SECTION 02641

BITUMINOUS CONCRETE PAVEMENT

02641.01 GENERAL

A. Description

Bituminous concrete pavement shall include, but not necessarily be limited to, furnishing and installing aggregate and asphalt mixes in accordance with the Contract Documents.

B. Related Work Included Elsewhere

1. Aggregate base and subbase course; Section 02621.

2. Sand asphalt base; Section 02642.

3. Plant mixed seal; Section 02643.

4. Asphalt support fabric; Section 02645.

C. Quality Assurance

1. Laboratory Tests

   a. Heat Stable Anti-Stripping Additive

      The County will test the compatibility of asphalt and aggregate proposed for use in accordance with MSMT 410. If the need for a heat stable anti-stripping additive is observed, the rate of dosage will be established by the Engineer.

   b. Testing and Sampling

      Tests shall be conducted on a lot-to-lot basis. The lot size shall not exceed 1000 tons. Each lot will be divided into five sublots. Two 4-inch diameter cores shall be obtained from each sublot at a randomly selected location no later than the next workday after compaction. These cores shall represent the day's production and shall be obtained before placement of the next course, or excessive traffic including construction equipment, is allowed to travel over the in-place material.

2. Trial Mixes

   a. Job Mix

      Trial mixes will be made in accordance with ASTM D 1559 as modified in MSMT 405.

The results of tests on trial mix specimens will be evaluated with respect to the criteria in Table 02641-1, and an appropriate asphalt content will be selected:

TABLE 02641-1

Marshall Test Requirements

Mix Designations	SC	SF	BF	BI	BC
Stability, min, pounds	1500	750	500	500	500
Flow 0.01 inches*	8-18	8-18	8-18	8-18	8-18
Voids, mineral aggregate,% min	16	16	14	13	12
Voids, total mix, %	3-5	3-5	3-5	3-5	3-5
Compaction Blows Used	75	50	50	50	50

*The upper limit of the flow requirements will be waived for mixtures including at least 50% slag.

If the combination of materials is such that an appropriate asphalt content at which all of these criteria are satisfied cannot be established; or previous experience has shown the proposed design to be unworkable or otherwise unsatisfactory, the Engineer may require the Contractor to submit a more suitable combination.

Tentative approval based on tests of laboratory mixtures of the proposed aggregates shall be obtained before beginning work on any mix.

Supplementary tests of laboratory mixed blends of asphalt from the plant and hot bin materials from actual production will be made by the Engineer as soon as possible after production is begun. Any necessary adjustments will be made and approval of the mix given based on the material meeting the grading and Marshall Test requirements by the hot bin test series.

In addition to the information supplied in the job mix design submittal, all approvals will contain the following:

1) a single percentage of bituminous material to be added to the complete gradation;

2) a single temperature at which the material is to be mixed; a new mixing temperature may be required for each change in source or lot of asphalt;

3) the specific gravity of the mixture at the approved asphalt content;

4) molding temperature for Marshall specimens.

b. Plant Mix Seal

A sample of 100 pounds of each aggregate component shall be submitted to the Engineer for preparation of an independent trial mix. The trial mix will be made and tested in accordance with MSMT 409. An asphalt content and mixing temperature will be selected by the Contractor subject to approval by the Engineer. The mixing temperature will be based on a viscosity of 800 ±50 centistokes.

c. Sand Asphalt

A sample of 100 pounds of material shall be submitted to the Engineer for preparation of an independent trial mix. The trial mix will be designed in accordance with MSMT 405. An appropriate asphalt content and mixing temperature will be selected by the Contractor subject to approval by the Engineer.

The Marshall stability of the trial mix at the selected asphalt content will be not less than 250 pounds.

3. Plant Control

a. Job Mix

When possible, plant control hot bin gradations will be determined in accordance with AASHTO T 27. The following tolerances shall apply:

Fraction passing No. 4 and larger sieves, %. ----------	±7
Fraction passing No. 8 through No. 100 sieves, % -------	±4
Fraction passing No. 200 sieve, % ----------	±2
Asphalt Content, %----------	±0.4
Ratio of dust to binder material, maximum----------	1.2
Deviation of Plant maximum specific gravity per lot versus design maximum specific gravity -------	±0.063
Temperature of Mix leaving plant versus design mix temperature ----------	±25°F

The job mix formula tolerance may fall outside the specified gradation limits.

b. Sand Asphalt

In evaluating plant control, Marshall specimens will be molded; and the specific gravity of these specimens shall be 95 to 97 percent of the maximum specific gravity. In addition, the bitumen content shall not vary by more than ±0.4 percent and the temperature of the mix leaving the plant shall not differ by more than ±25°F from the design mix temperature.

4. Proportioning Plant Requirements

a. Approval

The plant from which the Contractor proposes to obtain material will be approved by the Engineer before starting deliveries. All bins shall be fully charged prior to the inspection.

b. Notification Time

The Contractor shall notify the Engineer at least two working days prior to start of operation. The Engineer shall be kept informed of plant operational procedure and notified when a change is planned. Assigned Inspectors shall have safe access to all areas of the plant for the performance of their duties. All equipment, tools, machinery and parts of the plant must be maintained in a satisfactory working condition at all times. Whenever delivery of material to County projects is suspended for an indefinite period, the County Inspectors may be assigned elsewhere. The Contractor shall then notify the Engineer one normal working day in advance of resuming operations.

c. Storage

The storage of aggregates shall be such as to prevent segregation and contamination by foreign material or equipment. The stockpiles shall be built in layers of not more than 5 feet each and shall not exceed a 1:1 slope. Materials kept in adjacent stockpiles shall be kept separated by adequate partitions or spacing.

Bins with adequate compartments for each required size of aggregate shall be provided at the plant. Each compartment shall be designed to efficiently and freely discharge the material to the feeder or weighing system.

Bins discharging to feeder systems shall be equipped with accessible calibrated means to vary the quantity of material being fed. Partitions between bin compartments shall be constructed and maintained in a manner that shall prevent intermingling of aggregates.

d. Scales

Plant measuring devices shall comply with the current edition of the National Bureau of Standards Handbook 44, except as modified herein. Satisfactory means shall be provided either by weighing, metering, or volumetric measurements, to obtain the proper quantities of each component within the tolerances specified.

All proportioning devices and weigh hoppers or buckets shall be so constructed that safe accessible attachment of the necessary test weights is possible. All personnel necessary for the handling of test weights and the manipulation of measuring devices for calibration purposes shall be provided by the producer. The producer shall provide at least ten 50 pound calibrated test weights for testing measuring devices.

All scales, meters, and dispensers shall be so located that all markings and indicators shall be plainly visible to the operator and the Inspector from their operating or inspecting positions without excessive parallax errors.

When scales are of the beam type, there shall be a separate beam for each size of aggregate. There shall be an over and under indicator that shall start functioning when the load being applied is within 100 pounds of that desired. Each beam shall have a locking device designed and so located that the beam can easily be suspended or thrown into action. The weighing mechanisms shall be balanced on knife edges and shall be so constructed that they cannot be easily thrown out of alignment and adjustment. The weighing position of each beam shall be horizontal and free, and the frame shall be equipped with a device to indicate the horizontal position of the beam clearly and accurately. Poises shall be so constructed that they cannot be easily removed from the beam and can be held firmly in place. No material softer than brass shall be used, and the material used shall be non-corrosive. The scales shall be designed so that all fulcrums, clevises, shackles, and other working parts which are exposed may be readily kept clean and in proper working order.

Dial scales shall be of the compounding type having full complements of index pointers. Pointers so placed as to give excessive parallax errors shall not be used.

Unless otherwise approved by the Engineer, proportioning scales, meters, and dispensers or other such devices shall function within the following tolerance ranges indicated in Table 02641-2.

TABLE 02641-2

Type of Material	*Maintenance Tolerance	Units of Measure	Operating Tolerance
Aggregate	0.2%	Wt	**2.0%
Asphalt	0.2%	Wt or Vol	1.0%
Additives	0.5%	Wt or Vol	3.0% or ½ ounce respectively

* Maintenance tolerance shall be the specified percent of the total capacity of the scale or the smallest graduation, whichever is less.

** Operating tolerance shall be computed on the basis of the largest individual component, and this value shall apply to each individual component.

The minimum weight of any material shall be determined by the following formula:

$$\frac{0.1 \times \text{scale capacity}}{\text{operating tolerance expressed as a percent}} = \text{minimum weight}$$

Before any proportioning plant starts operation, and at least once each year thereafter, all scales, meters, dispensers, test weights, and other measuring devices shall be inspected, tested and certified to be in proper operating condition by competent testing agencies approved by the Engineer. During the period of operation, all scales, meters, dispensers, and other measuring devices must be tested monthly and certified for accuracy and operating condition by the producer or an approved testing agency. The certifications shall state capacities, minimum graduations, loads applied, and degree of accuracy obtained.

In addition, balance and zero conditions of scales shall be checked daily in the presence of the Inspector and at any other time the Inspector directs. The Engineer may, at any time, direct that any measuring device be tested by the producer or an outside agency if there is any doubt about the accuracy of such measuring device. Certificates of inspection shall be posted in a prominent place in the plant, and a copy shall be promptly submitted to the Engineer. The Engineer shall be notified at least two working days in advance of monthly scale inspections.

e. Sampling Equipment

All plants shall provide equipment satisfactory to the Engineer for obtaining samples from the last practical point prior to combination with other ingredients or introduction into the mixer. The sampling equipment shall have a minimum capacity of 30 pounds and shall be positioned to provide an accurate representation of the material being furnished. When the size of the sample is too large to be transported, approved sample splitting devices shall be available at the point of sampling that will split the sample to no more than twice the proper testing size.

The producer shall supply all personnel and equipment necessary for obtaining samples and for delivering them to the plant laboratory.

All samples shall be obtained when bins are at a level comparable to normal operations. Samples shall be obtained in the presence of and at such time as directed by the Inspector.

f. Safety

All safety requirements shall be in accordance with the standards established by the Maryland Occupational Safety and Health Administration.

g. Plant Laboratory

At proportioning, batching or mixing plants, the producers shall provide quarters suitable for a plant laboratory in which to house and use the equipment necessary to conduct the various tests required. These quarters shall be for the exclusive use of the Engineers and Inspectors for testing and recording purposes. When practical, the quarters shall be adjacent to the plant operator's location but shall never be located more than 300 feet distant.

The plant laboratory shall comply with the requirements of Section 01200, except as follows:

1) First aid kits, stretcher and drafting table will not be required.

2) Floor storage cabinets may be substituted for overhead cabinets.

3) Minimum inside width shall be 8 feet.

4) The utility table shall be required to support the various testing equipment when in use and shall be constructed accordingly.

5) Adequate facilities must be available to supply the water necessary for the performance of tests.

6) A telephone shall be provided.

5. Bituminous Concrete Plant Requirements

In addition to proportioning plant requirements previously specified, the following requirements shall apply to bituminous concrete plants:

a. Storage

Bituminous material shall be stored in tanks that are equipped with heating facilities capable of maintaining the asphalt temperature specified. Heating shall be accomplished by such means that no flame shall come in contact with the heating tank.

An asphalt circulating system of adequate capacity for proper and continuous circulation between storage tanks and proportioning units throughout the operating periods shall be provided. All pipelines and fittings shall be properly insulated to minimize heat loss.

A suitable line blender or other device, approved by the Engineer, shall be provided to accomplish the addition of an anti-stripping additive to the asphalt.

Mixing plants utilizing recycled material shall be capable of controlling and proportioning the recycled material and drying the recycled material directly or by heat transfer from other heated materials.

b. Sampling Device

A sampling device satisfactory to the Engineer shall be provided in the tank or recirculating or discharge line in such a manner that samples can be obtained during circulation or discharge. This device shall have an inside diameter not less than 1/2 inch nor greater than 1 inch. It shall be provided with a gate valve or petcock. Sampling devices shall also be provided on all hauling vehicles used for transporting liquid bituminous materials to projects or plants.

Bituminous materials on hand 30 days or more shall be retested.

c. Cold Bin

The plant shall be provided with a separate cold bin or tunnel opening for each size and type of mineral aggregate used in the mix, and in addition, each cold bin or tunnel opening shall be equipped with a calibrated gate and/or mechanical feed to provide a uniform and concurrent flow of aggregate prior to its introduction into the dryer.

d. Alarms

The plant shall be equipped with alarms that will function if delivery of any of the components of the mix shall fail. Materials shall be fed at a rate not to exceed that which the dryer can properly heat and dry.

e. Dryer

The dryer shall be of the rotating cylindrical type, suitably designed to heat and dry the aggregates to specification requirements and to continuously agitate the aggregates during heating.

f. Screens

Plant screens having normal capacities slightly in excess of the full capacity of the mixer and capable of separating all aggregate sizes into proper bins shall be provided. Efficiency of separating based on laboratory sieves shall be such that no more than 15% of the material in a bin is of smaller size than the nominal minimum size for that bin.

g. Storage

The plant shall include storage bins of sufficient capacity to supply the mixer when it is operating at full capacity. Bins shall be divided into at least three compartments arranged to ensure separate and adequate storage of appropriate fractions of the aggregate. Each compartment shall be provided with an overflow pipe that shall be of such size and at such location as to prevent any backing up of the material into other bins. Adequate and dry storage for mineral filler shall be separately provided. Provision shall also be made for the proportioning of all filler material.

h. Temperature Control

The plant shall be equipped with an approved thermometric instrument, so placed at the discharge chute of the dryer as to automatically register the temperature of the heated aggregates. The plant shall also have an approved thermometric instrument reading from 200 to 400°F, placed in the asphalt line at a suitable location visible to the Inspector and near the asphalt bucket charging valve of a batch plant and near such similar location in a continuous mixing plant.

i. Measurement of Asphalt

Satisfactory means, either by weighing, metering, or volumetric measurements, shall be provided to obtain the required percentage of asphalt in the mix. Asphalt shall be delivered to the mixer in a manner that will provide a uniform and thorough distribution of asphalt throughout the batch.

Where the asphalt quantity is controlled by metering, means shall be provided whereby the delivery through the meter may be checked by actual weight.

Suitable heat jacketing or other insulation shall be provided for maintaining the specified temperature of asphalt in pipelines, meters, weigh buckets, or other containers.

j. Locking Device

The plant shall be equipped with a time lock to control the operations of a complete mixing cycle. It shall lock the weigh 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 period and shall lock the mixer gate throughout the dry and wet mixing periods. In batch plants, the dry mixing period is defined as the time to introduce all aggregate into the pug mill, and it shall not be less than 5 seconds. The bituminous material shall not be introduced until completion of the dry mixing cycle. The wet mixing period is the time beginning after all bituminous material is in the mixer and ending when the mixer gate is opened. This time shall not be less than 15 seconds or the time required to thoroughly coat the aggregate with bitumen, whichever is greater. The setting of the time shall be performed in the presence of the Inspector.

k. Dust Control

When dust interferes with the efficient operation of the plant, proper housing, mixer covers, or dust collection systems shall be installed. With the approval of the Engineer, the producer may return uniformly to the mixture any or all of the materials collected by this system. Each plant must be equipped to measure, or calibrate, the amount and rate at which any fines are being fed back to the mix. It must also be able to control, or vary, that rate and amount.

l. Control of Asphalt Content

The plant operator shall perform the testing for the determination of asphalt content and these tests may be monitored by the County Inspector. The Inspector will maintain control charts on the asphalt extraction test results. The plant testing facility and the procedure for the evaluation of asphalt extraction data shall conform to the following requirements:

1) The plant operator shall provide a Maryland Occupational Safety and Health Administration approved test facility.

2) The asphalt extraction equipment and procedure shall meet the requirements of AASHTO T 164 or MSMT 408. The effluent from the extraction process shall be disposed of by the producer in accordance with all applicable Federal, State and Local laws governing disposal of hazardous materials.

3) The minimum sampling frequency shall be in accordance with the Sample Frequency Guide of the Materials Manual. Sample selection for each sublot shall be predetermined from a random selection table approved by the Engineer.

4) The validity of the plant test data may be determined by comparing it with the corresponding test data determined by a County laboratory. The plant data will be accepted if the deviation between two corresponding individual values is less than 0.34 and two sets

of data on the moving average of five test results are not greater than 0.22. The verification program if implemented by the County will proceed as follows:

a) Initially, there shall be a minimum of five plant and County laboratory extractions on a one for one basis until the plant can duplicate extraction test results within the deviation limits.

b) Once confidence is established, the plant operator may elect to increase the frequency of sampling. Each sample shall represent a sublot of material and sublots shall be of approximate equal size. The Inspector shall be informed daily of the frequency of the sublot selected. The tests performed by the County will be considered as referee tests only. Testing will be at random frequency and will be compared with companion plant samples for evaluation of the deviation limits.

5) In the event that the individual plant extraction value deviates by more than 0.34, the moving average of five plant values will be compared with five County laboratory values. When the moving average deviates by more than 0.22 or additional individual values deviate by more than 0.34, the plant will be notified that County laboratory data will be used for control and acceptance. The point of control will change at the time of notification.

Once notification of change of control has been given, the plant shall be allowed to run; and a maximum of 10 samples will be taken to verify compliance with the deviation limits. If the plant extraction values continue to deviate from the specified limits, even though the material being produced is within specifications, plant approval may be withdrawn.

If plant approval is withdrawn, the plant shall not produce material for County projects until it is recertified. The material produced during this period shall not be used on County projects.

6) Acceptance and payment of the material shall be in accordance with Subsection 02641-05. Each sample tested will represent the asphalt content for the tonnage encompassed by the sublot. Test results on samples are not to be averaged. The deviation limits between plant and County laboratory test results are solely for the purpose of establishing and verifying the point of control.

m. Compaction Pedestal

The producer shall provide a compaction pedestal, consisting of a wooden post having a minimum cross section of 8 inch x 8 inch capped with a 12 inch x 12 inch steel plate. The pedestal shall be mounted on a rigid floor slab or concrete block having minimum dimensions of 20 inches x 20 inches x 18 inches. The overall height of the finished pedestal shall be 25 inches $\pm$2 inches from ground level. A spring tension device designed to hold a Marshall compaction mold in place on the pedestal shall be provided and securely attached to the steel plate by the producer. The pedestal shall be located within or adjacent to the plant laboratory.

n. Truck Scales

Plants furnishing bituminous mixtures equipped with truck scales shall be operated and maintained by the producer. The truck scales shall comply with Section GP-9 except as modified herein.

Truck scales shall be securely mounted on a base adequate to provide stability and to ensure that the scales remain level and plumb at all times. All weighing equipment must be provided with adjusting devices which will permit any part thereof that gets out of adjustment or alignment to be readily readjusted or realigned so that the equipment will function properly.

The platform of the truck scales shall be of sufficient length and width to conveniently accommodate any trucks or complete hauling units that may be used to transport the bituminous mixtures in such a manner that the complete unit load can be weighed at one draft.

Regular checks that will be made of the net weight of mixtures as weighed on the truck scales shall be within plus or minus 2% of the total batch weights for each load. Failure to obtain this level of uniformity shall be sufficient cause for the rejection of the mixture and stoppage of all plant operations until the cause for such disparity in weights is remedied.

A plant record shall be kept and certified daily by the producer's representative, reviewed and signed by the Inspector at the plant. It shall show the date, contract number, the identification of the truck, type material being produced, the number of truckloads, and the total tons of mix.

A further certification of approval of each load of bituminous material delivered from the plant to the site of the work will be made by a delivery ticket carried by the truck drivers from the Inspector at the plant to the Inspector on the site of the work. The blank forms for the delivery tickets shall be furnished by the Contractor. Delivery tickets for each load shall be distinguished by a serial identification number and shall also show the date and the time at which the load leaves the plant, the identification

number of the truck, the weight of the loaded truck, its empty or tare weight, the net weight of the load, the temperature of the mixture, and the signature of the Inspector at the site of the work.

o. Automatic Weighing and Printout

In lieu of providing truck scales, the producer may provide an approved automatic weighing and printout system which will print in digital form, on a weigh ticket, for each load, the cumulative total of the batches discharged into the truck.

Plants shall provide a truck scale at a location approved by the Engineer to check the net weight of mixtures. The total batch weights shall be within plus or minus 2% of the truck scale measurements. Failure to obtain this level of uniformity shall be sufficient cause for the rejection of the mixture and stoppage of all plant operations until the cause for the disparity in weights is remedied.

In lieu of the plant record, a computer printout summary may be kept and certified daily by the producer's representative, and reviewed and signed by the Inspector at the plant. It shall show the date, contract number, the identification of the truck, a numerical identification of the type of material being produced, the number of truckloads, and total tons of mix.

Delivery tickets shall show the contract number, the type of mix, and otherwise shall be as specified previously in Item n above, except for the weight of the loaded truck, its empty or tare weight, and serially numbered tickets.

p. Hauling Units

The mixtures shall be transported from the paving plant to the work site in vehicles having tight bodies previously cleaned of foreign material, and the contents of each load shall be completely covered with canvas or other suitable material of sufficient size to protect it from the weather. Each truck hauling paving mixtures from the plant shall have a hole in the side of its body to permit the insertion of a thermometer. The hole shall be at least 1/4 inch and not more than 1/2 inch in diameter and located from 6 inches to 12 inches above the bed of the truck. The inside surfaces of all truck bodies used to haul paving mixtures shall be treated with an approved coating that will prevent adherence of the mixtures to the body.

All plants shall be equipped with suitable platforms, steps and walkways safely constructed and positioned to accommodate sampling of the finished mixture from the hauling vehicle.

q. Batch Type Plants

The following specific requirements shall apply to batch type plants. When an asphalt bucket is used for weighing the asphalt cement, it shall have sufficient capacity to hold not less than the full amount of asphalt required for one batch at the rated capacity of the mixer. It shall be heat jacketed and shall be suspended on dial scales or beam scales equipped with an over and under indicator so that a zero balance will be shown after each weighing and the new weight of asphalt cement measured accurately. The bucket shall be arranged to deliver the asphalt cement in a thin uniform sheet or in multiple streams the full width of the mixer, except in the case of a rotary mixer where the asphalt cement is sprayed.

This plant shall include a batch mixer of an approved twin pug mill type or a rotary drum type, heat jacketed and equipped with sufficient number of paddles or blades arranged to produce properly mixed batches of any material required under these Specifications.

If only one aggregate is used, one hot bin may be used. If two or more aggregates are used, at least two hot bins shall be used.

r. Continuous Type Plants

The following specific requirements shall apply to the continuous type plants. Continuous mixing by volumetric control will be permitted and shall include a means for accurately proportioning aggregate from each bin either by weighing or by volumetric measurement. When gradation control is by volume, the unit shall include a feeder mounted under the compartment bins. Each bin shall have an accurately controlled individual gate to form an orifice for volumetrically measuring the material drawn from each bin compartment. The orifice shall be adjustable by positive mechanical means and provided with a lock. Indicators shall be provided on each gate to show the size of the gate openings.

Any continuous plant shall include a means for calibrating the gate openings with weighed test samples. The materials fed out of the bins, through individual orifices, shall be bypassed to a suitable test box. The material from each compartment shall be confined in a separate box section. The plant shall be equipped to handle test samples weighing 100 pounds or more at the direction of the Engineer. All samples shall be weighed on accurate platform scales. The aggregate feeder gates shall be calibrated in the presence of the Engineer prior to setting the appropriate openings for each course required for the Project. Complete feeder gate calibration charts shall be furnished to the plant Inspector for his use.

A satisfactory means shall be provided to afford positive interlocking control between the flow of aggregate from the bins and the flow of bitumen from the meter or other proportioning source. This flow control

shall be accomplished by interlocking mechanical means or by any positive method under the Inspector's control.

The plant shall include a continuous mixer of an approved twin pug mill type, heat jacketed and capable of producing a uniform sufficiently coated mixture within the job mix tolerance. The paddles shall be adjustable for angular position on the shafts and reversible to retard the flow of the mix. The mixer shall carry a manufacturer's plate giving the net volumetric contents of the mixer at the several heights inscribed on a permanent gate and also giving the rate of aggregate per minute at plant operating speed.

s. Drum Mixer Plants

Drum mixer plants may be used if the average of five consecutive asphalt contents and gradations meet the original design and applicable tolerances, and no value fall outside the gradation specified. Drum mixer plants may be used subject to the inspection and approval of the plant and the equipment by the Engineer.

The following specific requirements will apply to drum mixer plants:

1) Drum mixer plants shall consist of an interlocking system of cold feed bins and conveyors synchronizing a continuous flow of aggregate with a positive flow of asphalt introduced into a dryer-mixer drum for appropriate mixing prior to its introduction into an adequate storage facility. A monitoring station located within a distance of 300 feet shall be provided for the purpose of controlling the entire operation. The monitoring station shall be equipped to give a continuous quantitative data on the production, proportioning and mixing of the mix ingredients.

2) An individual cold feed bin and belt scale shall be provided for each size of the aggregate used in the mix. In order to maintain a constant ratio between the quantities of each size aggregate and varying plant production rates, the feeder units of each bin shall be provided with interlocking controls. Weights shall be provided to check weighbridges. The conveyor that delivers the combined aggregates to the drum shall be fitted with a mechanical or electronic belt weighing device, linked directly to the asphalt metering pump to ensure that the desired asphalt content is maintained at varying production rates. An indicator for checking the quantity or rate of flow of the asphalt to the mixer shall be provided. An automatic shutoff shall be used on the total aggregate feed when any individual feeder flow or bituminous material flow is interrupted or an excess tolerance change occurs for a period of time which exceeds three feedback loops of the

system which is out of tolerance. The Engineer may require a scalping screen at an approved location of the plant.

3) Moisture sensors shall be installed in the fine aggregate bins to monitor moisture content. Wet aggregate weight shall be calculated to dry aggregate weight. Dry weight of the total aggregate flow shall be displayed digitally in appropriate units of weight and time.

4) The bituminous material flow shall be displayed digitally in appropriate units of weight or volume and time. The asphalt metering or other proportioning device shall provide a suitable bypass valve or other acceptable means for checking the accuracy of the flow.

5) The producer shall provide the Engineer with representative samples of the blended cold feed aggregates taken from a point as near as practical to their entry into the mixing drum, or the producer may provide extracted aggregate for testing for compliance with gradation requirements. The extraction method shall be any one of those given in AASHTO T 164 or ASTM D 2172. The producer shall provide all equipment and personnel required for the extraction of the aggregate in the minimum amounts as follows:

BC	17.6 pounds
BI	11.0 pounds
BF	11.0 pounds
SC	1.5 pounds
SF	0.4 pounds
PMS	1.5 pounds

When gradation control is to be based on the above procedure, the producer shall submit a job mix formula gradation based on the extracted aggregate.

6) The drum dryer-mixer shall be capable of simultaneously heating and mixing the introduced aggregate with asphalt to an acceptable thoroughly coated mix meeting the required temperature and mix designs. Pyrometers or other thermometric instruments shall be located at the discharge chute of the dryer-mixer to automatically register the temperature of the mix.

7) The mix shall be discharged into a suitable storage facility. No segregation shall occur during the handling of the finished mix.

8) In case of failure of the primary control system, the plant will be allowed to use an alternate system approved by the Engineer for a maximum of two working days.

6. Field Tests

a. Density Requirements

The specific gravity of samples taken in accordance with Section 02641.01, Article C, Paragraph b will be expressed as a percentage of the maximum specific gravity determined for each lot. The in-place density of each mixture, in each lot, shall be 92 to 97 percent. The results of the two cores in each basis of the average of all sublots tested for each lot of material.

If the average density value of all samples representing a lot falls outside of the 92 to 97 percent requirement, a new control strip constructed in accordance with Section 02641.01, Article C, Paragraph 6, Item b may be required.

On Contracts which include less than 500 tons, in instances where bituminous concrete is used in nontraffic bearing areas, where courses are 1 inch thick or less, or on resurfaced bridge testing in accordance with AASHTO T 238.

Price adjustment due to noncompliance with the density requirements will be in accordance with Section 02641.05.

b. Control Strip

A control strip having a minimum area of 600 yd^2 shall be constructed on the finish grade prior to the paving start-up for each type of construction other than those specified in Section 02641.01, Article C, Paragraph 6, item a. This strip shall be used to determine roller patterns and the number of passes required to obtain the proper density.

Sampling shall be performed by the Contractor in accordance with Section 02641.01, Article C, Paragraph 1, item b, or by a nuclear density gage in accordance with AASHTO T 238. After testing in the field, test cores shall be delivered to the plant inspector for verification of the Contractor's test results. Paving will be permitted to continue provided the density determined by the Contractor meets the requirements of Section 02641.01, Article C, Paragraph 6, item a. Should the plant inspector's core results fail to meet the required density, a new control strip shall be required and no paving will be permitted to continue until the specified density is met. However, all material laid prior to the construction of this new control strip will be accepted for full payment with respect to density. All work will be measured and paid for in accordance with Sections 02641.04 and

02641.05. Should removal of any control strip be required, it shall be done solely at the expense of the Contractor.

c. Surface Tolerances

After final compaction of each course, the surface of the pavement course shall be true to the established crown and grade and shall be sufficiently smooth so that when tested with a 10 foot straightedge placed upon the surface parallel with the center line, the surface shall not vary more than 1/8 inch within the 10 foot straightedge length from a true surface. The transverse slope of the finished surface of each course shall be uniform to such a degree that when tested with a 10 foot straightedge placed perpendicular to the centerline, the surface shall not vary greater than 3/16 inch from a true surface. Transverse joints on each course shall be checked with a 10 foot straightedge immediately after the initial rolling. Should the surface of each course vary more than 1/8 inch from true, the Contractor shall make immediate corrections suitable to the Engineer so that the finished joint surface shall not vary more than 1/8 inch from a true surface. The material in all other aspects shall meet these specifications.

The Contractor shall have available at all times an approved 10 foot straightedge.

d. Mix Temperature

The temperature of the mixture shall not be less than 225°F at the time of placement.

D. Submittals

1. Mix Design

a. Bituminous Concrete

The Contractor shall submit a written document containing the data from the laboratory study required by Paragraph 02641.02 B and the specific job mix design for each mix designation to be used on the Project to the Engineer for approval. This job mix design shall be submitted at least 3 weeks before the paving operation is to begin and contain the following information:

1) Mix designation;

2) Source of each component aggregate, asphalt, heat stable anti-stripping additive and; asphalt release agent;

3) Anticipated gradation and proportion of each aggregate component;

4) Combined gradation, extracted gradation, if used, and a single percentage of bituminous material to be added;

5) Percentage of heat stable anti-stripping additive;

6) Plant from which the material will be produced;

7) Plant target mixing temperature based on the viscosity of 220 centistokes;

8) Specific gravity of the mixture at the intended asphalt content;

9) Worksheets and graphs depicting the Marshall properties;

10) Number of compaction blow per face;

11) Maximum specific gravity;

12) The required information shall accompany sufficient material for preparation of a design mix for independent corroboration by the Engineer if required. A trial mix will total 200 pounds for each band specified, proportioned as noted in the submitted job mix letter. Where possible, this material shall be sampled from the hot bins.

If the Engineer's previous experience has indicated the proposed design mix to be unworkable or otherwise unsatisfactory, the Engineer may require the Contractor to submit a more suitable mix design. Approval must be obtained by the Contractor prior to production of any mix.

b. Plant Mixed Seal

The Contractor shall submit a written document containing the data from the laboratory study required by Paragraph 02641.02.C.5 and specific job mix design to the Engineer for approval. This mix design shall be submitted at least 3 weeks before the paving operation is to begin and contain the information indicated in Paragraph a. above except that items 8 and 9 are not required and the viscosity in item 7 shall be 800 centistokes.

c. Sand Asphalt

1) The Contractor shall submit a written document containing the data from the laboratory study required by Paragraph 02641.02.C6. and specific job mix design to the Engineer for approval. This mix design shall be submitted at least 3 weeks before the paving operation is to begin and contain the information indicated in Paragraph a. above.

2. Certificates of Compliance

Certificates of Compliance shall be submitted in accordance with the "General Provisions" for all bituminous materials. The certificates shall state that the bituminous material meets the requirements specified herein.

3. Resubmittals

Should the Contractor at any time propose to change the source of aggregate used in the mix, a revised job mix formula shall be submitted. If a change of asphalt source is requested, a stripping test shall be conducted prior to approval of the sources. Resubmittal shall meet all conditions of the initial submittal.

02641.02 MATERIALS

A. Materials Furnished by the County

The County will not furnish any materials for bituminous concrete pavement.

B. Contractor's Options

1. General

Unless otherwise stipulated on the Plans or in the Special Provisions, the Contractor shall propose the bands he intends to employ in the several bituminous concrete layers within the pavement structure.

2. Recycled Material

For base course construction, the Contractor may elect to use crushed, recycled bituminous pavement material up to a maximum of 50% by weight of the total mix. Crushed, recycled bituminous pavement material may be used in surface courses up to a maximum of 30% by weight of the total mix.

The exact allowable proportion of the recycled material and its suitability for use shall be determined by the Engineer.

C. Detailed Material Requirements

1. Aggregates

Aggregates shall meet the following requirements:

a. Course aggregate for bituminous concrete shall meet the Class A requirements of AASHTO M 80 using sodium sulfate to determine the soundness. Crushed gravel having a minimum of two fractured faces on at least 75 percent of the material and one fracture face on at least 90 percent of the material may be used in all bituminous mixes except plant mixed seal. The aggregate for surface mixes shall meet the polish requirements

when tested in accordance with MSMT 411. The aggregate used in plant mixed seal shall have a polish value of 8.5, minimum and a life cycle friction of 25 million strain-cycles, minimum; and for other final surface courses utilizing SC mix, the ultimate polish value shall be 3.5, minimum and a life cycle friction of 15 million strain-cycles, minimum.

The life cycle-friction requirement does not apply to BF mixes that are required to have an ultimate polish value of 3.5, minimum. Aggregate for use in plant mixed seal shall be from a source which has been previously qualified.

b. Fine aggregate for bituminous concrete, when subjected to five cycles of the sodium sulfate test in accordance with AASHTO T 104, shall not have more than 12% loss. Sand used in surface mixes shall be siliceous, and have minimums of 100% passing the 3/8 inch sieve and 90% passing the No. 4 sieve.

c. Mineral Filler

Mineral filler shall meet the requirements of AASHTO M 17 except the gradation shall be as follows:

Sieve Sizes U.S. Standard	Mass Percent Passing
No. 50	100
No. 100	95-100
No. 200	70-100

2. Bituminous Material

Asphalt cements shall meet the requirements of AASHTO M 226, Grade AC-20, Table 2, except the requirement for percent loss on heating is deleted. If use of a heat stable anti-stripping additive is required, it shall be added at the bituminous concrete mixing plant.

3. Heat Stable Anti-Stripping Additive

Where an additive is used, it will be introduced at the plant. This addition shall be accomplished by line blending, metering, or otherwise measuring to ensure accurate proportioning and thorough mixing. The Contractor will be reimbursed for inclusion of anti-stripping additive at the rate set in the Special Provisions.

4. Bituminous Concrete Mixtures

Bituminous concrete mixtures shall be plant mixed materials manufactured in a plant meeting the requirements of Section 02641.01.

a. Aggregate

Aggregates shall meet the physical requirements of Paragraph 1 above.

b. Bituminous Material

Bituminous material shall meet the requirements of Paragraph 2 above.

c. Laboratory Study

A laboratory study shall be conducted by the Contractor in accordance with AASHTO T 245 as modified by MSMT 405. If recycled bituminous pavement material is utilized, the laboratory study shall be conducted in accordance with MSMT 412.

d. Mix Design

All mixtures used on the projects shall be selected by the Contractor from Table 02641-3:

TABLE 02461-3

GRADATIONS

Surface Course Designation	SC	SF
Sieve Sizes U.S. Standard	Percent Passing	
3/4 inch	100	100
5/8 inch	95-100	-
1/2 inch	90-95	-
3/8 inch	75-90	75-100
No. 4	56-72	-
No. 16	31-45	25-45
No.200	2-9	1-10
Percent Sand*	15-35	20-40

*Sand for the surface mix shall only be required in the final surface course.

Base Course Designation	BC	BI	BF
Sieve Sizes U.S. Standard	Percent Passing		
2 inch	100	-	-
1-1/2 inch	90-100	100	100
3/4 inch	65-90	75-100	85-100
3/8 inch	-	55-30	65-90

In addition to the sieves cited above, the job mix design shall include discrete values for each of the following:

SC and SF - No. 4, No. 8, No. 30, No. 50, No. 100

BC, BI and BF - 3/8 inch, No. 4, No. 8, No. 16, No. 50, No. 200

5. Plant Mixed Seal

Plant mixed seal shall be manufactured in a plant meeting the requirements of Section 02641.01.

a. Aggregates

Aggregates shall meet the physical requirements of Paragraph 1 above.

b. Bituminous Material

Bituminous material shall meet the requirements of Paragraph 2 above with the following exceptions:

Tests on Residue from Thin-Film Oven Test	
Viscosity, 140°F, poises	8000 max.
Ductility, 77°F, 5 cm/min., cm	90 min.

The quantity shall be within 5 to 12%.

c. Laboratory Study

A laboratory study shall be conducted by the Contractor in accordance with MSMT 409, and an appropriate asphalt content selected.

d. Mix Design

The gradation of the material shall be the following and be subject to the applicable tolerances of Section 02641.01 except that the percent passing shall not fall outside the following gradation limits.

Sieve Sizes U.S. Standard	Mass Percent Passing
1/2 inch	100
3/8 inch	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5
No. 200	0-2

e. Heat Stable Anti-Stripping Additive

Plant mix seal will require an anti-stripping additive with a minimum dosage of 0.20 percent of the total weight of the asphalt.

f. Hot Bins

At least two hot bins shall be used, and their gradations shall meet the requirements of Section 02641.01 for evaluating plant control.

6. Sand Asphalt

Sand asphalt shall be manufactured in a plant meeting the requirements of Section 02641.01.

a. Aggregate

Aggregate shall be a natural or manufactured sand to which the Contractor may add other fine aggregate.

b. Bituminous Material

Bituminous material shall meet the requirements of Paragraph 2 above.

c. Laboratory Study

A laboratory study shall be conducted by the Contractor in accordance with AASHTO T 245, as modified by MSMT 405. An appropriate asphalt content shall be selected using the asphalt content associated with the maximum stability value as a guide. The Marshall stability of the mixture at the selected asphalt content shall not be less than 250 pounds.

d. Mix Design

The gradations of the material shall be tested in accordance with AASHTO T 27 and shall meet the following gradation:

Sieve Sizes U.S. Standard	Mass Percent Passing
2 inch	100
No. 200	0-12

The job mix formula shall not fall outside the specified gradation limits.

7. Prime Coat

Cutback asphalt grade MC-70 meeting the requirements of AASHTO M 82 except that the penetration on residue at 77°F shall be 90 to 250. Spray temperature range shall be 105-175°F.

8. Tack Coat

Emulsified asphalt designation RS-1 or CRS-1 meeting the requirements of AASHTO M 140 or M 208 respectively. Not more than 3.0 percent oil distillate by volume of emulsion will apply. The sieve test requirement for field samples will be a maximum of 0.4 percent.

02641.03 EXECUTION

A. Weather Restrictions

The following ambient air and surface temperature restrictions shall apply at the time of placement of bituminous concrete:

	Minimum Temperatures	
Mixes	Air Degrees F & Rising	Surface Degrees F & Rising
Plant Mix Seal	60	60
Surface	40	40
Base	32	32

Note: When the surface temperature or ambient air temperature falls below these limits, material en route may be placed at the Contractor's risk.

B. Preparation

1. Surface Condition

   a. Existing Paving

      The surface of the existing paving shall be clean and dry. All excess crack filling or patch material shall be removed.

   b. New Construction

      On new construction, the surface to receive the bituminous concrete pavement shall be prepared in accordance with the applicable section of the specifications. Prime aggregate base in accordance with Section 02664.03, Paragraph I.

2. Tack Coat

   Tack coat shall be applied where and as directed by the Engineer so that the resulting coating shall be residual asphalt uniformly spread at a rate of between 0.01 and 0.05 gallons per square yard of surface area. Due regard must be observed for safety and convenience of the public in the application and maintenance of tack coat. Where conditions permit, hauling trucks shall not track tack coat on newly completed surface courses.

3. Utility Castings

   a. Manholes, valve boxes, inlets, and other structures within the area to be surfaced shall be adjusted to grade and cross slope before placing of surface course.

b. Manhole and utility box covers shall have pick holes plugged or covered and inlets shall be covered to prevent the entry of paving materials.

c. After the surfacing operation has been completed, the Contractor shall uncover all utility castings and open all pick holes. The Contractor shall promptly clean out and remove any paving materials which enter manholes, inlets, vaults, or other structures as a result of his activities.

C. Transporting Mixture

The mixture shall be transported in vehicles meeting the requirements of Section 02641.01, Article C, Paragraph 5, Item o. Material received too late to be placed during daylight hours shall be rejected unless artificial light satisfactory to the Engineer is available.

D. Mix Temperature

The temperature of the mixture shall not be less than 225°F at the time of placement. In-place compaction shall be completed before the mixture cools to a temperature below 185°F as determined by a probe type surface thermometer supplied by the Contractor and approved by the Engineer.

E. Pavers

Unless otherwise permitted by the Engineer, mixtures shall be spread by means of a mechanical self-powered paver capable of spreading the mixture true to line, grade and crown set by the Engineer.

Bituminous pavers shall be self-contained, power-propelled units, provided with an activated screed or strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mixed material in lane widths applicable to specified typical section and thicknesses shown on the Plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing courses of bituminous plant mixed material in widths shown on the Plans.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed.

1. Screeding

   The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture. The use of automatic screed controls, in areas that are not practical such as cul-de-sacs, adjacent to curb and gutter and where there are manholes and water valves present, shall be left to the discretion of the Engineer.

When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture.

Reference lines or other suitable markings for the control of horizontal alignment shall be provided by the Contractor subject to approval of the Engineer.

For all projects involving 5,000 tons or more of bituminous mixture, the paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from outside reference lines, sensing the transverse slope of the screed and providing the automatic signals which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement.

The Contractor shall furnish and install all pins, brackets, tensioning devices, wire and accessories necessary for satisfactory operation of the automatic control equipment.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1%. The paver shall be equipped with automatic feeder controls, properly adjusted to maintain a uniform depth of material ahead of the screed.

2. Manual Operation

Manual operation will be permitted for the construction of irregularly shaped and minor areas, on plant mixed seal courses, or where otherwise directed.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for the remainder of the normal working day on which the breakdown or malfunction occurred provided this method of operation will produce results otherwise meeting specifications.

F. Joints

Longitudinal and transverse joints shall be made in a careful manner. Well bonded and sealed joints are required. If necessary, in order to obtain this result, joints shall be painted with asphalt. Both longitudinal and transverse joints in successive courses shall be staggered so as not to be one above the other. Longitudinal joints shall be staggered a minimum of 6 inches and shall be arranged so that the longitudinal joint in the top course being constructed shall be at the location of the line dividing the traffic lanes.

Joints between old and new pavements, or between successive days' work, shall be carefully made to ensure a thorough and continuous bond between the old and new surfaces. In the case of surface course, the edge of the old surface course shall be cut back for its full depth so as to expose a fresh surface. If necessary, to obtain a well bonded joint, the surface shall be painted with hot asphalt, after which the hot surface

mixture shall be placed in contact with it and raked to a proper depth and grade. Before placing the mixture against them, all contact surfaces, of curbs, gutters, headers, manholes, etc. shall be painted with a thin uniform coating of hot asphalt cement or asphalt cement dissolved in naphtha.

In making the joint along any adjoining edge, such as curb, gutter or an adjoining pavement, and after the hot mixture is placed by the finishing machine, just enough of the hot material shall be carried back to fill any space left open. This joint shall be properly set up with the back of a rake at proper height and level to receive the maximum compaction under rolling.

G. Screeded Surface

Immediately after any course is screeded and before roller compaction is started, the surface shall be checked, any inequalities adjusted, all fat, sandy accumulation from the screed removed by rake or hoe, 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 rolled. Porous or honeycombed spots shall be corrected. Broadcasting at the discretion of the Engineer may be used prior to rolling, to correct critical problems. Broadcasting of loose mixture over the new surface after rolling will not be permitted.

Mixtures may be spread by hand only at locations inaccessible to machine spreading. Mixtures shall then be handled and spread by means of shovels and rakes. Mixtures shall not be applied faster than they can be properly handled and spread.

1. Raking

   The raking shall be carefully and skillfully done so that after the first passage of the roller over the raked mixture a minimum amount of back patching will be required. The surface course mixture, after spreading and raking, shall be carefully luted from the sides before compaction. The width of the lute shall be not less than 2 feet, and the handle shall be sufficiently long to reach from the edge to midway of the width under construction.

2. Delivery and Placement

   Delivery and placement of mixtures shall be as continuous as possible to keep time between loads at a minimum. Plant production, transporting and placement of the mix shall be closely coordinated. The roller shall pass over the unprotected edge of the freshly laid mixtures only when the laying of this course is to be discontinued for a length of time as to permit the mixture to become chilled.

3. Heeling-In

   Where tapering of the bituminous concrete material from specified thicknesses to tie in with an existing bituminous concrete pavement or structure, heeling-in to the existing bituminous pavement or structure may be required. The heeling-in

operation shall include the removal of a transverse portion of the existing bituminous road metal in areas which will be indicated by the Engineer. Removal of existing surfacing for the heeling-in operation shall be included in the Contract unit price bid for the various courses of the bituminous concrete material.

In case of base widening, the surfacing adjacent to the bituminous material being placed shall be cleaned of all loose and foreign material.

H. Compaction

Rollers used for compaction shall be self propelled, reversible and in good condition. They shall be equipped and operated in a way to prevent the picking up of hot mixed material by the tires or roller faces.

1. Steel Wheel Rollers

   Steel wheel rollers may be two axle tandem, three axle tandem, and three wheeled or vibratory.

2. Pneumatic Tired Rollers

   Pneumatic tired rollers shall have not less than seven wheels with pneumatic tires of equal size. If satisfactory results are not obtained from the treaded tire, the Engineer reserves the right to require smooth tires. No combination of smooth and treaded tires will be allowed. Tires shall be kept uniformly inflated so that the difference in pressure in any two tires shall not exceed 5 psi. On the axle having an even number of wheels, the wheels shall be arranged to oscillate in pairs; or they may be individually sprung. The roller shall be equipped with power steering and some type of fluid drive or torque converter.

3. Rolling

   Rolling shall be accomplished by using any of the above types of rollers or combinations of them except that vibratory rollers may not be operated as vibrators on any surface course if, in the opinion of the Engineer, unsatisfactory surface texture or roughness will result from the use of a vibrator. Rollers cannot be used in a vibratory mode on bridge decks. Any damage through rolling shall be corrected at once with rakes and fresh mixture where required. Delays in rolling freshly raked mixture will not be tolerated.

   Rolling shall consist of six separate operations in the following sequence: transverse joint; longitudinal joint, edges, initial breakdown rolling; second or intermediate rolling; finishing rolling. The first rolling of all joints and edges, the initial or breakdown rolling, and the final or finish rolling shall be done with the steel wheel tandem rollers. Transverse joints shall be checked with a straightedge immediately following the initial rolling.

   Rolling shall follow the placement as closely as possible.

Rollers shall start longitudinally at the sides and proceed towards the center of the pavement except that on super elevated curves, rolling shall begin at the low side and progress toward the high side. Successive trips of the roller shall overlap by at least one-half of the width of the roller, and alternate trips shall not terminate at the same point. In base widening which is too narrow to permit the use of the aforementioned rollers, an approved power driven trench roller shall be used. If the trench has to be excavated wider than the proposed width of the widening, then an earth berm or shoulder shall be formed against the loose bituminous concrete as soon as it is placed. The two materials shall be rolled and compacted simultaneously. Rolling shall be conducted so that all roller marks are eliminated, and all parts of the pavement shall receive substantially equal compaction.

I. Traffic

No traffic will be permitted on bituminous concrete pavement until it has set sufficiently to prevent marking. When it is necessary to allow traffic onto freshly laid pavement, the material may be cooled by the use of a water wagon immediately following final rolling and before traffic use.

J. Curbs, Gutters, Etc.

Where permanent curbs, gutters, edge and other supports are specified, they shall be constructed before placing of the bituminous concrete, which shall then be placed and compacted against them.

K. Shoulders

Shoulders abutting the bituminous concrete surface course of any two lane pavement which is being used by traffic shall be completed as soon as possible after completion of the surface course on that lane. Whenever additional material is required to build up shoulders to match the raised edges of paving on resurfacing projects on which traffic is being maintained, the material required for the shoulder build up shall be sampled, tested and approved for use before any resurfacing of the traveled way may be started.

02641.04 METHOD OF MEASUREMENT

Measurement of bituminous concrete pavement will be made on the basis of the weight of bituminous concrete furnished, completed, and accepted. Weight shall be determined as specified in Section 02641.01, Article C, Paragraph 5, Item n.

02641.05 BASIS OF PAYMENT

A. Bituminous Concrete Pavement

1. Payment for bituminous concrete pavement will be made at the unit price(s) bid per ton. The price(s) bid shall include the preparation of, furnishing, hauling and placing all materials, including tack coat; preparation of all materials; and for all labor, tools, equipment; the setting of lines and guides; and incidentals necessary

to satisfactorily complete the work as shown, and specified, in strict accordance with the Contract Documents, and accepted by the Engineer.

2. Adjustment of existing manholes, valve boxes, inlets or other structures will not be measured for payment but shall be included in the price bid for the various bituminous concrete items unless otherwise indicated in the Contract Documents.

3. Payment will be made for contingent items when ordered by the Engineer. Payment will be made as specified in Sections 02951, 02952, 02953, 02954, 02955, 02956, and 02957.

B. Bid Price Adjustments

1. Asphalt Content Deviation and Price Adjustment

A price adjustment will be made when asphalt content tests indicate that the asphalt content (AC) of a bituminous concrete mixture does not meet Specifications. The unit price bid will be adjusted for payment in accordance with the pay factor noted in Table 02641-4. If the weighted average deviation exceeds the values in Table 02641-4, the Engineer may require removal and replacement of the completed work. The price adjustment will be made for each mix.

TABLE 02641-4

PRICE ADJUSTMENT BASED ON AC DEVIATIONS FROM TARGET VALUE

	WEIGHTED AVERAGE DEVIATIONS (dw)			
PAY FACTOR	2 TEST VALUES	3 TEST VALUES	4 TEST VALUES	5 TEST VALUES
1.00	< .55	< .47	< .42	< .39
0.95	.55 - .61	.47 - .52	.42 - .46	.39 - .43
0.90	.62 - .68	.53 - .58	.47 - .51	.44 - .47
0.80	.69 - .75	.59 - .64	.52 - .56	.48 - .52
0.70	.76 - .82	.65 - .70	.57 - .61	.53 - .56
0.60	.83 - .89	.71 - .76	.62 - .66	.57 - .60
0.50	.90 - .97	.77 - .82	.67 - .71	.61 - .64

Lot Payment = (Unit Price Bid) x (Pay Factor) x (Tonnage)

2. Pavement Density Deviation and Price Adjustment

A price adjustment due to noncompliance with the density requirements will be made against the unit price bid for bituminous concrete in accordance with Table 02641-5.

TABLE 02641-5

DENSITY PRICE ADJUSTMENT

NO.	PERCENT OF MAXIMUM DENSITY LOT AVERAGE	PAY FACTOR
1	Above 97.0	97%
2	92.0 to 97.0	100%
3	90.0 to 91.9	97%
4	89.0 to 89.9	95%
5	Below 89	80% or Rejected at Engineer's Discretion

Lot Payment = (Unit Price Bid) x (Pay Factor) x (Tonnage)

Any sublot below 87.0 percent will be cause for rejection of the entire lot by the Engineer and the Engineer may require the removal and replacement of the completed work. The price adjustment will be made for each mix.

C. Heat Stable Anti-Stripping Additive

Payment for heat stable anti-stripping additive will be made at the price specified in the "Special Provisions".

END OF SECTION