

## DIVISION 600 - INCIDENTAL CONSTRUCTION

## SECTION 601 - STRUCTURAL CONCRETE

**601.01 Description.** Structural concrete includes portland cement, fine aggregate, coarse aggregate, and water. The Contractor shall proportion and mix the structural concrete according to the contract. The Contractor may add admixtures for entraining air, retarding or accelerating the set, tinting and other purposes as required or permitted.

Whenever the twenty-eight (28) day compressive strength,  $f'_c$ , is four thousand (4000) pounds per square inch or greater, the Contractor shall designate the concrete by compressive strength. Also, the concrete shall be the minimum required at twenty-eight (28) days.

The twenty-eight (28) day  $f'_c$  that are less than four thousand (4000) pounds per square inch are for design information and designation of class in Table 601-I - Design of Concrete. They are not a requirement for acceptance of concrete.

The concrete pavement shall have the flexural strength,  $f'_r$ , shown in the contract at twenty-eight (28) days or six hundred fifty (650) pounds per square inch, whichever is more stringent.

The Contractor shall proportion the concrete designated by compressive strength such that the concrete will conform to the strength specified in this contract.

Concrete deposited in water shall be seal concrete.

The Contractor shall design concrete placed in bridge decks and pavements with an air content of three (3) percent. This includes entrapped and entrained air. The Contractor shall maintain the air content for plastic concrete within a tolerance of  $\pm$  one (1) percent during the work. Unless the contract designates the concrete by compressive strength, the concrete shall be class BD.

If the Contractor places concrete in bridge decks, the Contractor shall incorporate a water-reducing and set-retarding admixture into the concrete. The water-reducing and set-retarding admixture shall have the capability of varying the degree of retardation without adversely affecting the other characteristics of the concrete. The Contractor shall submit an admixture request to the Engineer for acceptance.

Unless specified in other parts of the contract, the concrete shall be Class A.

601.02 Design of Concrete. The design of concrete shall be as required in Table 601-I.

TABLE 601-I - DESIGN OF CONCRETE			
Class of Concrete	28-Day Strength $f'_c$ , psi	Minimum Cement Content 100 lbs./c.y. (8.0 Maximum)	Maximum Water-cement Ratio, lb./lb.
A	3000	5.6	0.55
B	2500	5.0	0.62
C	2000	4.4	0.71
D	1500	4.0	0.80
BD	3750	6.1	0.49
SEAL	3000	6.1	0.55
Designated by Strength $f'_c$ or $*f'_r$	As Specified	6.1	0.49
$*f'_r$ = Specified Modulus of Rupture			

The Contractor shall proportion the concrete materials using the absolute volume method. This method shall be according to the requirements for each concrete designated by class, cement content in pounds per cubic yard, or twenty-eight (28) day compressive strength specified in the contract. The Contractor shall use the volumetric proportioning methods as outlined in:

(1) the American Concrete Institute (ACI) Standard 211.1-89, "Recommended Practices for Selecting Proportions for Normal and Heavyweight Concrete," or

(2) other accepted volumetric proportioning methods, in the mix design.

The coarse aggregate size for concrete shall be No. 57 (one inch to No. 4) or No. 67 (3/4 inch to No. 4). For concrete placed in the bottom slab and stems of box girders, the Contractor will require the No. 67 size aggregate. If accepted by the Engineer in writing, the Contractor may use smaller size aggregates where the Contractor meets limited spacing between forms and reinforcement.

When called for in the contract, lightweight concrete shall have a minimum compressive strength of three thousand (3000) pounds per square inch at twenty-eight (28) days. The lightweight concrete shall contain not less than five hundred sixty (560) pounds of portland cement per cubic yard. The Contractor shall make, cure, and decide the compressive strength of lightweight concrete cylinders according to AASHTO T 22 and T 23. Lightweight shall have a maximum wet plastic unit weight of one hundred thirty-five (135) pounds per cubic foot and a nominal slump of three and a half (3-1/2) inches.

The Contractor shall conform to the following standard methods:

Sampling fresh concrete	HWY-TQ 12 and AASHTO T 141
Weight per cubic foot yield, and air content of concrete	AASHTO T 121
Slump of portland cement concrete	AASHTO T 119
Air content of freshly mixed concrete by the pressure method	AASHTO T 152
Specific gravity and absorption of fine aggregate	AASHTO T 84
Specific gravity and absorption of coarse aggregate	AASHTO T 85
Temperature of freshly mixed concrete	ASTM C1064

The Contractor shall test for strength according to the following:

Making and curing concrete compressive and flexural test specimens in the field	AASHTO T 23
Compressive strength of molded concrete cylinders	AASHTO T 22 (6 x 12 cylinders only)
Flexural strength of molded beams	AASHTO T 97

When the contract designates concrete by compressive strength,  $f'_c$ , or flexural strength,  $f'_r$ , the Engineer will require prequalification of materials and mix proportions proposed for use before the Contractor places such concrete. The Engineer will base prequalifications on past performance records using statistical computations of the population sizes and (n-1) weighting, or trial batch test reports in compliance with the computed

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minimum average strength for the material and mix proportions. The Engineer will resolve the minimum average strength on a probability of not more than one (1) in twenty (20) tests falling below the specified strength for the following conditions: \*

(1) If past performance records are available, the Contractor shall produce documented performance records. The documented performance records include: \*

(a) a minimum of fifteen (15) consecutive twenty-eight (28) day strength tests from projects having the same materials and mix proportions or \*

(b) two (2) groups totalling thirty (30) or more test results representing similar materials in which the mix proportion strengths are within (20) percent of the specified strength from within the last one (1) year. \*

The Engineer will analyze the performance records to establish a standard deviation. The Engineer will resolve the minimum average strength on the computed standard deviation. \*

(2) If no sufficient past performance records is available, the Engineer will assume the current standard deviation to be five hundred (500) pounds per square inch for compressive strength,  $f'_c$ , and fifty (50) pounds per square inch for flexural strength,  $f'_r$ . \*

Unless sufficient performance records are available from other projects at the Materials Testing and Research Branch, the Contractor shall submit test performance records or trial test reports for prequalifications provided: \*

(1) such data shall be the most recent tests made on concrete of the proposed mix design and \*

(2) the Contractor has made such data within one (1) year of the proposed use. \*

The test data and trial batch test reports shall include the following information:

(1) Date of mixing.

(2) Mixing equipment and procedures used.

(3) The size of batch in cubic yards and the weight, type and source of ingredients used.

(4) Slump of concrete.

(5) The air content of the concrete if the Contractor uses an air entraining agent. \*

(6) The age at time of testing and strength of concrete cylinders tested.

Trial batch test reports shall show that tests shall equal or exceed the minimum average strength. The test is the average twenty-eight (28) day test results of five (5) consecutive concrete cylinders or concrete beams taken from a single batch. No cylinder or beam shall have a strength less than eighty-five (85) percent of the minimum average strength. \*

An official of the firm that did the tests shall sign the test data and trial test reports. \*

The Contractor shall be responsible for the design of concrete mixture for the concrete work specified. When requested by the Engineer, the Contractor shall submit the mix designs using State Highways Division form DOT 4-151. Work shall not start until the Engineer accepts the mix design. The Engineer will accept the concrete mix design on information given in Table 601-I - Design of Concrete and other pertinent requirements of the contract. This acceptance will not relieve the Contractor from obligations to furnish a workable mixture. \*

The Engineer reserves the right to stop the work when the mix properties are sufficiently out of control and a series of excessively low strength tests are occurring. The Contractor shall not continue concrete work until the Contractor establishes the cause and informs the Engineer the necessary corrective action taken. The corrective action may range from a minor adjustment of proportions to the establishment of a new mix design. \*

**601.03 Materials.** Materials shall conform to the following: \*

Portland Cement	701.01
Fine Aggregate for Concrete	703.01
Coarse Aggregate for Concrete	703.02
Admixtures	711.03
Water	712.01

Coarse aggregates for lightweight concrete shall conform to ASTM C 330 except the contract waives Sections 5, 7 and 9. \*

**601.04 Quality Control.** In portland cement concrete production, the Contractor shall be responsible for the quality control of materials during the handling, blending, mixing, curing and placement operations. The person responsible for concrete production control and sampling and testing for quality control shall be proficient in concrete technology and shall have a sound knowledge of the contract. The person responsible shall be adjust concrete mix designs for improving workability and contract compliance. The \*

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Contractor shall sample, test and inspect the concrete necessary to assure quality control of the component materials and the concrete. Sampling and testing for quality control shall be according to the standard methods prescribed in this contract. The Contractor shall do the quality control tests for slump, air content, temperature, and unit weight during the production of structural concrete other than concrete for incidental construction. The Contractor shall notify the Engineer of the test results.

**601.05 Batching.** The Contractor shall measure and batch the materials according to the following provisions:

**(A) Portland Cement.** The Contractor may use sacked or bulk cement. The Contractor shall not use fraction of a sack of cement in a batch of concrete unless the Contractor weighs the cement.

The Contractor shall weigh bulk cement on an accepted weighing device. The Contractor shall seal and vent the bulk cement weighing hopper properly to preclude dusting during operation. The Contractor shall not suspend the discharge chute from the weighing hopper. Also, the Contractor shall arrange the discharge chute so that cement will not lodge in the hopper or leak from the hopper.

Accuracy of batching shall be  $\pm$  one (1) percent of the required weight.

**(B) Water.** The Contractor may measure water by volume or by weight. The device for measurement of water shall be readily adjustable and shall have an accuracy within one (1) percent of the quantity of water required for the batch. The Contractor shall arrange the device so that the Contractor shall not affect the measurements by variable pressures in the water supply line. The Contractor shall equip the measuring tanks with outside taps and valves to provide for checking their calibration or other accepted means. Water, as measured, shall be within one (1) percent of the required quantity.

**(C) Aggregates.** The Contractor shall store and stockpile the aggregates so that the Contractor avoids separation of coarse and fine particles within each size and does not intermix the various sizes before proportioning. The Contractor shall protect the stored or stockpiled aggregates from dust or other foreign matter. The Contractor shall stockpile the aggregates from different sources and of different gradings together.

The Contractor shall handle aggregates from stockpiles or other sources to the batching plant to secure a uniform grading of the material. The Contractor shall not use aggregates that have become segregated or mixed with earth or foreign matter. The Contractor shall stockpile or bin the aggregates at least twelve (12) hours before the Contractor batches the aggregate. The Contractor shall produce or handle the aggregates by hydraulic methods and wash the aggregates for draining. If the aggregates contain a high or non-uniform moisture content, the Contractor may require storage or stockpile over twelve (12) hours.

The Contractor shall proportion the aggregates by weight. The exception is that the Contractor may proportion the aggregates in concrete for minor structures, curbs, and sidewalks by volume or weight. For volume proportioning, the Contractor shall use the measuring boxes of known capacity to measure the quantity of each size of aggregate.

The Contractor shall base the batch weight on dry materials plus the total weight of moisture (both absorbed and surface) contained in the aggregate. The individual aggregates shall be within  $\pm$  two (2) percent of the required weights. The total weight of the aggregates shall be within  $\pm$  one (1) percent of the required weight.

**(D) Admixtures.** The Contractor shall store, proportion and dispense admixtures according to the following provisions:

**(1) Liquid Admixtures.** The Contractor shall dispense chemical admixtures, air entraining admixtures, and calcium chloride in liquid form. The Contractor shall dispense such liquid admixture by automatic dispensing equipment. Dispensers for liquid admixtures shall have sufficient capacity to measure the prescribed quantity required for each batch of concrete. Each dispenser shall include a graduated measuring unit into which the Contractor measures liquid admixtures to within  $\pm$  five (5) percent of the prescribed quantity for each batch. The Contractor shall read the graduations accurately from the point at which the Contractor controls proportioning operations to permit a visual check of batch accuracy before discharging. The Contractor shall mark each measuring unit clearly for the type and quantity of admixture.

The Contractor shall arrange with said supplier to provide safe and suitable facilities for sampling admixtures.

If the Contractor uses more than one (1) liquid admixture for the concrete mix, the Contractor shall provide a separate measuring unit for each liquid admixture. The Contractor shall dispense the liquid admixture by injecting. This is so that the Contractor does not mix the admixture at high concentrations and not interfere with the effectiveness of each other.

When the Contractor uses liquid admixtures in concrete that the Contractor mixes completely in paving or continuous mixers, dispensers shall operate automatically with the batching control equipment. The Contractor shall equip such dispensers:

- (a) with an automatic warning system
- (b) in good operating condition
- (c) that will provide a visible or audible signal
- (d) at the point that the Contractor controls proportioning operations

(e) when the quantity of admixture measured for each batch of concrete varies from the pre-selected dosage by more than five (5) percent or

(f) when the Contractor does not empty the entire contents of the measuring unit from the dispenser into each batch of concrete.

Unless the Contractor adds liquid admixtures to pre-measured water to the batch, the Contractor shall arrange their discharges into the batch of concrete to flow into the stream of water.

The Contractor shall measure and disperse special admixtures as recommended by the admixture manufacturer and as accepted by the Engineer. Special admixtures shall include "high range" water reducers requiring dosages greater than the capacity of conventional dispensing equipment.

**(2) Mineral Admixtures.** The Contractor shall protect mineral admixtures from exposure to moisture until used. The Contractor shall pile the sacked material to permit access for tally, inspection and identification for each shipment.

The Contractor shall provide adequate facilities to assure that the Contractor shall keep the mineral admixtures separated and to insert only the specified mineral admixtures from entering the work. The Contractor shall provide safe and suitable facilities for sampling mineral admixtures.

The Contractor shall incorporate the mineral admixtures into concrete using equipment conforming to 601.05(A) - Portland Cement.

When the Contractor mixes the concrete completely in paving or continuous mixers, the Contractor shall weigh the mineral admixture in a separate weigh hopper. The Contractor shall introduce the mineral admixture and cement simultaneously into the mixer with the aggregate proportionately.

When the Contractor requires interlocks for cement charging mechanisms and weigh the cement and mineral admixtures cumulatively, the Contractor shall interlock their charging mechanisms. The Contractor shall interlock them until the weight of cement in the weigh hopper is within the tolerances specified in Subsection 601.05(A) - Portland Cement.

In deciding the maximum amount of free water that the Contractor may use in the concrete, the Contractor shall consider the mineral admixture to be cement.



(E) **Bins and Scales.** The batching plant shall include separate and adequate bins for each size of aggregate. If the Contractor uses cement in bulk, the Contractor shall include a separate and adequate bin and weighing hopper.

The Contractor shall attach the cement weighing hopper to a separate scale for individual weighing or the Contractor may attach to the aggregate scale for cumulative weighing. If the Contractor weighs the cement cumulatively, the Contractor shall weigh the cement before the other ingredients.

Scales for batching shall be of the springless-dial or beam-type. When the Contractor uses beam-type scales, the Contractor shall make provisions to show the operator that the required load in the weighing hopper is approaching. The device shall show within the last two hundred (200) pounds of load and within fifty (50) pounds of overload.

Scales shall be accurate to 0.5 percent throughout the range of use. The Contractor shall design poises to lock so that the Contractor prevents unauthorized change of position. The State Measurement Standards Branch of the Department of Agriculture shall inspect the scales to assure their continued accuracy. The Contractor shall have not less than ten (10) fifty (50) pound weights for testing scales.

The supplier may equip batching plants to proportion aggregates and bulk cement by automatic weighing devices of accepted types.

(F) **Batching and Hauling.** To check the accuracy of batch weights, the Contractor shall resolve the gross and tare weights of batch trucks, truck mixers, and truck agitators when ordered. The Contractor shall weigh the equipment on certified scales at no cost to the State.

When mixing is at the work site, the Contractor shall transport the aggregates from the batching plant to the mixer. The Contractor shall transport the aggregates in batch boxes, vehicle bodies, or other containers of adequate capacity and construction. Partitions separating batches shall be adequate and effectively prevent spilling from one compartment to another while in transit or dumping. When the Contractor uses bulk cement, the Contractor shall use a suitable method for handling the cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer. The Contractor shall arrange batching and hauling to provide positive assurance of the actual presence in each batch of the entire cement content specified.

The Contractor shall transport bulk cement to the mixer in tight compartments carrying the full quantity of cement required for the batch. When the Contractor places cement in contact with the aggregates, the Engineer may reject the batches unless the Contractor mixes and places them within one and a half (1-1/2) hours from contact. The Contractor may transport cement in original shipping packages on top of the aggregates. Each batch shall contain the number of sacks required by the job mix.

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The Contractor shall deliver the batches to the mixer intact. The Contractor shall dump each batch into the mixer without loss of cement. Also, when the Contractor carries more than one batch on the truck, the Contractor shall dump the batch into the mixer without spilling the material from one batch compartment into another.

**601.06 Mixing.** The Contractor shall mix concrete in mechanically operated mixers. When the Engineer permits, the Contractor may mix batches not exceeding one-third (1/3) cubic yard by hand methods described in Subsection 601.07.

Mixers may be stationary or truck mixers. The mixer shall produce concrete uniform in color, appearance and distribution of the materials throughout the mass. Variation in the mixed concrete attributable to worn pickup or throw over blades will be just cause for inspection. If such inspection reveals the blades to be worn down more than one (1) inch below the original height of the manufacturer's design, the Contractor shall repair or replace the blades. The Contractor shall make a copy of the manufacturer's design, showing dimensions and arrangement of blades upon request.

The Contractor shall charge the batches into central or truck mixers so that a portion of the mixing water shall enter ahead of the cement and aggregates. The flow of water shall be uniform. Water shall be in the mixer by the end of the first quarter (1/4) of the mixing period. If the Contractor uses mixers having multiple compartment drums, the Engineer will consider the time required to transfer material between compartments mixing time. The speed at which the drum shall rotate shall be as designated by the manufacturer. If such mixing does not have a uniform and smooth texture, the Contractor shall give additional revolutions at the same speed until the Contractor secures a thorough mixing of each batch of concrete. The Contractor shall measure the mixing time from the time cement, aggregates, and sixty (60) percent of the water are in the drum. The volume of concrete mixed in each batch shall not exceed the manufacturer's guaranteed capacity. The Engineer will consider the guaranteed capacity of a mixer to be the manufacturer's rated capacity.

The Contractor shall equip central or truck mixers with an attachment for automatically timing the mixing of each batch of concrete. The timing device includes an automatic arrangement for locking the discharge chute and a device for warning the operator when the Contractor has mixed the materials the required length of time. If the timing or locking device become broken or fail to operate, the Contractor shall immediately place before the mixer operator a clock or watch having a second hand. If the Contractor fails to make repairs within three (3) days after the timing or locking device becomes unserviceable the Contractor shall shut down until the Contractor makes the proper repairs.

The required mixing time in stationary mixers shall be between fifty (50) seconds and five (5) minutes. The mixing time shall be as necessary to produce concrete that meets the uniformity criteria when tested according to Section 10.3.3 of ASTM C 94. The Contractor may designate the mixing time between fifty (50) seconds and five (5) minutes to do the uniformity tests. The mixed

concrete shall meet the uniformity requirements specified before the Contractor uses concrete for pavements or structures. The Engineer may allow the use of test concrete for appropriate incidental construction. The Contractor shall furnish labors, sampling equipment, and materials required for uniformity tests of the concrete mixture. The Engineer will furnish required testing equipment including scales, cubic measure, and air meter. The Engineer will do the test. The Engineer will not make payment for the labor, equipment, materials, or testing. The Engineer will consider them incidental to the concrete. After the Contractor establishes operational procedures of batching and mixing, the Engineer will not permit changes in procedure without re-establishing procedures by uniformity tests. The Contractor shall repeat the mixer performance tests whenever the appearance of the concrete or the coarse aggregate content of samples is not according to ASTM C 94. For truck mixers, the Contractor shall add (4) seconds to the specified mixing time if timing starts the instant the skip reaches its maximum raised position.

The Contractor shall mix the truck mixed concrete at the proportioning plant. The mixer shall operate at agitating speed while in transit. The Contractor may mix the truck mixed concrete at the point of delivery provided the Contractor adds the cement, or cement and mixing water, at that point. Mixing of truck mixed concrete shall begin immediately after the introduction of the mixing water to the cement and aggregates, or introduction of the cement to the aggregates.

A truck mixer includes a water tight revolving drum suitably mounted and fitted with adequate blades, and equipped with electrically or mechanically actuated revolution counters. Truck mixers shall produce a thoroughly mixed and uniform mass of concrete and shall discharge concrete without segregation.

The Contractor shall attach a metal manufacturer's standard rating plate to each truck mixer permanently. The rating shall state its maximum capacity in terms of volume of mixed concrete for the various uses. The Contractor shall also attach a manufacturer's data plate to each truck mixer. The data plate shall state the maximum and minimum mixing speeds and other data desired by the manufacturer. If the Contractor uses the truck mixers for mixing, the volume of concrete in each batch shall not exceed the maximum capacity shown on the metal rating plate. If the equipment does not have a rating plate, an attested copy of the manufacturer's rating shall suffice or the batch volume shall not exceed sixty-three (63) percent of the gross interior volume.

The Contractor shall operate truck mixers at the speed of rotation designated by the manufacturer. The mixing speeds for the revolving drum type shall be between six (6) and eighteen (18) revolutions per minute. The Contractor shall mix truck mixed concrete initially between seventy (70) and one hundred (100) revolutions per minute at mixing speed after the ingredients including water are in the mixer. When the batch volume does not exceed sixty-three (63) percent of the gross volume of the drum or ninety-one

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(91) percent of the rated maximum capacity, the number of revolutions required for mixing shall be between fifty (50) and one hundred (100) revolutions per minute. The Contractor may add water to the mixture not more than two (2) times after the Contractor completes the initial mixing. Each time the Contractor adds water, the Contractor shall turn the drum an additional thirty (30) revolutions or more at mixing speed until the Contractor mixes the concrete uniformly.

When the Contractor furnishes shrink-mixed concrete, the Contractor shall transfer the concrete that the Contractor has partially mixed at a central plant to a truck mixer. Requirements for transit-mixed concrete shall apply. The Engineer will not allow credit in the number of revolutions at mixing speed for partial mixing in a central plant.

When the Engineer permits hand mixing, the Contractor shall make hand mixing in batches not more than one-third (1/3) cubic yard and mix on a watertight, level platform. The Contractor shall measure the proper amount of coarse aggregate in measuring boxes and spread on the platform. The Contractor shall spread the fine aggregate on this layer. The coarse aggregate and fine aggregate layers shall not be not more than one (1) foot in total depth. The Contractor shall spread dry cement on this mixture. The Contractor shall turn the whole mass not less than two (2) times dry. The Contractor shall then add sufficient clean water and distribute evenly. The Contractor shall turn the whole mass again not less than three (3) times not including placing in the carriers or forms.

**601.07 Transporting Mixed Concrete.** The Contractor may transport mixed concrete to the delivery point in:

- (1) truck agitators, or
- (2) truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or
- (3) in non-agitating hauling equipment, provided the:
  - (a) consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place and
  - (b) provided the mixed concrete after hauling to the delivery point conforms to the uniformity criteria when tested as specified in Section 10.5.1 of ASTM C 94.

A truck agitator includes a watertight revolving drum or a watertight container suitably mounted and fitted with adequate revolving blades and a removable cover. The Contractor shall operate truck mixers or truck agitators within the limits of capacity and speed of rotation designated by the manufacturer for agitating. Agitators shall not exceed eighty (80) percent of gross drum volume. Agitating speed for both the revolving drum mixers and

revolving blade type agitators shall be between two (2) and six (6) revolutions per minute of the drum or of the mixing blades. The Contractor shall equip truck mixers or truck agitators with electrically or mechanically actuated counters. The Contractor shall actuate the counters after the introduction of the cement to aggregates.

Bodies of non-agitating hauling equipment shall be smooth and watertight metal containers equipped with gates that will permit control of discharge of the concrete. The Contractor shall provide accepted covers for protection against weather. When the Contractor hauls concrete in non-agitating trucks, the Contractor shall complete the discharge within thirty (30) minutes after introduction of the mixing water to the cement and aggregates.

When the Contractor uses a truck mixer or agitator for transporting concrete to the delivery point, the Contractor shall complete the discharge:

- (1) within one and a half (1-1/2) hours or
- (2) before two hundred and fifty (250) revolutions of the drum or blades for central mixed concrete, or three hundred (300) revolutions of the drum or blades for truck mixed concrete, whichever comes first after the introduction of the:
  - (a) mixing water to the cement and aggregates, or
  - (b) cement to the aggregates.

In hot weather or under conditions contributing to quick stiffening of the concrete, the Contractor shall reduce the time specified by the Engineer.

The manufacturer of truck mixed concrete and of central mixed concrete shall furnish the Engineer a delivery ticket with each truck load of concrete before unloading at the jobsite. The printed, stamped, or written delivery ticket shall have the following information:

- (1) Name of concrete plants,
- (2) Serial number of ticket,
- (3) Date and truck number,
- (4) Name of Contractor,
- (5) Specific project, route, or designation of job (name and location),
- (6) Specific class or designation of concrete according to the contract,
- (7) Quantity of concrete in cubic yards,
- (8) The time the Contractor loads the batch or first mixing of cement and aggregates occurs,

- (9) Name and quantity of admixture, if any, |
- (10) Readings of non-resettable revolution counters of truck mixers after the introduction of the cement to aggregates, or the introduction of the mixing water to the cement and aggregates, |
- (11) "Central Mixed" or "Premixed" if the Contractor mixes the concrete completely in a central mixer. \* |

The Contractor shall furnish additional information designated by the Engineer and required by the job specification upon request. \*

**601.08 Consistency.** The Contractor shall regulate the amount of water used in concrete mixes so that the consistency of the concrete is according to AASHTO T 119 and the nominal slump range is according to Table 601-II. When the Contractor finds the slump of the concrete to exceed the nominal slump, the Contractor shall adjust the mixture of subsequent batches. \*

The Contractor shall gage the consistency of the concrete by the ability of the equipment to properly place the concrete, not by the difficulty in mixing, transporting, or pumping. The Engineer will reject harsh or unworkable concrete that the Contractor cannot place properly. The Contractor shall remove them at no cost to the State. \*

The slump for concrete shall be as specified in Table 601 -II.

TABLE 601-II - SLUMP FOR CONCRETE		
Type of Work	Nominal Slump Inches	Maximum Slump Inches
Concrete Pavements	0 - 3	3 1/2
Reinforced Concrete Structures		
Sections Over 12 Inches Thick	0 - 4	5
Sections 12 Inches Thick or Less	2 - 5	6
Non-reinforced Concrete Facilities	1 - 3	4
Concrete Placed Underwater	6 - 8	9
Bridge Decks	0 - 3	3 1/2

If adverse or difficult conditions exists, the Contractor may exceed the above specified slump limitation if permitted by the Engineer in writing before the Contractor maintains placement of concrete and the water-cement ratio. The cost of additional cement and water, or admixture shall be at no cost to the State. The Engineer will not allow additional compensation. \*

601.09 **Forms.** The Contractor shall construct forms according to the applicable sections of the contract. \*|

601.10 **Placing Concrete.** The Contractor shall place concrete according to the applicable sections of the contract. \*|

601.11 **Finishing Concrete Surfaces.** The Contractor shall finish concrete surfaces according to the applicable sections of the contract. \*|

601.12 **Curing Concrete.** The Contractor shall cure the concrete according to the applicable sections of the contract. \*|

601.13 **Method of Measurement.** The Engineer will measure concrete according to the applicable sections of the contract. \*|

601.14 **Basis of Payment.** The Engineer will pay for the accepted concrete according to the applicable sections of the contract. \*|