Spreading Concrete: In addition, No walking through vibrated concrete will be permitted. Concrete pavement repairs shall be one continuous placement at the repair location and no stopping of concrete placement will be permitted unless ordered by the Engineer. If a repair location can not be completed in one continuous placement, the concrete placed shall be removed and disposed of at the Contractors expense.

3.08 Joints: The Contractor shall construct joints as shown in the contract plans.

3.09 Finishing and texturing: In addition, the Contractor may use any air screed that meet the approval of the Regional Materials Engineer. The Contractor shall submit to the Engineer for approval a list of paving equipment to be used on the project two weeks prior to being concrete placement.

3.10 Curing: Immediately after texturing, cure the pavement in accordance with § 502-3.10A. Use any atomizing mechanical sprayers capable of exerting consistent pressure without hand pumping. The applicators shall be equipped with tank agitators to continuously mix the curing compound. Use nozzles with spray shields to prevent drift. Flush nozzles daily before use and keep an adequate supply of spare nozzles on the project site. In a slip form paving operation, use self-propelled applicators guided by the same reference system as the slip form paver. In a fixed form operation, applicators need not be self-propelled.

3.13 Surface test: In addition, if the portland cement concrete pavement will be diamond ground as part of the contract, the contractor shall meet the requirement of this section prior to the diamond grinding treatment.

3.16 Thickness Tolerance: This section will not apply to this specification.

Concrete Testing Requirements. The Contractor shall be responsible for all testing. The Contractor shall submit a detailed outline of the testing procedure, to be used on the project, to the Engineer at the project pre-construction meeting for evaluation and acceptance by the Regional Materials Engineer. The plan submitted shall included a minimum of the following:

1. The ACI Certified Testing Technician(s) (including a copy of certification).
2. Location of testing facilities.
3. How the Contractor intends to allow for state witnessing of the testing procedures.
4. General outline of how testing will be conducted during the project (ie. testing times).
5. The manner in which test results will be documented to the Engineer for final acceptance of repairs.

The Contractor shall provide any additional information to the Engineer at the pre-construction meeting to aid in the

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evaluation of the testing procedure by the Regional Materials Engineer. The Contractor shall address or modify any testing procedures deemed necessary by the Regional Materials Engineer.

All testing shall be completed by an ACI Certified Testing Technician(s), using all ASTM Standard procedures for concrete testing and as outlined above. The Contractor shall notify the Engineer and provide the Engineer with any assistance needed so that the testing procedure can be witnessed by the Engineer or his designee. All testing results shall be sent directly to the Engineer for evaluation and acceptance. Any concrete mix failing to meet the design requirements or not witnessed by the Engineer or his designee will result in that concrete placement being rejected and repaired according to §502-3.15 Defective or Damaged Concrete.

All the above testing shall be completed for each truck load of concrete. The testing of the concrete cylinders shall be governed by the curing time of the designed mix to reach the 14 MPa compressive strength. The curing time shall begin for a truck load of concrete after the application of the curing compound to the pavement placement in which the truck load was used. The cylinders shall have the curing compound applied at the same time as the pavement placement. All concrete cylinders cast for testing shall be cured with the same treatments and at a location near to the concrete placement for the chosen time period. The Contractor shall cast an additional set of cylinders per placement if requested by the Engineer. The State reserves the right to conduct any additional testing needed to verify the mix design requirements.

Saw Cutting. It shall be the responsibility of the contractor to make the initial saw cuts (stage 1 sawcut) in the concrete pavement at the locations specified in the contract plans or by the Engineer. An early entry or a green cut saw approved by the Director of Materials Bureau equipped with diamond saw blades, blade guards, depth of cut controls and guides that are capable of making straight cuts to the dimensions shown on the contract plans shall be used. Damage to the Pavement resulting from improper saw cutting, as determined by the Engineer, shall be repaired according to §502-3.15 Defective or Damaged Concrete.

Opening Pavement To Traffic. The Contractor shall be responsible for completing the pavement repairs within the maintenance and protection of traffic guidelines specified in the contract plans.

Failure of the Contractor to meet the minimum strength requirement (14 MPa) for the concrete pavement repairs shall not relieve the contractor of his/her responsibility to re-open the roadway to traffic as outlined in the contract plans. Concrete pavement, represented by the cylinders cast, that has **not** achieved the minimum compressive strength and must be opened to traffic shall be deemed defective and repaired according to §502-3.15 Defective or Damaged Concrete.

Any concrete pavement repairs that crack or spall prior to the acceptance of the project shall be deemed defective and repaired according to §502-3.15 Defective or Damaged Concrete.

METHOD OF MEASUREMENT

The Engineer will calculate the volume of concrete in cubic meters placed from payment lines shown on the contract plans and the field measured longitudinal length of the pavement repaired.

BASIS OF PAYMENT

In the cubic meter bid price include the cost of all materials, equipment, and labor necessary to; design the concrete mixes, trial batch, complete laboratory testing, and mix, place, finish, and cure the concrete pavement repair material.