

SPECIFICATION CHANGES. The Standard Specifications shall be changed as per the attached.

Highlights of the changes are as follows:

- Classes DP, GG and HP added to the concrete class options.
- Allowance for Blended cements, microsilica, and Ground Granulated Blast Furnace Slag.
- A requirement for a means of sampling on all microsilica powder, and if necessary, cement and pozzolan storage bins.
- Increase allowable mixing revolutions for classes HP and DP concrete.
- A dedicated telephone for the inspection facility.
- A fire-proof file cabinet for the inspection facility.
- A facsimile machine available for the inspector's use at all PCC production plants.
- A minimum size requirement for the plant automation room.
- A requirement for notification to the Regional Materials Engineer of any concrete produced for Department projects no later than 3:00 PM on the day prior to production.

DISAPPROVED SPECIFICATIONS: The following specifications are disapproved for use:

- ITEM 18502.6029 M CEMENT CONCRETE FOR PAVEMENT REPAIRS
- ITEM 18555.9804 M FOOTING CONCRETE, CLASS HP
- ITEM 18555.9805 M CONCRETE FOR STRUCTURES, CLASS HP
- ITEM 18557.0198 M SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE, BOTTOM FORMWORK REQUIRED
- ITEM 18557.0598 M SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE, BOTTOM FORMWORK NOT REQUIRED
- ITEM 18557.0798 M SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE, BOTTOM FORMWORK REQUIRED
- ITEM 18557.0998 M SUPERSTRUCTURE SLAB WITH SEPARATE WEARING SURFACE, BOTTOM FORMWORK NOT REQUIRED
- ITEM 18557.2098 M STRUCTURAL APPROACH SLAB WITH INTEGRAL WEARING SURFACE
- ITEM 18557.2298 M STRUCTURAL APPROACH SLAB WITH SEPARATE WEARING SURFACE

NEW SPECIFICATIONS: The attached new and revised specifications include:

- ITEM 555.0104 M FOOTING CONCRETE, CLASS A (No Concrete Class Substitution except as permitted in §555- 3.12)
 - ITEM 555.07 M CONCRETE FOR STRUCTURES, CLASS GG (Deposited Under Water)
 - ITEM 555.08 M FOOTING CONCRETE, CLASS HP
 - ITEM 555.09 M CONCRETE FOR STRUCTURES, CLASS HP
- A replacement for item 18502.6029 M, CEMENT CONCRETE FOR PAVEMENT REPAIRS will be issued under a separate Engineering Instruction.

CONTACT PERSON. Any questions regarding the specification changes should be directed to the Field Engineering I section of the Materials Bureau at (518) 457-5956.

Make the following *changes* to the Standard Specifications of January 2, 1995 :

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Under **§555-3.04 Handling and Placing Concrete A. General :**

line 34; *delete* "Table 501-7, Concrete Uniformity" and *replace* with "Table 501-5, Concrete Uniformity".

line 45; *delete* "Tables 501-04, Air-Content, and 501-5, Slump Values. " and *replace* with "Table 501-3, Concrete Mixtures."

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Under **§555-3.12 Foundation Concrete. :** *add* the following to the end of the paragraph: "When Footing Concrete, Class A is specified ; Class HP may be substituted for all footing placements, and Class H may be substituted when the footing is 1 meter thick or less.

Under **§555-5.02 Concrete for Structures. :** *delete* lines 38 through 43 and *replace* with the following:

Item No.	Item	Pay Unit
555.0104 M	Footing Concrete, Class A (No Concrete Class Substitutions Allowed, except as permitted in §555-3.12)	Cubic Meter
555.0105 M	Concrete for Structures, Class A	Cubic Meter
555.05 M	Concrete for Structures, Class F	Cubic Meter
555.06 M	Concrete for Structures, Class G (Deposited Under Water)	Cubic Meter
555.07 M	Concrete for Structures, Class GG (Deposited Under Water)	Cubic Meter
555.08 M	Footing Concrete, Class HP	Cubic Meter
555.09 M	Concrete for Structures, Class HP	Cubic Meter

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Under **§701-01 PORTLAND CEMENT - GENERAL :**

line 14; after "ASTM C150 ..." *add* the following: "For uniformity with recognized Industry terminology, Types 1, 2, 3, and 5 may also be designated as Types I, II, III, and V respectively. Type I/II is defined as a cement that meets the requirements of both Types I and II cement."

Line 18; after " ASTM C150," *delete* "Table 2a".

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Under **§704-03 PRECAST CONCRETE - GENERAL :**

line 5; after "§501-2,..." *delete* "§501-3.02 and §501-3.03 except as noted herein ." and *replace* with the following: "§501-2.03 and §501-3.02 except as noted herein. "

Page 5-1 : Delete the title for Section 500 and **delete** Section 501 of the Standard Specifications of January 2, 1995 in its entirety and **replace** with the following:

“Section 500

PORTLAND CEMENT CONCRETE

SECTION 501 - PORTLAND CEMENT CONCRETE - GENERAL

501-1 DESCRIPTION. These general requirements apply to concrete furnished for pavement, structures and incidental construction. Additional requirements may be specified in the contract item. All testing will be done in accordance with Department procedures.

501-2 MATERIALS.

501-2.01 Composition of Mixtures. The Contractor shall inform the Regional Director, in writing, of the materials sources prior to mixing concrete. Proportion and mix portland cement, fine aggregate, coarse aggregate, water, admixtures, pozzolan and /or microsilica to create a homogeneous portland cement concrete mixture.

Produce the class of concrete indicated in the contract documents. However, substitutions may be made according to Table 501-1, Concrete Class Options.

**TABLE 501-1
CONCRETE CLASS OPTIONS**

Concrete Class Specified	Allowable Class Options
A	C, E, F*, H or HP
C	F*
D	DP
DP	None
E	F* or H or HP
H	HP
F, G, GG, or HP	None
I	J
J	None

*Regional Director approval required for pavement applications, including approach slabs. D.C.E.S. approval required for structural or deck applications, excluding approach slabs. Class F may not be used in mass placements, or as a substitute for Class A in Sign Structure, Signal Pole, and Luminary foundations.

501-2.02 Material Requirements.

Portland Cement	§701-01	Admixtures	§711-08
Blended Portland Cement	§701-03	Fly Ash	§711-10
		Microsilica	§711-11
Coarse Aggregates	§703-02	GGBFS *	§711-12
Concrete Sand	§703-07	Water	§712-01

* Ground Granulated Blast Furnace Slag

A. Cementitious Materials. Use only cementitious materials meeting §701-01 whose brand name and type appears on the Department's Approved List. Cementitious materials stored over the winter at concrete producing facilities will be retested for specification compliance. All contaminated, or hardened cementitious material will be rejected and not used in Department work.

The Department will consider requests to evaluate alternate cements, pozzolan or microsilica. The use of alternatives is subject to approval by the Director, Materials Bureau.

1. Portland Cement. Use Type I, Type II or Type I/II cement, except as indicated below or in the contract documents.

Type I cement is restricted to fresh water and low sulfate soil areas. Use Type II or Type I/II cement in high sulfate, and salt water areas. Salt water areas are defined as; The Hudson River south of the Newburg-Beacon Bridge, and all other tidal / sea water spray areas of New York State. Type I/II cement is defined as a cement that meets the requirements of both Type I and Type II cements. High alkali cement is defined as any portland cement having an alkali content in excess of 0.70% as denoted on the Approved List. High alkali cement use is restricted, unless otherwise approved by the Regional Director, to mixtures that do not contain reactive aggregates (as denoted in the Department's List of Approved Sources of Aggregates).

2. Blended Portland Cement. Blended cements meeting the requirements of §701-03, may be used as follows:

a. Type IP or SM. Blended Portland Cement (Type IP or Type SM), may be used in all classes of concrete listed in Table 501-03, Concrete Mixtures, except Class F. Type IP or SM blended cement replaces the portland cement/pozzolan portion of the designed mix in Class DP, G, GG, or HP concrete. When using Type IP or SM blended cement in Class DP and HP concrete, an addition of Microsilica §711-11 is required.

b. Type SF. Blended Portland Cement (Type SF), may be used in Class DP or HP concrete. Type SF blended cement replaces the portland cement/microsilica portion of the designed mix in Class DP or HP concrete. When using Type SF blended cement in Class DP or HP concrete, an addition of Fly Ash, §711-10, or Ground Granulated Blast Furnace Slag (GGBFS), §711-12, is required.

c. Ternary Blend. Blended Portland Cement (Ternary Blend), may be used in Class DP or HP concrete. Ternary blend cement in Class DP or HP concrete replaces the entire portland cement/pozzolan/microsilica portion of the designed mix. No subsequent addition of cementitious material is required or allowed.

3. Pozzolan. Pozzolan is defined as Fly Ash, §711-10, or Ground Granulated Blast-Furnace Slag (GGBFS), §711-12. All classes of concrete, except Class F, allow or require a pozzolan as a partial replacement for portland cement. Classes DP, G, GG, and HP concrete require the use of a pozzolan.

4. Microsilica. Class DP and HP concrete require Microsilica, §711-11, as a partial replacement for portland cement. Microsilica, a pozzolanic material, is not included in the definition of a pozzolan in these specifications.

B. Aggregates. Aggregate from the Approved List of Sources of Fine and Coarse Aggregates will be taken from stockpiles, barges, conveyor belts or bins and tested for gradation at the plant site in accordance with NYSDOT Materials Method 9.1. Rejected aggregates may be reprocessed or reworked to meet the gradation requirements.

1. Concrete Sand. Sand meeting the ASTM C33 Sieve Analysis for FINE AGGREGATE is acceptable when the material passing the 75 μ m sieve (wet) is limited to a maximum 3 % by mass, and the sand meets all other requirements of §703-07, Concrete Sand.

2. Coarse Aggregate. Use only crushed stone, crushed gravel or crushed slag meeting the requirements of §703-02, Coarse Aggregates in either one or a combination of size designations specified in Table 703-4, Sizes of Stone, Gravel and Slag, and graded according to Table 501-2, Coarse Aggregate Gradations.

Aggregates not meeting the requirements in Table 703-4, but are uniform in size, may be approved by the Regional Director. When these sizes are combined to meet the mixture gradation requirements of Table 501-2, the gradation requirements of §703-02 shall not apply. Blending of aggregates during the batching process may be approved by the Regional Director. When blending aggregates prior to batching, the blending method requires approval by the Regional Director.

**TABLE 501-2
COARSE AGGREGATE GRADATIONS**

Sieve Sizes	Type CA 1 General Limits % Passing	Type CA 2 General Limits % Passing
37.5 mm	—	100
25.0 mm	100	93-100
12.5 mm	90-100	27-58
6.3 mm	0-15	0-8

NOTE: ASTM C33 Size Number 7 is an acceptable equivalent to the Type CA 1 gradation.
ASTM C33 Size Number 57 is an acceptable equivalent to the Type CA 2 gradation.
Material passing the 75 μ m sieve (wet) is limited to a maximum 1.0 % by mass for ASTM sizes 7 and 57.

C. Admixtures. Use only admixtures meeting §711-08 that appear on the Department's Approved List. Admixtures not conforming to §711-08 are subject to approval by the Director, Materials Bureau.

501-2.03 Concrete Batching Facility Requirements. Batching facilities must be of sufficient design and capacity to produce the quantity of concrete specified. Batching facilities that differ from conventional designs will be considered for use by the Director, Materials Bureau.

A. Acceptance. Each facility requires initial and annual approval by the Director, Materials Bureau. The Regional Director may disapprove use of a previously approved facility at any time for non-conformance with the specifications. Once disapproved, production for Department work will not be allowed until corrective measures are implemented under the approval of the Regional Director.

B. Bins. Each facility requires:

- Sufficient size and number of storage bins to produce the quantity of concrete specified.
- Positive separations between fine aggregate and various sizes of coarse aggregates.
- Separate cement, pozzolan, and microsilica bins, except Type I and Type II cement may be combined in common storage unless the cement is intended for use in high sulfate or salt water areas as described in 501-2.02 A. Cementitious Materials.
- Cement, pozzolan, and microsilica bins with protection from rain and moisture.
- A means of safely obtaining uncontaminated samples from all microsilica bins, as approved by the Regional Materials Engineer.

- A means of safely obtaining uncontaminated samples from any cement or pozzolan bin that has been determined by the Regional Materials Engineer as either unsafe to sample, or difficult to verify the acceptability of its contents.

Sampling will be conducted, or witnessed by the Regional Materials Engineer's representative.

C. Weigh Hoppers and Discharge Chutes. Each facility requires:

- Separate weigh hoppers for aggregate and cementitious materials. 5
- Enclosed cement weigh hopper to protect against moisture and reduce escaping dust.
- Chutes arranged so that materials will not lodge or be lost on discharge.
- No chutes suspended from any part of the weighing system.
- Vibrators arranged so that no significant vibrations are transmitted to the scales or other plant control equipment during the weighing process. 10

D. Scales. Each facility requires:

- Load cell type scales which indicate the load at all stages of the weighing operation, from zero to full capacity, when installed for weighing materials after January 2, 2003.
- Scales that meet the requirements of the National Institute of Standards and Technology - Handbook 44, with no less than 500 or more than 2000 scale divisions. 15
- Digital displays or repeating dials that match the primary scale within 1 division.
- Minimum resolution of digital displays or repeating dials equivalent to the minimum resolution on the primary scale.
- Digital displays or repeating dials located in direct sight of the operator's normal work station. 20
- Face of digital displays protected from manipulation.

Test all plant scales for accuracy, at no additional cost, by a qualified technician as follows:

- Annually, prior to use for Department work.
- At intervals of not more than 90 calendar days.
- Whenever a plant changes location. 25
- At any time ordered by the Regional Director.

Provide a cradle or test platform, approved by the Regional Director, for each scale, and at least 20 standard 25 kg (or metric equivalent) test weights. The use of a set of test weights for two or more facilities will be permitted when they can be available within 1 hour. If directed by the Regional Director, make provisions for locking scales against tampering. 30

E. Proportioning Control Equipment. Proportion the materials by automatic proportioning devices approved by the Director, Materials Bureau. All systems must be approved to operate in metric units on or before January 2, 2003, unless otherwise indicated in the contract documents.

The Regional Director may require the locking or sealing of proportioning equipment that is subject to manipulation. Install automatic proportioning equipment in a dust and weather protected area of at least 4.0 square meters, with no internal dimension less than 2.0 meters. 35

Include equipment to:

- Produce all batches in fully automatic mode using preprogrammed metric mix designs. The only manual operation allowed is a switch or button to start the batching sequence and/or discharge the completed batch. 40
- Accurately proportion the various components of the mixture by mass, or by volume for admixtures and water, in the proper order so that aggregates and cementitious materials are displayed cumulatively (when appropriate). 45
- Deliver each constituent within the tolerances indicated in Table 501-4, Batching Tolerances.
- Control the cycle sequence.

- Interrupt and stop the automatic batching operations via auxiliary interlock cutoff circuits, whenever an error exceeding the acceptable tolerance occurs in proportioning, for all materials except water.
- Time the mixing operations for central mix plants, and provide a clear indication on the recordation whenever the mix time has been interrupted.

Interlock the system so that during the batching of cementitious materials, aggregates and admixtures;

- No inlet gate can open while the weigh hopper discharge gate is open.
- No inlet gate can open while another material is being weighed in a shared weigh hopper.
- No weigh hopper discharge gate can open:
 - a. While the hopper is being filled.
 - b. Until the full batch mass is within delivery tolerance.
- No new batch can be weighed until the hopper is entirely empty of the previous batch and the scale has returned to within the allowable zero tolerance.

F. Admixture Dispensing Systems. Equip plants with calibrated systems that meet the following:

- A sufficient number of dispensing systems to supply the concrete mixture specified.
- The ability to dispense each admixture through its own measuring system.
- Accurate measurement within the tolerance limits specified in Table 501-4, Batching Tolerances.
- A bypass valve to obtain a calibrated sample of admixture from each measuring device.
- Uniform distribution of admixture throughout the mix within the specified mixing period.
- When multiple admixtures are added, no direct contact with each other prior to mixing.
- An approved automatic admixture dispensing system in plants equipped with automated proportioning systems.
- Volumetric measuring devices interlocked with the automated proportioning equipment that insure the preset quantity has been actually measured and completely discharged.
- A readable indication at the operator's normal work station of the actual quantity batched.

Interlock the admixture system with the automated proportioning system so that aggregate and/or cement weigh hopper discharge gates cannot be opened until the preset quantity of admixture has been batched or discharged.

Recordation of the presence of admixture is dependent on completion of admixture discharge.

G. Recordation Equipment. Equip all plants with digital recording instruments approved by the Director, Materials Bureau, that meet the following requirements:

- Is readily accessible and readable at the operator's normal work station.
- Provides quantity recordation of each aggregate component, cement, pozzolan, microsilica, admixture, fine aggregate moisture content, and water (at central mix plants) for each batch of concrete.
- Records the batch number, concrete class, date (day, month, year), and time of day to the nearest minute on each batch record.
- Provides separate recordation of cement, pozzolan, microsilica, admixtures, and aggregate component quantities. Water at central mix plants may be recorded by mass or volume.
- Provides cumulative recordation (when batching cumulatively) of mass and/or volume as indicated on the batching scale or meter within an accuracy of ± 1 scale or meter graduation.
- Has a minimum recorder resolution equivalent to or less than the minimum graduation on the scale or meter, unless otherwise approved by the Director, Materials Bureau.
- Provides a clear and legible copy of all batch records, containing permanent identification of the time and all quantities in each batch, to the Department.
- Automatically stamps the date and time of batch completion on each batch and /or delivery ticket.
- Provides clear identification on batch recordation when:
 1. Initiating a batch without all conditions satisfied for full automated production.
 2. An out of tolerance condition is accepted during batching.
 3. A system is taken out of the full automated mode during the batching sequence.
 4. A system produces a "demonstration" or "simulated" batch.

5. A system reprints a batch ticket.
6. The timing of a central mixer has been interrupted.

When the automation system can produce other than standard size batches (full, half or quarter cubic meter increments), recordation will be subject to approval of the Director, Materials Bureau.

H. Inspection Facility. Provide a weatherproof building or trailer, for use as an inspector's testing laboratory and office that meets the following criteria:

- Meets all applicable uniform fire prevention and building code requirements.
- Office area partitioned from the testing laboratory.
- Minimum gross area of 15 square meters, a minimum internal width of 2.1 meters and a ceiling height of not less than 2.3 meters.
- Protected from a noise level greater than an 8 hour, time weighted average of 85 Dba.
- Laboratory area with tables, work benches, shelving, and other equipment for testing portland cement concrete mixes.
- Increase the area proportionally to house and operate any additional testing equipment, and when there are multiple plants at one site, size the increase of the laboratory and office space to be adequate for performing inspection duties during all production circumstances.

Use the inspection facility only for its intended purpose, and when the inspection facility is used by more than one inspection authority, the Department will have priority. The facility and its location are subject to approval by the Regional Materials Engineer. Maintain the inspection facility, office, and testing equipment in good operating and clean condition. The Producer will be responsible for routine cleaning.

Equip the inspection facility with the following:

1. Office Equipment;
 - Standard size (approx. surface dimensions: 75 cm x 150 cm) office desk with drawers and a chair.
 - Fireproof file cabinet with at least two locking drawers and two keys.
2. First Aid Equipment;
 - An adequately stocked first aid kit at the plant site.
 - An emergency eye wash station in the laboratory area.
 - Safety equipment including gloves, dust mask, etc..
3. Sanitary Facilities;
 - Flush type toilet at the plant site, enclosed in a properly vented, separate room and complying with applicable sanitary codes.
 - A portable toilet may be substituted when a facility is set up on a temporary basis for a specific project.
4. Lighting;
 - Electric, non glare, providing a minimum illumination level of 1000 lux at desk and work bench level.
5. Laboratory Sink / Potable water;
 - Sink and faucet with an adequate supply of clean water for testing, and if necessary, a water cooler for potable drinking water.
6. Heating and Cooling;
 - Adequate heating and air conditioning equipment to maintain an ambient temperature of 20 $\pm$ 3°C.

7. Ventilation;
 - Minimum 0.1 m³/sec exhaust hood, vented to the atmosphere, located over the sample drying area.
8. Communication Equipment;
 - Telephone with a dedicated line in the laboratory office and a fax machine at the inspection facility or plant site for the inspector's use.
9. Fire Extinguisher;
 - 4.5 kilogram capacity multi-class ABC fire extinguisher, maintained and located in the laboratory area.
10. Coarse Aggregate Sieve Shaker;
 - Power driven, with a minimum clear sieve area of 0.21 square meters.
 - Anchored to a firm base.
 - Imparts a vertical, or lateral and vertical motion.
 - Equipped with an automatic timing shut-off device and dust cover.
 - Fully enclosed and weatherproof when located outside the inspection facility.
11. Fine Aggregate Sieve Shaker;
 - Power driven, independent of the coarse aggregate shaker.
 - For 200 mm minimum diameter sieves.
 - Imparts a vertical, or lateral and vertical motion.
 - Equipped with an automatic timing shut-off device.
12. Sample Splitter;
 - Able to split samples with a particle size of 13 to 50 millimeters.
13. Large Scale;
 - Minimum capacity of 14 kilograms with a maximum graduation of 0.005 kg.
14. Small Scale;
 - Minimum capacity of 1500 grams with a maximum graduation of 0.1 g.
15. Sample Drying Appliance;
 - Stove or hot plate sized to rapidly dry aggregate samples.
16. Miscellaneous Testing Equipment;
 - Miscellaneous equipment as per Department written directives or as requested by the Regional Director.

501-2.04 Concrete Mixer and Delivery Unit Requirements. Each mixer requires a Manufacturer's plate, which contains the mixing capacity of the mixer, in a convenient visible location. Repair or replace blades inside the drum that have become heavily encrusted with mortar, or are loose, broken, bent, scalloped or worn 20% in any dimension or otherwise damaged.

- A. Central Mixers.** Central mixers meeting the following may be used unless otherwise specified:
- Equipped with an acceptable timing device that prohibits a batch of concrete from being discharged before the specified mixing time has elapsed (as per §501-3.03 C) without a clear indication on the recordation equipment.
 - Able to discharge the entire batch in an unrestricted manner into a hopper or delivery unit.

B. Delivery Units. Delivery units are subject to inspection as per NYSDOT Materials Method 9.1 and approval by the Regional Director. If found unfit, it will be disapproved until properly repaired.

Completely clean and empty the agitating and non-agitating units of concrete and wash water before loading again.

1. Truck Mixer Requirements. Use an inclined axis rotating drum type with a water tank system able to measure water (liters) going into the drum within a 2% accuracy, and equipped with a hatch in the drum periphery to permit access to inspect the inside.

Each truck mixer unit will be inspected and approved annually by the Regional Materials Engineer for use in Department work, and additional inspections will be made during use to determine its operating condition. Truck mixers will not be permitted to mix batches greater than the maximum capacity indicated on the Manufacturer's rating plate.

a. Transit Mixed Concrete. Equip each truck mixer used for transit mixed concrete with an electrical revolution-counting device mounted in a clearly visible position as follows:

- Separate counters showing ; The number of drum revolutions at speeds within the mixing range and the total number of drum revolutions.
- Both counters legible to one revolution and designed to accept a non-standard electric plug for resetting each counter to read zero when loading at the batch plant.
- Tamper-proof such that if tampering occurs, the counters will become inoperative or the device will otherwise indicate tampering, including the interruption of electric power.
- Installed to count the number of revolutions of the drum only in the direction of mixing.
- Adjusted so that it counts the number of revolutions specified for the mixing and agitating drum speed within the tolerances indicated on the Manufacturer's rating plate, but not to exceed the following Department's requirements for truck mixers:

Mixing - 6 RPM minimum to 18 RPM maximum

Agitating - 2 RPM minimum to 6 RPM maximum

The mixing and agitating revolution limits may be adjusted for individual mixing units upon approval of the Director, Materials Bureau.

b. Central Mixed or Truck Mixed Concrete. Equip each truck mixer used for central or truck mixed concrete, either as described in §501-2.04 B.1.a., for Transit Mixed Concrete, or as follows:

- Mixing speed capability- 6 RPM minimum to 18 RPM maximum
- Agitating speed capability - 2 RPM minimum to 6 RPM maximum
- Approved counter- located in a position readily visible to the Engineer that accurately counts the number of revolutions in the direction of mixing.

2. Non- Agitating/Open Haul Units for Central Mixed Concrete.

Each truck shall be:

- Sound and watertight enough to prevent loss of material during delivery.
- Free of contamination.
- Covered to protect the concrete from adverse drying or precipitation, when ordered by the Engineer.

C. Mobile Concrete Mixing Units. A mobile concrete mixing unit, with the Engineer's approval, may be used for miscellaneous work such as curb, gutter, headwalls, catch basins, manholes, drop inlets, field inlets, sign foundations, lighting structure foundations, anchor units, pullboxes, leveling footings and similar placements.

Equip the mobile mixing unit with proportioning devices that deliver the materials within the following tolerances by mass:

Cement	0 to +4%
Fine Aggregate	±2%
Coarse Aggregate	±2%

Water	±1%
Admixtures	±3%

Use a self contained, continuous mixing type, that meets the following:

- Carries unmixed dry bulk cementitious materials, fine and coarse aggregate, water and admixtures sufficient for at least 4.5 cubic meters per batch, unless otherwise approved by the Regional Materials Engineer. 5
- Measures the amount of cement being introduced into the mix by a clearly visible meter which is kept clean at all times.
- Records the quantity of cement by a ticket printer that, as a minimum, records the number of revolution counts of the cement feeder. 10

1. **Water system:**

- a. Provides positive control of the water flow into the mixing chamber.
- b. Water flow indicated by a readily adjustable flow-meter to provide for minor variations in aggregate moisture. 15
- c. Equipped with a bypass valve or hose suitable to determine batching accuracy.

2. **Admixture System:**

- a. Equipped with at least one admixture delivery system.
- b. Provides positive control of the admixture flow into the unit's mix water system.
- c. Flow-meters to control the amount of admixture added to the mix. 20
- d. Dispenses admixtures in a manner that provides uniform distribution throughout the concrete.
- e. Adds admixture in the amount necessary to achieve the required air content.
- f. Equipped with a bypass valve to obtain a calibrated sample to determine batching accuracy.

3. **Mobile Mixing Unit:**

- a. Capable of combining aggregates, cement, water and admixture into a thoroughly mixed and uniform mass, and discharging the mixture without segregation. 25
- b. Set the mixing time to achieve proper and uniform mix, as determined by the Engineer.
- c. Stockpile all mix materials at the project site, unless otherwise approved by the Engineer
- d. Provide the necessary scales, containers and personnel, approved by the Engineer, to calibrate the unit. 30
- e. Calibrate the unit and provide a record of the calibration to the Engineer for the mix design to be used. The Regional Materials Engineer will furnish the mix design information and the calibration procedure. The Department reserves the right to witness calibration of the unit.
- f. Prior to actual use, demonstrate to the Engineer that the concrete meets the specification requirements for slump, air content and proportioning. Proportioning may be verified in accordance with NYSDOT Materials Method 9.4. 35

Correct any improper mixer conditions as approved by the Engineer. Improper conditions include, but are not limited to, blades that have become heavily encrusted with mortar, or are loose, broken, bent, scalloped, or worn 20% in any dimension or otherwise damaged. The Engineer will discontinue use of a unit that performs unsatisfactorily. 40

D. Small Mixing Units. The Engineer may allow a small construction mixer to mix small quantities of concrete. Mix for at least 90 seconds after all materials are in the mixer, and the Engineer will test the concrete for the specified slump and air content.

501-3 CONSTRUCTION DETAILS

501-3.01 Proportioning. Proportion all ingredients, except for admixtures, according to Table 501-3, Concrete Mixtures and as determined by the Department unless otherwise indicated in the contract documents. Any concrete mix design not meeting the requirements of Table 501-3 will be subject to approval by the Director, Materials Bureau.

A. Aggregates and Cementitious Materials. Aggregate and cementitious material proportions are indicated in Table 501-3, Concrete Mixtures, for standard classes of concrete. Mixes containing aggregate other than those permitted by §501-2.02B, Aggregates, are subject to approval by the Director, Materials Bureau.

Certain aggregates appear in the Approved List of Sources of Fine & Coarse Aggregates that have use limitations with a high alkali portland cement. Notify the Regional Director prior to using these aggregates with a high alkali portland cement. Under these circumstances, the Regional Director may allow 15-20% by mass of the cement to be replaced with Fly Ash (§711-10). Approval may be withdrawn when unsatisfactory results occur. This only applies to Classes A, C, D, E, H, I, or J.

Classes DP, G, GG, and HP require partial replacement of portland cement with pozzolan (Fly Ash or GGBFS). No pozzolan is permitted in Class F.

B. Admixtures. Admixtures are used to achieve the desired set retardation, water reduction, slump, and/or the required air content, and are not considered part of the solid volume. The admixture manufacturer's recommended maximum dosage rate should not be exceeded to obtain the desired results as specified in Table 501-3.

1. Air Entrainment. Air entraining agent is required for all mixes to produce concrete with an air content in the range specified in Table 501-3, Concrete Mixtures unless otherwise indicated in the contract documents. The Engineer will test the concrete for plastic air content, and reject concrete with air contents outside the specified limits.

2. Retardation. The setting time of concrete may be retarded when necessary for proper placement. A water-reducing and retarding admixture (§ 711-08, ASTM Type D), is required in Class DP for Structural Slab Overlays (§ 584), Class HP for Superstructure Slabs and Structural Approach Slabs (§ 557), Class G and Class GG concrete. It may be used with, or in place of, a water-reducing admixture (§ 711-08, ASTM Type A) in other applications that allow Class DP or Class HP. Limit the use of the water-reducing and retarding admixture to the minimum amount required to achieve retardation during placing conditions. Unless otherwise specified, the use of water-reducing and retarding admixtures are subject to approval of the Regional Director.

3. Water Reduction. Unless otherwise specified, a water-reducing admixture (§ 711-08, ASTM Type A), is required in Classes DP, HP, I and J concrete. For all other classes, except G and GG, a water-reducing admixture may be used, subject to advance notification and approval of the Regional Materials Engineer.

High Range Water-Reducing Admixtures (§ 711-08, ASTM Type F), may not be used unless allowed by specification, plans, or the Director, Materials Bureau.

C. Water. Add water to obtain the slump desired by the Engineer, within the Design Mix Guidelines of Table 501-3, Concrete Mixtures. The Engineer will test the concrete for slump, and reject concrete with a slump greater than the guidelines for use in Department work. Concrete with insufficient slump may be adjusted to within the guidelines of §501-3.03 by adding water and remixing, when permitted by the specifications or the Engineer.

D. Pozzolan. Up to 20% of the cement content for Classes A, C, D, E, H, I, and J may be substituted with a pozzolan (Fly Ash or GGBFS), except where prohibited by the Regional Director. No additional pozzolan is permitted in Classes DP, G, GG, or HP. No pozzolan is permitted in Class F.

E. Microsilica. Microsilica meeting the requirements of §711-11 may be added as part of a Blended Cement (§701-03, Type SF or Ternary Blend) or batched independently as a powder, or a slurry.

**TABLE 501-3
CONCRETE MIXTURES**

Concrete Class	Design Mix Guidelines (where sand fineness modulus = 2.80) ¹						Primary Use
	T.C.M. ⁵ Content (kg/m ³)	Sand % Total Agg. (solid volume)	Water/ cement- itious mat'ls (by mass)	Air Content % desired (Range)	Slump Range (mm)	Type of Coarse Aggregate Gradation	
A	360	36.2	0.46	6.5 (5.0 - 8.0)	65 - 90	CA 2	general purpose structural
C	359	35.8	0.44	6.5 (5.0 - 8.0)	40 - 65	CA 2	pavement: slipform paving, form paving
D	430	45.8	0.44	7.5 (6.0 - 9.0)	65 - 90	CA 1	thin structural applications
DP ²	430	45.8	0.40	7.5 (6.0 - 9.0)	50-125	CA 1	thin structural applications, overlays
E	384	35.8	0.44	6.5 (5.0 - 8.0)	75 - 100	CA 2	structural slabs and structural approach slabs
F	425	34.6	0.38	6.5 (5.0 - 8.0)	50 - 75	CA 2	high early strength for pavement or structural applications
G ³	431	45.0	0.45	6.0 (4.0 - 8.0)	150 - 180	CA 2	underwater
GG ³	475	45.0	0.45	6.0 (4.0 - 8.0)	150- 180	CA 1	underwater (special)
H	400	40.0	0.44	6.5 (5.0 - 8.0)	75 - 100	CA 2	pumping applications
HP ²	405	40.0	0.40	6.5 (5.0 - 8.0)	75 - 125	CA 2	pumping, structural slabs, approach slabs, substructures exposed to chlorides
I ⁴	380	41.0	0.44	6.0 (4.0 - 8.0)	15 - 40	CA 2	slip forming highway median barriers
J ⁴	403	45.8	0.44	6.0 (4.0 - 8.0)	15 - 40	CA 1	slip forming structural median barriers, parapet walls and curbs

NOTES :

- Mixture proportions will be computed by the Regional Materials Engineer using the fineness modulus and bulk specific gravities (saturated surface dry) of the aggregates proposed for use.
- Class DP and HP require the replacement of portland cement with 20% pozzolan and 6% microsilica and the addition of a water reducing admixture and / or water- reducing and retarding admixture. Refer to §501-3.01 B, Admixtures.
- Class G and GG require the replacement of portland cement with 20% pozzolan, and the addition of a water- reducing and retarding admixture. Refer to §501-3.01 B, Admixtures.
- These mixes require the use of a water reducing admixture. Refer to §501-3.01 B, Admixtures.
- T.C.M. = Total Cementitious Material.

501-3.02 Handling, Measuring and Batching Materials. Arrange the batching facility and equipment to assure a continuous supply of material to the work.

When written approval is granted by the Regional Director, bagged cement, pozzolan or microsilica may be incorporated into the mix. Adjust the batch size to use whole bags of cementitious materials and batch the aggregates at the plant site according to these specifications.

A. Stockpiles. Build good draining bases for stockpiles, at the batching facility, on prepared aggregate, concrete, metal or wood surfaces, or barge floors, subject to approval by the Regional Director. Build the stockpiles by methods which do not cause particle segregation. Stockpile all aggregates separately, by source and size so that no cross contamination occurs. Label all Department approved stockpiles by source number.

Handle aggregates throughout the batching process such as to maintain uniform grading of the material. In case the aggregates contain a high or non-uniform moisture content, stockpile the aggregates for a sufficient length of time to stabilize the moisture content.

Equip each plant with a moisture sensing device that indicates, on a readily visible scale or chart, the fine aggregate moisture content as it is batched. Indicate the free moisture content on the batch recordation during batching. The free moisture content during batching is limited to a maximum of 8% of the fine aggregate's saturated-surface dry mass.

The Regional Materials Engineer will determine the acceptability and accuracy of the moisture sensing device. If the device is considered accurate, the free moisture content of the fine aggregate may be allowed to be adjusted between batches based on the most recent moisture reading. No adjustment for free moisture will be allowed for an individual batch after batching starts.

B. Heating Materials for Cold Weather Concreting. Use equipment that uniformly heats the materials. To obtain the specified temperature of the plastic concrete when the air temperature is below 0°C, heat the aggregates by steam or dry heat and heat the mix water. When the air temperature is 0°C or more, and the aggregates are free of ice, the specified temperature may be obtained by heating only the mix water. The equipment and operations for heating the materials must be approved by the Regional Director prior to use on Department projects.

Specified Temperature Range (minimum - maximum)

Mix Water	20°C	-	80°C
Aggregate	4°C	-	40°C
Plastic Concrete in place	10°C	-	20°C

To avoid the possibility of flash set when water is heated over 40°C, combine the water and aggregate in the mixer so that the water temperature is reduced before cement is added.

C. Batching.

1. Aggregates. When sizes are weighed cumulatively, allow a ±2% tolerance for each draw mass, based on the combined aggregate batch mass. If sizes are weighed separately, apply the tolerance to each scale mass.

2. Cement and Pozzolan.

a. Batching without microsilica powder added independently on a common scale: Weigh the cement, blended cement, or pozzolan cumulatively with a ±1% tolerance for each draw mass, based upon the combined mass of cementitious materials. Weigh the pozzolan last in the weighing sequence.

b. Batching *with* microsilica powder added independently on a common scale: Weigh the cement, Type IP or SM blended cement, or pozzolan cumulatively with a $\pm 0.5\%$ tolerance for each draw mass, based upon the combined mass of cementitious materials. Double the minimum allowable batch mass. Weigh the microsilica last in the weighing sequence.

3. Microsilica.

a. Batching *with* cement, Type IP or SM blended cement, or pozzolan on a common scale: Weigh the microsilica powder cumulatively with a $\pm 0.5\%$ tolerance for each draw mass, based upon the combined mass of cementitious materials. Double the minimum allowable batch mass. Weigh the microsilica last in the weighing sequence.

b. When batching microsilica powder on a separate scale, allow a $\pm 1.0\%$ tolerance for the total draw mass of microsilica.

c. When batching microsilica slurry, add the microsilica slurry with the permanently installed automation system or a two stop, off-line, automated batching system, approved by the Regional Materials Engineer as meeting the following requirements:

System interlocks:	To interrupt and stop the batching whenever an out of tolerance condition occurs
Meter accuracy:	$\pm 1.0\%$ by volume of slurry
Batching Tolerance:	$\pm 2.0\%$ by volume of slurry
Program quantity:	liters, nearest tenth
System recordation:	1. Correct date and time 2. Truck number (or other method relating slurry to batch ticket) 3. Delivered quantity (liters, nearest tenth)

Locate the control box/ printer for the off-line batching system at the plant operator's work station unless otherwise approved by the Regional Materials Engineer. Calibrate the system according to procedures approved by the Regional Materials Engineer. Re-calibrate the system if any part, or all, of the system is moved. Electrical circuits used to check delivery tolerances may be set at any span within the full allowable tolerance for any approved batch size. For plants not equipped to automatically adjust tolerances, set the tolerance span for the minimum approved batch size when producing varying batch sizes.

Agitate the slurry as necessary to prevent separation. Remove and replace slurry that reaches a temperature less than 0°C , at no additional cost to the Department.

D. Delivery Tickets.

Each delivery ticket must contain the following:

- Delivery Ticket Number
- Plant Identification, with plant name and location and/ or facility number
- Contract Number
- Concrete Class or Item Number
- Quantity (Nominal Batch Size)
- Truck Number
- Batch Number
- An Automatically Applied Time- Date Stamp (immediately upon completion of batching) which may consist of one of the following:

- a. Time - Date stamp by separate printing device on a regular ticket
- b. Time - Date printed by a batch weight recorder on a printed ticket.
- c. Time - Date printed by a batch weight recorder on a printed tape. Affix a copy of the tape to the regular delivery ticket..

E. Failure of Automatic Batching, Admixture Dispensing and Recording Equipment.

If automatic proportioning, admixture dispensing or recording instruments fail, the plant may be allowed, subject to approval of the Regional Director or his representative, to continue producing concrete for the Department for up to 48 hours from the time of breakdown. Written permission of the Regional Director will be required to operate without these instruments for periods longer than 48 hours.

During this period, batch all materials within the automatic proportioning system tolerances.

**TABLE 501-4
BATCHING TOLERANCES**

Cement, Pozzolan, or Blended Cement	± 1% (by mass) of total cementitious materials, if no microsilica is weighed cumulatively on common scale. ± 0.5% (by mass) of total cementitious materials, if microsilica powder is weighed cumulatively on a common scale.
Microsilica Powder	±0.5% (by mass) of total cementitious materials, if weighed cumulatively with cement, Type IP or SM blend, or pozzolan.
Microsilica Powder	± 1% (by mass) if weighed on a separate scale.
Microsilica Slurry	± 2% (by volume)
Aggregate	± 2% (by mass)
Water (See Note 1)	± 1% (by mass or volume)
Admixtures	±3% (by mass or volume) or ±30 ml, whichever is greater
Zero -Aggregate (See Note 2)	+ 2%
Zero -Cementitious Mat'ls. (See Note 2)	+ 1%
Zero-Water (See Note 1,2)	+ 1%

Notes : 1: Tolerance applies to water added at central mix plants only.

2: Zero Tolerance is based on the minimum allowable batch size.

501-3.03 Concrete Mixing, Transporting and Discharging.

A. General. Mix the concrete at a central mix plant, in truck mixers in transit or at the site. When mixed at a central mix plant, transport the concrete in vehicles acceptable to the Regional Director. Place the fresh concrete directly into the forms or into conveyance equipment approved by the Regional Director before evidence of initial set. No water addition will be permitted after the mix has reached the mid-point of the slump range, as indicated in Table 501-3, Concrete Mixtures, for the class used. Concrete with a discharge temperature exceeding 32°C will be subject to rejection.

Notify the Regional Materials Engineer's office by 3:00 PM on the day before any production for the Department. Supply fresh concrete at a rate consistent with placement operations as determined by the Engineer. The Regional Director may disapprove the use of any type of concrete mixing or transporting units when unsatisfactory results occur.

Load the mixer, regardless of type, in a manner approved by the Regional Director and mix batches of concrete no larger than the rated capacity shown on the Manufacturer's plate.

A summary of time limitations for various types of concrete mixing equipment, from the beginning of batching to the completion of discharge, is given in Table 501-7, Summary of Concrete Batching, Mixing, Hauling and Discharging.

B. Concrete Uniformity. Use a mixer that combines aggregates, cementitious materials, water and admixtures into a uniform mass within the specified time. The mixer is required to discharge the mixture without segregation, and meet the uniformity requirements in Table 501-5, Concrete Uniformity. The Department will perform tests when required by the specifications or requested by the Regional Director.

It will only be necessary to verify that mixing equipment meets uniformity requirements if evidence of non-uniform concrete is found or a reduced mixing time for central mixers is requested. A reduction in the batch size below the rated mixer capacity or reduced mixing speed tolerance limits may be required to obtain uniformity.

C. Central Mixed Concrete. Central mixed concrete is concrete mixed in a stationary mixer and transported in approved agitating or non-agitating delivery units to the deposition point. If microsilica slurry is batched, consult the slurry supplier so that microsilica balling does not occur. Use a minimum 90 second mixing time after all materials are in the drum, unless tests show that the requirements of Table 501-5, Concrete Uniformity, can be consistently obtained at a lesser time as approved by the Director, Materials Bureau.

Use delivery units that transport thoroughly mixed concrete without loss of uniformity meeting the requirements of §501-2.04 B.1.b. or §501-2.04 B.2., pertaining to Central Mixed Concrete.

Travel on a haul road free from holes, washboarding or other features that cause segregation in plastic concrete.

Do not exceed the time limit between completion of mixing at a central mix plant and completion of discharge as noted in Table 501-6, Time Limits for Delivery of Central Mixed Concrete.

When transporting central mixed concrete in units approved for truck mixing, add a minimum of 90% of the design water to the mix with the batch plant water system.

Two additions of water will be allowed at the discharge point to obtain initial slump. After each addition, mix the concrete at least 30 mixing-speed revolutions before discharging. The initial loads may, with prior written approval by the Regional Materials Engineer, also be adjusted by using a water-reducing admixture (§711-08, ASTM Type A). This adjustment will be limited to the first trucks arriving for a particular placement before any adjustments have been made at the batching facility. Observe the maximum number of mixing revolution or water addition requirements. Make all subsequent admixture additions or adjustments during production at the batching facility. No additions or adjustments are allowed when non-agitating / open haul units are used.

**TABLE 501-5
CONCRETE UNIFORMITY**

Test	Permissible Variation (Concrete samples taken at two locations in the batch)
1. Mass per cubic meter calculated to an air-free basis	32.0 kg per m ³
2. Air Content, % by volume of concrete	1.0%
3. Slump: Average slump 100 mm or less Average slump greater than 100 mm	25 mm 40 mm
4. Coarse aggregate content, portion by mass of each sample retained on a 4.75 mm sieve	6.0%
5. Unit mass of air-free mortars based on average for all comparative samples tested	1.6 %

NOTE: The Department will take samples at the mixer discharge point and test in accordance with Materials Method 9.2.

TABLE 501- 6
TIME LIMITS FOR DELIVERY AND DISCHARGE OF CENTRAL MIXED CONCRETE

Delivery Unit	Maximum Time (Minutes)
Non-Agitating / Open haul	30
Agitating - rotating drum	90 *

* The Engineer will reject the concrete if there is evidence of initial set, and may reduce the time limit in hot weather or under unusual conditions if unsatisfactory results occur. For concrete that does not contain a water- reducing and retarding admixture , the time to initial strike-off or placement of subsequent lifts is included in the delivery and discharge time limit.

D. Transit Mixed Concrete. Transit mixed concrete is concrete batched at the production facility and mixed completely in a truck mixer at the following locations or combinations thereof: the plant, while in transit, or the discharge point. Transit mix may be used for all concrete items unless otherwise specified. Use a truck mixer meeting the requirements of §501-2.04 B. 1.a., pertaining to Transit Mixed Concrete.

Load the mixer as follows:

1. Totally drain the drum of wash water before loading.
2. Revolve the drum while loading the mix ingredients , except when adding microsilica slurry, and add approximately 90% of the design water.
3. Begin mixing within 5 minutes of cement to aggregate contact .

If microsilica slurry is batched, consult the slurry supplier so that microsilica balling does not occur.

Mix for a minimum of 100 mixing- speed revolutions and then check for consistency. If the truck is en route to the project, change the speed from mixing to agitating after 100 mixing revolutions. Unless restricted by local traffic laws, do not stop the rotation of the drum during transit.

Two additions of water will be allowed to obtain initial slump at the discharge location . After each addition, mix at least 30 mixing speed revolutions. For Class DP or HP concrete, mix a total of 100 to 200 mixing speed revolutions. For all other classes of concrete, mix a total of 100 to 160 mixing speed revolutions.

The initial loads may, with prior written approval by the Regional Materials Engineer, also be adjusted by using a water- reducing admixture (§711-08, ASTM Type A). This adjustment will be limited to the first trucks arriving for a particular placement before any adjustments have been made at the batching facility. Observe the maximum number of mixing revolution or water addition requirements. Make all subsequent admixture additions or adjustments during production at the batching facility.

After mixing, either discharge the load immediately or revolve the drum at agitating speed. Once begun, discharge the entire load within 50 minutes.

For mixes containing a water- reducing and retarding admixture, the total time interval from the moment the cement makes contact with the aggregates to the completion of discharge shall not exceed 90 minutes.

For mixes that do not contain a water- reducing and retarding admixture, the total time interval from the moment the cement makes contact with the aggregates to the completion of initial strike off or placement of subsequent lifts shall not exceed 90 minutes.

The Regional Director may reduce the total time limit in hot weather or under unusual conditions, if unsatisfactory results are obtained.

TABLE 501-7
SUMMARY OF CONCRETE BATCHING, MIXING, HAULING AND DISCHARGING

Central Mixed Concrete	Transit Mixed Concrete		Truck Mixed Concrete	
Begin Batching	Begin Batching		Begin Batching REGULAR MIX	Begin Batching LAYERED MIX
Load mixer	Hatch load, or ribbon load materials through barrel hopper.		Load aggregates. Drum may be rocked or revolved	Load fine agg. , then SSD coarse agg. through hatch. Drum may be rocked.
End of Batching and Begin Mixing	Add approx. 90% of design water			
90 Second minimum after all materials are in the mixer.			Load Cement (See Note 3)	Load Cement (See Note 3)
End of Mixing	Cement In Contact With Aggregates 5 Minutes max.		Cement In Contact With Aggregates 30 Minutes max.	Cement In Contact With Aggregates 90 Minutes max.
Open Haul Rotating Units Drum	Begin Mixing at plant or in transit			
	Class HP or Class DP 100 rev. minimum 200 rev. maximum			
30 Minutes maximum	Mix: 6-18 rpm		Begin Mixing At project, after adding water	
90 Minutes maximum (See Note 2)	All Other Classes 100 rev. minimum 160 rev. maximum		Mix: 6-18 rpm	
Completion of Discharge	Mix: 6-18 rpm		100 rev. minimum 160 rev. maximum	
(When concrete is transported in units approved for mixing, see Note 1)			15 Minutes maximum	
	90 Minutes max. (See Note 2)		End of Mixing Agitate 2-6 rpm	
	End of Mixing Agitate 2-6 rpm		30 Minutes maximum	
	Begin Discharge		Completion of Discharge	
	50 Minutes maximum			
	Completion of Discharge			

Note 1: The remainder of the design water may be added at the work site to attain initial slump. When approved by the Regional Materials Engineer, only the first trucks may be adjusted to obtain initial slump using a water-reducing admixture (§711-08, ASTM Type A). Exceeding the maximum mixing revolutions or water addition requirements will not be permitted.

Note 2: For mixtures that do not contain a water-reducing and retarding admixture (§711-08, ASTM Type D), the 90 minute maximum time includes the time to initial strike-off, or placement of subsequent lifts.

Note 3: Add cement through hatch. Do not move drum while cement is being added.

§ 501-3

E. Truck Mixed Concrete. Truck mixed concrete is concrete completely mixed in a truck mixer meeting the requirements of §501-2.04 B.1.b. Truck Mixers, after adding water at the discharge location. Apply §501-3.04 D. Transit Mixed Concrete, except as follows:

1. Loading of Mixer:

a. Regular Truck Mix (cement in contact with moist aggregates). The drum may be rocked or revolved while loading coarse and/or fine aggregates with admixtures. Load the cement last, while keeping the drum stationary. Begin mixing within 30 minutes of cement to aggregate contact. 5

b. Layered Truck Mix (cement in contact with Saturated Surface Dry(SSD) or drier coarse aggregate). Batch the fine aggregate with admixtures, coarse aggregate and cement all separately. Load these materials through a hatch in the side of the drum in the following sequence: fine aggregate with admixtures, coarse aggregate, and cement last. The drum may be rocked after adding each aggregate size, but kept stationary while loading the cement. Begin mixing within 90 minutes of cement to coarse aggregate contact. 10 15

2. Mixing: Begin mixing at the discharge location. Add water to the drum either from the head section or by dual injection from both the head and discharge end. Mix for a minimum 100 revolutions or until uniform concrete of the specified consistency is produced, whichever is longer. Do not exceed a 15 minute mixing period.

3. Discharge: Discharge the entire load within 30 minutes after mixing. 20

501-4 METHOD OF MEASUREMENT. The Engineer will compute the volume of concrete as the number of cubic meters within the payment lines indicated on the plans or as specified by the Engineer. No deductions will be made for the volume of embedded reinforcement, structural shapes or joint materials. Also, no deductions will be made in concrete pavement for catch basins, manholes, etc. unless otherwise indicated in the contract documents. 25

501-5 BASIS OF PAYMENT. Include the cost of furnishing all materials, equipment and labor necessary to complete the work in the unit price bid for the appropriate items."