ITEM 557.0403 11 – HIGH EARLY STRENGTH CONCRETE WITH NON-CHLORIDE ACCELERATOR FOR FULL DEPTH/FULL SPAN SLAB REPLACEMENT

DESCRIPTION

This work shall consist of the construction of a structural full depth slab using portland cement concrete with fibers and a non-chloride accelerator added. The concrete maturity method shall be used to estimate in-place concrete strength and to determine the time of opening the bridge slab to traffic based on a required maturity (temperature-time) factor and a minimum time of 12 hours from casting to opening to traffic.

MATERIALS

Materials used in this work shall conform to the following requirements:

Material	Type	Reference
Portland Cement	Type III	701-01
Fine Aggregate		501-2.02B
Coarse Aggregate	Type CA 2	501-2.02B
Water		712-01
Air-Entraining Agent	Neutralized vinsol resin based only	711-08
Non-Chloride Accelerator		Approved List
Fibers		711-01
Epoxy Coated Bar Reinforcement		709-04 See Note 2 below
Mechanical Connectors for Reinforcing Bar Splices		709-10
Burlap		711-06
Membrane Curing Compound	White	711-05
Polyethylene Curing Cover		711-04
Insulating Materials		711-07 See Note 3 below
Joint Materials		See Note 4 below

1. The maximum allowable total chloride content in concrete shall not exceed 0.10% by weight of cement. Testing shall be done in accordance with written procedural directives of the Department.
2. Devices for supporting and tying reinforcement shall be as per Section 556-2.01.
3. Insulating materials shall have a certified total R-value that is necessary to achieve the required internal concrete temperature and maturity.
4. Joint materials shall be as specified in Contract Plans.

Proportioning Concrete

A. The Contractor shall design and test a concrete mixture that has high early strength and long term durability and satisfies the following parameters:
   1. Cement content shall be 490 kg/m^3.
   2. Water-cement ratio shall not exceed 0.40 by weight, including water in the accelerating admixture solution and based on a Saturated Surface Dry (SSD) condition of aggregates.
   3. Coarse aggregate content shall be 1000 kg/m^3 minimum.

4. Fine aggregate content shall be a minimum of 35% of total aggregate content.
5. Air-Entraining admixture dosage shall be the minimum dosage necessary to achieve the specified air content.
6. Accelerating admixture dosage shall be the minimum dosage necessary to achieve the specified strength.
7. Fibers content shall be 0.54 kg/m^3 minimum and dosed in full bag increments, but it can be increased if the specified slump can be achieved.
8. Slump shall be 50mm, the desired value, or within the range of 40mm to 90mm.
9. Air content shall be 6%, the desired value, or within the range of 4.5% to 7.5%.
10. Compressive strength shall be 17 MPa reached within 9 to 12 hours and 21 MPa reached within 12 to 15 hours.
11. Water temperature at time of mixing shall be 21°C to 40°C.
12. Water reducers of all ranges are not allowed.
13. Air-entraining and accelerating admixtures shall be compatible.

B. A suggested initial trial mixture with SSD batch mass of each material per cubic meter is shown below:

Material	Mass	**Unit**
Cement	490	kg/m^3
Fine Aggregate (sand)	*	kg/m^3
Coarse Aggregate (stone)	1030	kg/m^3
Water	185	L/m^3
Air-Entraining Admixture	415	mL/m^3
Accelerating Admixture	11286	mL/m^3
Fibers	0.54	kg/m^3

* Sand content shall be a minimum of 35% of total aggregate content.

C. The Contractor shall submit detailed mix design for the specific materials to be used and test data to the Department's Regional Materials Engineer, at least 21 days prior to use. This submittal shall include the following material and test data based on at least two acceptable trial batches, each with a minimum size of 3 m^3:
    1. Mix design material sources
    2. Aggregate data including gradation of stone and fineness modulus (FM) of sand, and specific gravity and absorption (SSD moisture) for stone and sand
    3. Mix design batch weights, after adjusting for actual moisture contents of sand and stone at time of each trial
    4. Air content, slump, concrete temperature and ambient temperature at time of each trial
    5. Compressive strengths and corresponding maturities (temperature-time factors) at 9, 12, 15, 18 and 24 hours, and at 3 and 7 days, in addition to compressive strength at 28 days.

D. The materials used for trial batches shall be from the same source and of the same type as those proposed to produce concrete for actual work. Final acceptance of in place concrete will be based on conformance with these specifications and satisfactory test results on field samples taken during

placement. After the concrete is accepted, the Contractor shall assume full and sole responsibility for this concrete mix including handling, placement and performance of the in-place concrete.

E. The Contractor shall assign a qualified Quality Control Engineer the responsibility to plan, monitor and report on trial batches, material testing and field application and validation of the maturity method.

MATURITY METHODOLOGY

The concrete maturity method is based on ASTM C1074-04 Standard Practice for Estimating Concrete Strength by the Maturity Method.

The procedure for utilizing the concrete maturity method to determine in-place concrete strengths includes three steps: development of the strength-maturity relationship, monitoring the maturity of the concrete placement, and regular validation of the strength maturity relationship. Any changes in the mix design, its components, or proportions will require that a new strength-maturity relationship be developed by the Contractor, utilizing a testing laboratory approved by the NYSDOT. The strength-maturity relationship shall be developed prior to actual work or during construction, prior to any placement.

A pre-placement meeting is required with the Engineer, inspection staff and the Contractor, before developing the strength-maturity relationship. The Contractor shall provide details on using the concrete maturity method. Information includes, but is not limited to, detailed procedure, equipment list, and persons responsible for testing.

Maturity Test Equipment

The Contractor shall provide a Concrete Maturity Meter (or Reader) and data loggers that can:

1. Provide a maturity value based on the Temperature Time Method or Equivalent Age as detailed in ASTM C1074-04.
2. Continuously log and store temperature, time and maturity data.
3. Accurate to within $\pm$1°C when the meter is calibrated as per the manufacturer's instructions.
4. Take readings every 5 minutes for the first 24 hours and through 7 days.
5. Download data it into a spreadsheet or print it.

Maturity reader and data loggers shall be used to establish a strength-maturity curve for each trial batch. The same maturity equipment shall be used during the trial batches, field evaluation and full scale construction. Submit Maturity Meter and data logger specifications to the Engineer for approval at least 21 days prior to the test batches.

No contract work under this item will be permitted until the Contractor (i) possesses the maturity reader and enough data loggers as required to estimate in-place concrete strength (ii) has supplied the maturity equipment to the Engineer, and (iii) has provided training to the Engineer's Staff and the Contractor's Quality Control Engineer, who will be using the maturity equipment.

ITEM 557.0403 11 – HIGH EARLY STRENGTH CONCRETE WITH NON-CHLORIDE ACCELERATOR FOR FULL DEPTH/FULL SPAN SLAB REPLACEMENT

Developing a Strength-Maturity Relationship

Prior to developing a strength-maturity relationship, and at least once per year, the Contractor shall calibrate the maturity meter as per the manufacturer's instructions. The Contractor shall provide certification of calibration.

The Contractor shall develop for each trial batch (at least two batches) a strength-maturity relationship (compressive strength versus temperature-time factor), by following this procedure. The Contractor shall:

1. Cast a minimum of 27 cylinders (150mm x 300mm) using the procedure outlined in Materials Method 9.2. Make the cylinders from a minimum batch size of 3 m^3. Additional specimens are recommended in case some cylinders are defective. Have the cylinders cast by an ACI Certified Concrete Field Testing Technician, Grade I or higher.
2. Perform all other tests on the concrete as required by the Standard Specifications and record the data.
3. Prepare three data loggers, by attaching each to the maturity meter and activating it immediately before embedding it into fresh concrete.
4. Embed one logger into the fresh concrete of each of three cylinders, as per the method below. Take care to insure that the loggers are within 50mm to 100mm of any surface and that the logger wires are accessible outside the cylinder. The three specimens with the loggers are to be tested under compression last.
5. Attach the maturity meter to each logger and verify that time and temperature data is being stored continuously.
6. Moist cure the cylinders as per Materials Method 9.2.
7. Perform compression tests at the ages of 9, 12, 15, 18 and 24 hours, and 3, 7 and 28 days. Test three cylinders at each age. Calculate the average compressive strength of the three cylinders. Record the individual and average compressive strengths. Record the individual and average maturity values at the time of each test, except for the 28-day age.
    a. If a cylinder is obviously defective, as defined in ASTM C39, discard it.
    b. If an individual cylinder is not within $\pm$10% of the average value, discard the results and recalculate the average value.
    c. If two or more of the three cylinder are defective, evaluate a new batch unless additional cylinders are available.
8. Plot the average strengths versus the maturity value at each time interval. Draw a best-fit curve through the data points.
9. Sign and certify the strength-maturity relationship. Provide copies of the curve and supporting data to the Engineer in Charge, the Regional Materials Engineer and the Director of the Materials Bureau.

Logger Positioning Method:

As per ASTM C 1074-04, the proper positioning of a logger (sensor) is to insert a small diameter rigid rod into the center (within $\pm$15mm) of a freshly made cylinder. The rod will push aside any interfering aggregate particles. The rod is removed and the logger is inserted into the cylinder. The side of the cylinder mold should be tapped with a rubber mallet or the tamping rod to ensure that the concrete comes into contact with the logger.

Field Evaluation of the Strength-Maturity Relationship

The Contractor shall evaluate in the field the strength-maturity relationship, by following this procedure. This evaluation shall be performed one time only, during the first placement of this material. The Contractor shall:

1. Mix multiple batches (at least two) of accelerated concrete, each with a minimum size of 3 m^3, but not more than 4 m^3.
2. For each batch, test for slump and air content.
3. Cast concrete onto a designated slab area of the deck, using mechanical vibrators and finish the surface as specified.
4. Prepare multiple maturity data loggers; number of loggers shall be as per the schedule below.
5. Insert (embed) three loggers per batch into fresh concrete and position them at mid-depth of the deck, as per the method in the previous section. Gently finish the disturbed small surface areas at the locations of the loggers, using small flat metal tools and allowing enough length of protruding wire for later connection to the maturity reader.
6. Cast three concrete cylinder specimens (150mm x 300mm) per batch, and for each cylinder insert a logger into its mid-center as per the positioning method above.
7. Cast additional concrete cylinders, as per the schedule below.
8. Group the cylinders corresponding to each batch.
9. Cure all of the concrete cylinders under the same conditions as the deck slab, and as per this specification.
10. Test each group of additional cylinders for compressive strength, at the ages of 9, 12, 15 and 18 hours.
11. Record temperature and maturity data from each group of loggers (in cylinders and deck slab), at the ages of 9, 12, 15 and 18 hours.
12. Compare for each group, maturity data from the cylinders to that from the deck slab.
13. Compare strength and maturity of the field data with the laboratory data from the previous section.
14. Download temperature and time record from all loggers at 24 hours.
15. Test the logger cylinders for compressive strength at 24 hours, after downloading the data.
16. For each batch, plot the average compressive strength at the various specified times versus the average maturity as recorded by the logger cylinders.
17. Compare the strength-maturity curves for the logger groups in the deck.
18. Plot an average strength-maturity curve for all loggers in the deck slab and compare with the laboratory data.
19. Report all of the data to the Engineer.

Field Evaluation Cylinder and Logger Schedule:

The number of concrete cylinders cast from each batch shall be fifteen (15), including three cylinders with loggers. The number of loggers per batch shall be six (6); three loggers inserted in the deck slab and one logger inserted in each of three cylinders.

Estimation of In-Place Strength

The Contractor shall estimate in-place strength of concrete by following this procedure. This estimation shall be performed during each placement of a lane-span throughout the project's duration. The Contractor shall:

1. Embed one logger per batch at mid-width of the slab, and one additional logger for three consecutive batches (about 60 m^2 slab area), either in the largest or middle batch (in the same order of priority) and at about 0.6 m from slab edge. Embed an additional logger in the last batch.
2. Embed one logger in a cylinder specimen cast from the largest or middle batch of three consecutive batches.
3. Attach the maturity meter to each logger immediately after its insertion and verify that maturity data is being stored continuously. If the logger is not functioning as expected, gently remove it and insert another logger in its place.
4. Cast one cylinder specimen per batch, and one additional cylinder for three consecutive batches.
5. Download maturity data from all loggers and manually record time, temperature and cumulative temperature-time at these times:
    a. End of day's construction of a slab area, to verify that all loggers are still functioning properly
    b. Five hours before the expected time of opening to traffic, to monitor maturity and corresponding strength gain
    c. One hour before the expected time of opening to traffic, to verify that the required strength is or will be achieved.
6. If the maturity data from a slab logger indicates low strength gain, test under compression a cylinder (without logger) that had been cast from the same batch as the slab area in question.
7. Perform compression tests on the remaining cylinders at an age of 24 hours or as required by the Engineer.
8. The decision to open the roadway to traffic shall be based primarily on maturity data from the loggers in the slab.

Maturity Validation

Validation of the strength-maturity relationship shall continue during deck replacement. For each lane-span and at least once per day of placement, perform a validation test as follows:

1. Cast three cylinders
2. Insert a maturity logger in one of the cylinders.
3. Insert one maturity logger into the slab.
4. Test the cylinders for compressive strength as close as possible to the maturity value corresponding to the design strength of 21 MPa. Download the maturity data immediately prior to testing.
5. If the average value of compressive strength of each pair of cylinders is within 10% of the estimated value, the strength-maturity relationship will be validated.
6. If the average cylinder value is more than 10% below the estimated value, the strength maturity relationship will need to be re-established.
7. If the average difference between the estimated and measured strengths is more than 10% above the estimated value, the relationship may require re-establishment.

EQUIPMENT

All equipment proposed for use will require the Engineer's approval prior to the start of the work. The

specific method and equipment that the Contractor proposes to use for finishing will be subject to the approval of the Regional Construction Engineer. The Contractor shall supply sufficient equipment and personnel to ensure prompt placement of the concrete produced. Specific equipment requirements are as follows:

Placing and Finishing. This shall meet the requirements of Subsection 557-3.05 and 557-3.07.

Surface Texturing Equipment. The specific equipment to be used shall be approved by the Engineer. Prior to approval, the Contractor shall demonstrate to the Engineer's satisfaction that the equipment is capable of providing the required surface texture.

The Contractor shall use only Truck Mixed Concrete. Mobile mixers shall not be allowed. The Contractor shall supply sufficient equipment and personnel to ensure prompt placement of the concrete produced.

Truck Mixed Concrete

Section 501-2.04B of the Standard Specifications shall apply, together with the following modifications:

A. Physical Requirements:

1. *Flow Meters.* Truck mixers shall be equipped with in line water flow meters capable of being easily reset to "0", of withstanding water temperatures of up to 93^{o}C and have a manufacturer's certified flow rate capacity of 265 liters per minute. The flow meters shall be mounted in such a manner as to allow the Engineer easy access for reading the meter.

   The flow meters will be inspected and approved by the Regional Materials Engineer prior to their being approved for contract work. The batching delivery tolerance for the water flow meter shall be 1% by weight or volume. The actual flow rate as measured by the Regional Materials Engineer shall not be less than 190 liters per minute. The flow meters shall be equipped with air strainers capable of removing all trapped air in the system.

2. *Air Pressurized Tanks for Accelerator Solution*. Truck mixers shall be equipped with air pressurized tanks having a capacity sufficient to meet the accelerator solution design needs of the mix. The air pressurized tank shall be capable of discharging the design quantity of accelerator solution into the truck mixer drum in less than 1 minute. The tank's output hose leading into the truck mixer drum shall be made of clear plastic. The air pressurized tank shall be equipped with a properly working relief valve.

B. Quantity:

The maximum quantity of concrete to be produced at any one time by truck mixer shall be 5 cubic meters. The minimum batched quantity shall be the minimum allowable batch size for the specific batch facility or 3 cubic meters, whichever is greater.

C. Batching and Mixing:

Stockpiling of aggregates shall meet the requirements of Section 501-3.02A.

The Contractor shall batch and operate their truck mixers in accordance with Subsection 501-3.03E Truck Mixed Concrete. The prescribed amount of accelerator solution to be used shall be introduced into the air pressurized tank at the batch plant.

Immediately prior to the batching of each truck, the Contractor shall make a determination of the actual material batch quantities, adjusting for fineness modulus, bulk specific gravity, absorption, and moisture content of the aggregates. Additionally, water shall be adjusted for the quantity of water present in the accelerator solution. After determining adjusted batch quantities, the Contractor shall submit the data and calculations to the State representative at the concrete plant for review and approval.

The air-admixture shall be added to the mix drum at the batch plant, along with coarse and fine aggregates and the cement. Batching and mixing shall be in accordance with §501-3.03E. The fibers shall be added in increments of whole bags using a method approved by the Regional Materials Engineer.

Upon approval, the Contractor shall indicate in writing on the delivery ticket the exact number of liters of water to be added to the mix at the job site. Upon arrival at the job site, the driver shall give the delivery ticket to the Engineer. Before the addition of water into the truck mixer, the Contractor shall execute 20 dry revolutions and reset the flow meter to zero.

Add 95% of the water quantity designated on the delivery ticket in one complete uninterrupted operation. No water is to be removed from the truck mixer for any purpose whatsoever, while water is being added to the drum. The accelerator solution shall be discharged into the truck mixer drum after 90% of the water has been added to the concrete.

The mixing cycle shall be executed at the rate of twelve to eighteen rotations per minute (rpm).

Discharge a small amount of concrete for visual inspection and perform one or two slump tests as required by the Inspector. If the measured slump is more than the allowed maximum value of 90mm, the batch shall be rejected. If the slump is within the allowed range and the workability of the mix is to the satisfaction of the inspector, proceed with placement of the batch.

Otherwise, add the remaining 5% of water and mix the concrete for additional 30 mixing revolutions.

Perform another slump test and two air content tests on representative samples from the middle portion of the batch (after discharging about half of the concrete). If the slump is not within the allowed range, the batch shall be rejected.

ITEM 557.0403 11 – HIGH EARLY STRENGTH CONCRETE WITH NON-CHLORIDE ACCELERATOR FOR FULL DEPTH/FULL SPAN SLAB REPLACEMENT

Test Equipment

The Contractor shall furnish a recording thermometer to measure the temperature of plastic concrete at the time of discharge. No contract work under this item will be permitted until the Engineer possesses the thermometer. This shall meet the requirements of Subsection 584-2.04C, except that it shall be capable of recording temperatures in the -1°C to 77°C range.

CONSTRUCTION DETAILS

General

All the requirements of Subsection 584-3 Construction Details shall apply except where modified in this specification.

The locations of deck to be replaced shall be shown on the plans or will be designated by the Engineer. Replacements shall conform to the details shown on the drawings.

A 0.102mm polyethylene film shall be installed to act as a bond breaker where required by this item, or where directed by the Engineer.

Structural Slab Wetting

Structural slab surfaces and all existing concrete surfaces to which new concrete will be bonded shall be pre-wetted continuously for a minimum of two hours, to a saturated surface dry condition but free of standing water, immediately prior to placement of fresh concrete.

Forms

Forms shall meet the requirements of Subsections 557-3.03A, B and D and 557-3.13. Permanent forms shall be used whenever possible. Contractor shall provide locations where permanent forms are not provided for approval by the Engineer.

Placing and Fastening Steel Section 557-3.04 of the Standard Specifications shall apply.

Concrete Placement

Section 557-3.05 of the Standard Specifications shall apply except as modified herein or in other sections. Placement by pumping is not allowed.

The temperature of the concrete at the point of discharge shall be between 24^{o}C and 29^{o}C.

The maximum time permitted from the end of mixing to the completion of concrete discharge shall be twenty minutes. All concrete remaining in the drum after that time interval shall be rejected and removed from the work site.

No cold joints shall be allowed.

Concrete Joints

Deck joints shall be as detailed and specified on the Contract Plans.

ITEM 557.0403 11 – HIGH EARLY STRENGTH CONCRETE WITH NON-CHLORIDE ACCELERATOR FOR FULL DEPTH/FULL SPAN SLAB REPLACEMENT

Weather Limitation

Concrete placement operations may be started only during the following weather conditions:

- Air temperature at the time of concrete placement is more than 10^{o}C and rising but less than 35^{o}C,
- Average air temperature is higher than 7^{o}C for the previous three consecutive days, and
- Expected average air temperature is more than 7^{o}C within the next two days.

The Contractor shall obtain on a daily basis national weather service reports.

All temperatures shall be measured in the shade. No placement of concrete will be permitted if the air temperature is or can be expected to lie outside these ranges. During concrete placement the contractor shall record the maximum and minimum temperature readings and general weather conditions in each 24-hour period. A copy of the temperature readings shall be included in permanent records of the job. No concrete shall be placed when it is raining or when rain is expected within 2 hours of placement.

If at any time during the curing period, the air temperature falls outside the range specified for curing, as per §557-3.11, the concrete shall be inspected for damage. Concrete damaged by temperature as determined by the Engineer shall be removed and replaced by the Contractor at no cost to the State.

Mixing water temperature shall be based on the prevailing ambient air temperature at the time of concrete placement, as follows:

1. For mild weather, with air temperatures between 10^{o}C and 21^{o}C, concrete mixing-water shall be between 21^{o}C and 40^{o}C.
2. For warm weather, with air temperatures above 21^{o}C, there is no need for heating the mixing water and its temperature shall be between 21^{o}C and 29^{o}C.

Surface Finishing and Texturing

Section 557-3.07 of the Standard Specifications shall apply.

Curing

Upon completion of the concrete placement operation for each batch, including surface finishing and insertion of logger(s), the top surface of the slab shall be covered by wet burlap and moist cured continuously as long as possible, while allowing sufficient time for removal of the burlap, drying of the slab surface, coating of the surface with a membrane curing compound and drying of the compound, before the scheduled time for opening to traffic. Other covers shall be placed on the wet burlap, if warranted by weather conditions and maturity readings as outlined below.

If air temperature at the time of concrete placement is 16^{o}C and rising and the slab is exposed to the sun, and if the same weather trend is expected to continue during the next 12 to 15 hours, this procedure shall be followed:

1. Cover the slab surface by wet burlap only.
2. Monitor every two hours the maturity data, particularly the internal temperature, and estimate the strength development.

3. If maturity readings indicate lower than expected strength development, the wet burlap shall be covered by a 0.102mm thick polyethylene sheet (vapor barrier or tarp), which in turn shall be covered by a thermal insulating blanket to maintain internal maximum temperature of less than or equal to 55^{o}C and post peak temperatures of less than or equal to 35^{o}C.
4. If the internal maximum temperature exceeds 55^{o}C, or the post peak temperatures are greater than 35^{o}C, and the strength development is satisfactory, remove the blanket and sheet covers.

If air temperature at the time of concrete placement is 10^{o}C to 16^{o}C and the slab is not exposed or partly exposed to the sun, due to clouds or physical barriers, and if the same weather trend is being forecasted, this procedure shall be followed:

1. Apply moist curing (wet burlap) for about one hour after concrete placement.
2. Cover the wet burlap by a 0.102mm thick polyethylene sheet, and cover the sheet by a thermal insulating blanket to maintain internal maximum temperature of less than or equal to 55^{o}C and post peak temperatures of less than or equal to 35^{o}C.
3. After all batches are cast into the designated slab, remove temporarily the sheet and blanket covers to verify that the burlap is still wet; if needed, re-apply moisture to the burlap and place back the sheet and blanket covers.
4. Monitor every two hours the maturity data, particularly the internal temperature, and estimate the strength development.
5. If the internal maximum temperature exceeds 55^{o}C, or the post peak temperatures are greater than 35^{o}C, and the strength development is satisfactory, remove the blanket and sheet covers.

For concrete cylinder specimens cast from the same batches, follow the same curing requirements as the placed concrete, until the time of moving the cylinders to a testing laboratory.

The polyethylene sheets and insulating blankets shall extend a minimum of 300mm beyond the edges of the placement. Each blanket shall be securely weighted down to prevent the uncovering of the concrete.

Particular care shall be taken to ensure that the edges of the insulating material are weighted sufficiently to ensure direct contact of the existing concrete and the newly placed concrete and to prevent wind intrusion beneath the polyethylene vapor barriers

The insulation blankets shall be weighted down with sand bags weighing a minimum of 7 kg each. The sand bags shall be placed 600mm on center, beginning at the edges and proceeding inward in a grid pattern over the entire concrete placement area.

Damaged or Defective Concrete

The provisions of §557-3.16 shall apply. Shrinkage cracks will be cause for rejection of the concrete.

Opening to Traffic

When the deck placement area has achieved the temperature-time or maturity requirement established by the maturity testing, the wet burlap shall be removed, as well as the polyethylene vapor barrier and insulation blankets, if present. A minimum time of 12 hours (preferably 15 hours), from casting to opening to traffic, is required in addition to the specified maturity. The concrete surface shall be

immediately coated with a minimum of two coats of white pigmented membrane curing compound at an application rate of 3.7 square meters per liter for each coat. One coat shall be applied in the transverse direction and the second coat applied in the direction of traffic flow.

When curing compound has cured sufficiently to prevent tracking, the placement area may be opened to traffic.

Concrete placement operations shall be timed within the workday such that the required temperature and curing is achieved at the time specified on the plans for opening the reconstructed slab to traffic.

METHOD OF MEASUREMENT

Measurement will be taken as the number of square meters of field measured plan area of concrete placed, measured to the nearest 0.1 square meters.

BASIS OF PAYMENT

The unit price bid per square meter shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work as shown on the plans or called for in the specifications. Unless otherwise provided, the unit price bid shall include the cost of furnishing and placing bar reinforcement, concrete joints, mechanical connectors where specified, water for wetting, concrete curing materials, the cost of screed rail supports and other brackets or braces necessary to support finishing machines, and the cost of equipment and testing needed for the maturity method and other required testing.

Where permanent metal forms are used, the cost of furnishing all facilities required for access, removing the permanent forms for inspection or repair purposes, painting the cut edges of the forms and repairing the concrete as required herein shall be included in the price bid for this work.

No extra compensation for corrective finishing or repairs to damaged or defective concrete will be paid.

All saw cutting and concrete removal (including cleaning and blast cleaning of surfaces in contact with the new concrete) will be paid for under their appropriate items.

Progress payments will be made on a per-span basis as follows:
Forty (40) percent of the area will be paid for after all reinforcing is properly placed. Forty (40) percent of the area will be paid for after the concrete has been properly placed and cured. The remainder will be paid for after completion of all curing, and necessary corrective work.