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SECTION 300 – PAVEMENT AND SURFACE COURSES

SECTION 301 – PLANT-MIX ASPHALTIC CONCRETE

301.01 – DESCRIPTION

This section covers base course, level course, surface course or any combination of these courses as shown on the plans. The mixture shall be composed of a mineral aggregate uniformly coated with an approved asphaltic cement and shall be laid upon an approved base course or old pavement in accordance with these specifications and in conformity with the line, grade and typical cross sections shown on the plans.

301.02 – MATERIALS

Materials shall meet the requirements of Section 931. The Contractor shall have ample material in the stockpiles at the plant site at the beginning of each day's operation to supply and be used for that day's operation.

301.02.01 – WEATHER AND TEMPERATURE LIMITATIONS

No asphaltic concrete shall be laid when there is frost in the course on which it is being laid. Unless specified otherwise by the Engineer, asphaltic concrete surface courses shall be laid only when one (1) of the following conditions of temperature and wind velocity prevail:

TABLE 301.02.01 – WEATHER AND TEMPERATURE LIMITATIONS

Temperature (ºF)	Wind Velocity MPH Maximum
60 or Above	40
50-60	15
45-50	5

Asphaltic concrete surface course shall not be laid when temperature is less than forty-five degrees F (45°F), except in unusual circumstances when the wind is virtually still and the surface on which the course is being laid is warmer than forty-five degrees F (45°F) In no case shall surface course be laid when the temperature is less than forty degrees F (40°F).

301.03 – EQUIPMENT

A) General - All plants used by the Contractor for the preparation of asphaltic concrete mixture shall have both capacity and controls sufficient to produce the asphalt mixture at the rate required for the satisfactory prosecution of the job within the specified time, and to produce asphalt mixture meeting the requirements of Section 931.

Batch mixing plants shall conform to the special requirements of Section 301.03(C).

Drum mixing plants shall conform to the special requirements of Section 301.03(D).

B) Requirements for all Plants - Mixing plants shall be of sufficient capacity and coordinated to adequately handle the proposed bituminous construction.

1) Equipment for Preparation of Bituminous Material - Tanks for storage of the bituminous material shall be equipped to heat and hold the material at the required temperatures. The heating shall be accomplished by steam coils, electricity, or other approved means so that no flame shall come in contact with the tank. The circulating system for the bituminous material shall be designed to assure proper and continuous circulation during the operating

period. Provision shall be made for measuring and sampling materials in storage tanks.

2) Cold Aggregate Feed - The plant shall be provided with accurate mechanical means for uniformly feeding the aggregate into the dryer so that uniform production and uniform temperature will be obtained.

Dryer - A dryer of satisfactory design for drying and heating the mineral aggregate shall be provided. The dryer shall be capable of drying and uniformly heating the mineral aggregate to the temperature requirements set forth in these specifications without burning or overheating any portion.

Bituminous Control Unit - Satisfactory means, either by weighing or metering, shall be provided to obtain the proper amount of bituminous material in the mix within the tolerance specified. Means shall be provided for checking the quantity or rate of flow of bituminous material into the mixer.

Suitable means shall be provided, either by steam jacketing or other insulating for maintaining the specified temperature of the bituminous material in the pipe lines, meters, weight buckets, spray bars, and other containers or flow lines.

3) Thermometric Equipment - An armored continuous recording thermometer of adequate range in temperature reading shall be fixed in the bituminous line at a suitable location near the charging valve at the mixer unit.

The plant shall also be equipped with either an approved dial scale mercury actuated thermometer, and electric pyrometer, or other approved thermometric instruments so placed at the discharge chute of the dryer as to register automatically or indicate the temperature of the heated aggregates or mixture.

The Engineer may require replacement of any thermometer by an approved temperature recording apparatus for better regulation of the temperature of aggregates.

4) Dust Collector - The plant shall be equipped with a dust collector constructed to waste or return uniformly all or any part of the material collected as directed.

5) Truck Scales - The bituminous mixture shall be weighed on approved scales furnished by the Contractor or on public scales at the Contractor's expense. Such scales shall be inspected and sealed as often as the Engineer deems necessary to assure their accuracy, but not less than once every six (6) months.

6) Safety Requirements - Adequate and safe stairways to the mixer platform and sampling points shall be provided and guarded ladders to other plant units shall be placed at all points where accessibility to plant operations is required. Accessibility to the top of truck bodies shall be provided at the plant site by a platform or other suitable device to enable the Engineer to obtain sampling and mixture temperature data. A hoist or pulley system shall be provided to raise scale calibration equipment, sampling equipment and other similar equipment from the ground to the mixer platform and return. All gears, pulleys, chains, sprockets and other dangerous moving parts shall be thoroughly guarded and protected. Ample and unobstructed space shall be provided on the mixing platform. A clean and unobstructed passage shall be maintained at all times in and around the truck loading area. This area shall be kept free from drippings from the mixing platform.

7) Asphalt Quality - The asphalt manufacturer is responsible for the quality of the produced asphalt. From time to time, the Engineer may require the QC test result on the asphalt. It shall be the responsibility of the Contractor to provide the information.

8) Asphalt Source - The Contractor shall not change the asphalt source without written approval from the Engineer.

C) Additional Requirements for Batching Plants

1) Plant Scales - Scales shall be accurate to 0.5% of the maximum load that may be required. Poises shall be designed to be locked in any position to prevent unauthorized change of position. The Contractor may provide an approved automatic printer system which will print the weights of the material delivered, provided the system is used in conjunction with an approved automatic batching and mixing control system. Such weights shall be evidenced by a weigh ticket for each load. Scales shall be inspected and sealed as often as the Engineer may deem necessary to assure their continued accuracy, but not less than once every six (6) months.

2) Screens - Plant screens, capable of screening all aggregates to the specified sizes and proportions and having normal capacities in excess of the full capacity of the mixer, shall be provided. All screens shall be kept unclogged and free from rips and tears.

3) Hot Aggregate Bins - The plant shall include storage bins of sufficient capacity to supply the mixer when it is operating at full capacity. Bins shall be arranged to assure separate and adequate storage of appropriate fractions of the heated mineral aggregates. Separate dry storage shall be provided for mineral filler when used and the plant shall be equipped to control the feed of such material into the mixer. Each bin shall be provided with overflow pipes of such size and at such location as to prevent backing up of material into other compartments or bins. Each compartment shall be provided with its individual outlet gate, constructed so that when closed there shall be no leakage. The gates shall cut off quickly and completely. Bins shall be so constructed that samples can be readily obtained.

4) Weight Box or Hopper - The equipment shall include a means for accurately weighing each size of aggregate in a weight box or hopper suspended on scales and of ample size to hold a full batch without hand raking or running over. The gate shall close tightly so that no material is allowed to leak into the mixer while a batch is being weighed.

5) Bituminous Control - The equipment used to measure the bituminous material shall be accurate to plus or minus (±)0.5%. The bituminous material bucket shall be a non-tilting type with a suitable cover. The length of the discharge opening or spray bar shall be not less than three-fourths (3/4) the length of the mixer and it shall discharge directly into the mixer. The bituminous material bucket, its discharge valve or valves and spray bar shall be adequately heated. Steam jackets, if used, shall be efficiently drained and all connections shall be so constructed that they will not interfere with the efficient operation of the bituminous scales. The capacity of the bituminous material bucket shall be at least fifteen percent (15%) in excess of the weight of bituminous material required in any batch. The plant shall have an adequately heated quick-acting, non-drip, charging valve located directly over the bituminous material bucket.

   The indicator dial shall have a capacity of at least fifteen percent (15%) in excess of the quantity of bituminous material used in a batch. The controls shall be constructed so that they may be fixed at any dial setting and will automatically reset to that reading after the addition of bituminous material to each batch. The dial shall be in full view of the mixer operator. The flow of bituminous material shall be automatically controlled so that it will begin when the dry mixing period is over. All of the bituminous material required for one batch shall be discharged in not more than fifteen (15) seconds after the flow has started. The size and spacing of the spray bar openings shall provide a uniform application of bituminous material the full length of the mixer. The section of the bituminous line between the charging valve and the spray bar shall be provided with a valve and outlet for checking the meter when a metering device is substituted for a bituminous material bucket.

6) Mixer - The batch mixer shall be an approved type capable of producing a uniform mixture within the job mix tolerances. If not enclosed, the mixer box shall be equipped with a dust hood to prevent loss of dust.

   The clearance of the blades from all fixed and moving parts shall not exceed one inch (1”) unless the maximum diameter of aggregate in the mix exceeds one and one-fourth inches (1

¼"), in which case the clearance shall not exceed one and one-half inches (1 ½").

7) Control of Mixing Time - The mixer shall be equipped with an accurate time lock to control the operations of a complete mixing cycle. It shall lock the weight box gate after the charging of the mixer until the closing of the mixer gate at the completion of the cycle. It shall lock the bituminous material bucket throughout the dry mixing periods. The dry mixing period is defined as the interval of time between the opening of the weight box gate and the start of introduction of bituminous material. The wet mixing period is the interval of time between the start of introduction of bituminous material and the opening of the mixer gate.

   The control of the timing shall be flexible and capable of being set at intervals of five (5) seconds or less throughout a total cycle of up to three (3) minutes. A mechanical batch counter shall be installed as a part of the timing device and shall be so designed as to register only completely mixed batches.

   The setting of time intervals shall be performed in the presence of and at the direction of the Engineer.

D) Additional Requirements for Dryer Drum Mixing Plants

1) General - The basic requirements of this method of operation is to provide positive control of the bituminous material flow automatically coupled with the aggregate feed flow to maintain the required proportions to deliver a well-coated homogeneous mixture of asphaltic concrete at the prescribed temperature, gradation and asphalt content.

2) Aggregate Handling and Proportioning - The aggregate feeding system shall provide a means for accurately calibrating the material feed for each individual aggregate. A screening unit shall be placed between the aggregate cold feed bins and the drum mixer to remove oversized aggregate and roots, clay balls, etc.

   Moisture adjustments of the cold aggregate will be taken into consideration before the aggregate is weighed. The cold aggregate shall be weighed by use of a belt scale or other device, which will automatically regulate the bituminous feed and permit instant correction of variations in the load. A method and facilities shall be provided for obtaining representative samples of the combined mix of aggregate from the belt at any time during production operations.

3) Bituminous Control - The bituminous material shall be introduced through an indicating meter, which will accurately measure only the flow of that material. The asphalt pump shall be operated within the rated capacity of the manufacturer's recommendation.

   A pressure gauge shall be installed between the pump and the meter.

4) Interlocking Control - The aggregate feeding system shall be interlocked with the asphalt pump and shall be quick adjusting and shall maintain a constant and uniform flow throughout the range of its calibration.

   The interlocking control shall indicate a visual and/or an audible signal when the level of material on any one feeder approaches the strike off capacity of the feed gate or otherwise fails to feed the proper proportion of aggregate, or the pressure falls on the bituminous supply lines.

5) Drum Dryer Mixer - The drum dryer mixer shall be equipped with automatic burner controls and temperature sensing of the mixture at discharge.

6) Surge or Storage Bins - The drum mix plant shall be equipped with a surge bin or storage bin. If storage of the hot mix asphalt is required, the surge or storage bin shall be designed so that the characteristics of the mixture being stored or surged shall not be changed. All mixture delivered from a surge or storage bin shall meet the specifications for the mix being delivered.

E) Bituminous Pavers - Bituminous pavers shall be self-contained, power propelled machines,

provided with an activated, heated screed, with an approved automatic control device for laying the mix to the specified slope, grade, and crown. The screed shall effectively produce a finished surface of the required evenness and uniform texture without tearing, shoving, or gouging the mixture uniformly in front of the screed.

Pavers used for shoulders and similar construction shall be capable of spreading and finishing courses of asphalt mixture in widths shown on the plans.

Motor graders equipped with a blade of not less than twelve (12) feet, and a wheelbase of not less than sixteen (16) feet, tight and in good operating condition may be used for spreading leveling courses.

F) Compacting Equipment - Compacting equipment shall be designed to produce the pavement density and surface smoothness herein specified, and shall be maintained in first-class operating condition.

301.04 – CONSTRUCTION METHODS

A) Preparation of Asphaltic Cement - The asphaltic cement shall be heated at the paving plant to a temperature of three hundred degrees F (300°F) to three hundred fifty degrees F (350°F).

B) Preparation of Mineral Aggregates - The mineral aggregates shall be dried and heated at the paving plant so that when delivered to the mixer they shall be at as low a temperature as is consistent with proper mixing and laying, and in no case to exceed three hundred twenty-five degrees F (325°F). Aggregates may be fed simultaneously into the same drier but in such case, immediately after heating, they shall be screened into the bin sizes specified. Oversize material, crushed after passing through the drier shall not be incorporated into the mixer without again being heated and dried.

C) Preparation of Bituminous Mixture - The hot aggregate prepared as prescribed above shall be accurately measured and conveyed into a mixer in the proportionate amounts of each aggregate required to meet the specified grading.

The mixture shall be made by first charging the mixer with the mineral aggregate and filler and mixing these dry for a period of from five (5) to twenty (20) seconds after which the asphaltic cement shall be added and the mixing continued for a period of not less than thirty (30) seconds, or longer, if necessary to produce a homogeneous mixture in which all particles of the mineral aggregate are uniformly coated.

D) Loading and Transportation of Mixture - The mixture shall be transported from the mixing plant to the work in tight vehicles with metal bottom previously cleaned of all foreign materials. When directed by the Engineer the vehicles shall be suitably insulated and each load shall be covered with canvas or other suitable material of sufficient size to protect it from weather conditions. The inside surface of all vehicles used for hauling mixtures may be lightly lubricated with a truck bed release agent just before loading, but excess of lubricant will not be permitted. No loads shall be sent out so late in the day as to interfere with spreading and compacting the mixture during daylight unless artificial light satisfactory to the Engineer is provided.

E) Tack Coat - Before the asphaltic mixture is laid, the surface upon which it is to be placed shall be cleaned thoroughly to the satisfaction of the Engineer, and if indicated on the plans, shall be given a uniform tack coat application with asphalt of the type shown herein. This tack coat shall be applied, as directed by the Engineer, with an approved sprayer at the rate of not to exceed 0.10 gallon per square yard of surface. All contact surfaces of curbs and gutters, manholes and other structures shall be painted with a thin uniform coat of asphaltic material used for the tack coat or in case no tack coat is shown on the plans, curbs and other structures shall be painted with a thin uniform coating of emulsified asphalt.

F) Placing Asphaltic Mixture - The asphaltic mixture shall be laid at a temperature from two hundred sixty degrees F (260°F) to three hundred degrees F (300°F) and only upon an approved base which

is dry. The mixture shall be delivered on the job at a minimum workable temperature which will produce the density herein specified after final compaction.

When existing paving is to be resurfaced to a crown section not conforming to that of the original paving, the asphaltic concrete leveling course shall be placed in lifts beginning at the point on the existing slab requiring the greatest addition of material and by the addition of successive lifts of material, gradually shaping the crown to conform to that required in the finished slab. The last increment of material shall consist of a uniform thickness of an asphaltic concrete wearing surface.

When the asphaltic mixture is placed in a narrow strip along the edge of an existing pavement, or used to level up small areas of an existing pavement, or placed in small irregular areas where the use of a finishing machine is not practical, the finishing machine may be eliminated, when authorized by the Engineer, provided a satisfactory surface can be obtained by other approved methods.

Immediately after any course is screeded, and before compaction is started, the surface shall be checked, and any inequalities adjusted, all fat sandy accumulation from the screen removed by a lute, and all fat spots in any course removed and replaced with satisfactory material. Irregularities in alignment and grade along the outside edge shall also be corrected by the addition or removal of mixture before the edge is compacted.

The mixture shall be distributed into place by means of shovel and lute in a loose layer of uniform density and correct depth. Shovelers and rakers shall work skillfully together so that the finished product will require a minimum amount of rework after the first compactive effort.

Placing of mixture shall be as continuous as possible and 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 mixture to become chilled.

Thickness of compacted course shall be as specified in the plans, not greater than six inches (6”) in depth. Thickness will be reduced by the Engineer, if the required densities cannot be obtained.

Forms will not be required when the finishing machine is of such type as not to require forms for grade control. When forms are required they shall have a thickness equal to the compacted surface course and shall remain in place until final surface finishing, other than rolling, has been completed.

In placing a level-up course with the spreading and finishing machine, the forms, binder twine or cord, shall be set to line and grade established by the Engineer. When directed by the Engineer, level-up shall be spread with an approved motor patrol grader.

Fillets, spandrels and other large areas which cannot be laid with a machine shall be placed in accordance with Section W-IV, "Fillets, Spandrels and other Large Hand Worked Areas", in the Asphaltic Concrete Paving Manual.

G) Joints - Longitudinal and transverse joints shall be made in such a manner that a smooth, strong, neat union is obtained, between the respective lanes or lane ends. They shall be made by the methods and procedures outlined in Section W-III, "Joints" of the Asphalt Paving Manual or some other method acceptable to the Engineer. Longitudinal joints shall conform to the tolerances defined in Section W-III 1-a (3) or Section W-III b (3) "Alignment", of the manual.

Transverse or longitudinal joints accumulating mud, dust, or foreign matter shall be trimmed back to the satisfaction of the Engineer so that a proper bond of asphaltic concrete will be obtained. Longitudinal joints with an undue dust film shall be tacked with an approved tack coat before the adjoining lane is placed.

Joints with PC Concrete such as curbs, gutters, and pavements shall be made to conform to Section W-III, "Asphaltic Concrete to Portland Cement Joints" in the Asphaltic Concrete Paving Manual. Joints with manholes, valve boxes and inlet grates shall be made to conform to sections

as shown on the sheet of details.

H) Compaction - Rolling shall be done in such a manner that a surface will be obtained meeting the tolerance for smoothness and density requirements specified and all roller marks shall be eliminated.

The target density for compaction shall be 94 percent of the maximum theoretical density shown on the latest laboratory mix design report for the percent asphalt content recommended except in situations as described below. Tests to establish the maximum theoretical density of the plant mixture shall be performed as often as necessary to ensure an accurate value is used in the calculation of roadway density.

The average roadway density shall be not less than the target density. Individual roadway densities more than two percent (2%) below the target densities will not be accepted. It is the intent that the contractor achieve uniform compaction at or above the target density. The difference from the high to low percent density tested shall not exceed four percent (4%).

When Type B, M or D asphalt concrete is placed on an existing surface that has not received full-width milling, in a plan thickness of 2" or less, the average target density shall be ninety-three percent (93%) of maximum theoretical density.

When the existing surface has been milled full-width, or if a leveling course has been placed prior to the overlay, the average target density shall be ninety-four (94) percent of maximum theoretical density, (Type B, M or D).

In the interest of appearance and practicality, non-destructive tests on the pavement may be required by the Engineer for resurface courses.

In order to aid the Contractor in achieving the foregoing requirements for compaction, Section W-V, "General Rolling Operations" has been included in the Asphaltic Concrete Paving Manual, J. Rogers Martin being the author.

A self-propelled pneumatic roller may be required by the Engineer to obtain the specified density and surface texture.

I) Testing and Correcting Surface - The riding qualities of the finished surface shall be satisfactory to the Engineer. In case of dispute, the remaining provisions of the standard specifications shall apply.

For the purpose of testing the finished surface, a ten (10) foot straightedge shall be available on the work. Depressions which may develop after the first rolling shall be remedied by loosening the surface depressions not being noticeable until the final compaction has been made, the surface course shall be removed and sufficient new material laid to form a true even surface.

The finished pavement surface shall show no deviation from the general surface in excess of one-sixteenth inch (1/16”) per foot as measured in the following manner:

A ten (10) foot straightedge shall be placed parallel to the centerline of the roadway so as to bridge any depressions.

Ordinates measured from the face of the straightedge to the surface of the pavement shall not exceed one-sixteenth inch (1/16”) for each foot in distance from the nearest point of contact with a maximum permissible variation of three-sixteenths inch (3/16”).

Such portions of the completed pavement as are defective in finish, density, or composition, or that do not comply in all respects with the requirements of these specifications shall be taken up, removed and replaced with suitable material properly laid in accordance with these specifications.

Prior to the acceptance of the pavement, the pavement shall be flooded with a sufficient quantity of water to show if areas of ponding exist. All areas of ponding in excess of one-fourth inch (1/4”) in depth and any length of curb and gutter that ponds in excess of one-fourth inch (1/4”) in depth, shall

be removed and replaced by the Contractor and at the Contractor's expense.

The water may be applied by tank truck or with fire hose if a fire hydrant is available. The water shall be applied as directed by the Engineer and all expenses borne by the Contractor.

When it is necessary to remove and replace a section of curb and gutter any remaining portion of the curb and gutter adjacent to joints that is less than ten (10) feet in length shall also be removed and replaced by the Contractor and at the Contractor's expense.

J) Opening to Traffic - No traffic shall be permitted on the asphaltic concrete pavement until it has received its final rolling and cooled to a temperature of one-hundred fifty (150) degrees.

K) Returns, Driveways and Other Extremities - These areas shall be placed in accordance with Section W-VII, "Resurfacing at Returns, Driveways and other Extremities", of the Asphaltic Concrete Paving Manual.

301.05 – TESTING

301.05.01 – DESCRIPTION

It is the intent of these specifications that the pavement shall be constructed strictly in accordance with the thickness shown on the plans.

Where any pavement is found not so constructed, the following rules relative to core drilling pavement, replacement of the faulty pavement and adjustment of payment shall govern. All pavements shall be cored and measured for thickness before being accepted by the City as hereinafter provided.

All hot mix asphaltic pavements that will be maintained by the City will be tested according to the following section:

A) General: The asphaltic pavement base and surface coarse will be accepted by the engineer on a "Lot" by "Lot" base. A "Lot" is considered to be 2,000 tons or part thereof or one (1) day of plant production.

B) Acceptance Testing: The acceptance testing of a "Lot" will be performed by a qualified testing laboratory approved by the City.

C) Tests results reports: Tests reports will be mailed on a daily basis in duplicate to the following address:

Field Engineer
City of Oklahoma City
420 West Main, Suite 700
Oklahoma City, OK 73102

D) Asphaltic Concrete Mix Design: Asphaltic concrete mix design and initial job-mix formula are the responsibility of the contractor and shall be submitted to the City for approval by the engineer.

The mix design shall be prepared in a City approved laboratory. The mix design and the initial job-mix formula for the contractor should be within the limits of the City's specifications. A new mix design is required should the material source change or results with the job-mix formula prove unsatisfactory.

E) Sampling and Testing: Sampling and testing of the asphaltic concrete at the job site shall be in accordance with Table 301.05.01. In all cases, it is the responsibility of the contractor to notify the testing laboratory one (1) day in advance of the work that is to be performed. It is the responsibility of the contractor to prove the acceptability of a "Lot" that does not have the required testing. The City reserves the right to request the removal of "Lots" that do not have the required testing.

F) Acceptance: Acceptance of all asphaltic concrete lifts (new construction and overlays) 1 1/2 inches or greater in thickness will be based on density as specified in Section 301.05 F) 1). All lifts less

than 1 1/2 inches in thickness will be accepted on the basis of Section 301.01 4) 2).

1) All asphaltic concrete lifts 1 1/2 inches or greater thickness. The target density of each lot shall be 94 percent (unless specified otherwise by the Engineer) of the maximum Theoretical Specific Gravity at the Job Mix Formula asphalt content determined by the most recent specific gravity of the bituminous paving mixture in accordance with the AASHTO T 209. The roadway density of each lot will be the average of tests on three (3) separate specimens taken within the limits of the area represented by the lot. The locations and times of the test specimens collection shall be established by the engineer or his/her representative.

   The City appointed testing laboratory shall cut test specimens for each lot from the pavement by sawing or coring a specimen having a minimum size of four inches (4") on the cut side or diameter, not more than five (5) feet from the edge of travel way. The cost of cutting specimens and satisfactorily repairing the specimens area shall be paid by the City or the contractor depending on the type of contract as specified in sub-section (g). Repairing the specimen area with asphalt will be the responsibility of the contractor. Density may be on the specimens or through use of nuclear density gauges. The use of a nuclear density gauge or testing on the specimens shall be at the discretion of the engineer.

   Acceptance and payment will be based on tests by the approved testing laboratory and the decision of the engineer. The minimum density of 92 percent and maximum density of 96 percent are the acceptable levels of density (unless otherwise specified by the Engineer).

2) All lifts less than 1 ½ inches in thickness. The acceptance of asphaltic concrete lifts that are less than 1 ½ inches will be at the discretion of the engineer.

G) Payment: The City will appoint an approved testing laboratory and will compensate the laboratory for the services rendered directly for projects that are contracted and paid for by the City. Compensation for the services rendered will be in accordance with the agreement between the City and the testing laboratory.

   The contractor shall retain the services of an approved testing laboratory and will compensate the testing laboratory directly for its services for projects that are not contracted and paid for by the City. Compensation for the services rendered will be based on the agreement between the contractor and the testing laboratory. However, the testing services rendered should meet the specifications and provision of the City.

TABLE 301.05.01
SCHEDULE OF TESTS FOR ACCEPTANCE OF PLANT MIX ASPHALT CONCRETE PAVEMENT

Asphalt Extraction And Gradation	1000 tons Asphalt Pavement
Roadway Density Of Asphalt Mix	4 Per 2000 Tons Asphalt Pavement or as directed by the City Engineer
Hveem Stability Test And Density Of Molded Specimen	1 Per 2000 Tons Asphalt Pavement
Maximum Theoretical Specific Gravity Of Asphalt Mix	1 Per 2000 Tons Asphalt Pavement

301.05.02 – CORE DRILLING PAVEMENT

All pavements shall be cored and measured for thickness at (minimum of three) such points as the Engineer may select in each lot of paving.

TABLE 301.05.02 – TOLERANCE IN PAVEMENT THICKNESS

GROUP	DEFICIENCY IN THICKNESS (PERCENT)	PENALTY IN PERCENT REDUCTION IN UNIT PRICE
A	0-5%	NONE
B	5-6%	5%
	6-7%	10%
	7-8%	15%

	8-9%	20%
	9-10%	25%
C	10-12.5%	50%
	12.5-15%	75%
D	>15%	NO PAYMENT

Should any core show a deficiency of more than 0.25 inches check cores shall be taken each way in the lane so deficient, as directed by the Engineer, until the thickness of the pavement is not more than 0.25 inch deficient. The average thickness of the deficient cores shall determine the percent of penalty that shall be used to calculate the reduction in unit price for each square yard so deficient.

All costs in connection with core drilling the pavement and refilling the core holes shall be borne by the Contractor. Core holes shall be filled in an acceptable manner with material matching the pavement from which the cores were cut. The coring of the pavement shall be performed by a City approved testing lab.

For pavement slab, the average thickness of which, determined as hereinafter provided, is within 0.25 inch, of the thickness required on the plans, the contract unit price offered shall be used in payment.

For pavement slab, the average thickness of which determined as hereinafter provided, is less than the thickness shown on the plans by more than 0.25 inch, but less than 0.75 inch, an adjusted unit price shown in Table 301.05.02 will be used in payment.

No additional payment over the contract unit price will be made for any slab the average thickness of which, determined as hereinafter provided, exceeds the thickness shown on the plans.

The thickness of the slab will be determined by average of 9-point gage jig measurement of the thickness of adjacent cores, and the average thickness determined from each pair of adjacent cores shall apply to the length of lane between those cores. The last deficient core and the first core of satisfactory thickness shall be averaged to determine what deduction in payment will be made from the length of lane laying between them. In calculating the average thickness of the slab, the Engineer shall make a decision on the pavement measurements that are in excess of the thickness specified on the plans.

If, in the opinion of the Engineer, a deficiency in slab thickness of 0.75" or more is sufficient to impair seriously the service expected from the pavement, the Contractor will be required to remove the deficient area and to replace it with slab of a satisfactory quality and thickness. The Contractor will receive no compensation for materials or labor involved in the removal and replacement of the defective slab. If, on the other hand, in the opinion of the Engineer, there is no probability of immediate failure, he may allow the Contractor the choice of leaving the defective slab in place and receiving no compensation or payment for same, or of removing and replacing the pavement as provided.

If the Contractor believes that the cores and measurements taken are not sufficient to indicate fairly the actual thickness of pavement, he may request that additional cores and measurements be taken. The cost of additional cores and measurements will be paid by the Contractor. Cores will not be spaced closer than ten (10) feet.

Deductions for deficient thickness may be entered on any estimate after the information becomes available. No pavement shall be accepted for payment until it has been cored and provisions of Section 301 have been adhered to.

301.06 – METHOD OF MEASUREMENT

Asphaltic concrete may be measured by the square yard of surface area of specified thickness or by the ton (2000 lbs.) of mixture accepted in place. Asphaltic concrete leveling course shall be measured by the ton (2000 lbs.) of material accepted in place. Tack coat will be measured by the gallon at the temperature applied.

301.07 – BASIS OF PAYMENT

The various items measured as provided above will be paid for at the contract unit price bid:

ASPHALTIC CONCRETE TYPE (A – E) (X INCHES)	S.Y.
ASPHALTIC CONCRETE TYPE (A – E)	TON
ASPHALT CONCRETE, TYPE (A – E) (POL. MOD.)	TON
ASPHALTIC CONCRETE LEVELING COURSE	TON

Such payment shall be compensation in full for furnishing all materials, labor, equipment, tools and incidentals, and for performing the work in accordance with these specifications.

SECTION 302 – RECYCLED HOT-MIX ASPHALT CONCRETE (RHM – ASPHALT CONCRETE)

302.01 – DESCRIPTION

This section covers the construction of asphaltic concrete using a combination of salvaged bituminous material and virgin material.

302.02 – MATERIALS

The bituminous mixture shall comply with the requirements of Section 931.

Salvaged materials shall be sized to pass a two inch (2") sieve.

Liquid asphalt will meet the requirements of Section 931 with the Viscosity Grade to be established by the mix design. Commercial softening agents must be approved by the Engineer and only after they have been tested for premature hardening with the salvaged and virgin materials to be used on this project.

All virgin aggregates shall meet the requirements of Section 931.

A maximum of 25 percent salvaged bituminous material by weight may be used in all bituminous mixtures. All salvaged bituminous material shall be assumed to contain 30 percent natural sand for mix design purposes.

302.03 – EQUIPMENT

Mixing shall be performed in either a batch plant or a dryer drum plant in accordance with Section 301.05, modified as required to facilitate recycling operations in conformance with current air pollution standards. Mixing shall continue until homogeneity and a uniform coating can be achieved.

302.04 – CONSTRUCTION METHODS

A) Preparation of Asphaltic Cement - The asphaltic cement shall be heated at the paving plant to a temperature of two hundred seventy-five degrees F (275°F) to three hundred twenty-five degrees F (325°F).

B) Preparation of Mineral Aggregates - The mineral aggregates shall be dried and heated at the paving plant so that when delivered to the mixer they shall be at as low a temperature as is consistent with proper mixing and laying, and in no case to exceed three hundred twenty-five degrees F (325°F). Aggregates may be fed simultaneously into the same drier but in such case, immediately after heating, they shall be screened into the bin sizes specified. Oversize material, crushed after passing through the drier shall not be incorporated into the mixer without again being heated and dried.

L) Preparation of Bituminous Mixture - The hot aggregate prepared as prescribed above shall be accurately measured and conveyed into a mixer in the proportionate amounts of each aggregate required to meet the specified grading.

The mixture shall be made by first charging the mixer with the mineral aggregate and filler and mixing these dry for a period of from five (5) to twenty (20) seconds after which the asphaltic

cement shall be added and the mixing continued for a period of not less than thirty (30) seconds, or longer, if necessary to produce a homogeneous mixture in which all particles of the mineral aggregate are uniformly coated.

M) Loading and Transportation of Mixture - The mixture shall be transported from the paving plant to the work in tight vehicles with metal bottom previously cleaned of all foreign materials. When directed by the Engineer the vehicles shall be suitably insulated and each load shall be covered with canvas or other suitable material of sufficient size to protect it from weather conditions. The inside surface of all vehicles used for hauling mixtures may be lightly lubricated with a thin oil or soap solution just before loading, but excess of lubricant will not be permitted. No loads shall be sent out so late in the day as to interfere with spreading and compacting the mixture during daylight unless artificial light satisfactory to the Engineer is provided.

N) Tack Coat - Before the asphaltic mixture is laid, the surface upon which it is to be placed shall be cleaned thoroughly to the satisfaction of the Engineer, and if indicated on the plans, shall be given a uniform tack coat application with asphalt of the type shown herein. This tack coat shall be applied, as directed by the Engineer, with an approved sprayer at the rate of not to exceed 0.10 gallon per square yard of surface. All contact surfaces of curbs and gutters, manholes and other structures shall be painted with a thin uniform coat of asphaltic material used for the tack coat or in case no tack coat is shown on the plans, curbs and other structures shall be painted with a thin uniform coating of emulsified asphalt.

O) Placing Asphaltic Mixture - The asphaltic mixture shall be laid at a temperature from two hundred twenty-five degrees F (225°F) to three hundred degrees F (300°F) and only upon an approved base which is dry. The mixture shall be delivered on the job at a minimum workable temperature that will produce the density herein specified after final compaction.

When existing paving is to be resurfaced to a crown section not conforming to that of the original paving, the asphaltic concrete leveling course shall be placed in lifts beginning at the point on the existing slab requiring the greatest addition of material and by the addition of successive lifts of material, gradually shaping the crown to conform to that required in the finished slab. The last increment of material shall consist of a uniform thickness of an asphaltic concrete wearing surface.

When the asphaltic mixture is placed in a narrow strip along the edge of an existing pavement, or used to level up small areas of an existing pavement, or placed in small irregular areas where the use of a finishing machine is not practical, the finishing machine may be eliminated, when authorized by the Engineer, provided a satisfactory surface can be obtained by other approved methods.

Immediately after any course is screeded, and before compaction is started, the surface shall be checked, and any inequalities adjusted, all fat sandy accumulation from the screen removed by a lute, and all fat spots in any course removed and replaced with satisfactory material. Irregularities in alignment and grade along the outside edge shall also be corrected by the addition or removal of mixture before the edge is compacted.

The mixture shall be distributed into place by means of shovel and lute in a loose layer of uniform density and correct depth. Shovelers and rakers shall work skillfully together so that the finished product will require a minimum amount of rework after the first compactive effort.

Placing of mixture shall be as continuous as possible and 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 mixture to become chilled.

Thickness of compacted course shall be not more than eight inches (8”) in depth. Thickness will be reduced by the Engineer, if the required densities cannot be obtained.

Forms will not be required when the finishing machine is of such type as not to require forms for grade control. When forms are required they shall have a thickness equal to the compacted

surface course and shall remain in place until final surface finishing, other than rolling, has been completed.

In placing a level-up course with the spreading and finishing machine, the forms, binder twine or cord, shall be set to line and grade established by the Engineer. When directed by the Engineer, level-up shall be spread with an approved motor patrol grader.

Fillets, spandrels and other large areas which cannot be laid with a machine shall be placed in accordance with Section W-IV, "Fillets, Spandrels and other Large Handworked Areas", in the Asphaltic Concrete Paving Manual.

P) Joints - Longitudinal and transverse joints shall be made in such a manner that a smooth, strong, neat union is obtained, between the respective lanes or lane ends. They shall be made by the methods and procedures outlined in Section W-III, "Joints" of the Asphalt Paving Manual or some other method acceptable to the Engineer. Longitudinal joints shall conform to the tolerances defined in Section W-III 1-a (3) or Section W-III b (3) "Alignment", of the manual.

Transverse or longitudinal joints accumulating mud, dust, or foreign matter shall be trimmed back to the satisfaction of the Engineer so that a proper bond of asphaltic concrete will be obtained. Longitudinal joints with an undue dust film shall be tacked with an approved tack coat before the adjoining lane is placed.

Joints with PC Concrete such as curbs, gutters, and pavements shall be made to conform to Section W-III, "Asphaltic Concrete to Portland Cement Joints" in the Asphaltic Concrete Paving Manual. Joints with manholes, valve boxes and inlet grates shall be made to conform to sections as shown on the sheet of details.

Q) Compaction - Rolling shall be done in such a manner that a surface will be obtained meeting the tolerance for smoothness and density requirements specified and all roller marks shall be eliminated.

The target density for compaction shall be 94 percent of the maximum theoretical density shown on the latest laboratory mix design report for the percent asphalt content recommended except in situations as described below. Tests to establish the maximum theoretical density of the plant mixture shall be performed as often as necessary to ensure an accurate value is used in the calculation of roadway density.

The average roadway density shall be not less than the target density.

Individual roadway densities more than two percent (2%) below the target densities will not be accepted. It is the intent that the contractor achieve uniform compaction at or above the target density. The difference from the high to low percent density tested shall not exceed four percent (4%).

When Type B, M or D asphalt concrete is placed on an existing surface that has not received full-width milling, in a plan thickness of 2" or less, the average target density shall be ninety-three percent (93%) of maximum theoretical density.

When the existing surface has been milled full-width, or if a leveling course has been placed prior to the overlay, the average target density shall be ninety-four (94) percent of maximum theoretical density, (Type B, M or D).

When Type E asphalt concrete is placed, the <u>minimum</u> density shall be ninety-one (91) percent of maximum theoretical density.

In the interest of appearance and practicality, density tests on the pavement may be waived by the Engineer for resurface courses.

In order to aid the Contractor in achieving the foregoing requirements for compaction, Section W-V, "General Rolling Operations" has been included in the Asphaltic Concrete Paving Manual, J.

Rogers Martin being the author.

A self-propelled pneumatic roller may be required by the Engineer to obtain the specified density and surface texture.

R) Testing and Correcting Surface - The riding qualities of the finished surface shall be satisfactory to the Engineer. In case of dispute, the remaining provisions of the standard specifications shall apply.

For the purpose of testing the finished surface, a ten (10) foot straightedge shall be available on the work. Depressions which may develop after the first rolling shall be remedied by loosening the surface depressions not being noticeable until the final compaction has been made, the surface course shall be removed and sufficient new material laid to form a true even surface.

The finished pavement surface shall show no deviation from the general surface in excess of one-sixteenth inch (1/16") per foot as measured in the following manner:

A ten (10) foot straightedge shall be placed parallel to the centerline of the roadway so as to bridge any depressions.

Ordinates measured from the face of the straightedge to the surface of the pavement shall not exceed one-sixteenth inch (1/16") for each foot in distance from the nearest point of contact with a maximum permissible variation of three-sixteenths inch (3/16").

Such portions of the completed pavement as are defective in finish, density, or composition, or that do not comply in all respects with the requirements of these specifications shall be taken up, removed and replaced with suitable material properly laid in accordance with these specifications.

Prior to the acceptance of the pavement, the pavement shall be flooded with a sufficient quantity of water to show if areas of ponding exist. All areas of ponding in excess of one-fourth inch (1/4") in depth and any length of curb and gutter that ponds in excess of one-fourth inch (1/4") in depth shall be removed and replaced by the Contractor and at the Contractor's expense.

The water may be applied by tank truck or with fire hose if a fire hydrant is available. The water shall be applied as directed by the Engineer and all expenses borne by the Contractor.

When it is necessary to remove and replace a section of curb and gutter any remaining portion of the curb and gutter adjacent to joints that is less than ten (10) feet in length shall also be removed and replaced by the Contractor and at the Contractor's expense.

S) Opening to Traffic - No traffic shall be permitted on the asphaltic concrete pavement until it has received its final rolling.

Returns, Driveways and Other Extremities - These areas shall be placed in accordance with Section W-VII, "Resurfacing at Returns, Driveways and other Extremities", of the Asphaltic Concrete Paving Manual.

302.05 – TESTING

302.05.01 – DESCRIPTION

It is the intent of these specifications that the pavement shall be constructed strictly in accordance with the thickness shown on the plans.

Where any pavement is found not so constructed, the following rules relative to core drilling pavement, replacement of the faulty pavement and adjustment of payment shall govern. All pavements shall be cored and measured for thickness before being accepted by the City as hereinafter provided.

All hot mix asphaltic pavements that will be maintained by the City will be tested according to the following section:

A) General: The asphaltic pavement base and surface coarse will be accepted by the engineer on a

"Lot" by "Lot" base. A "Lot" is considered to be 2,000 tons or part thereof or one (1) day of plant production.

B) Acceptance Testing: The acceptance testing of a "Lot" will be performed by a qualified testing laboratory approved by the City.

C) Tests results reports: Tests reports will be mailed on a daily basis in duplicate to the following address:

Field Engineer
City of Oklahoma City
420 West Main, Suite 700
Oklahoma City, OK 73102

D) Asphaltic Concrete Mix Design: Asphaltic concrete mix design and initial job-mix formula are the responsibility of the contractor and shall be submitted to the City for approval by the engineer.

The mix design shall be prepared in a City approved laboratory. The mix design and the initial job-mix formula for the contractor should be within the limits of the City's specifications. A new mix design is required should the material source change or results with the job-mix formula prove unsatisfactory.

E) Sampling and Testing: Sampling and testing of the asphaltic concrete at the job site shall be in accordance with Table 301.05.01. In all cases, it is the responsibility of the contractor to notify the testing laboratory one (1) day in advance of the work that is to be performed. It is the responsibility of the contractor to prove the acceptability of a "Lot" that does not have the required testing. The City reserves the right to request the removal of "Lots" that do not have the required testing.

F) Acceptance: Acceptance of all asphaltic concrete lifts (new construction and overlays) 1 1/2 inches or greater in thickness will be based on density as specified in Section 301.05 F) 1). All lifts less than 1 1/2 inches in thickness will be accepted on the basis of Section 301.01 F) 2).

1) All asphaltic concrete lifts 1 1/2 inches or greater thickness. The target density of each lot shall be 94 percent (unless specified otherwise by the Engineer) of the maximum Theoretical Specific Gravity at the Job Mix Formula asphalt content determined by the most recent specific gravity of the bituminous paving mixture in accordance with the AASHTO T 209. The roadway density of each lot will be the average of tests on three (3) separate specimens taken within the limits of the area represented by the lot. The locations and times of the test specimens collection shall be established by the engineer or his/her representative.

   The approved testing laboratory shall cut test specimens for each lot from the pavement by sawing or coring a specimen having a minimum size of four (4) inches on the cut side or diameter. The cost of cutting specimens and satisfactorily repairing the specimens area shall be paid by the City or the contractor depending on the type of contract as specified in sub-section (g). Repairing the specimen area with asphalt will be the responsibility of the contractor. Density may be on the specimens or through use of nuclear density gauges. The use of a nuclear density gauge or testing on the specimens shall be at the discretion of the engineer.

   Acceptance and payment will be based on tests by the approved testing laboratory and the decision of the engineer. The minimum density of 92 percent and maximum density of 96 percent are the acceptable levels of density (unless otherwise specified by the Engineer).

2) All Lifts Less Than 1 1/2 Inches in Thickness. The acceptance of asphaltic concrete lifts that are less than 1 1/2 will be at the discretion of the engineer.

G) Payment: The City will appoint an approved testing laboratory and will compensate the laboratory for the services rendered directly for projects that are contracted and paid for by the City. Compensation for the services rendered will be in accordance with the agreement between the City and the testing laboratory.

The contractor shall retain the services of an approved testing laboratory and will compensate the testing laboratory directly for its services for projects that are not contracted and paid for by the City. Compensation for the services rendered will be based on the agreement between the contractor and the testing laboratory. However, the testing services rendered should meet the specifications and provision of the City.

TABLE 302.05.01 – SCHEDULE OF TESTS FOR ACCEPTANCE OF RECYCLED HOT-MIX ASPHALT CONCRETE PAVEMENT.

Asphalt Extraction And Gradation	1000 tons Asphalt Pavement
Roadway Density Of Asphalt Mix	4 Per 2000 Tons Asphalt Pavement or as directed by the City Engineer
Hveem Stability Test And Density Of Molded Specimen	1 Per 2000 Tons Asphalt Pavement
Maximum Theoretical Specific Gravity Of Asphalt Mix	1 Per 2000 Tons Asphalt Pavement

301.05.02 – CORE DRILLING PAVEMENT

All pavements shall be cored and measured for thickness at (minimum of three) such points as the Engineer may select in each lot of paving.

TABLE 302.05.02 – TOLERANCE IN PAVEMENT THICKNESS

GROUP	DEFICIENCY IN THICKNESS (INCHES IN DECIMALS)	PENALTY IN PERCENT
		REDUCTION IN UNIT PRICE
A	0.00” TO 0.25”	NONE
B	0.26” TO 0.30”	5%
	0.31” TO 0.35”	10%
	0.36” TO 0.40”	15%
	0.41” TO 0.45”	20%
	0.46” TO 0.50”	25%
C	0.51” TO 0.55”	60%
	0.56” TO 0.60”	70%
	0.61” TO 0.70”	80%
	0.71” TO 0.75”	90%
D	OVER 0.75”	NO PAYMENT

Should any core show a deficiency of more than 0.25 inches check cores shall be taken each way in the lane so deficient, as directed by the Engineer, until the thickness of the pavement is not more than 0.25 inch deficient. The average thickness of the deficient cores shall determine the percent of penalty that shall be used to calculate the reduction in unit price for each square yard so deficient.

All costs in connection with core drilling the pavement and refilling the core holes shall be borne by the Contractor. Core holes shall be filled in an acceptable manner with material matching the pavement from which the cores were cut. The coring of the pavement shall be performed by a City approved testing lab.

For pavement slab, the average thickness of which, determined as hereinafter provided, is within 0.25 inch, of the thickness required on the plans, the contract unit price offered shall be used in payment.

For pavement slab, the average thickness of which determined as hereinafter provided, is less than the thickness shown on the plans by more than 0.25 inch, but less than 0.75 inch, an adjusted unit price shown in Table 302.05.02 will be used in payment.

No additional payment over the contract unit price will be made for any slab the average thickness of which, determined as hereinafter provided, exceeds the thickness shown on the plans.

The thickness of the slab will be determined by average of 9 point gage jig measurement of the thickness of adjacent cores, and the average thickness determined from each pair of adjacent cores shall apply to the length of lane between those cores. The last deficient core and the first core of satisfactory thickness shall be averaged to determine what deduction in payment will be made from the length of lane laying between them. In calculating the average thickness of the slab, the Engineer shall make a decision on the pavement measurements that are in excess of the thickness specified on the plans.

If, in the opinion of the Engineer, a deficiency in slab thickness of 0.75" or more is sufficient to impair seriously the service expected from the pavement, the Contractor will be required to remove the deficient area and to replace it with slab of a satisfactory quality and thickness. The Contractor will receive no compensation for materials or labor involved in the removal and replacement of the defective slab. If, on the other hand, in the opinion of the Engineer, there is no probability of immediate failure, he may allow the Contractor the choice of leaving the defective slab in place and receiving no compensation or payment for same, or of removing and replacing the pavement as provided.

If the Contractor believes that the cores and measurements taken are not sufficient to indicate fairly the actual thickness of pavement, he may request that additional cores and measurements be taken. The cost of additional cores and measurements will be paid by the Contractor. Cores will not be spaced closer than ten (10) feet.

Deductions for deficient thickness may be entered on any estimate after the information becomes available. No pavement shall be accepted for payment until it has been cored and provisions of Section 301 have been adhered to.

302.06 – METHOD OF MEASUREMENT

Asphaltic concrete may be measured by the square yard of surface area of specified thickness or by the ton (2000 lbs.) of mixture accepted in place.

Asphaltic concrete leveling course shall be measured by the ton (2000 lbs.) of material accepted in place.

Tack coat will be measured by the gallon at the temperature applied.

302.07 – BASIS OF PAYMENT

The various items measured as provided above will be paid for at the contract unit price bid

RHM - ASPHALTIC CONCRETE TYPE (A – E) (X INCHES)	S.Y.
RHM - ASPHALTIC CONCRETE TYPE (A – E)	TON
RHM - ASPHALT CONCRETE, TYPE (A – E) (POL. MOD.)	TON
RHM - ASPHALTIC CONCRETE LEVELING COURSE	TON

Such payment shall be compensation in full for furnishing all materials, labor, equipment, tools and incidentals, and for performing the work in accordance with these specifications.

SECTION 303 – MICRO SURFACING

303.01 – DESCRIPTION.

This work shall consist of the application of micro surfacing material to an existing pavement surface in lifts 1 inch (25 mm) thick or less. The micro surfacing shall be a mixture of polymer-modified emulsified asphalt, mineral aggregate, mineral filler, water, and other additives—all properly proportioned, mixed, and spread on the surface in accordance with the plans and specifications.

303.02 – MATERIALS.

Materials shall meet the requirements of Section 931

303.03 – EQUIPMENT.

The material shall be mixed by a self-propelled Micro Surfacing machine which shall be a continuous-flow mixing unit; this unit shall accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, and water to a revolving multi-blade mixer, and then discharge the thoroughly-mixed product on a continuous-flow basis. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler, and water to maintain an adequate supply to the proportioning devices. The machine shall also be equipped with self-loading devices which provide for the loading of all materials while continuing to lay Micro Surfacing, thereby eliminating unnecessary construction joints. The machine shall be equipped with opposite side driving stations to optimize longitudinal alignment. The machine shall be equipped to allow the mix operator to have full hydrostatic control of the forward and reverse speed during application of the micro surfacing material. The self-loading devices, opposite side driving stations, and forward and reverse speed controls shall be the original, manufacturer-designed equipment. Provide individual volume or weight controls for proportioning each material to be added to the mix. Calibrate and properly mark each material control device. The aggregate feed to the mixer shall be equipped with a revolution counter or similar device so the amount of aggregate used may be determined at any time. The emulsion pump shall be the positive displacement type and shall be equipped with a revolution counter or similar device so that the amount of emulsion used may be determined at any time. The mixing machine shall be equipped with a water pressure system and nozzle type spray bar to provide a water spray immediately ahead of and outside the spreader box. It shall also be equipped with an approved feeder that will provide a uniform, positive, accurately metered, predetermined amount of the specified mineral filler at the same time and location that the aggregate is fed. When construction is being performed under traffic, all equipment, including loading vehicles and supply trucks, will be required to operate in a single lane on which micro surfacing is being applied. The Contractor' s equipment for Micro Surfacing shall be operated in such a manner which will permit traffic to move safely and expeditiously through and around the work area. If the mineral aggregates are stored or stockpiled, handle them in such a manner as to prevent segregation, mixing of the various materials or sizes, and contamination with foreign materials. The grading of aggregates proposed for use and as supplied to the mixing plant shall be uniform. Furnish suitable equipment of acceptable size to work the stockpiles and prevent segregation of the aggregates. Screen and weigh the mineral aggregate at the stockpile prior to jobsite delivery. Screens and scales shall be approved by the Engineer. Keep all equipment used in the storage and handling of asphaltic material in a clean condition at all times, and operate it in such a manner that there will be no contamination with foreign matter.

303.04 – CONSTRUCTION METHODS.

1) **Weather Limitations.** Spread the material only when the atmospheric temperature is at least 50°F (10° C) or above in the shade and 4 feet (1.2 m) above the ground away from any artificial heat source, and the weather is not foggy or rainy.

2) S**urface Preparation.** Thoroughly clean area to be Micro Surfaced of all vegetation, loose aggregate, and soil. Apply water used in pre-wetting the surface at a rate to dampen the entire surface without any free-flowing water ahead of the spreader box.

3) **Test Panel.** Prior to the application of the micro surfacing mixture, place a test panel, at a location established by the Engineer, to demonstrate the compatibility of the modified emulsion and the mineral aggregate under field conditions. This test panel shall also be used to demonstrate the following:

   a) Mix uniformity; compliance of the mix to the requirements for proportioning the asphalt, mineral filler, and mineral aggregate; and adequate compliance with performance requirements for set, cure, stability, and conformance to the typical section. From this test panel, it will be determined

by the Engineer whether or not the mix is acceptable.

4) **Leveling Course.** When designated on the Plans or in the Contract or deemed necessary by the Engineer, apply a leveling course. Adequately cure the leveling course as approved by the Engineer before the final surface course is placed. At the direction of the Engineer, before the final surface course is placed, preliminary micro surfacing material may be required to fill ruts, utility cuts, depressions in the existing surface, etc. Ruts may be filled independently with a rut filling spreader box either 5 or 6 feet (1.5 or 1.8 m) in width to fill the rut or with a full-width scratch coat pass as directed by the Engineer.

5) **Spreading.** Spread the Micro Surfacing mixture uniformly by means of a mechanical-type squeegee box, equipped with augers to spread the materials uniformly throughout the box. Flexible seals shall be in contact with the road to prevent loss of mixture from the box. The rear flexible seal shall act as a strike-off and shall be adjustable. The spreader shall be maintained to prevent the loss of the Micro Surfacing product in surfacing super-elevated curves. The mixture shall be spread to fill all cracks and minor surface irregularities and leave a uniform application of fine aggregate and asphalt on the surface. The seam, where two spreads join, shall be neat appearing and uniform.

NOTE: If, in the opinion of the Engineer, the seam is rough enough to cause a noticeable effect on the steering of an automobile, the seam shall be removed and a new Micro Surfacing patch applied Patching shall be machine-applied patches with a full-width spreader box.

Operate the self-loading devices in such a manner as to eliminate unnecessary construction joints, and avoid overruns into the gutter. Remove all excess material from ends of each job site immediately.

6) **Curing and Maintaining Traffic.** Provide adequate means to protect the Micro Surfacing from damage by traffic until the mixture has cured sufficiently so that it will not adhere to or be picked up by the tires of vehicles.

NOTE: Any damage done by traffic to the Micro Surfacing shall be repaired by the Contractor and not measured for payment.

Suspend application of the surfacing materials early enough each day to permit traffic to safely travel over the completed work before dark. Work required or materials used in maintaining of traffic will not be paid for directly but shall be considered subsidiary to other items of work and shall be the responsibility of the Contractor.

303.06 – METHOD OF MEASUREMENT.

Mineral aggregate will be measured by the dry weight ton including mineral filler. *Polymer-Modified Emulsified asphalt* will be measured by the gallon (liter) or ton of residual asphalt cement.

303.07 – BASIS OF PAYMENT.

The accepted quantities, measured as provided above, shall be paid for at the contract unit price as follows:

EMULSIFIED ASPHALT	GALLON
EMULSIFIED ASPHALT	TON
TYPE I AGGREGATE	TON
TYPE II AGGREGATE	TON
TYPE III AGGREGATE	TON

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

SECTION 304 – PORTLAND CEMENT CONCRETE PAVEMENT

304.01 – DESCRIPTION

This section covers the wearing course of Portland Cement Concrete constructed in one (1) course on the prepared subgrade in accordance with these specifications and in conformity with the lines, grades, thickness and typical cross section shown on the plans.

304.02 – MATERIALS

All materials shall conform to the requirements specified in the special references, which are as follows:

Fly Ash	922
Portland Cement Concrete	932
Pre-molded Expansion Joint Filler	932
Hot Poured Sealing Filler	932
Cold Type Sealing Filler	932
Reinforcing Steel	941

304.03 – EQUIPMENT

The City Engineer shall approve design, capacity, and mechanical condition of equipment and tools necessary for handling materials and performing all parts of the work. The equipment shall be at the job site sufficiently ahead of the start of construction operations to be examined thoroughly and approved.

A) Batching Plant and Equipment

1) General - The batching plant shall include bins, weighing hoppers, and scales for the fine aggregate and for each size of coarse aggregate. If cement is used in bulk, a bin, hopper, and separate scale for cement shall be included. The weighing hoppers shall be properly sealed and vented to preclude dusting during operation.

2) Bins and Hoppers - Bins with adequate separate compartments for fine aggregate and for each size of coarse aggregate shall be provided in the batching plant.

3) Scales - The scales for weighing aggregates and cement shall be of either the beam type or the springless dial type. They shall be accurate within 0.5% throughout the range of use. When beam-type scales are used, provision, such as a "tell-tale" dial, shall be made for indicating to the operator that the required load in the weighing hopper is being approached. A device on weighing beams shall indicate critical position clearly. Poises shall be designed to be locked in any position and to prevent unauthorized change. The weigh beam and "tell-tale" device shall be in full view of the operator while charging the hopper, and he shall have convenient access to all controls.

   Scales shall be inspected and sealed as often as the Engineer may deem necessary to assure their accuracy but not less than every six (6) months. The Contractor shall have on hand not less than ten (10) fifty (50) pound weights for frequent testing of all scales.

B) Automatic Batching Equipment - Automatic batching of aggregates and bulk cement will be permitted subject to satisfactorily proportioning aggregates and cement and compliance with the following conditions:

   The plant shall be maintained level to an accuracy necessary for the proper operation of the weighing mechanism. When necessary to check scales, any bins carrying suspended weighing equipment shall be duly loaded for not less than two (2) hours prior to any test of weighing equipment. This checking shall be done at times so as to minimize time lost in normal construction operations. The weighing mechanism shall be so constructed or shielded as to provide accurate operation during windy or other adverse weather conditions.

   At each plant stop, a single actuation of a starting device shall be the only manual operation

required to proportion the designated amount of each ingredient into the weight hopper or hoppers.

The automatic batching equipment shall be interlocked in such a manner that the charging mechanism of any weight hopper cannot be opened until the scale has returned to zero (0). When the discharge mechanism of the weight hopper has closed the discharge mechanism cannot be opened until all ingredients have been batched to their designated weights, within the specified tolerances; if separate aggregate components are weighed cumulatively in a single hopper, the aggregates will be weighed in the selected sequence.

The designated batch weight of bulk cement and of each separate aggregate component shall be preset at the direction of the Engineer before the batch cycle starts.

The automatic batching equipment shall be capable of conversion to manual operation if necessary.

C) Mixers

1) General - Concrete may be mixed at the site of construction or at a central point or wholly or in part in truck mixers. Each mixer shall have attached in a prominent place a manufacturer's plate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

   The mixer shall be equipped with a calibrated water measuring device so designed that the accuracy of measurement will not be affected by variations of pressure in the water supply line, and capable of accurately measuring the water to within one (1) percent of the amount of mixing water required.

2) Mixers at Site of Construction - Mixing shall be in an approved mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified mixing period, and of discharging and distributing the mixture without segregation on the prepared grade. The mixer shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum has been charged and release it at the end of the mixing period. The device shall be equipped with a bell or other suitable warning device adjusted to give a clearly audible signal each time the lock is released. In case of failure of the timing device, the mixer may be used for the balance of the day while it is being repaired, providing that each batch is mixed ninety (90) seconds.

3) Truck Mixers, Truck Agitators, and Non-Agitator Trucks - Vehicles used for mixing and hauling central-mixed concrete, shall conform to the requirements of AASHTO M-157, modified as follows:

   Permissible wear of blades shall be not more than one-sixth (1/6) of the original width of blades, according to the manufacturer's specification.

D) Finishing Equipment

1) Finishing Machine - The finishing machine shall be equipped with at least two (2) oscillating type transverse screeds or other approved method of striking off the concrete.

2) Vibrators - Vibrators, for full width vibration of concrete paving slabs, may be the internal type with either immersed tube or multiple spuds. Pan type vibrators, if used, shall be used in conjunction with internal type vibrators. They may be attached to the spreader or the finishing machine, or may be mounted on a separate carriage. They shall not come in contact with the joint, load transfer devices, subgrade, or side forms. The rated frequency of the surface vibrators shall not be less than thirty five hundred (3,500) impulses per minute. And the frequency of the internal type shall not be less than five thousand (5,000) impulses per minute for tube vibrators and not less than seven thousand (7,000) impulses per minute for spud vibrators.

   When spud type internal vibrators, either hand operated or attached to spreaders or finishing machines, are used adjacent to forms, they shall have a frequency of not less than

thirty five hundred (3,500) impulses per minute.

3) Transverse Grooving Machine - When specified, the transverse grooving machine shall be either a vibrating roller or a comb equipped with steel tines. The machine shall be self-propelled and shall automatically lift the roller or tine comb bar near the edge of the pavement to minimize edge damage. Hand grooving methods will be permitted in a manner approved by the Engineer in those areas where the mechanical equipment cannot be used.

E) Concrete Saw - When sawing joints is elected or specified, the Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions and at the required rate. The Contractor shall provide at least one standby saw in good working order. An ample supply of saw blades shall be maintained at the site of the work at all times during sawing operations. The Contractor shall provide adequate artificial lighting facilities for night sawing. All of this equipment shall be on the job both before and continuously during concrete placement.

F) Forms - The side forms shall be metal, of approved cross section and bracing, of a height not less than the prescribed edge thickness of the concrete section, and a minimum of ten (10) feet in length for each individual form. Forms shall be of ample strength and shall be provided with adequate devices for secure setting so that when in place they will withstand the impact and vibration of equipment imposed thereupon without appreciable springing or settlement. In no case shall the base width be less than eight (8) inches for a form eight (8) inches or more in height. The forms shall be free from warps, bends, or kinks and shall show minimum variation from the true plane for face or top. Each ten (10) foot length of forms shall be provided with at least three (3) pins for securely staking in position. Sufficient forms shall be provided for satisfactory prosecution of the work. Ten (10) foot metal form sections shall be used in forming curves with a two hundred fifty (250) foot, and larger, radius. For curves with a radius of less than two hundred fifty (250) feet, acceptable flexible metal forms or wood forms may be used upon approval by the Engineer.

Forms shall be clean of old accumulated concrete, grout, or other materials. The forms shall be sprayed or covered with a form release agent prior to their use.

G) Subgrade Machine - The subgrade machine shall be of an approved type that will cut the subgrade, subbase or base reasonably close to the lines, grades and typical cross sections shown on the plans.

H) Subgrade Roller - Subgrade rollers shall be of adequate size to compact the subgrade or subbase to the required density.

I) Header Boards - Header boards to be used when paving operations are stopped, shall be of two (2) inch material and cut to the exact cross section of the paving slab. The boards shall be so designed as to permit accurate installation of dowels or tie bars as called for on the plans.

J) Longitudinal Float - The longitudinal float may either be a mechanical float or screed mechanism meeting the approval of the Engineer or a manually operated float. The hand operated float shall be a rigid straightedge float not less than twelve (12) feet nor more than eighteen (18) feet in length with a troweling or smoothing surface not less than eight (8) inches nor more than twelve (12) inches in width, and shall be worked from bridges spanning the pavement.

Longitudinal floats shall be maintained in good repair and working order at all times. If satisfactory results are not being obtained by use of a mechanical float, a manually operated float shall be available on the job for immediate use in lieu of the mechanical float.

The mechanical float shall be so adjusted and so operated that the screed will have a small quantity of concrete in front of it at all times. The screed shall not be raised or lowered solely for the purpose of maintaining the proper amount of concrete in front of the screed.

In lieu of the mechanical or hand operated longitudinal float, the use of a finishing machine with the float pan type finisher, will be permitted provided that satisfactory performance and specified

surface smoothness and tolerances are obtained.

K) Small Tools, Belt and Burlap Drag - The Contractor shall furnish a sufficient number of work bridges, hand floats, ten (10) foot straightedges, and small tools to satisfactorily complete the pavement as specified herein. Any float or straightedge which becomes warped or distorted and any belts or finishing tools which are defective, shall be promptly replaced with acceptable appliances.

Belts shall be used only with the approval of the Engineer. The belt shall be of three-ply canvas or of canvas-rubber composition at least ten (10) inches wide, and at least two (2) feet longer than the width of the pavement slab.

The burlap drag shall consist of a seamless strip of burlap or cotton fabric, which shall produce a uniform surface of gritty texture after dragging it longitudinally along the full width of pavement. The dimensions of the drag shall be such that a strip of burlap or fabric at least three (3) feet is in contact with the full width of pavement surface while the drag is used. The drag shall consist of not less than two (2) layers of burlap with the bottom layer approximately six (6) inches wider than the upper layer.

L) Spraying Equipment - The equipment for applying the white pigmented curing membrane shall be the fully atomizing type equipped with a tank agitator which will keep the compound thoroughly mixed during application. Hand sprayers of the pressure tank type approved by the Engineer may be used to apply curing membrane to vertical surfaces, irregular areas or edges after form removal.

M) Joint Sealing Equipment - The joint sealing equipment used on the project shall meet the requirement of the Oklahoma Department of Transportation and shall be approved by the Engineer.

304.04 – CONSTRUCTION METHODS

A) Setting Forms - All forms shall be set on a firm solid subgrade which has been thoroughly compacted. Any variations in the subgrade above or below grade shall be corrected by cutting or filling with earth. Fills shall be thoroughly tamped as required by the Engineer.

The forms shall be set to the required grade and alignment with exactness and shall be joined together neatly and tightly.

The length and number of pins used in setting the forms shall be such as to maintain them at the correct line and grade. The accuracy of the alignment and grade of the forms shall be checked both while they are being set, and just before the placing of the concrete, with a straightedge not less than ten (10) feet long and a carpenter's hand level not less than three (3) feet long. The forms shall not deviate from true line by more than 0.25 inch at any point. Forms which show a variation from the correct alignment and grade, shall be reset or removed and replaced with other forms, as directed by the Engineer. If the subgrade under the forms becomes unstable at any time before concrete is placed, the forms shall be reset on a firm foundation.

Where integral curb is required, the face forms shall be accurately and securely clamped in place immediately after the slab is poured and struck off, lamps and spreaders shall be spaced close enough together to prevent bulging or spreading of the face forms during the placing and compacting of the curb concrete. Spreaders shall be metal templates not less than one-eighth (1/8) inch and not more than three-sixteenths inch (3/16”) in thickness and of the proper shape. Special devices, when approved by the Engineer, may be used for supporting the face form. In general, clamps and spreaders or other supporting devices shall be placed no more than six (6) feet apart.

All forms shall be cleaned and oiled before concrete is placed provided that when directed by the Engineer curb-face forms shall be wetted instead of oiled.

B) Optional Use of a Slip Form Paver - If the Contractor so elects, he may use a slip form paver in lieu of the conventional paving train and stationary side forms.

When a slip form paver is used, all requirements of placing pavement with rigid forms shall be complied with except as provided herein:

1) Grade - After the grade or base has been placed and compacted to the required density, the areas which will support the paving machine will be brought to the proper elevation and profile by means of a properly designed and approved machine. If the density of the base or grade has been disturbed by any of the foregoing operations, it shall be corrected by additional compaction before concrete is placed.

2) Placing Concrete - The concrete shall be placed with an approved slip form paver designed to spread, consolidate, screed, and float-finish the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finish will be necessary to provide a dense and homogenous pavement in accordance with the plans and specifications. The machine shall vibrate the concrete for the full width and depth of the strip of pavement being placed. Such vibration shall be accomplished with vibrating tubes or arms working in the concrete. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms.

3) Finishing - Final surface shall conform to the requirements of Section 304.04.05.

C) Placing Concrete

1) General - All concrete shall be placed within a maximum time of 1-1/2 hours from the time the Portland Cement and water is introduced into the mixer. No concrete shall be placed unless an Inspector is present. The prepared subgrade shall be wet down by sprinkling uniformly with water before the placing of concrete begins. Only an amount of water that will be immediately absorbed by the subgrade shall be applied, care being taken that no pools of water or muddy spots are created. During dry, warm weather, the Contractor shall wet the subgrade down thoroughly several hours before the placing of concrete begins, when required by the Engineer. No concrete shall be placed unless the subgrade has been approved by the Engineer.

   The concrete shall be deposited on the subgrade in such a manner as to require as little rehandling as possible. The necessary spreading shall be done by means of shovels. Spreading by means of rakes will not be permitted. Any portion of a batch of concrete in which there is any segregation of materials during the operation of depositing and spreading shall be thoroughly mixed with the main body of the batch during the process of spreading.

   The operation of placing concrete shall be continuous between regular transverse joints provided, however, when work is unavoidably suspended for a period longer than thirty (30) minutes after the depositing of concrete has begun or until the concrete has taken initial set, then a transverse joint as hereinafter specified shall be placed and the slab completed to this joint. Mixing and placing of concrete shall be stopped in time to allow finishing to be completed in daylight hours, unless special permission to do otherwise is granted by the Engineer. When concrete is placed or finished at night, adequate illumination satisfactory to the Engineer, shall be provided.

2) Unreinforced Slabs - The concrete shall be placed the full depth of the slab in as nearly one (1) operation as possible.

3) Reinforced Slab - When the slab is to be reinforced, concrete shall first be deposited, spread and struck off uniformly as shown on the plans. When required by the Engineer, the Contractor shall check the uniformity and accuracy of the surface of this lower portion of the slab by use of the strike-off template. All variations in excess of one inch (1”) above or below the required elevation shall be eliminated. The reinforcement shall then be placed as hereinafter specified. The placing of the top portion of the slab shall then begin immediately after the reinforcement is properly placed but in no instance shall the time interval between the placing and striking off of the lower portion of the slab be longer than fifteen (15) minutes. Any dirt or other foreign matter which collects on the surface of the first layer shall be carefully and completely removed before

the upper layer is placed. The concrete shall be brought up to and struck-off at an elevation slightly above the required finish grade.

Where it is necessary, in the opinion of the Engineer, in placing the top portion of the slab, for trucks to back upon the concrete and reinforcement already in place, sound planks not less than three (3) inches in thickness and not less than twelve (12) inches in width, shall be placed for the wheels to run on. No truck shall back over any area of concrete in which dowel or tie bars are in place. Any bending or displacing of the reinforcement by the trucks shall be immediately corrected before covering with the top concrete.

4) Placing Concrete During Cold Weather - No concrete shall be placed on a soft, wet or frozen subgrade. In general, no concrete shall be placed when the air temperature in the shade and away from artificial heat is below thirty-five degrees F (35°F) or below forty degrees F (40°F) and falling unless with the special permission of the Engineer or as hereinafter provided. However, the Engineer may require that no concrete be placed when in his opinion the concrete might become damaged from subsequent low temperatures.

304.04.01 – PLACING INTEGRAL CURB

Where integral curb is required the concrete curb shall be placed and compacted before the slab concrete has taken its initial set. The curb shall be built to the required line, grade and dimension, and shall be shaped in strict conformity with the detail plans. The concrete shall be sufficiently worked and spaded while being placed in the combed surface and assure the working of sufficient mortar to the top and front face to facilitate the obtaining of a smooth, uniform surface.

304.04.02 – PLACING REINFORCING STEEL

A) Steel Bar Reinforcement - Steel reinforcing bars including tie bars, if shown and required on the plans, shall be of the size and type indicated thereon and shall be open hearth new billet steel of structural, intermediate, or hard grade, ASTM Designation A-615, or shall be rail steel concrete reinforcement bars, ASTM Designation A-616. All steel shall be bent cold. When tie bars are to be bent they shall be of structural or intermediate grade.

1) Deformed Bars - When deformed bars are specified, the forms of the bar shall be such as to provide a net sectional area at all points equivalent to that of a plain square or round bar of equal nominal size.

2) Fabricated Steel Bar or Rod Mats - When fabricated steel bar or rod mats are specified, the mats shall meet the current requirements of specifications for "Fabricated Steel Bar or Rod Mats for Concrete Reinforcement", ASTM Designation A-184.

B) Steel Wire Fabric Reinforcement - When steel wire fabricated reinforcement is specified, or permitted as an option, the wire fabric shall conform to the gauge and wire spacing shown on the plans and the requirements of the standard specifications for "Cold-Drawn Steel Wire for Concrete Reinforcement", ASTM Designation A-82. Longitudinal and transverse wires shall be electrically welded together at all points of intersection and the welds shall be of sufficient strength that they will not be broken during handling or placing. All welding and fabrication of the fabric sheets shall conform to the requirements of the standard specifications for "Welded Steel Wire Fabric for Concrete Reinforcement", ASTM Designation A-185. Welded steel wire fabric shall be furnished in flat sheets as per plan dimensions and steel fabric having been previously bundled into rolls will not be accepted. If wire fabric is used, it will replace only the longitudinal and transverse bars. The tie bars and load transmission units at joints will not be affected.

304.04.03 – JOINTS IN PAVEMENTS

A) General - The type and dimensions of joints shall be as shown on the plans or called for in these specifications. All joints shall be constructed true to line, having no variation therefrom greater than

one-half (1/2) inch at any joint. Transverse joints shall be perpendicular to, and longitudinal joints shall be parallel to, the centerline of the pavement. The plane of all joints shall be perpendicular to the subgrade. All joints shall extend the full length and width of the slab, and, with the exception of dummy joints, shall extend the full depth of the slab so as to entirely separate slabs, or slabs and structure. All headers or forms used in joint construction shall be securely held in place so as to be rigid and unyielding during the entire operation of placing and finishing the concrete and constructing the joint. Headers shall be held in place by iron pins of sufficient length to serve the purpose properly, unless permission to do otherwise is granted by the Engineer. After the concrete is placed, all iron pins shall be removed. Headers shall be kept oiled or greased while in use. All formed or tooled joints shall be edged with a one-fourth inch (1/4") radius edging tool.

B) Location of Joints - The location of joints in pavements shall be as shown on the plans, and as provided in these specifications, or as directed by the Engineer. Where shown on the plans or directed by the Engineer, expansion joints one inch (1") in thickness shall be placed between the pavement slab and all rigid structures projecting into or confined within the pavement slab. In general, expansion joints shall be placed at the PC & PT of each intersection return. Contraction joints shall be evenly spaced between expansion joints. Spacing will be not less than twelve (12) feet, nor more than eighteen (18) feet. When, due to unavoidable suspension of work, a joint is required, such joint shall be located not nearer than ten (10) feet to any other transverse joint. When the concrete deposited on the subgrade is not sufficient to permit the location of the joint ten (10) feet or more past the last joint constructed, the concrete shall be removed from the subgrade and disposed of by the Contractor. During the placing of any longitudinal slab section, the joint as required above shall be a transverse construction joint having bonded dowel bars, provided that the location of the joint be ten (10) feet or more past the last transverse joint and not nearer than ten (10) feet to the next transverse joint located in compliance with these specifications. All slabs placed adjacent to an existing slab shall have joints placed to match those in the existing slab.

C) Longitudinal Joints - Longitudinal joints shall be formed by sawing or by a parting strip of metal or other approved premoulded material securely held in place while placing the concrete slab. Deformed steel tie bars of specified length, size, spacing and material shall be placed perpendicular to longitudinal joints.

The parting strip shall be securely held in place perpendicular to the surface and true to line and grade, by metal pins, at intervals that average not greater than three (3) feet. The minimum length of parting strips shall be ten (10) feet and adjoining sections shall be securely fastened together by lapping and pinning by means of a slip joint or other approved method. The Contractor shall furnish an approved gauge riding on the side forms for accurately checking the position of the parting strip before concrete is placed against it.

For sawed longitudinal joints, tie bars shall be placed perpendicular to the longitudinal joints. They shall be placed by approved mechanical equipment or rigidly secured by chairs or other approved supports to prevent displacement. Tie bars shall not be painted or coated with asphalt or other material, or enclosed in tubes or sleeves.

When tested with a straightedge, the surface across any joint shall not vary from the straightedge by more than one-eighth (1/8) inch. Concrete edges at joints which are not sawed shall be tooled to one-eighth (1/8) inch radius or as otherwise shown on the plans.

The longitudinal joint shall be sawed before the end of the curing period or shortly thereafter and before any equipment or vehicles are allowed on the pavement. The sawed area shall be thoroughly cleaned and, if required, the joint shall immediately be filled with sealer.

D) Transverse Expansion Joints - The expansion joint filler shall be continuous from form to form, shaped to the subgrade and to the keyway along the form. Preformed joint filler shall be furnished in lengths equal to the pavement width or equal to the width of one lane. Damaged or repaired joint filler shall not be used unless approved by the Engineer.

The expansion joint filler shall be held securely in position. An approved installing bar, or other device, shall be used if required to secure preformed expansion joint filler at the proper grade and alignment during placing and finishing of the concrete. Finished joints shall not deviate more than one-fourth inch (1/4") in the horizontal alignment from a straight line. If joint fillers are assembled in sections, there shall be no offsets between adjacent units. No plugs of concrete shall be permitted anywhere within the expansion space.

The installing bar shall be a substantial metal plate or shape and shall have a length of one-half (1/2) inch less than the specified width of the slab and shall be cut to the specified crown of the slab in cross section with a width not to exceed one-half (1/2) inch less than the specified depth of the slab and shall be staked in position so that the top edge, unless otherwise provided on the plans, will be not more than one inch (1") below the proposed pavement surface; the lower edge shall be cut to conform to the prescribed cross section of the subgrade; the installing bar shall be slotted from the bottom as necessary to permit the installation of the required dowels and may be further cut away at intervals along its length so as to allow the concrete to make contact with the pre-molded filler at close intervals. Suitable means shall be provided on the bar for facilitating its removal. Header boards, sheet metal holders, or other devices in lieu of the installing bar, must meet the approval of the Engineer.

Pre-molded joint filler shall be appropriately punched to the exact diameter and location of the dowels. It shall, unless otherwise provided, be furnished in lengths equal to the pavement width; however, in cases where pavement two or more traffic lanes wide is being placed, the pre-molded filler may be furnished in sections, provided the length of each section is equal to the width of one lane. Where more than one section is used in a joint, the sections shall be securely laced or clipped together. The pre-molded joint filler shall be placed on the side of the installing bar nearest the mixer. The bottom edge of the filler shall project to or slightly below the bottom of the slab and unless otherwise prescribed, the top edge shall be one inch (1") below the surface of the pavement. While the concrete is being placed, the top edge of the filler shall be protected by a metal channel cap of at least one and one-half (1 1/2) inch sheet thickness material, having flanges not less than one and one-half (1 1/2) inch in depth.

After the concrete has been placed on both sides of the joint and struck off, the installing bar shall be slowly and carefully withdrawn leaving the pre-molded filler in place. Before the installing bar and channel cap is completely withdrawn, the concrete shall be carefully vibrated and additional freshly mixed concrete worked into any depression left by the removal of the installing bar. The filler must be exposed for the full width of the slab. The installing bar must be cleaned and re-oiled prior to each installation of a joint. After the removal of the side forms, the ends of the transverse joints at the edges of the pavement shall be carefully opened for the entire depth of the slab. Before the pavement is opened to traffic, pre-molded joints shall be sealed or topped out with the joint sealing filler specified for poured joints leaving a neat uniform strip of joint sealing filler slightly below the surface of the pavement.

Joints in concrete curbing that cannot be satisfactorily sawed shall be formed by means of steel templates or other approved joint forming dividers installed at the time the concrete is poured and at the location of the joint to be sawed.

E) Transverse Contraction Joints shall be formed by sawing or tooling. Sawing of transverse contraction joints shall begin as soon after pouring the pavement as can be done without causing undue raveling. Succeeding joints shall be sawed consecutively from beginning to end of the day's run, and all transverse joints shall be sawed to the depth specified on the plans soon enough to prevent uncontrolled transverse cracking.

F) Construction Joints: Unless otherwise directed, transverse construction joints shall be constructed when there is an interruption of more than thirty (30) minutes in the concrete operations. No transverse joint shall be constructed within ten (10) feet of an expansion joint, contraction joint, or plane of weakness. If sufficient concrete has not been mixed at the time of interruption to form a

slab at least ten (10) feet long, the excess concrete back to the last preceding joint shall be removed and disposed of as directed.

A rigid header shall be provided with holes or slots for dowel bars that shall be of the spacing and dimensions as for expansion joints.

G) Load Transfer Devices: Approved load transfer devices shall be firmly held in the position indicated on the plans. Dowels shall be held in position parallel to the surface and centerline of the slab by an approved support. Dowels for expansion joints shall be capped as shown on the plans.

In lieu of using dowel assemblies at contraction joints, dowel bars may be placed in the full thickness of pavement by a mechanical device approved by the Engineer.

304.04.04 – PLACING DOWEL BARS AND TIE BARS

A) General - Dowel bars and tie bars shall be accurately spaced during the placing of concrete, as shown on the plans. The bars shall be carefully placed so that they will project an equal distance into each slab adjacent to the joint and so that they will be parallel to the subgrade and perpendicular to the joint. All bars shall be maintained in their proper position using metal supports approved by the Engineer, until firmly and securely embedded in the concrete. All forms, headers or premoulded expansion joint material used shall have the necessary holes drilled or punched, or the necessary notches or slots provided at proper locations to permit the bars extending through them. Bars shall be placed at the midpoint of the depth of the slab.

B) Tie Bars - Tie bars (across all joints other than expansion or contraction joints) shall be deformed bars. The concrete shall be thoroughly spaded adjacent to the bars to secure good bond throughout the length of the bars and prevent the formation of voids.

The ends of tie bars which are to protrude from the edge of the pavement slab where driveway slabs are to be built, or in other instances where special permission is given by the Engineer, may be carefully bent at right angles so as to lay along the form or header, when the concrete is placed. As soon as the form is removed, the bent and partially embedded portion of the bar shall be carefully pried out and straightened to its proper position, care taken not to damage the concrete or the bar.

C) Slip Dowel Bars for Expansion Joints - Dowel bars across expansion joints shall be plain bars mounted in a supporting cage as shown on the plan. On one side of the joint, the bars shall be completely coated with a heavy paint. The ends of the bars which are painted shall be encased in a metal or cardboard tube. Where necessary to provide a grip on the bar to prevent the tubes being displaced from their proper position, the tubes shall be knocked out-o-round slightly. The open end of the tube shall be maintained in its proper position on the bar by means of a felt plug or wire across tube.

Dowels shall be held in place accurately parallel to the surface and centerline of the slab by a device of metal rods, which is left in the pavement. Dowels shall be installed in this device before it is placed on the subgrade. The device shall be rigid enough to hold the dowels in proper position. None of the members of the device shall cross the joints in such a way as to restrict the free opening and closing of the joint.

304.04.05 – CONSOLIDATING AND FINISHING CONCRETE PAVEMENT

A) General - The sequence of operations shall be the strike-off and consolidation, floating and removal of laitance, straight-edging, and final surface finish.

In general, the addition of superficial water to the surface of the concrete to assist in finishing operations will not be permitted. If the application of water to the surface is permitted, it shall be applied as a fog spray by means of approved spray equipment.

B) Machine Finishing - The concrete shall be distributed or spread as soon as placed. As soon as the

concrete has been placed, it shall be struck off and screeded by an approved finishing machine. The machine shall go over each area of pavement as many times and at such intervals as necessary to give the proper compaction and to leave a surface of uniform texture. Excessive operation over a given area shall be avoided. The tops of the forms shall be kept clean by an effective device attached to the machine and the travel of the machine on the forms shall be maintained true without lift, wobbling, or other variation tending to affect the precision finish.

During the first pass of the finishing machine, a uniform ridge of concrete shall be maintained ahead of the front screed for its entire length. Vibrators for full width vibration of concrete paving slabs shall meet the requirement in Section 304.03. If uniform and satisfactory density of the concrete is not obtained by the vibratory method at joints, along forms, at structures, and throughout the pavement, the Contractor will be required to furnish equipment and methods which will produce pavement conforming to the specifications.

C) Hand Finishing - Hand finishing methods will not be permitted except under the following conditions:

In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade or in transit when the breakdown occurs.

Narrow widths or areas of irregular dimensions where operation of the mechanical equipment is impractical may be finished by hand methods.

Concrete as soon as placed shall be struck off and screeded. An approved portable screed shall be used. A second screed shall be provided for striking off the bottom layer of concrete if reinforcement is used.

The screed for the surface shall be at least two (2) feet longer than the maximum width of the slab to be struck off.

Consolidation shall be attained by the use of a suitable vibrator or other approved equipment.

In operation, the screed shall be moved forward on the forms with a combined longitudinal and transverse shearing motion, moving always in the direction in which the work is progressing and so manipulated that neither end is raised from the side forms during the striking off process. If necessary, this shall be repeated until the surface is of uniform texture reasonably true to grade and cross section, and free from porous areas.

D) Floating - After the concrete has been struck off and consolidated, it shall be further smoothed, trued, and consolidated by means of a longitudinal float using one of the following methods as specified or permitted.

1) Hand Method - The hand operated longitudinal float shall be not less than twelve (12) feet in length and six (6) inches in width, properly stiffened to prevent flexibility and warping. The longitudinal float operated from foot bridges resting on the side forms and spanning but not touching the concrete, shall be worked with a sawing motion, while held in a floating position parallel to the road centerline, and passing gradually from one side of the pavement to the other. Movement ahead along the centerline of the pavement shall be in successive advances of not more than one-half (1/2) the length of the float. Any excess water or soupy material shall be wasted over the side forms on each pass.

2) Mechanical Method - The mechanical longitudinal float shall be of a design approved by the Engineer and shall be in good working condition. The tracks from which the float operates shall be accurately adjusted to the required crown. The float shall be accurately adjusted and coordinated with the adjustments of the transverse finishing machine so that a small amount of mortar is carried ahead of the float at all times. The forward speed shall be adjusted so that the float will lap the distance specified by the Engineer on each transverse trip. The float shall pass over each area of pavement at least two (2) times, but excessive operation over a given area will not be permitted. Any excess water or soupy material shall be wasted over the side forms on each pass.

3) Alternative Mechanical Method - As an alternative to Item 2 above, the Contractor may use a machine composed of a cutting and smoothing float, or floats, suspended from and guided by a rigid frame. The frame shall be carried by four (4) or more visible wheels riding on and constantly in contact with the side forms.

   If necessary, following one of the preceding methods of floating, long-handled floats having blades not less than five (5) feet in length and six (6) inches in width may be used to smooth and fill in open-textured areas in the pavement. Long-handled floats shall not be used to float the entire surface of the pavement in lieu of, or supplementing, one of the preceding methods of floating. When strike-off and consolidation are done by the hand method and the crown of the pavement will not permit the use of the longitudinal float, the surface shall be floated transversely by means of the long-handled float. Care shall be taken not to work the crown out of the pavement during the operation. After floating, any excess water and laitance shall be removed from the surface of the pavement by a straightedge ten (10) feet or more in length. Successive drags shall be lapped one-half (1/2) the length of the blade.

E) Belting (Paving with Rigid Forms) - When straightedging is completed and water sheen has practically disappeared and just before the concrete becomes nonplastic, the surface may be belted with a suitable belt meeting the requirements of Section 304.03(k). The belt shall be operated with short strokes transverse to the road centerline and with a rapid advance parallel to the road centerline.

   Either machine belting or hand belting will be permitted. The transverse belt will not be required if a satisfactory finish can otherwise be obtained.

F) Burlap Drag - A burlap drag shall be used for the finish of the pavement surface. The burlap or cotton fabric drag shall produce a uniform surface of gritty texture after dragging it longitudinally along the full width of pavement. For pavement sixteen (16) feet or more in width, the drag shall be mounted on a bridge which travels on the forms. The drag shall be maintained clean and free from encrusted mortar. Drags that cannot be cleaned shall be discarded and new drags substituted.

G) Final Surface Finish Requirements - The pavement surface shall be worked and finished during the operation of consolidating and finishing so that the final surface will conform to the following test requirements:

   A ten (10) foot straightedge shall be placed on the pavement surface parallel to the centerline and bridging any depressions or with one end on any high spot. Ordinates measured from the face of the straightedge to the pavement surface shall not exceed one-sixteenth inch (1/16”) for each one (1) foot distance from the nearest point of contact, provided that no ordinate shall exceed a maximum of one-fourth inch (1/4”).

   When tested with the straightedge as soon as the concrete has hardened sufficiently to permit walking on it without marring the surface, any high spots found in excess of the tolerance above permitted shall be removed by rubbing with a carborundum stone. In any event the rubbing shall cease when the coarse aggregate is reached and care shall be taken not to loosen any coarse aggregate.

   Prior to acceptance of the pavement, the pavement shall be flooded with a sufficient quantity of water to indicate areas of ponding, should they exist. All areas of ponding in excess of one-fourth inch (1/4”) in depth, and any length of curb and gutter that ponds in excess of one-fourth inch (1/4”) in depth, shall be removed and replaced by the Contractor and at the Contractor's expense.

   The water may be applied by tank truck or with fire hose if a fire hydrant is available. The water shall be applied as directed by the Engineer and all expenses borne by the Contractor.

   Any area or section of pavement removed shall be not less than ten (10) feet in length nor less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab and/or curb and gutter, adjacent to joints, that is less

than ten (10) feet in length, shall also be removed and replaced to the particular joint by the Contractor and at the Contractor's expense.

304.04.06 – CONSOLIDATING AND FINISHING INTEGRAL CONCRETE CURB

While the curb forms are being filled, the concrete shall be thoroughly spaded next to the forms to assure a smooth, dense surface. The concrete shall then be carefully tamped, using a tamper approved by the Engineer, until a uniformly dense concrete is obtained. After this initial compacting, additional concrete shall be added, tamped and struck off to the required finish curb grade, care being taken to work the coarse aggregate well beneath the surface. As soon as the concrete has set sufficiently to retain its shape without support of the face form, the clamps, spreaders and face form shall be removed. The back forms shall be removed within twenty-four (24) hours after pouring the concrete. Any honeycombed or rough surfaces shall be immediately corrected when the forms are removed, using mortar when necessary. The edges of the curb shall be neatly rounded to the required radii. The top and front face shall be thoroughly floated with a moist wooden float, apply clean water ahead of the float, until all form marks or other irregularities are completely removed. The curb surfaces shall be checked with a ten (10) foot straightedge immediately after removal of the forms, and all variations greater than one-fourth inch (1/4") in ten (10) feet from a true surface shall be corrected immediately. The final finish shall be obtained by uniformly brushing the entire top and front face before the concrete sets hard, using a brush approved by the Engineer 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.

304.04.07 – CURING CONCRETE PAVEMENT

A) General - A membrane type-curing compound will be used for curing all concrete pavement.

B) Method of Application - The curing compound shall be applied under pressure by means of a spray nozzle in such a manner as to cover the entire exposed surface thoroughly and completely with a uniform film. Sufficient pressure shall be applied to the spray machine to force the compound to leave the nozzle as a fine mist.

   The compound shall be applied to the fresh concrete immediately after the surface has been finished and before the initial set of the cement has taken place. The application of curing compound shall be close to the finishing at all times and all finished concrete shall be sprayed immediately after the superficial water, if any has subsided.

   The edges of paving slab shall be coated with the sealing compound within thirty (30) minutes after removal of the forms. This shall be a continuous process, and waiting until all forms have been removed before making application will not be permitted.

   When concrete is cast in forms, the concrete shall be kept continuously wet during the stripping operations, and when the surface does not require finishing after removal of the forms, the curing compound shall be applied immediately after removal of the form before the surface has had an opportunity to dry out. On the surface requiring a carborundum finish, the curing compound shall be applied immediately following the finishing operations before the surface dries.

   If hair checking develops before the curing compound can be applied, the procedure set forth above shall be performed as specified in standard specifications for the particular type of work under construction, and the curing compound shall be applied after the burlap has been removed.

   If, in the opinion of the Engineer, discontinuities, or pinholes, or abrasions in the membrane exist, a second coat shall be applied to the effected areas. No walking on the cured surface will be permitted for twenty-four (24) hours after application to prevent breaking the membrane. If this is done, the abrasions will be corrected by the use of additional curing compound.

C) Rate of Application - The sealing compound shall not be applied at a coverage rate lighter than specified below without express approval of the Engineer in charge.

Steel trowel finish	25 sq. yds. per gallon
Rough float finish	22 sq. yds. per gallon
Walls, smooth forms	25 sq. yds. per gallon or until solution drips and runs

Whenever the atmospheric temperature is one hundred degrees F (100°F) or more, the Engineer shall have the right to require an additional coat at a rate of approximately thirty (30) square yards per gallon, if he deems the additional material essential to obtain adequate water retention, in which case the second coat shall be applied thirty (30) minutes after the first.

D) Membrane Curing Compound - The membrane curing compound shall conform to the requirements of Section 932, and shall be of a suitable consistency for spraying, at the time of application. The membrane curing compound shall be applied to the green concrete as soon as the excess water has disappeared from the surface and the slab is finished, but before the concrete has taken initial set. The membrane curing compound shall be applied as specified in Section 932.

304.04.08 – PROTECTION OF CONCRETE IN COLD WEATHER

When concrete is placed while the temperature is below thirty-five degrees F (35°F) or below forty degrees F (40°F) and falling, the headers and curb back shall not be removed for seven (7) days and the slab and curb shall be covered with visqueen and dry burlap, cotton blankets, or equal.

When concrete is placed under the temperature conditions given above, or, when at any time within seventy-two (72) hours after concrete is poured, the air temperature goes below thirty-five (35) degrees F, a layer of dry straw not less than eight (8) inches in thickness shall be placed on the burlap and loose, dry dirt shall then be placed over the straw layer in sufficient quantity only to prevent the straw becoming displaced or blown off.

The straw layer shall be placed regardless of the curing method which may be in effect at the time and shall remain in place throughout the regular curing period. While cold weather prevails during the curing period, water shall be applied to the pavement or covering material only as directed by the Engineer. In general, no water shall be applied while the temperature is forty degrees F (40°F) or lower.

304.04.09 – PROTECTION OF PAVEMENT FROM TRAFFIC

As soon as the placing of concrete begins, the Contractor shall provide means for completely protecting the pavement from any and all damage or marring of the surface. Barricades, lights and signs shall be provided where directed by the Engineer. At all places where it is necessary to maintain public or private crossing over the pavement, the Contractor shall at his own expense provide and maintain bridges or other devices that will prevent the damage or marring of the concrete.

304.04.10 – BACKFILLING SLAB EDGES AND INTEGRAL CURB

Slab edges and the back side of integral curbs shall be banked with earth as soon as the forms are removed and the required finishing operations completed. Before the pavement is opened to traffic or the work accepted, the area outside the slab edges or back of the curbs shall be backfilled with select earth approved by the Engineer, thoroughly compacted in layers not exceeding six (6) inches in depth and neatly graded off flush with the top of the slab or top of curb or as shown on the plans.

Where the general elevation of the parking area is lower than the top of the curb or slab where there is no curb, the minimum width of the backfill shall be two (2) feet, unless otherwise shown on the plans, measured at the top of curb or slab surface.

304.04.11 – OPENING TO TRAFFIC

Between April 1, and October 15, pavement shall be opened to traffic in not less than seven (7) days from the date the concrete is placed. A fourteen (14) day curing period will be required at all other times.

304.04.12 – OPENING FOR DRIVEWAYS

Opening for driveways shall be left in the curb where directed by the Engineer, and shall be constructed in conformity with the detailed drawing and "Oklahoma City Standard Residential Driveway Openings". Two (2) inch to six (6) inch curb in the driveway opening shall be considered the same as regular curb insofar as measurement and payment are concerned.

304.05 - TESTING

The maximum number of concrete cylinder tests to be ordered by the Engineer and paid for by the Contractor shall be in accordance with the following schedule. (A test shall consist of four (4) cylinders, two (2) to be tested at an age of seven (7) days and two (2) to be tested at an age of twenty-eight (28) days.)

TABLE 304.05 - TESTING SCHEDULE PORTLAND CEMENT CONCRETE PAVEMENT

Description	Method of Test	Maximum quantity represented by one test
Concrete Cylinders	ASTM C-31-03a	600SY concrete paving

One test for slump, temperature and entrained air content shall be made for each set of four (4) concrete test cylinders or test beams cast.

Air entrainment tests shall be made in accordance with ASTM Designation C-173 or C-231 or subsequent revisions thereto.

In the event the slab on a street is poured in strips or lanes of less than twenty-six (26) feet in width, a minimum of one (1) set of concrete cylinders will be made in each block of each strip or lane so poured.

304.05.01 – STRENGTH REQUIREMENTS

Portland Cement Concrete shall meet the requirements of Section 932.

304.05.02 – TOLERANCE IN THICKNESS

It is the intent of these specifications that the pavement shall be constructed strictly in accordance with the plans. Any deficiency shall be governed by Section 301.

304.06 – METHOD OF MEASUREMENT

Portland Cement Concrete Pavement. The yardage to be paid for under this item shall be number of square yards of concrete pavement of the type shown on the Plans or in the Proposal, completed and accepted, measured complete in place. The width for measurement will be the width from outside to outside of the completed pavement, but not to exceed the width as shown on the Plans or as directed by the Engineer. The length will be the actual length measured along the riding surface of the centerline of the road, and shall exclude the length occupied by bridges, approach slabs, and all other exceptions. Reinforcing steel, load transfer devices, joint fillers and joint sealers will not be measured for payment.

Approach Slabs. The yardage to be paid for under this item will be measured as provided above for portland cement concrete pavement.

304.07 – BASIS OF PAYMENT

The accepted quantities of concrete pavement, and approach slabs, measured as provided above, will be paid for at the contract unit price for:

PORTLAND CEMENT CONCRETE PAVEMENT	SY
APPROACH SLABS	SY

PORTLAND CEMENT CONCRETE PAVEMENT (CONTINUOUSLY REINFORCED) SY

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 portland cement in lieu of standard cement.

SECTION 305 - CONCRETE CURB AND GUTTER

305.01 - DESCRIPTION

This section covers the construction of concrete curbs and gutters, either separate or in combination, for pavements and roadways in accordance with these specifications and in conformity with the lines, grades, and cross sections shown on the plans. The mixture of the Portland Cement Concrete shall conform to the strength requirements specified for Portland Cement Concrete, Section 932.

Integral concrete curb shall be constructed as specified under Portland Cement Concrete Pavement.

305.02 – MATERIALS

All materials shall conform to the requirements specified in Section 900 and the special references, which are as follows:

Portland Cement Concrete	932
Pre-molded Expansion Joint Filler	932
Hot Poured Sealing Filler	932
Cold Type Sealing Filler	932
Reinforcing Steel	941

305.04 – CONSTRUCTION METHODS

A) Excavation - Excavation shall be made to the required depth, and the base upon which the curb is to be set shall be compacted in accordance with applicable density requirements for the base material.

B) Forms - The forms shall be of metal, wood, or other suitable material, straight and free from warp, and of such construction that there will be no interference to the inspection of grade or alignment. All forms shall extend for the entire depth of the curb or curb and gutter and shall be braced and secured sufficiently so that no deflection from alignment or grade will occur during the placing of the concrete. All forms shall be cleaned thoroughly and oiled before the concrete is placed against them.

Fastening hardwood strips to the bottom of the forms, not to exceed two (2) inches in built-up thickness to provide the specified thickness may be permitted. Prior to use the Engineer shall approve the material and method of fastening the built-up section.

C) Equipment - A self-propelled curb machine may be used when approved by the Engineer. The curb machine shall be capable of extruding a uniformly textured material to the shape and density specified and placing it in reasonably close conformity to the established line and grade.

D) Placing Concrete - The subgrade and/or base, and forms shall have been checked and approved by the Engineer before concrete is placed. During placing, the concrete shall be thoroughly consolidated next to the forms by use of a suitable vibrator or other approved equipment.

E) Surface Finish - As soon as the curb concrete has set sufficiently to retain its shape without support, the final surface finish shall be obtained by uniformly brushing the surface in a manner approved by the Engineer. The edges of the curb shall be neatly rounded to the required radii. The top and front face of curbs shall be checked for irregularities during the finishing operation using a ten (10) foot straightedge, and all variations greater than one-fourth inch (1/4”) shall be corrected immediately.

F) Joints - All joints in curb and gutters shall be perpendicular to the subgrade, at right angles to the longitudinal axis of the curb and shall entirely separate the adjacent sections of concrete. Expansion and contraction joints shall be constructed at the same location as similar joints in the paving slab (if present).

Expansion joints shall be pre-molded expansion joint filler and shall be of the thickness and placed at the locations shown on the plans or as directed by the Engineer. Joints shall, in general, be placed in the curb, gutter, or combined curb and gutter opposite the joints in the pavement.

G) Curb Openings - Where curb is to be omitted for driveways or other cause, the top of the curb shall be constructed slightly higher at the back than at the front as shown on the plans or as directed by the Engineer. Such curb may be classified as "Lip Curb" in the special provisions or proposal, but unless so classified shall be considered as regular curb.

H) Extruded Method - When the extruded method is used to construct curb and gutter, the extrusion machine shall be operated on a string or wire line set to reproduce the line and grade shown on the plans.

Concrete shall be uniformly fed to the machine, and shall be of such consistency that after extrusion, the concrete will maintain the shape of the curb and gutter without support. The finished curb and gutter shall present a well-compacted mass with a surface free from voids and honeycombs, and reasonably true to established shape, line, and grade. Joints shall be constructed at the same locations as required when form construction is being used. Weakened joints spaced at twenty (20) foot intervals shall be made by sawing unless other methods are approved by the Engineer.

I) Curing - Protection - Opening to Traffic - Concrete curbs and gutters shall be cured, protected during cold weather, and opened to traffic in accordance with the requirements specified from Portland Cement Concrete Pavement.

J) Placing Dowel Bars - Where shown on the plans, dowel bars or tie bars shall be placed across joints or for tying curbs and gutters to adjacent curbs or slabs.

The ends of the tie bars which are to protrude from the edge of a slab, curb or gutter may be carefully bent at right angles so as to lay along the form or header when the concrete is placed. As soon as the form is removed the bent and partially embedded portion of the bar shall be carefully pried out and straightened to its proper position, care being taken to disrupt the concrete as little as possible.

K) Backfill - The back side of curbs and gutters shall be backfilled as soon as the forms have been removed and the required finishing operations completed. The backfill shall be of earth approved by the Engineer and neatly graded off flush with the top of the curb or gutter, or as shown on the plans. Backfill material shall be wheel rolled as it is placed. Care shall be taken not to damage the concrete in placing or compacting the backfill.

Where the general elevation of the parking area is lower than the top of the curb or gutter, or where there is no curb, the minimum width of the backfill shall be two (2) feet at the level of the top of the curb or gutter, unless shown as otherwise on the plans.

L) Driveways - See Section 304.04.12.

305.05 – TESTING

The maximum number of concrete cylinder tests to be ordered by the Engineer and paid for by the Contractor shall be in accordance with the following schedule. A test shall consist of four (4) cylinders, two (2) to be tested at seven (7) days and two (2) at twenty-eight (28) days.

TABLE 305.05 – TESTING SCHEDULE CURB AND GUTTER		
Description	Method of Test	Maximum quantity represented by one test
Concrete Cylinders	ASTM C-31 – 03a	800 LF Curb and Gutter

One test for entrained air content, slump and temperature shall be made for each set of four (4) concrete test cylinders or test beams cast.

Air entrainment tests shall be made in accordance with ASTM Designation C-173 or C-231 or subsequent revisions thereto.

305.06 – METHOD OF MEASUREMENT

Concrete curb and gutter will be paid for at the contract unit price per linear foot. The price bid per linear foot shall include the cost of the required depression at sewer inlets as shown on the inlet design of the required construction, expansion and contraction joints including the expansion joint filler and expansion joint filler seal, any reinforcing or dowels required by the plans, and any extra or special height curb required at inlet depressions. Such price shall be full compensation for all labor, materials, tools, equipment, tests and incidentals necessary to complete the work in accordance with the plans and specifications.

305.07 – BASIS OF PAYMENT

The curb and gutter measured as provided above will be paid for at the contract unit price bid

CURB AND GUTTER L.F.

Such payment shall be compensation in full for furnishing all materials, labor, equipment, tools and incidentals, and for performing the work in accordance with these specifications.

SECTION 306 – HIGH-EARLY-STRENGTH CONCRETE PAVEMENT

306.01 – DESCRIPTION

A) General Requirements. When high-early-strength concrete pavement is specified, it shall meet the requirements of Section 932, except that the compressive strength shall not be less than 3000 PSI when tested 72 hours after being batched. All other requirements herein before specified for concrete pavement shall be applicable subject to the following modifications.

B) Slip-Form Paver. If slip-form paver is used in place of conventional paving methods, in addition to all requirements of conventional paving methods the following requirements must also be followed.

1) Grade. After the grade or base has been placed and compacted to the required density, the areas which will support the paving machine shall be cut to the proper elevation by means of a properly designed machine. The grade on which the pavement is to be constructed shall then be brought to the proper profile by means of a properly designed machine. If the density of the base is disturbed by the grading operations, it shall be corrected by additional compaction before concrete is placed. The grade shall be constructed sufficiently in advance of the placing of the concrete. When the foundation for the surface is stabilized with an admixture, the area under the pavement and the supporting area for the paving machine shall be within the specified tolerances for the foundation type before concrete is placed.

2) Placing Concrete. The concrete shall be placed with an approved slip-form paver designed to spread, consolidate, screed, and float-finish the freshly placed concrete in one complete pass of the machine in such manner that a minimum of hand finish will be necessary to provide a dense and homogeneous pavement in conformance with the Plans and Specifications. The machine shall vibrate the concrete for the full width and depth of the strip of pavement being placed. Such vibrations shall be accomplished with vibrating tubes or arms working in the concrete or

with a vibrating screed or pan operating on the surface of the concrete. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms.

The slip-form paver shall be operated with a continuous forward movement and all operations of mixing, delivering and spreading concrete shall be so coordinated as to provide a uniform progress with stopping and staring of the paver held to a minimum. If, for any reason, it is necessary to stop the forward movement of the paver, the vibratory and tamping elements shall also be stopped immediately.

3) Finishing. A tube float finishing machine shall be used immediately following the slip-form paver, in a manner approved by the Engineer.

4) Tolerances. Tolerances of the finished pavement shall meet the requirements of Section 414.04(t) of Oklahoma Department of Transportation Specifications except that for the outer 6 inches along the edges of the pavement, a maximum deviation of 1/4 inch from a 10 foot straightedge placed perpendicular to the center line of the roadway will be permitted. When auxiliary parallel lanes are constructed using a slip-form paver, there shall be no appreciable slump along edges of adjoining lanes. Any valleys or depressions that will not drain properly shall be corrected by the Contractor at his own expense to the satisfaction of the Engineer.

5) Curing. Unless otherwise specified, curing shall be done in accordance with the method of Section 304.04. The curing media shall be applied at the appropriate time and shall be applied uniformly and completely to all surfaces and edges of the pavement.

6) Joints. All joints shall be constructed in accordance with Section 304.04.

7) Protection Against Rain. In order that the concrete may be properly protected against the effects of rain before the concrete is sufficiently hardened, the Contractor will be required to have available at all times materials for the protection of the edges and surface of the unhardened concrete. Such protective materials shall consist of standard metal forms or wood plank having a nominal thickness of not less than 2 inches and a nominal width of not less than the thickness of the pavement at its edge for the protection of the pavement edges, and covering material such as burlap or cotton mats, curing paper, or plastic sheeting material for the protection of the surface of the pavement. When rain appears eminent, all paving operations shall stop and all available personnel shall begin placing forms against the sides of the pavement and covering the surface of the unhardened concrete with the protective covering.

306.05 – TESTING

Pavement tolerances will be according to Section 304.05.

Pavement slabs may be rejected because of unsound concrete, uncontrolled cracking, malfunctioning of the sawed joints, spalling, honeycombing, surface irregularities, insufficient thickness, or for any deficiencies commonly associated with poor quality pavements. Rejected slabs shall be removed and replaced with new pavement conforming to these requirements. The removal and replacement shall be at least one lane in width and ten feet in length. Where the linear extent of removal falls within ten feet of a transverse joint, the removal limits shall be extended to the joint.

306.06 – METHOD OF MEASUREMENT

High Early Strength Concrete Pavement. The yardage to be paid for under this item shall be number of square yards of concrete pavement of the type shown on the Plans or in the Proposal, completed and accepted, measured complete in place. The width for measurement will be the width from outside to outside of the completed pavement, but not to exceed the width as shown on the Plans or as directed by the Engineer. The length will be the actual length measured along the riding surface of the centerline of the road, and shall exclude the length occupied by bridges, approach slabs, and all other exceptions. Reinforcing steel, load transfer devices, joint fillers and joint sealers will not be measured for payment.

Approach Slabs. The yardage to be paid for under this item will be measured as provided above for portland cement concrete pavement.

306.07 – BASIS OF PAYMENT

The accepted quantities of concrete pavement, and approach slabs, measured as provided above, will be paid for at the contract unit price for:

HIGH-EARLY-STRENGTH CONCRETE PAVEMENT	SY
HIGH-EARLY-STRENGTH CONCRETE APPROACH SLABS	SY
HIGH-EARLY-STRENGTH CONCRETE PAVEMENT (CONTINUOUSLY REINFORCED)	SY

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 portland cement in lieu of standard cement.

SECTION 307 – PLANER PROFILING PAVEMENTS

307.01 – DESCRIPTION

This work shall consist of profiling the existing pavement surface to a depth shown on the Plans below the present finished grade and removing gouges, spalls, ridges, ruts or other imperfections. The planer profiling work shall produce a plane surface with surface aggregate sheared by the scarifying action yielding a surface of uniform texture free from longitudinal ridges, with a pattern which will meet straightedge requirement for "plant mix asphalt concrete pavement" Section 301 and textured in a manner approved by the Engineer

307.03 – EQUIPMENT

The planer profiling machine shall be one piece of equipment especially designed and built for this type of work. It shall be self-propelled, fully automated to control the depth of cut and slope from a preset or traveling reference line. The machine shall be capable of cutting reasonably flush to the curb and to inlets, manholes, or similar items within or adjacent to the pavement. The planing operation shall be performed continuously by the forward motion of the machine. If a heater planer machine is used it shall have, in addition to the above, the means in combination, for controlled heating and planing the existing surfaces without burning or tearing the surface. The blades for cutting shall be self-sharpening, controlled from the operator's station and shall deliver the cuttings into windrows in a manner approved by the Engineer. The width of the heating and cutting shall be not less than four (4) feet and the effective wheel base of the machine shall be not less than eighteen (18) feet. The heating method used shall not detrimentally soot or oil-coat the aggregates or asphaltic materials.

307.04 – CONSTRUCTION METHODS

The Contractor shall provide all necessary warning lights, barricades, flagmen and signs incidental to the protection of the public and workmen during the planer profiling operations as required by the current edition of the Manual on Uniform Traffic Control Devices. The existing pavement surface shall be uniformly profiled. If a heater planer is used the surface shall be heated to a temperature of no more than two hundred seventy-five degrees F (275°F) and shall be shaved or cut to the new planed surface.

The temperature at which the work is performed, the nature and condition of the equipment, and the manner of performing the work shall be such that the pavement is not torn, broken, burned or otherwise damaged by the planing operation. The machine shall make as many passes as necessary to remove the irregularities and to profile the surface to the depth shown on the Plans in a manner approved by the Engineer. Unless otherwise shown on the Plans, all material removed from the surface will not be paid for separately but shall become

the property of the Contractor and shall be disposed of by him in a manner approved by the Engineer.

307.06 – METHOD OF MEASUREMENT

Planer profiling will be measured by the square yard of surface area of completed and accepted work.

307.07 – BASIS OF PAYMENT

Accepted quantities of planer profiling, measured as provided above, will be paid for at the contract unit price for:

PLANER PROFILING SY

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

SECTION 309 – COLD MILLING PAVEMENT

309.01 – DESCRIPTION

This work shall consist of cold milling and removing existing pavement surfaces below the present grade to a depth shown on the plans, removing ridges, ruts and other imperfections as determined by the Engineer. The milling operation shall produce a plane surface that will provide a smooth riding surface for traffic.

309.03 – EQUIPMENT

The Contractor shall provide a power operated milling machine capable of planing a minimum depth of one and one-half inches in a single pass. The equipment shall be self-propelled with sufficient power, traction and stability to maintain accurately and automatically establishing profile grades along each edge of the machine by referencing the existing pavement by means of a ski, or matching shoe or from an independent grade control, and shall have an automatic system for controlling cross slope at a given rate. The machine shall be equipped with an integral loading means to remove the material being cut from the pavement surface and to discharge the cuttings into a truck, all in a single operation.

309.04 – CONSTRUCTION METHODS

The existing pavement shall be uniformly milled to provide a uniform texture, true to line, grade and cross section, it shall have no deviations in excess of three-sixteenths inch (3/16”) in ten (10) feet. Any portion of the planed surface not meeting this requirement shall be corrected in a manner approved by the Engineer.

The machine shall make as many passes as necessary to remove irregularities and to profile the surface to the depth and cross slope shown on the Plans.

Cold milling shall be done in a manner that will not create undue traffic hazards.

The milling operation shall be performed in each lane in such a manner that the milled lanes are evened up as near as practical at the end of each day's operation so as to eliminate the hazard of an exposed vertical edge when traffic is carried through construction.

All materials removed shall become the property of the Contractor and shall be disposed of by him in a manner approved by the Engineer.

309.06 – METHOD OF MEASUREMENT

Cold milling pavement will be measured by the square yard of surface area.

309.07 – BASIS OF PAYMENT

Accepted quantities of cold milling pavement, measured as provided above, will be paid for at the contract unit price for:

COLD MILLING PAVEMENT SY

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

SECTION 310 – CONCRETE JOINT REHABILITATION

310.01 – DESCRIPTION

This work shall consist of sawing, cleaning and sealing contraction joints in existing portland cement concrete pavement in reasonably close conformity with the details shown on the Plans or as approved by the Engineer.

310.02 – MATERIALS

Materials shall meet the requirements of Section 932 for the type joint filler or sealer shown on the Plans or designated in the Proposal.

310.03 – EQUIPMENT

All necessary equipment shall be furnished by the Contractor. The minimum requirements for the construction equipment as required to complete the work as specified herein.

A) Concrete Saw - Sawing equipment adequate in size and power to complete the sawing of concrete joints to the required dimensions.

B) High Pressure Water Pumping System - High pressure water pumping system capable of delivering sufficient pressure and volume of water to thoroughly flush concrete slurry from sawed joints.

C) Sand Blasting Unit - Compressed air pressure type sand blasting equipment of proper size and capacity to clean joint surfaces as specified. The unit shall be equipped with suitable traps for removal of all free water and oil from the compressed air.

D) Air Compressors - Air compressors capable of delivering compressed air having a pressure in excess of 90 psi and equipped with suitable traps for removal of all free water and oil from the compressed air.

E) Extrusion Pump - Air powered extrusion pumps as required for applying joint sealer with an output capable of delivering a sufficient volume of material to the joint.

F) Injection Tool - A mechanical injection device as required for applying the sealer into the joint.

310.04 – CONSTRUCTION METHODS

A) Sawing Joints - The existing contraction joints shall be cut to the width and depth shown on the Plans. Sawing shall be done in such a manner as to produce a new joint having a cut face on both sides and be uniform in width along its full length.

B) Flushing Joints - Within five (5) minutes after sawing, the resulting slurry shall be removed from the joint and immediate area flushed with a high-pressure water system and other equipment necessary to thoroughly remove the slurry.

C) Cleaning Joint Faces

1) General - The cut faces of the joints shall be thoroughly cleaned of all foreign materials, as may be required for proper installation and bonding of the joint sealer or filler, including old sealant or any residue from water flushing operations, by sandblasting as required. The use of portable hand saws will not be permitted for cleaning joint faces.

   The cut faces of the joint shall be thoroughly air dried for a minimum of forty-eight (48) hours after flushing with water. Blow-drying of the joints with compressed air will not be permitted.

2) Sandblasting - After complete drying, the joint shall be sandblasted. The sandblaster nozzle shall be attached to a mechanical aiming device so as to direct the sandblast to approximately a forty-five (45) degree angle and at a maximum of two (2) inches from the faces of the joint. Both

joint faces shall receive sandblasting.

After sandblasting the joints shall be blown out using filtered oil free and moisture free air at a minimum of 90 psi and 120 cfm. Blowing out of the joint shall be accomplished by using a blow tube that will fit into the joint.

After blowing, the joint shall be checked for any residual dust or coating. If any is found the sandblasting and blowing operations shall be repeated until the joint is cleaned. The cleaned joints shall be sealed the same day as cleaned. Joints left open overnight shall be recleaned prior to sealing.

3) Joint Contamination - In the event the open joints prepared for installation of joint sealing materials become contaminated by traffic, or the result of weather conditions, they shall be recleaned as specified above or as approved by the Engineer.

D) Bond Breaker Rod - When shown on the plans or recommended by the sealant manufacturer, a bond breaker rod shall be installed prior to application of the joint sealant. The bond breaker rod shall be of the type recommended by the manufacturer of the sealant material. The bond breaker rod shall be installed in a manner that will produce the dimensions (width and depth) described on the Plans.

E) Sealing Joints

1) Approval of Joints for Sealing - The Department's inspectors will examine joints prepared for sealing just prior to installation of the joint filler or sealer. Joints will not be approved for sealing if contaminated or not adequately dry as required for bonding of sealing materials.

2) Installation of Joint Sealers and Fillers: A representative of the joint filler and/or joint sealer manufacturer shall be on the job site at the beginning of the joint sealing operation to demonstrate to the Contractor and to the Department's inspectors the manufacturer's acceptable standards for installation of the joint sealant materials.

3) Application of Joint Sealers: Joint Sealers - The joint sealer shall be applied, using a mechanical injection tool approved by the Engineer. Application of the joint sealer will not be permitted when the joint temperature is less than forty degrees F (40°F). Joints shall not be sealed unless they are thoroughly clean and dry. Sealers to fill the joint shall be injected into the joint and applied in a manner which causes it to bond to the joint face surfaces. The surfaces of sealers requiring tooling shall be tooled, using an approved mechanical device to produce a slightly concave surface approximately 0.25 to 0.50 inch below the pavement surface. Tooling shall be accomplished before a skin forms on the surface of the sealer. The use of soap or oil as a tooling aid will not be permitted. Tooling will not be required if the sealer is self-leveling.

4) Bonding Failures - Failure of the sealant to bond to sawed surfaces of the concrete joint will be cause for rejection and repair shall be at the Contractor's expense.

F) Traffic - Traffic shall not be allowed on the fresh applied sealant until it becomes tack free.

310.06 – METHOD OF MEASUREMENT

Concrete joint rehabilitation will be measured by the linear foot after the joint sealant is in place.

310.07 – BASIS OF PAYMENT

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

CONCRETE JOINT REHABILITATION LF

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

SECTION 311 – FABRIC REINFORCEMENT FOR ASPHALT CONCRETE PAVEMENT

311.01 – DESCRIPTION

This work shall consist of the application of reinforcement fabric for plant mix asphalt concrete pavement in accordance with these Specifications and in reasonably close conformity with the locations and dimensions shown on the Plans or established by the Engineer.

311.02 – MATERIALS

Materials shall meet the requirements specified in 900 - Materials.

311.03 – EQUIPMENT

A) General - Equipment and tools necessary for performing all parts of the work shall be furnished by the Contractor in conformance with Section 100 General Provisions.

B) Fabric Laydown Equipment - Mechanical laydown equipment shall be capable of handling full or partial rolls of fabric and shall be capable of laying the fabric smoothly without excessive wrinkles and/or folds. When manual laydown is required, a length of standard one inch (1") pipe, together with suitable roll tension devices shall be used for proper roll handling.

C) Miscellaneous Equipment - Miscellaneous equipment shall include stiff bristle brooms to smooth the fabric, scissors or blades to cut the fabric, and brushes as required for use in appyling asphalt binder to fabric overlap as spliced joints.

311.04 – CONSTRUCTION METHODS

A) Surface Preparation - The surface on which the fabric is to be placed shall be free of dirt, dust, water, oil or other foreign matter.

B) Application of Bituminous Binder - Bituminous binder material shall be heated and uniform spray applied over the area to be fabric covered. Laps shall be mopped between layers of fabric. The longitudinal lap may be sprayed with the distributor. The minimum application temperature of the bituminous binder shall not be less than two hundred ninety degrees F (290°F). If the fabric is oversprayed, the maximum application temperature shall not exceed three hundred twenty-five degrees F (325°F) to avoid damage to the fabric. The bituminous binder shall be applied at the rate of 0.20 to 0.35 gal./SY (actual application rates will be based on asphalt retention tests for the fabric used) as established by the Engineer. Application of the bituminous material shall be accomplished with an asphalt distributor. Areas not accessible to the distributor shall be hand sprayed. The distributor shall be started and stopped over paper or roofing felt to provide neat cutoff lines. The width of binder application shall be two (2) to six (6) inches wider than the fabric width. Care shall be exercised in the application of the binder to avoid spills or excessive application to cause flushing of the bituminous material.

C) Placement of Reinforcement Fabric - The fabric shall be placed after the bituminous binder has been applied and before the binder has cooled and lost tackiness. The fabric shall be unrolled and placed into the binder with the unfused (fuzzy) side down with a minimum of wrinkles. Every effort shall be made to lay the fabric as smoothly as possible. The fabric shall be broomed to remove air bubbles and maximize fabric contact with the pavement surface. Wrinkles shall be cut and laid out flat. If misalignment of the fabric occurs the fabric shall be cut, realigned and jointed as directed by the Engineer. Overlap of fabric at joints shall be between four (4) and six (6) inches. Transverse joints shall be shingled in the direction of paving to prevent edge pick up by the paver. Additional binder shall be applied to joints at the rate specified by the Engineer. Transverse joints shall be mopped, brushed or hand sprayed. The longitudinal joints shall be sprayed with the distributor. The reinforcement fabric shall be embedded into the bituminous binder and bonded to the pavement. Self-propelled pneumatic tired rollers may be used if deemed necessary by the Engineer. Fabric not overlaid the same day shall be blotted with clean apparently dry sand before

being turned to traffic. Sand for blotting will be included in other items for payment.

D) Weather Limitations - Asphalt binder shall not be applied for installation of the fabric when the air temperature is less than fifty degrees F (50°F) unless otherwise approved by the Engineer.

E) Tack Coat - Tack coat, if required, for the pavement overlay shall be applied in accordance with Section 313. The bituminous material type, grade, rate of application and temperature shall be approved by the Engineer. Cut-back asphalt or emulsified asphalt containing petroleum distillate additives shall not be used.

F) Pavement Overlay - Placement of the asphalt concrete pavement overlay should closely follow fabric lay down unless otherwise permitted by the Engineer. Any damage or disbonding of the fabric reinforcement membrane caused by traffic or wet weather conditions due to unnecessary delay or negligence of the Contractor shall be repaired at his own expense. In the event excess binder bleeds through the fabric before the overlay is placed, the excess material shall be blotted by spreading sand on the affected area as directed by the Engineer. The temperature of the paving mix at time of placement on the reinforcement fabric membrane shall not exceed three hundred twenty-five degrees F (325°F) to prevent damage to the fabric. The turning of pavers or other vehicles should be gradual and kept to a minimum to avoid damage to the fabric. Should equipment tires pick up the fabric or the paver cause movement of the membrane during paving operations asphalt paving mix may be broadcast ahead of trucks and the paver to prevent damage. Any damage to the reinforcement membrane due to equipment shall be repaired by the Contractor at his expense.

311.06 – METHOD OF MEASUREMENT

Fabric reinforcement will be measured by the square yard in place.

Bituminous binder will be measured by the gallon in accordance with Section 311.04.

311.07 – BASIS OF PAYMENT

The accepted quantities of fabric reinforcement and bituminous binder, measured as provided above, will be paid for at the contract unit price for:

FABRIC REINFORCMENT	S.Y.
BITUMINOUS BINDER	GAL

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

SECTION 312 – DIAMOND GRINDING CONCRETE PAVEMENT

312.01 – DESCRIPTION

This work shall consist of grinding portland cement concrete pavement to restore drainage and riding characteristics to the pavement surface. This work shall be accomplished in accordance with these Specifications and in reasonably close conformity to the details shown on the Plans.

312.03 – EQUIPMENT

The grinding equipment shall be a power driven, self-propelled machine that is specifically designed to smooth and texture portland cement concrete pavement with diamond blades. The effective wheel base of the machine shall not be less than twelve (12) feet. It shall have a set of pivoting tandem bogey wheels at the front of the machine and the rear wheels shall be arranged to travel in the track of the fresh cut pavement. The center of the grinding head shall be no further than three (3) feet forward from the center of the back wheels.

The equipment shall be of a size that will cut or plane at least three (3) feet wide. It shall also be of a shape and dimension that does not encroach on traffic movement outside of the work area. Equipment that causes excessive ravels, aggregate fractures, spalls or disturbance of the transverse and

longitudinal joints or cracks will not be permitted.

312.04 – CONSTRUCTION

A) Grinding Pavement - The Plans will designate the areas of pavement surfaces to be ground. Grinding shall be performed in the longitudinal direction so that grinding begins and ends at lines normal to the pavement centerline. The entire area designated on the Plans shall be ground until the pavement surfaces of adjacent sides of transverse joints and cracks are in the same plane. Extra depth grinding to eliminate minor depressions in the pavement to obtain one hundred (100) percent texturing will not be required.

The construction operation shall be scheduled and proceed in a manner that produces a uniform finished surface. Grinding shall be accomplished in a manner that eliminates joint or crack faults, while providing positive lateral drainage by maintaining a constant cross-slope between the edges of grinding operations. Auxiliary or ramp lane grinding shall transition as required from the mainline edge to provide positive drainage and an acceptable riding surface.

1) Surface Texture and Grooving - The grinding process shall produce a pavement surface that is uniform in appearance with a longitudinal line type texture. The surface shall have grooves between 0.09 to 0.15 inches wide, spaced up to 0.125 inches apart. The peaks of the ridges shall be approximately one-sixteenth inch (1/16") higher than the bottom of the grooves.

2) Slurry Removal - The Contractor shall provide positive means for removal of grinding slurry or residue by vacuum or other continuous methods. Slurry shall not be allowed to flow across lanes being used by traffic.

3) Pavement Smoothness

i) Profiling Pavement Surface - All ground surfaces shall be profiled by the Contractor for smoothness using the profilograph specified on the Plans or in the Proposal. Profiles will be made three (3) feet from and parallel to each edge of pavement and at the approximate location of each longitudinal joint for all pavement areas. Pavement so test shall have a profile index of five (5) inches per mile or less using 0.2 inch blanking width. Individual high points in excess of 0.3 inch, as determined by measurements of the profilograph shall be reduced by grinding, until such high points as indicated by reruns of the profilograph do not exceed 0.3 inch.

After grinding has been completed to reduce individual high points in excess of 0.3 inch, additional grinding shall be performed as necessary to reduce the profile index to values specified above in any 0.1 mile section along any line parallel with the pavement edge.

Additional grinding shall be performed as necessary. All ground areas shall be neat rectangular areas of uniform surface appearance.

ii) Straight Edge Tolerance - The surface may be straightedged, at locations to be determined by the Engineer, with a straightedge ten (10) feet long. When the straightedge is laid on finished pavement parallel to centerline or normal to the centerline, the maximum distance to the roadway surface from the bottom edge of the straightedge shall not exceed one-eighth (1/8) inch at any point. Additional grinding will be required at the locations found in excess of the one-eighth (1/8) inch tolerance.

B) Traffic Control - Traffic control shall be in accordance with the Manual on Uniform Traffic Control Devices.

312.06 – METHOD OF MEASUREMENT

Diamond grinding concrete pavement will be measured by the square yard. The square yards measured will be the final textured surface area regardless of the number of passes required to achieve acceptable results. Minor areas of untextured pavement within the designated areas to be textured will

be included in the measurement.

312.07 – BASIS OF PAYMENT

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

DIAMOND GRINDING SY

SECTION 313 – TACK COAT

313.01 – DESCRIPTION.

This work shall consist of preparing and treating an existing bituminous or concrete surface with bituminous material in accordance with these Specifications and in reasonably close conformity with the lines shown on the Plans or established by the Engineer.

313.02 – MATERIALS.

Materials shall meet the requirements specified in the following Section of Section 900-Materials:

Asphalt Materials 931.03

The emulsified asphalt may be diluted as specified or approved by the Engineer.

313.03 – EQUIPMENT.

Distributors, heating equipment, and supply tanks shall meet the requirements of Section 301.

313.04 – CONSTRUCTION METHODS.

Clean the existing surface or course to the satisfaction of the Engineer before tack coat is placed. Apply the tack coat, as directed by the Engineer, at the rate of—and not to exceed—0.1 gallon per square yard of surface. Paint all contact surfaces of curbs and gutters, manholes, and other structures with a thin, uniform coat of asphalt material used for the tack coat. Apply the tack coat in such manner as to minimize damage, offer the least inconvenience to traffic, and permit one-way traffic without pickup or tracking of the bituminous material.

NOTE: Do not apply tack coat during wet or cold weather, when wind drift presents a potential problem to the traveling public or adjacent property, after sunset, or to a wet surface; however, the surface may be damp. Tack coat that is not "covered" the same day may be reapplied at a rate that insures proper adhesion as directed by the Engineer.

The quantity, rate of application, temperature, and areas to be treated shall be approved prior to application.

313.06 – METHOD OF MEASUREMENT.

Tack coat will be measured by the gallon before dilution.

NOTE: Water used in dilution of emulsified asphalt will not be measured for payment.

313.07 – BASIS OF PAYMENT.

The accepted quantities, measured as provided above, will be paid for at the contract unit price as follows:

TACK COAT GAL

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

SECTION 390 – PAVEMENT AND SURFACES CONSTRUCTION STANDARD BID ITEMS

390.01 – DESCRIPTION

This section covers Standard Bid Items used in the contract documents for the construction of pavements and surfaces. Additional bid items may be called out in the Special Provisions, other sections of the Standard Specifications, or as directed by the Engineer for additional work covered and change orders.

SECTION	CODE	DESCRIPTION	UNIT
301	301-01	ASPHALTIC CONCRETE TYPE (A – E) (X INCHES)	S.Y.
301	301-02	ASPHALTIC CONCRETE TYPE (A – E)	TON
301	301-03	ASPHALT CONCRETE, TYPE (A – E) (POL. MOD.)	TON
301	301-04	ASPHALTIC CONCRETE LEVELING COURSE	TON
302	302-01	RHM - ASPHALTIC CONCRETE TYPE (A - E) (X INCHES)	S.Y.
302	302-02	RHM - ASPHALTIC CONCRETE TYPE (A - E)	TON
302	302-03	RHM - ASPHALT CONCRETE, TYPE (A - E) (POL. MOD.)	TON
302	302-04	RHM - ASPHALTIC CONCRETE LEVELING COURSE	TON
303	303-01	EMULSIFIED ASPHALT	GAL.
303	303-02	EMULSIFIED ASPHALT	TON
303	303-03	TYPE I AGGREGATE	TON
303	303-04	TYPE II AGGREGATE	TON
303	303-05	TYPE III AGGREGATE	TON
304	304-01	PORTLAND CEMENT CONCRETE PAVEMENT	S.Y.
304	304-02	APPROACH SLABS	S.Y.
304	304-00	PORTLAND CEMENT CONCRETE PAVEMENT (CONTINUOUSLY REINFORCED)	S.Y.
305	305-00	CURB AND GUTTER	L.F.
306	306-00	HIGH-EARLY-STRENGTH CONCRETE PAVEMENT	S.Y.
306	306-00	HIGH-EARLY-STRENGTH CONCRETE APPROACH SLABS	S.Y.
306	306-00	HIGH-EARLY-STRENGTH CONCRETE PAVEMENT (CONTINUOUSLY REINFORCED)	S.Y.
307	307-00	PLANER PROFILING	S.Y.
309	309-00	COLD MILLING PAVEMENT	S.Y.
310	310-00	CONCRETE JOINT REHABILITATION	L.F.
311	311-00	FABRIC REINFORCMENT	S.Y.
311	311-00	BITUMINOUS BINDER	GAL.
312	312-00	DIAMOND GRINDING	S.Y.
313	313-00	TACK COAT	GAL.