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DIVISION V

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SECTION 501

TOLERANCE IN PAVEMENT THICKNESS

It is the intent of these specifications that all pavement shall be constructed in accordance with the details and to the thickness shown on the plans. After the street pavement is complete, should any question arise as to a possible deficiency in pavement thickness, at any location; then core specimens shall be cut from the completed pavement at these locations. If the average thickness of the pavement as determined by caliper measurements of the cores made in accordance with AASHTO T-148, shows the average pavement thickness to be equal to or greater than the specified thickness or not more than 5 % less than the specified thickness the Contractor will receive full payment for the pavement in question; provided that any core which shows a total pavement thickness greater than the specified thickness or a core which shows a deficiency of more than 10% below the specified thickness shall not be used in calculating the average pavement thickness. It being the intent of these specifications to reject any pavement which is more than 10% deficient in thickness.

Should the average pavement thickness, determined as described above, be between 5% and 10% less than the specified thickness then the Contractor may accept reduced payment for the area represented by the cores made, in accordance with the following schedule:

<u>Deficiency in Thickness Per Cent of Total</u>	<u>Reduction in Contract Prices</u>
Less than 5%	None
5% to 6%	10%
6% to 7%	20%
7% to 8%	30%
8% to 9%	40%
9% to 10%	50%
More than 10%	No Payment*

*Portland cement concrete pavement must be removed and replaced to specified thickness. Asphaltic concrete pavement must be brought to specified thickness by applying tack coat and an overlay of surface material in not less than one (1) inch increments.

The Contractor shall pay for all cores regardless of the average total thickness.

When approved by the Engineer, the Contractor may correct any pavement thickness between 5% and 10% deficiency, after which he will receive full payment.

Each core taken will be assumed to represent the thickness of the pavement for a longitudinal distance of one hundred (100) feet, fifty (50) feet on each side of the core location and transversely for one-half (1/2) street width. The Contractor may make and pay for additional cores to define any section of pavement which shows to be deficient in thickness, to within closer limits than set out above, if he so desires.

Core holes shall be filled with material matching the pavement from which the cores were cut, in an acceptable manner and at the expense of the Contractor.

SECTION 502

SLURRY SEAL SURFACE TREATMENT

502.01 DESCRIPTION: This work shall consist of a mixture of emulsified asphalt, mineral aggregate, and Portland cement or hydrated lime filler, proportioned, mixed and spread on a pavement surface where shown on the plans, as specified herein, and as directed by the Engineer.

502.02 MATERIALS: Materials shall meet the requirements of Section 704.

502.03 EQUIPMENT: The slurry seal coat shall be mixed in either continuous type spiraled blade or pugmill mixers. The mixers shall be in approved condition and equipped with calibrated controls to measure the proper amount of asphalt emulsion, water, filler and aggregates.

(A) Spreading Equipment: The slurry mixture shall be uniformly spread by means of a controlled spreader box conforming to the following requirements:

1. The spreader shall have strips of flexible rubber belting or similar material on each side of the spreader box and in contact with the pavement to prevent loss of slurry from the box.
2. The box shall have baffles, augers or other suitable means to insure uniform application on super-elevated sections and shoulder slopes.
3. The rear flexible strike-off blade shall be adjusted to obtain a uniform spread of the slurry seal coat at the specified rate.
4. A basket shaped sieve of ½ inch mesh or other approved device shall be provided on the slurry machine to collect oversized aggregate particles and debris.
5. Surface texture shall be applied with an approved drag. The drag, two feet wider than the spreader box, may be attached to the spreader box. The drag shall be maintained clean and free from encrusted material. Drags that cannot be cleaned shall be replaced.

Slurry mixture to be spread in areas inaccessible to the controlled spreader box may be spread by other methods approved by the Engineer.

502.04 CONSTRUCTION: The slurry seal coat shall be applied at the minimum rate shown on the plans or specified in the proposal. Prior to the application of the slurry seal, the Contractor shall place a trial panel, at a location established by the Engineer, to demonstrate mix uniformity and that the mix complies to the requirements of proportioning the asphalt, filler, aggregate and weight per square yard in place. From this demonstration panel it will be determined by the Engineer whether or not the mix is acceptable as the job mix. The exact proportions will then be determined and job mix established by the Engineer.

Slurry seal coats shall not be placed when the atmospheric temperature is below 60 degrees F. or during wet weather. Prior to placing the slurry seal coat, all dirt, mud, trash, or other loose materials shall be cleaned from the area to be covered. A leveling course of slurry seal shall be applied to those highway extents deemed necessary by the Engineer. The leveling course shall be adequately cured as determined by the Engineer before the final surface treatment

SECTION 502 - SLURRY SEAL SURFACE TREATMENT

course is applied. Immediately preceding the placement of the slurry seal mixture, the pavement surface shall be uniformly dampened with a fog coat of dilute asphalt emulsion in a manner approved by the Engineer and at a rate not to exceed 0.10 gallon per square yard of surface.

Hand tools shall be available in order to remove spillage, ridges, or bumps in the finished slurry seal course. Work shall be completed early enough to allow traffic to safely travel over finished work before dark.

502.05 METHOD OF MEASUREMENT: Slurry seal coat will be measured by the square yard for the specified thickness of completed and accepted work. If a second application is deemed necessary, it shall be measured for payment unless it is from causes for which the Contractor is responsible.

502.06 BASIS OF PAYMENT: The accepted quantity, measured as specified above, will be paid for at the contract unit price for:

Slurry Seal Coat-----SQ. YD.

which shall be full compensation for furnishing all materials, equipment, labor and incidentals to complete the work as specified.

SECTION 503

ASPHALT CONCRETE

503.01 DESCRIPTION: This item shall consist of one or more courses of compacted asphalt concrete leveling, binder and/or surface course. The mixtures shall be composed of a mineral aggregate uniformly coated with an approved asphalt cement and shall be laid upon a previously compacted and approved subgrade or overlay of an existing street. Thicknesses of the various courses shall be as shown on the plans for each project constructed under these specifications.

503.02 MATERIALS: Materials shall meet the requirements specified in Section 708 of these specifications.

The bituminous plant mix shall be composed of a mixture of aggregate, filler, if required, and bituminous material.

Prior to use, samples of all materials proposed to be used under these specifications shall be submitted to an approved laboratory for test and for preparation of trial mixtures to determine the initial job-mix formula. The cost of job-mix design shall be borne by the Contractor. Asphalt shall be 85-100 penetration unless otherwise specified. A Certificate of Compliance in accordance with Subsection 105.11 of these specifications will be required for the asphalt. Local materials will be approved for use when they meet the gradation and other requirements specified herein, except for surface courses, as noted in Section 705 of these specifications. Proportioning of the various materials entering into the asphalt mixture shall be as directed by the laboratory and in accordance with these specifications. The Engineer or his representative shall have access at any time to all parts of the paving plant. Satisfactory equipment and construction methods shall be used as hereinafter specified.

After the plant is in operation, a satisfactory job-mix formula will be determined. Any appreciable changes from the laboratory approved job-mix formula will be retested by the laboratory.

The job-mix formula with the allowable tolerances shall be within the master range specified for the particular type of bituminous concrete. The job-mix formula for each mixture shall be in effect until modified in writing by the Engineer. The job-mix formula for each mixture shall establish a single percentage of bituminous material to be added to the aggregate, and a single temperature at which the mixture is to be delivered at the point of discharge.

After the job-mix formula is established, all mixtures furnished for the project shall conform thereto with the following ranges of tolerances:

Passing No. 4 and larger sieves	± 5 per cent
Passing No. 8 to No. 100 sieves (incl.)	± 4 per cent
Passing No. 200 sieve	± 2 per cent
Bitumen	± 0.4 per cent
Temperature of mixture	± 20 degrees F.

The above variations from the job-mix formula shall not permit the use of any mix which would be outside of the specification limits through the applications of the variations.

Should a change in sources of materials be made, a new job-mix formula shall be established before the new material is used. When unsatisfactory results or other conditions make it necessary, the Engineer may establish a new job-mix formula.

SECTION 503 - ASPHALT CONCRETE

503.03 EQUIPMENT REQUIREMENTS: All plants and equipment used by the Contractor for the preparation, laying and compaction of materials under these specifications shall meet the requirements of the current Standard Specifications for Highway Construction of the Oklahoma State Highway Commission.

503.04 CONSTRUCTION METHODS:

(A) Inspection and Control of Asphalt Mixing Plants:

1. General: For verification of weights and measures, character of materials and determination of temperatures used in the preparation of the paving mixes, the Engineer or his authorized representative will at all times have access to all portions of the mixing plant, aggregate plant, storage yards and other facilities for producing and processing the materials of construction. All sampling and testing of processed and unprocessed material shall be under the control and direction of the Engineer, and shall be accomplished in accordance with the provisions set forth in these specifications.
2. Job-Mix Formula: The Engineer will make frequent gradation analysis of the completed mix as provided in the special provisions, to be certain that the materials being used and produced are within the tolerances of the job-mix formula and the specifications for the mix number being used. If the mix is found to be outside of the job-mix formula tolerances, or outside of the specification limits, correction shall be made in quantities measured from the hot bins and adjustments made at the cold bin feeders.
3. Sampling and Testing: Stockpiles and bins may be sampled for gradation analysis and examined for dust coating and for other purposes, in compliance with stated requirements.

Gradation analysis of each hot bin may be performed and a combined analysis computed twice a day, once in the forenoon, and once in the afternoon. A combined gradation analysis may be performed twice a day. If materials do not run uniform, more frequent tests will be made. When requested by the Engineer, the Contractor shall provide representative samples by taking aggregate from the discharge of the aggregate through each of the hot bin gates, or by drawing aggregate from each bin through the mixing chamber (without asphalt) into a truck or other receptacle. At least one sample will be taken from each 300 tons of the mix being produced. Samples will be used to determine compliance with general and special requirements set forth in these specifications.

(B) Preparation of Area to be Paved: The area to be paved shall be true to line and grade, and have a dry and properly prepared surface prior to the start of paving operations. It shall be free from all loose screenings and other loose or foreign material.

Where a base is rough or uneven, a leveling course shall be placed by use of a paver or motor grader and shall be properly compacted before the placing of subsequent courses.

When a leveling course is not required, all depressions and other irregularities shall be patched or corrected and the work approved by the Engineer before the paving operation begins. All fatty and unsuitable patches, excess crack or joint filler, and all surplus bituminous material shall be removed from the area to be paved. Blotting of excessive deposits of asphalt with sand or stone shall not be permitted.

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Where the area to be paved is a prepared soil or aggregate base, it shall be primed in accordance with Section 412 of these specifications. The prime coat shall consist of an application of the asphalt material indicated, and at the rate specified. The prime coat shall be allowed to cure properly before any further operations are permitted on the primed area.

A tack coat shall be applied when the surface to be paved is an existing portland cement concrete, brick or asphalt pavement. When a tack coat is required, it shall consist of an application of the asphalt material indicated, and at the rate specified in Section 411 of these specifications.

The surface of curbs, gutters, vertical faces of existing pavement and all structures in actual contact with asphalt mixes shall be painted with a thin, complete coating of asphalt material to provide a closely bonded watertight joint.

(C) Preparation of Paving Asphalt: The asphalt shall be heated at the paving plant to a temperature at which it can be uniformly distributed throughout the mix. It shall be delivered into the Contractor's tank at a temperature not exceeding 350 degrees F. and shall not be heated above this temperature for any operation of the paving plant.

(D) Preparation of Handling of Aggregates: Coarse and fine aggregates shall be stored at the plant in such a manner that the separate sizes will not become intermixed. Cold aggregates shall be carefully fed to the plant in such proportions that surpluses and shortages in the hot bins will not cause breaks in the continuous operation. When loading aggregate into stockpiles and trucks the material shall be placed in such a manner as to prevent segregation of aggregate sizes. Coarse and fine aggregate shall be sampled and tested upon arrival at the plant in accordance with the standard methods. Samples of coarse and fine aggregate shall be submitted to the Engineer for testing prior to the start of work, and as often thereafter as requested by the Engineer.

When coarse aggregate grading is such that the material will tend to segregate during stockpiling or handling, it shall be supplied in two or more sizes. Each size of coarse aggregate required to produce the combined gradation specified shall be placed in individual stockpiles at the plant site and separated by bulkheads or other means approved by the Engineer. Likewise, when it is necessary to blend fine aggregates from one or more sources to produce the combined gradation, each source or size of fine aggregate shall also be placed in individual stockpiles. Aggregate from the individual stockpiles shall be fed through separate bins to the old elevator feeders. They shall not be blended in the stockpile.

1. Drying: The aggregate shall be thoroughly dried and heated to provide a paving mix temperature within a tolerance ± 20 degrees F., of that specified by the Engineer. The moisture content of the heated and dried aggregate shall not exceed 0.5 percent. The quantity of material fed through the dryer shall in all cases be held to an amount which can be thoroughly dried and heated in accordance with that specified in "Proportioning and Mixing".
2. Screening: Aggregates shall be screened into sizes such that they may be recombined into a gradation meeting the requirements of the job-mix formula.
3. Hot Aggregate Storage: Hot screened aggregate storage shall be accomplished in such a manner as to minimize segregation and loss of temperature of the aggregate.

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(E) Mixing:

1. The aggregates shall be combined in the mixer in the amount of each fraction of aggregates required to meet the job-mix formula. The bituminous material shall be measured or gauged and introduced into the mixer in the amount specified by the job-mix formula. The moisture content of the bituminous mixture at the point of discharge shall not exceed 2 per cent.

2. When batch type mixers are used, the dry mixing time shall be from 2 to 20 seconds after which the asphalt cement shall be added and the mixing continued for a period necessary to produce a homogeneous mixture in which all particles of the mineral aggregate are uniformly coated. Wet mixing time shall be determined by the Engineer for each plant and for each type of aggregate used.

3. When continuous type mixers are used, the pugmill blades shall be so adjusted as to retard the flow of material through the mixer as may be required to produce a homogeneous mixture in which all particles of the mineral aggregate are uniformly coated. Mineral filler may be added in continuous type mixers after a premixing period of aggregate and asphalt but the device for introducing the mineral filler shall be driven from the same power unit through positive chain or gear drives so that it will be interlocked with the pump and aggregate feed. Suitable means shall be provided for accurate calibration with weight samples.

4. When dryer drum mixers are used, the cold aggregates and bituminous materials in job-mix formula proportions shall be introduced into the dryer in a manner approved by the Engineer.

The position and shielding of the burner; the length of the flame; the length, slope, rotational speed and configuration of the dryer; air velocity controls; rate of feed and stack temperature shall be so designed and operated to produce a well-coated homogeneous bituminous mixture meeting the requirements of Section 705 for the type specified.

(F) Loading: Precaution shall be taken to prevent segregation of materials in the mixture.

(G) Tack Coat: Tack coat, if required, shall be in accordance with Section 411.

(H) Weather Limitations: The minimum air temperature in the shade at which asphalt concrete may be laid shall be 35 degrees F. if rising, or 40 degrees F. if falling. Asphalt concrete shall not be laid when there is frost in the foundation course. When a strong wind is blowing or conditions otherwise are such that the material becomes chilled to an extent which prevents proper leveling and thorough consolidation, the laying of the asphalt concrete shall be stopped.

(I) Spreading and Finishing: The asphalt mixture shall be laid with a paver meeting the requirements of Subsection 503.03 at a temperature of from 225 degrees F. to 325 degrees F. and only upon an approved surface which is dry. The mixture shall be delivered on the job at an optimum workable temperature which will produce the density herein specified after final compaction. After the optimum workable temperature is determined, it shall not vary more than ± 20 degrees F.

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The alignment of one edge of the asphalt mixture shall be established by a string or wire line in advance of the placing of the asphalt mixture.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked and luted by hand tools. For such areas the mixture shall be dumped, spread and screeded to give the required compacted thickness. Broadcasting shall not be permitted.

Placing of mixtures shall be as continuous as possible.

When production of the mixture can be maintained and when practical, pavers may be used in echelon to place the wearing course in adjacent lanes. The roller shall pass over the unprotected edge of the fresh laid mixture only when the laying of this course is to be discontinued for such length of time as to permit the mixtures to become chilled.

In placing a leveling course with the spreading and finishing machine, binder twine or cord shall be set to line and grade established by the Engineer. When directed by the Engineer, the material may be spread with an approved leveling device.

Immediately adjacent to curbs, gutters, manholes, and other structures, the wearing course mixture shall be spread uniformly high so that after compaction it will be approximately 0.25 inch above the edges of such structures. Before placing mixture against them, all contact surfaces of curbs, gutters, headers, manholes, etc., shall be cleaned and painted with a thin uniform tack coat of a type specified herein.

(J) Joints: Longitudinal and transverse joints on succeeding lifts shall be staggered approximately 7 inches and made in a careful manner.

The longitudinal joints in the surface layer shall be at lane lines.

Well bonded and sealed joints are required. Joints between old and new pavements or between successive days' work, shall be carefully made in such a manner as to insure a thorough and continuous bond between the old and new surfaces. The edge of the previously laid course shall be cut back to its full depth so as to expose a fresh vertical surface, after which the edge shall be painted with a tack coat and the hot mixture shall be placed in contact with it and raked to a proper depth and grade.

(K) Compaction: As soon after being spread as it will bear the compaction equipment without undue displacement, the asphalt mixture shall be thoroughly and uniformly compacted.

Unless otherwise directed, compaction shall begin at the sides and proceed longitudinally parallel to the road center line and gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be compacted first, followed by the regular compaction procedure. On super-elevated curves the compaction shall begin at the low side and progress to the high side by overlapping of longitudinal trips parallel to the center line.

Self-propelled pneumatic tired rollers shall be used on the wearing course following the initial rolling with steel wheel roller and before finish rolling with steel wheel roller. The surface course shall be rolled a minimum of two coverages with pneumatic tired roller or until the surface is sealed as approved

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by the Engineer. Compactors shall move at a low but uniform speed with the drive roll nearest the paver. Compaction shall be continued until all marks are eliminated and a minimum density of 95 percent of a laboratory compacted density has been obtained.

The Contractor shall cut test samples from the pavement by sawing or coring at locations and times established by the Engineer. The cost of cutting samples and placing new materials and finishing satisfactorily areas where samples have been taken will be included in the price bid for mixture in place.

Any displacement occurring as a result of the reversing of direction of a compactor, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in compaction not to displace the line and grade of the edges of the bituminous mixture.

Adhesion of the mixture to the compactors will not be permitted.

Along forms, curbs, headers, walls, and other places not accessible to the compaction equipment, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers. A trench compactor to transmit compression to a depressed area may be used when approved by the Engineer.

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective shall be removed and replaced with fresh hot mixture, which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of bituminous material shall be removed and replaced at the expense of the Contractor.

(L) Tolerances: The tolerances allowable on the surface course will be as indicated by the table below, for the category of facility being constructed:

a. Local Street	1/4" in 10'
b. Collectors	1/4" in 10'
c. Arterial	1/8" in 10'

A 10 foot straightedge furnished by the Contractor shall be held in successive position parallel and perpendicular to the street center line in contact with the surface, and the entire area checked from one side to the other. Corrective action, if required, will be by a suitable method of grinding or cutting.

(M) Testing Schedule, General: The following testing will be required on mixes produced under these specifications:

1. Job-Mix Design: The Contractor shall provide the City with a complete job-mix design accomplished by a laboratory approved by the City. A design need not be accomplished for each project, but the design for each project must have been accomplished not longer than six months before the commencement of the project. The Contractor will be responsible for the cost of the job-mix design.
2. Aggregates: The Contractor shall provide the contracting agency with copies of the tests required by Subsection 705.02 for each aggregate to be used on this project. If the contracting agency elects to have additional testing accomplished, they shall be responsible for the costs thereof.

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3. Asphalt: The Contractor shall obtain from his asphalt supplier, and furnish the contracting agency with, a Certificate of Analysis of each different type and grade of asphalt used on the project. All asphalt products will be required to meet the provisions of the Standard Specifications for Highway Construction of the Oklahoma Highway Commission. If the owner elects to have additional testing accomplished on the asphalt materials, he shall be responsible for the cost of same.

503.05 METHOD OF MEASUREMENT: Asphalt concrete pavement shall be measured by the square yard of the specified thickness and types of courses in place and accepted.

503.06 BASIS OF PAYMENT: The accepted quantities measured as provided above, will be paid for at the contract unit price for:

- Asphaltic - Concrete Type A----- Tons
- Asphaltic - Concrete Type B----- Tons
- Asphaltic - Concrete Type C----- Tons

which shall be compensation in full for preliminary tests and for all additional tests required by these specifications, for furnishing all materials, labor, equipment, tools and incidentals, and for performing the work in accordance with these specifications. No payment will be made for tack coat material used in painting longitudinal construction joints, curbs, gutters, headers, manholes, etc.

SECTION 504

PORTLAND CEMENT CONCRETE PAVEMENT

504.01 DESCRIPTION: This work shall consist of a pavement composed of Portland cement concrete, with or without reinforcement as specified, constructed on a prepared subgrade or base course in accordance with these specifications and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

504.02 MATERIALS:

(A) Materials shall meet the requirements specified in the following Subsections of Section 700 - Materials:

Portland Cement-----	701.01, .02
Air-Entraining Admixtures-----	701.03
Water-----	701.06
Fine Aggregate-----	701.07
Coarse Aggregate-----	701.08
Joint Seal-----	722.04, .05, .06
Joint Filler-----	722.01, .02, .03
Steel Reinforcement, Dowel Bars & Tie Bars-----	723.01, .02
Metal Caps for Dowel Bars-----	724.01
Metal Parting Strip-----	724.03
Curing Materials-----	734.01-734.06 Incl.
Chemical Admixtures for Concrete-----	701.04

504.03 EQUIPMENT: Equipment necessary for the proper construction of the work shall be on the project in first class working condition, before construction operations begin, and shall be approved by the Engineer as to design, capacity and mechanical condition. The Engineer shall have the right to reject any equipment which is not capable of producing the specified results, or which cannot be properly calibrated or controlled. Rejected equipment shall be replaced with approved equipment.

504.04 CONSTRUCTION METHODS:

(A) Subgrade Construction Requirements: The bottom of the excavation for the pavement or top of the fill shall be known as the pavement subgrade and shall conform to the lines, grades and cross sections shown on the plans.

All soft and yielding material and other portions of the subgrade which will not compact readily when rolled or tamped shall be removed as directed and replaced with suitable material placed and compacted as specified in Section 401.

The subgrade shall be brought to a firm and unyielding condition with a uniform density meeting the criteria established by the Engineer. It shall be compacted at or slightly above the optimum moisture content.

All utility trenches and structure excavations shall be backfilled to natural or finished grade as soon as conditions permit. All backfill shall be made with select soil. All backfilled areas which function as subgrade as described above shall meet the subgrade requirements specified in this section.

Concrete shall not be placed upon a soft, spongy or frozen subgrade or other subgrade, the stability of which is, in the opinion of the Engineer, unsuitable for the placement of concrete.

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Immediately prior to placing the concrete, the subgrade shall be tested for conformity with the cross section shown on the plans by means of an approved template riding on the side forms. If necessary, material shall be removed or added, as required, to bring all portions of the subgrade to the correct elevation. It shall then be thoroughly compacted and again tested with the template.

Concrete shall not be placed on any portion of the subgrade which has not been tested for correct elevation. The subgrade should also be cleared of any loose material which may have fallen upon it.

(B) Protection of Subgrade: The finished subgrade shall be maintained in a smooth and compacted condition until the concrete has been placed.

The mixer, ready-mix trucks, or other equipment shall not operate between the forms in the paving lane unless conditions of the job will not permit operation from the shoulder or outside the lane. Mixer or ready-mix trucks shall not be permitted to operate from previously paved lanes until the pavement is ready to open to traffic. When it is necessary to operate trucks between the forms and the trucks cause rutting or displacement of the subgrade material, either lighter trucks shall be used or suitable runways shall be provided. The Contractor shall re-roll or hand-tamp the subgrade to correct any ruts or other objectionable irregularities which may have been caused by the trucking of materials.

A berm shall be graded between the curb and sidewalk, or property line where there are no existing sidewalks, in a neat, workmanlike manner. All excess concrete and debris shall be removed from the excavation behind the curb line before backfilling.

(C) Sand Cushion: After the subgrade has been properly prepared, a layer of clean durable sand may be placed thereon, if required by the plans; and in accordance with Section 409; after which it shall be thoroughly wet down. The Sand shall be completely saturated to settle the sand and to moisten the subgrade.

(D) Batching: Measurement and batching of cement, fine and coarse aggregates shall be by weight on scales that are accurate to within 4/10 of one per cent. One sack of cement shall be considered to weigh 94 lb. net. Bulk cement and cement from fractional sacks shall be weighed.

(E) Composition of Concrete: The proportions of Portland cement, fine aggregate, coarse aggregate and water shall be such as to produce a dense, plastic concrete with a slump of not less than one (1) inch nor more than three (3) inches and which will have a minimum 28-day compressive strength of at least thirty-five hundred (3500) pounds per square inch when sampled and tested in accordance with ASTM, C31 and C39 or AASHTO, T23 and T22 respectively.

Unless otherwise herein provided, each cubic yard of concrete shall contain 564 lbs. (6.0 sacks) of cement \pm 2 per cent. The maximum size aggregate shall not exceed 30% of the pavement slab thickness.

All concrete shall be air-entrained and the volume of air in the freshly mixed concrete shall be based on the following tabulation:

<u>MAXIMUM SIZE OF COARSE AGGREGATE</u>	<u>AIR CONTENT BY VOLUME</u>
1-1/2", 2" and 2-1/2"	4% to 6%
3/4" to 1"	5% to 7%
3/8" to 1/2"	6-1/2% to 8-1/2%

SECTION 504 - PORTLAND CEMENT CONCRETE PAVEMENT

The entrained air shall be obtained either by using air-entraining cement or an air-entraining admixture that meets the applicable requirements of latest ASTM, and AASHTO specifications.

When high-early-strength concrete for pavement is specified or used, it shall be in accordance with Section 701.

The use of admixtures for any purpose other than air-entrainment will be permitted only with the written permission of the Engineer.

(F) Consistency: Slump shall be determined using AASHTO T-119 or ASTM JC-143. The Contractor shall keep a standard slump cone on the job at all times. Should water need to be added at the job site to increase slump within limits, the cement must be increased at the same time so that the water per sack of cement does not exceed 5.5 gallon per sack.

(G) Job Mixed Concrete: All handling, measuring and batching of materials; mixing of concrete and equipment used for job mixed concrete shall conform to the Standard Specifications for Highway Construction of the Oklahoma State Highway Commission.

(H) Ready Mixed Concrete: Ready-mixed concrete shall be mixed and transported in accordance with the current AASHTO Specifications for Ready-Mixed Concrete, Designation M-157.

When concrete is hauled in truck mixers, no more than 60 minutes shall elapse from the time water is added to the mix until the concrete is deposited in place at the site of work. Retempering concrete by adding water or by other means shall not be permitted.

When construction conditions are such that it is absolutely necessary for trucks hauling concrete to operate on the grade between forms they shall not back over previously deposited concrete.

(I) Measuring Air Content: The air content of freshly mixed air-entrained concrete may be checked at least twice daily. Concrete with air contents above or below the amount specified in Section 504.04(E) shall be corrected by adjust-ment in the mix design or quantities of air-entraining admixture being used.

The air content shall be measured in accordance with ASTM Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method (Designation C-231) or ASTM Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method (Designation C-173).

(J) Forms: Forms shall be made of metal and shall have a depth equal or greater than the prescribed edge thickness of the pavement slab, except when curb form is added after machine finishing. They shall have a base width of not less than eight (8) inches. The minimum length of each section of form used shall be ten (10) feet. Each section of form shall be straight, free from bends or warps.

The maximum deviation of the top surface of any section shall not exceed one-eighth (1/8) inch, or the inside face not more than one fourth (1/4) inch from a straight line. The method of connection between sections shall be such that the joint thus formed shall be free from movement in any direction. Forms shall be of such cross section and strength and so secured as to resist the pressure of the concrete when placed, and the impact and vibration of any equipment which they support, without springing or settlement.

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Each ten (10) foot length of form shall have at least three (3) form braces and pin sockets which shall be spaced at intervals of not more than five (5) feet, having the end brace and socket not more than six (6) inches from the end of the form. Approved flexible forms shall be used for construction where the radius is 150 feet or less.

(K) Setting Forms: The subgrade under the forms shall be compacted and cut to grade so that the form when set will be uniformly supported for its entire length at the specified elevation. Forms shall be joined neatly and in such a manner that the joints are free from play or movement in any direction. Forms shall be set, as herein specified. The supply of forms shall be sufficient to permit their remaining in place for at least 12 hours after the concrete has been placed. All forms shall be cleaned and oiled each time they are used.

(L) Grade and Alignment: The alignment and grade elevations of the forms shall be checked by the Contractor and the necessary corrections made by the Contractor immediately before placing the concrete. When any form has been disturbed or any subgrade thereunder has become unstable, the form shall be reset and rechecked.

(M) Placing, Consolidation and Finishing, General: The prepared subgrade shall be uniformly wet down by sprinkling with water in such a manner as to provide a damp surface at the time the concrete is to be placed on the subgrade. No concrete shall be placed unless the subgrade has been approved by the Engineer. When sand cushion is required, it shall conform to Section 504.04(C). The sequence of operations shall be the placing, strike-off and consolidation, floating if necessary, straightedging and final surface finishing.

1. Placing: Concrete shall be placed in such a manner as to prevent segregation of material, and in such a manner as to require as little rehandling as possible. Necessary hand spreading shall be done with shovels. Spreading of concrete with rakes or vibrators will not be allowed. Concrete shall be placed as uniformly as possible to the required depth and width of the construction lane in successive batches, and in a continuous operation between transverse joints without the use of intermediate bulkheads.

When the work is unavoidably suspended for a period longer than thirty (30) minutes after the placing of concrete has begun, or when the concrete has taken initial set, a transverse construction joint, in accordance with Section 504.04(G)(7) shall be constructed and placing of concrete completed to this joint. Where concrete is to be placed adjoining a previously constructed lane of pavement and mechanical equipment will be operated upon the existing lane of pavement, that lane shall have attained the strength specified for opening to traffic in accordance with Section 504.04(T).

Concrete shall be placed as near to expansion and contraction joints as possible without disturbing them but shall not be dumped onto a joint assembly. In the distribution of the concrete, care shall be taken to place a sufficient volume along the outside form lines so that the curb section can be consolidated and finished simultaneously with the slab.

No concrete shall be placed around manholes or other structures until they have been brought to the required grade and alignment. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.

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2. Strike-Off and Consolidation: Following the placing of the concrete, it shall be struck-off to a cross section and to an elevation such that when the concrete is properly consolidated and finished, the surface of the pavement will be in reasonably close conformity with the cross section and elevation shown on the plans or established by the Engineer. Strike-off and consolidation may be done with a mechanical finishing machine, vibrating screed or hand finishing methods when approved by the Engineer.

Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies.

Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. The vibrator shall never be operated longer than 15 seconds in any one location.

After the pavement has been struck off and consolidated, it shall be scraped with a straightedge, 10 feet long, equipped with a handle to permit operation from the edge of the pavement. Any excess water and latent material shall be removed from the surface of the pavement. The straight-edge shall be operated parallel to the centerline of the pavement and shall be moved forward one-half its length after each pass.

Irregularities shall be corrected by adding or removing concrete. All disturbed places shall be again straightedged. The use of long handled floats shall be confined to a minimum; they may be used only in emergencies and in areas not accessible to finishing equipment. The hand-operated float shall be a rigid straight-edge float with a troweling or smooth surface, not less than eight (8) inches nor more than twelve (12) inches in width.

Before final finishing is completed and before the concrete has taken its initial set, the edges of the slab and curb shall be carefully finished with an edger of the radius shown on the plans.

3. Finishing: A burlap drag or belt drag shall be used for a final finish. The burlap drag shall be at least three (3) feet wide and long enough to cover the pavement width. The belt drag shall be twelve (12) inches wide and long enough to cover the pavement width. The belt or burlap drag shall be kept clean and damp with water while in use. It shall be laid on the pavement surface and dragged in the direction in which the pavement is being placed. Belt surface finishing done by using a see-saw motion will not be permitted.

In general, adding water to the surface of the concrete to assist in finishing operations shall not be permitted. If it is permitted, it shall be applied as a fog spray with approved spray equipment.

Face forms may be removed as soon as the concrete has set sufficiently to retain its shape. The back forms shall be removed within twenty- four (24) hours after the concrete has been placed and any honeycombed areas shall be immediately filled with mortar after which curing compound shall be applied. The edges of all curbs shall be neatly rounded with the required edging tools. The top and front face shall be thoroughly floated with a moist wooden float, after applying clean water to moisten the surface, until all form marks are removed. The curb surfaces shall be checked with a ten (10) foot straightedge immediately after the removal of the forms and all variations greater than one-fourth (1/4) inch in ten (10) feet from true surface shall be corrected immediately. The final finish shall be

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obtained by uniformly brushing the entire top and front face of the curb before the concrete sets hard, using a brush and applying clean water during the operation. The brush strokes shall be made up the front face and outward across the top and vice versa.

During the finishing operation, the gutters shall be straightedged for their full length to prevent the formation of water pockets or low places. If, after completion, excessive irregularities exist in the gutters, the high spots shall be removed by rubbing with a carborundum stone or sections of pavement shall be removed and replaced to the satisfaction of the Engineer.

(N) Surface Tolerances and Test: In order to provide a riding surface of acceptable smoothness, reasonably accurate control shall be maintained in placing, spreading, consolidating and finishing the concrete pavement. The Contractor shall use equipment as may be required to provide a surface tolerance, not to exceed one-fourth (1/4") inch in ten (10) feet, nor one-sixteenth (1/16") inch deviation in one (1) foot.

As soon as the concrete has hardened sufficiently to permit foot traffic, the pavement surface shall be tested with a 10-foot straightedge or other approved device for compliance with the specified tolerances. Areas showing high spots exceeding these tolerances shall be removed with an approved grinding tool.

(O) Integral Curb: Integral curbs shall be required along the edges of all street pavement as indicated on the plans, except at such locations as the Engineer may direct. Depressed or lip curbs shall be provided at all driveway entrances and at such other locations as designated by the Engineer.

The integral curb shall be constructed immediately following the finishing operation. Special care shall be taken so that the curb construction does not lag the pavement construction and form a "cold joint".

Steel curb forms shall be required to form the backs of all curbs except where street returns of small radius or other special sections make the use of steel form impractical.

In placing concrete curb, sufficient spading shall be done to secure adequate bond with the paving slab and eliminate all voids in the curb.

Curbs shall be formed to the cross section as shown on the drawings with a mule or templates supported on the side forms and a wood float not less than four feet in length.

The finished surface of the curb and gutter shall be checked by the use of the 10-foot straightedge and corrected if necessary.

(P) Curing, General: Concrete shall be cured by protecting it against loss of moisture, rapid temperature change, and from rain, flowing water, and mechanical injury for a period of not less than 5 days from the beginning of the curing operations. Moist curing, waterproof paper, white polyethylene sheeting, liquid membrane compound or a combination thereof may be used for curing. Immediately after finishing operations have been completed, the entire surface of the newly laid concrete shall be covered by the curing medium which is applicable to local conditions and approved by the Engineer. The edge of concrete slabs exposed by the removal of forms shall be protected immediately to provide these surfaces with continuous curing treatment equal to the method selected for curing the slab surface and to prevent injury to pavement edges.

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The use of a covering material which contains or becomes contaminated with sugar in any form, tannic acid, or any other substances considered detrimental to portland cement, will not be permitted. The initial curing medium shall be effective and shall be applied so as to prevent checking, cracking, and the appearance of dry spots in the surface of the concrete. The Contractor shall have the equipment needed for adequate curing at hand and ready to install before actual concrete placement begins. In all cases in which the curing medium requires the use of water, the curing shall have prior right to all water supply. Failure to provide sufficient cover material of the type selected, failure to maintain saturation for the entire curing period in the moist-curing methods, lack of water to adequately care for both curing and other requirements, or other failures to comply with curing requirements shall be cause for immediate suspension of concreting operations.

1. Moist Curing: Moist curing shall be accomplished by covering of burlap, or other approved fabric mat, used singly or in combination.

Curing mats shall be thoroughly wet when applied and kept continuously wet and in intimate contact with the pavement surface for the duration of the moist curing period.

Other fabric mats shall be furnished in the widths or lengths, after shrinkage, required to cover the entire width and edges of the pavement lane. Mats or burlap shall be lapped at joints between adjacent sheets to prevent drying of this location. Moist curing, when used as initial curing, shall be continued for not less than 24 hours.

2. Waterproof Paper Curing: The surface of the concrete shall be wetted with a fine spray of water and then covered with the waterproof paper. The paper shall be in pieces large enough to cover the entire width and edges of the slab and shall be lapped not less than twelve (12) inches. Paper shall be adequately weighted to prevent displacement or billowing due to wind. Paper folded down over the side of the pavement edges shall be secured by a continuous bank of earth. Tears or holes appearing in the paper during the curing period shall be immediately repaired.

3. White Polyethylene Sheeting: White polyethylene shall meet the specifications under Section 734.05 and applied in accordance with Subsection 504.04(P)(2).

4. Liquid Membrane Curing Compound: Pigmented liquid membrane curing compound shall meet the specifications under Section 734.

The curing compound must be applied to cover the surface completely and uniformly at a rate which will achieve the performance requirement specified in AASHTO M-148. This method of curing shall be applied immediately behind the final finishing operation or after the initial curing when a combination of methods are used. Failure to provide complete and uniform coverage at the required rate will be cause for discontinuance of this method of curing and the substitution of one of the other approved methods. The compound shall be kept agitated to prevent the pigment from settling. Special care shall be taken to apply the curing compound to the pavement edges immediately after the forms have been removed. Minimum rate of application acceptable is one gallon per 200 square feet.

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(Q) Joints, General: All joints shall be constructed perpendicular to the surface of the pavement slab and shall be of the type, dimensions and at the locations shown on the standard drawings, unless otherwise specified on the plans. Suitable guides or devices shall be used to assure satisfactory alignment of the joints.

When joints are to be sawed, any procedure which results in premature and uncontrolled cracking or undue raveling, shall be immediately revised by adjusting the time interval between the placing of the concrete and the sawing of the joints.

The edges of the pavement and those joints where such edging is shown on the plans shall be rounded with an edger having a radius of not larger than 1/8 inch.

Transverse joints, except keyed and tied construction joints, shall be continuous across the entire paved area including the curb.

1. Transverse Joints: Transverse joints shall be contraction, expansion or construction joints. Contraction and expansion joints shall be placed as indicated above and construction joints wherever construction may require them. They shall make a right angle with the surface of the pavement.
2. Transverse Expansion Joints: Expansion joints shall be used only where shown on the plans or standard drawings. They shall extend the entire width of the pavement and from the subgrade to one (1) inch below the surface of the pavement. The filler shall be held accurately in place during the placing and finishing of the concrete by a bulkhead, a metal channel cap or other approved method.

Under no circumstances shall any concrete be left above the expansion material or across the joint at any point. Any concrete spanning the ends of the joint next to the forms shall be carefully cut away after the forms are removed.

Before the pavement is opened to traffic, the groove above the filler shall be cleaned and sealed with specified joint sealing material covered under Section 722.

3. Transverse Contraction Joints: Transverse contraction joints shall be of the sawed, formed dummy groove or premolded strip type.
4. Transverse Sawed Contraction Joints: When transverse contraction joints are to be formed by sawing, care must be taken to saw the grooves soon after placing to prevent the formation of cracks due to contraction of the slab. All transverse joints shall be sawed at least 1/4 of the slab depth. Any procedure for sawing joints that results in premature and uncontrolled cracking shall be revised immediately by adjusting the time interval between the placing of the concrete and the cutting of the joints.
5. Transverse Formed Dummy Groove Joints: Transverse dummy groove joints shall be formed by a groove or cleft in the top of the slab of the dimensions shown on the plans. The groove shall be made in the plastic concrete by a suitable tooling device and shall extend vertically downward 1/4 of the slab depth from the surface and shall be true to line.

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6. Transverse Premolded Strip Joints: Transverse premolded strip joints shall be of the proper dimensions as shown on the plans or standard drawings. The premolded filler is placed in a vertical groove formed to receive it. The top of the filler should be flush with the pavement surface.
7. Transverse Construction Joints: Transverse construction joints of the type shown on the plans or standard drawings shall be placed wherever the placing of concrete is suspended for more than 30 minutes. A butt type joint with dowels shall be used if the joint occurs at the location of a contraction joint. Keyed joints with tiebars shall be used if the joint occurs at any other location.
8. Dowels: If joints are to be equipped with dowels, they shall be of the dimension and at the spacing and location indicated on the plans or standard drawings. They shall be firmly supported in place, accurately aligned parallel to the pavement grade and the centerline of the pavement by means of a shop fabricated support which will remain in the pavement and will insure that the dowels are not displaced during construction. One-half of the length of each dowel shall be painted and greased and in expansion joints one end shall be equipped with a tight fitting cap of the dimensions shown on the plans conforming to Section 724 of this specification. Dowels shall conform to Section 723 of this specification.
9. Longitudinal Joints: Longitudinal joints shall be of the sawed, dummy groove, premolded strip, or the keyed construction type. Joints between construction lanes shall be the keyed construction type. When longitudinal joints contain tiebars, the tiebars shall be placed perpendicular to the longitudinal joints by approved mechanical equipment or rigidly secured by chairs or other approved supports that will prevent displacement.
10. Sawed Longitudinal Center Joints: Sawed longitudinal center joints shall be sawed grooves made with a concrete saw after the concrete has hardened. The saw cut shall be at least 1/4 of the slab depth. The joint may be sawed at any time prior to the time the pavement is open to traffic. These joints are otherwise formed in the same manner as the transverse sawed joints.
11. Longitudinal Formed Dummy Groove Joints: Longitudinal dummy groove joints are formed in the same manner described for Transverse Formed Dummy Groove joints.
12. Longitudinal Premolded Strip Joint: Longitudinal premolded strip joints are formed in the same manner described for Transverse Premolded Strip Joints.
13. Longitudinal Construction Joints: Longitudinal construction joints (i.e., joints between construction lanes) shall be of the dimensions shown on the plans or standard drawings. The key shall be constructed by placing a deformed metal plate against the form when the first lane adjacent to the joint is placed. This metal plate shall be removed with the form. When placing the second slab, care must be taken that no concrete is left to overhang the lip formed in the first slab by the edging tool.
14. Tiebars: Tiebars, when indicated, shall be of deformed steel in accordance with Section 723 and of the dimensions and at the spacing specified. Tiebars shall be firmly supported by subgrade chairs or so installed as not to be displaced during construction operations.

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15. Joint Sealer: After the curing period, all sawed and dummy groove joints in the pavement shall be cleaned and sealed with material meeting the requirements of Section 722. All foreign material, joint sawing residue, dirt and curing membrane shall be removed. Joints shall be slightly underfilled (about 1/4 inch) to prevent extrusion of sealer. Any excess material should be removed from the pavement surface as soon after sealing as possible.

16. Integral Curb Joints: In the construction of transverse joints of concrete integral curb pavement, special care must be taken to see that all transverse joints extend continuously through the pavement and curb.

(R) Structures: All manholes, catch basins, or structures of a permanent nature encountered in the areas to be paved shall be raised or lowered as the case may be, to the surface of the new pavement and the necessary expansion material as specified in Subsection 722.01 and 722.02 placed around each structure for the full depth of the slab and of the thickness shown on the plans.

(S) Cold Weather Protection: Except by specific written authorization, concreting shall cease when the descending air temperature in the shade falls below 40 degrees F. It shall not be resumed until the ascending air temperature in the shade rises to 35 degrees F.

When concrete has been placed in cold weather and the temperature may be expected to drop below 35 degrees F., straw, hay, insulated curing blankets, or other suitable material shall be provided along the line of work. Whenever the air temperature may be expected to reach the freezing point during the day or night, the material shall be spread over the concrete deep enough to prevent freezing of the concrete. Concrete shall be protected from freezing temperatures until it is at least five (5) days old. Concrete injured by frost action shall be removed and replaced at the Contractor's expense.

(T) Protection and Opening to Traffic: The Contractor shall protect the pavement against all damage prior to final acceptance of work by the owner. Traffic shall be excluded from the pavement by erecting and maintaining barricades and signs. As a construction expedient, the subgrade planer, concrete finishing machine, and similar equipment may be permitted to ride upon the edges of previously constructed slabs provided the concrete is more than 72 hours old, and the equipment has rubber-tired wheels to run on the finished slab.

Traffic shall be excluded from the newly constructed pavement for a period of 14 days after the concrete is placed or longer if weather conditions make it advisable to extend this time; provided, however, that at the discretion of the Engineer the pavement may be opened to traffic when specimen cylinders made, cured and tested in accordance with Subsection 504.04(V) have attained a compressive strength of 3500 psi. Prior to opening to traffic, the pavement shall be cleaned of loose material and the joints shall be filled and trimmed as herein required.

(U) Slip-Form Paver, General: In lieu of the construction methods described in the preceding section of the specifications, the Contractor may use a slip-form paver. When the slip-form paver is used, all reference in the preceding sections of this specification referring to forms shall be deleted.

Slip-form pavers shall be equipped with vibratory and tamping bar assemblies which are effective over the full width of the pavement. The paver shall also have a metal float with a bullnosed front end for the full width of the pavement, excluding curbs, which will extrude the concrete under pressure. The curb shall be formed by extrusion plates or mules mounted at the rear of the machine.

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1. Subgrade Construction: The subgrade shall be brought to the proper grade and cross section by means of a properly designed and operated machine. The subgrade shall comply with Subsection 504.04(A), 504.04(B), and 504.04(C) of this specification. If any traffic is allowed to use the prepared subgrade, some device, satisfactory to the Engineer, shall be provided for checking and correcting the subgrade immediately ahead of placing the concrete.

The subgrade work, especially the path on which the tracks of the paver ride, must be done carefully and accurately as its degree of precision greatly affects the resulting smoothness of the pavement surface.

2. Placing Concrete: Concrete shall be of uniform slump and adequately supplied in front of the paver. The rate of progress shall be controlled so that the forward movement of the paver will be as nearly continuous as practicable. If it is necessary to stop the forward movement of the paver, the vibrator and tamping elements shall also be stopped immediately. Care must be taken to see that a sufficient supply of concrete passes around the float and the belt along the form line to form the integral curb where shown on the plans.

3. Finishing: Final finishing operations shall conform to the applicable sections of this specification, 504.04(M).

(V) Testing and Acceptance Requirements:

1. Test Specimens: It shall be the responsibility of the Contractor to furnish evidence to the owner that the quality of the materials and work-manship entering into the work complies with the plans and specifications. In order to accomplish this, the minimum schedule of satisfactory tests listed herein shall be performed by a testing laboratory approved by the owner. When tests reveal that the quality of materials or workmanship does not meet the requirements of the specifications, additional tests shall be made as directed by the Engineer until the number of satisfactory tests called for in the schedule have been made. The cost of all testing provided for in the schedule, including the furnishing and taking of all samples, shall be included in the price bid for the work complete in place, unless otherwise specified.

TEST SCHEDULE

<u>Description</u>	<u>Quantity of Item Represented by One Test</u>
Concrete Cylinders (Pavement)	800 Square Yards
Concrete Cylinders (Curb & Gutter)	300 Lineal Feet

Satisfactory tests shall be as defined in Subsection 105.10.

2. Strength Requirements: Strength. On delivery to the site of the work, the concrete shall be workable, plastic consistency and shall consist of portland cement, fine aggregate, coarse aggregate and water, in a mixture that shall have a compressive strength of not less than thirty-five hundred (3,500) pounds per square inch when tested at the age of twenty-eight (28) days. The making of Compression Test Specimens and the method of Compression Tests shall conform to the requirements of AASHTO T-23 and AASHTO T-22. The test specimens shall be made from concrete taken from the mixture in actual use and field cured for a period of 3 days.

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3. Air Content: One test for entrained air content shall be made for each set of 4 concrete test cylinders. Air entrainment tests shall be made in accordance with AASHTO T-152.

4. Slump Tests: Slump tests shall be taken as required by the Engineer and in accordance with AASHTO T-119.

5. Tolerance in Strength: It is the intent of these specifications that the strength of the concrete shall not be less than that specified. Where any concrete or test cylinder fails to meet the specified strength, the following rules relative to replacement of the faulty concrete and adjustment of payment shall govern:

For concrete, the average core or test cylinder strength of which determined as provided above, is less than its specified strength but not less than twenty-five hundred (2,500) pounds per square inch compressive strength, an adjustment price shall be used in payment, which price shall bear the same ratio to the contract unit price as the strength by actual test bears to the specified strength.

For concrete, the average core or test cylinder strength of which determined as provided above, is less than twenty-five hundred (2,500) pounds per square inch compressive strength, the Engineer may have the choice of leaving the deficient concrete in place and the Contractor shall not receive compensation or payment for same, or removal and replacement of the deficient concrete by the Contractor with satisfactory concrete which, when accepted, will be included for payment. The Contractor, however, shall receive no compensation for the material or labor involved in the removal and replacement of the deficient concrete.

Concrete, the average strength of which, determined as provided above, is less than two thousand (2,000) pounds per square inch compressive strength will not be accepted and the Contractor shall be required to remove same. The Contractor shall then replace the deficient concrete with satisfactory concrete which, when accepted, will be included for payment.

Should any question arise as to the possible deficiency of the concrete strength at any location in the pavement after the construction of the street pavement is completed, then core specimens shall be taken at these locations in accordance with ASTM C42 or AASHTO T24. If the test results show the strength of the concrete pavement in question meets or exceeds the specified strength, the cost of coring, testing of cores and repair of core holes shall be borne by the owner. If the test results show the concrete pavement in question does not meet the specified strength, the cost of coring, testing of cores and repair of core holes shall be borne by the Contractor.

(W) Thickness Tolerance: Tolerance of concrete pavements shall be in accordance with Section 501.

(X) High Early Strength Concrete, General: When high early strength concrete pavement is specified, it shall meet all other requirements for regular concrete except that Type III or Type III (AE) cement shall be used.

1. Curing: When high early strength concrete pavement is specified or used, the pavement shall be cured in the same manner as is provided for regular pavement.

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2. Opening to Traffic: Traffic shall be excluded from the newly constructed pavement for a period of not less than 24 hours and for 72 hours if necessary, as determined by the Engineer.

504.05 METHOD OF MEASUREMENT: Concrete pavement will be measured by the square yard from face of curb to face of curb for the thickness specified on the plans. Integral curb of the type specified and lip curb will be measured by the linear foot along the face of the curb and shall include that portion of the concrete slab below the base of the curb. Curing, joint construction, joint filler and sealer, dowel bar and tubes, cores and core repair and thickened edge will not be measured for payment but shall be considered incidental to other items of work.

504.06 BASIS OF PAYMENT: Accepted quantities measured as provided above will be paid for at the contract unit price for:

- Portland Cement Concrete Pavement-----SQ. YD.
- Portland Cement (Concrete Pavement HES)-----SQ. YD.

which shall be full compensation for furnishing all materials, equipment, labor, and incidentals to complete the work as specified.

No additional compensation will be allowed when the Contractor, at his option, uses High-Early-Strength (HES) Portland Cement in lieu of Standard Portland Cement.