

ITEM 250

HOT MIX ASPHALTIC CONCRETE BASE COURSE (BLACK BASE)

250.1 Description. This item shall consist of a base course mixture of compacted mineral aggregate and asphaltic material, constructed on an approved sub-grade, in accordance with the plans and specifications and in conformity with the lines and grades.

It is the intent of these specifications that the asphaltic mixtures produced and placed shall meet the requirements of these specifications, for one hundred percent payment. The Contractor shall have the responsibility for the design, production, transportation and laydown of asphaltic concrete mixtures. All phases of this work shall meet the requirements of this item and be subject to inspection and acceptance by the Engineer.

The Contractor shall exercise quality control over materials and their assembly, design, processing production, hauling, laydown, compaction and all associated equipment. Quality control is defined as the constant monitoring of equipment, materials and processes to ensure that asphaltic concrete mixtures produced and laid are uniform, and are within control limits, and meet all acceptance requirements of this item and other specification requirements. If these specifications are not being met, and satisfactory control adjustments are not being made, operations shall be discontinued until proper adjustments and uniform operations are established. Control shall be accomplished by a program independent of, but correlated with, the Engineer's quality assurance testing program and shall verify that all requirements of the job mix are being achieved and that necessary adjustments provide specification results.

At all times, when the plant is in operation, the Contractor shall require his supplier to have a level II specialist certified by TxDOT's approved hot mix asphalt certification program and will be available to the plant operator who is capable of designing asphaltic concrete mixes, performing tests and analyses to put the plant into operation and producing a mixture meeting the specifications. The daily operations at the plant will not begin without the presence of the qualified technician, as stated above.

The tests made by the Engineer in his quality assurance testing program shall not relieve the Contractor of his responsibility of quality control.

250.2 Materials.

A. Mineral Aggregate: The mineral aggregate shall be composed of a coarse aggregate and a fine aggregate and, if required, mineral filler. Samples of coarse aggregate, fine aggregate and mineral filler, shall be submitted in minimum 10 pound bags when requested by the Engineer. Unless otherwise required, one or more mineral aggregates containing both coarse and fine aggregate may be used to produce the specified mixture. The documented aggregate test results shall be submitted with the asphalt mix design.

1. Coarse Aggregate: The coarse aggregate shall be that part of the aggregate retained on a No. 10 sieve and shall consist of clean, tough, durable fragments of aggregate and/or mechanically crushed aggregate, reclaimed asphalt pavement (RAP) or a combination thereof, as hereinafter specified, of uniform quality throughout and shall be free from dirt, organic or other injurious matter occurring either freely in the material or as a coating on the aggregate. Samples of each aggregate shall be tested for approval by the Engineer. The coarse aggregate shall have an abrasion of not more than forty (40) when subjected to the Los Angeles Abrasion Test, test method ASTM C131.

Physical Requirements for Coarse Aggregate

Aggregate contained in RAP will not be required to meet these requirements except as shown on the plans.

Test	Requirement
Abrasion Loss	Not more than 40%
Deleterious Material	Less than 2.0%
Decantation	Less than 2.0%

2. Reclaimed Asphalt Pavement (RAP). RAP is defined as a salvaged, milled, pulverized, broken or crushed asphaltic pavement. The RAP to be used in the mix shall be crushed or broken to the extent that 100 percent will pass the 2 inch sieve.

The stockpiled RAP shall not be contaminated by dirt or other objectionable materials. Stockpiled, crushed RAP must have either a decantation of no more than 5 percent, or

a plasticity index of no more than 10, when tested in accordance with Test Method TEX-406-A, Part I, or Test Method Tex-106-E, respectively. This requirement applies to stockpiled RAP from which the asphalt has not been removed by extraction.

Only RAP from designated sources will be allowed in mixes using more than 25 percent RAP, unless otherwise shown on the plans.

3. Fine Aggregate: Fine aggregates consist of manufactured sands, screenings, and field sands. At most 15% of the total aggregate may be field sand or other uncrushed fine aggregate. The fine aggregate shall be that part of the aggregate passing the No. 10 sieve and shall consist of sand and fine aggregate particles from the coarse aggregate material sources or a combination thereof. Sand shall be composed of durable particles free from injurious foreign matter. Screening shall be of the same or similar materials as specified for coarse aggregates. Fine aggregate from each source shall be non-plastic.

Physical Requirements for Fine Aggregate

Test	Requirement
Plasticity Index	Not more than 6%
Sand Equivalent Value	Not less than 45

4. Mineral Filler: Mineral filler, when required, shall consist of thoroughly dried stone dust, slate dust, Portland cement, lime, fly ash or other mineral dust approved by the Engineer. The mineral filler shall be free from foreign matter. Fines collected by bag house or other air cleaning or dust collecting equipment may be permitted as mineral filler in amounts up to two percent of the asphaltic mixture, provided that the portion passing the No. 200 master gradation limit is not exceeded. When these fines are permitted in the asphaltic mixture, they shall be introduced in the same manner prescribed for other mineral fillers.

When mineral filler is permitted by the Engineer, it shall be controlled by a measuring device acceptable to the Engineer.

A hopper or other acceptable storage system shall be required to maintain a constant supply of mineral filler to the measuring device.

Mineral filler shall meet the following gradations, when tested in accordance with TxDOT Test Method Tex-200-F.

PERCENT BY WEIGHT OR VOLUME

Passing No. 30 Sieve	100
Passing No. 80 Sieve, not less than	75
Passing No. 200 Sieve, not less than	55

B. Bituminous Material:

1. Asphalt Binder: Unless otherwise shown on the plans, the asphalt binder shall be PG 64-22, Performance Grade, asphalt binder in accordance with TxDOT's Item 300, section 300.2.J, "Performance Graded Binders", of the Texas Department of Transportation, latest edition, of Standard Specifications for Construction of Highways, Streets, and Bridges.

- C. Prime Coat: Asphaltic material for Prime Coat shall be in accordance with Item 310, Prime Coat and shall meet the requirements of Item 300, "Asphalts, Oils and Emulsions", in the Texas Department of Transportation's "Standard Specifications for Construction of Highways, Streets and Bridges", Latest Edition. The application rate for Prime Coat shall be 0.25 - 0.35 gallons per square yard. Prime coat shall not be applied when the air temperature is below 60°F. and falling, but may be applied when the air temperature is above 50° F. and is rising. Asphalt shall not be placed when the temperature of the surface on which the asphalt is to be placed is below 50° F.

The curing period for prime coat shall be a minimum of 24-hours, or as directed by the Engineer.

- D. Additives: Additives to facilitate mixing and/or improving the quality of the asphaltic mixture shall be used when noted on the plans or in the specifications. It may be used with written permission of the Engineer. If lime or a liquid antistripping agent is used, then add in accordance with TxDOT's, Item 301, "Asphalt Antistripping Agent", latest edition.

250.3

Mixtures

- A. General: The paving mixture shall consist of a uniform mixture of coarse aggregate, fine aggregate, mineral filler, if required, and asphaltic material binder. The supplier of the black base shall submit a proposed mixture design report, which conforms to all the requirements of this specification, for verification by the Engineer. Include the following items in the mixture design report:

- The combined aggregate gradation, source, specific gravity, and percent of each material used.
- Plotted job-mix gradation on a gradation chart with sieve sizes raised from 0.45 power. This plot must show that the proposed gradation of the job-mix formula is within the limits of master gradation.
- Results of all applicable test.
- Signature of the Level II person or persons who performed the design.
- Date the mixture-design was performed, and a unique identification number for the mixture-design.

Approval of the proposed design, by the County, will require that the supplier maintain the source and quality of aggregates proposed throughout production and changes which require modification of the proposed mix design will be subject to the approval of the Engineer. The supplier of the black base shall follow the established job mix formula both as to asphalt content and gradation.

The grading of each constituent shall be such as to produce, when properly proportioned, a mixture conforming to the following limitations for grading for the type specified. The exact proportions of each constituent producing the total aggregate within these limits shall meet the following requirements:

TABLE III

GRADATION OF COMPOSITE AGGREGATE

SIEVE SIZE	PERCENT PASSING BY WEIGHT
1-1/2"	100
1"	90-100
3/8"	45-70
No. 4	30-55
No. 40	15-30

TABLE IV

GRADATION OF COMPOSITE AGGREGATE
(Hot In-Place Recycled Asphalt)

SIEVE SIZE	PERCENT PASSING BY WEIGHT
1" Sieve	100
7/8" Sieve	95-100
5/8" Sieve	75-95
3/8" Sieve	60-80
No. 4 Sieve	40-60
No. 10 Sieve	27-40
No. 40 Sieve	10-25
No. 80 Sieve	3-13
No. 200 Sieve	1-6

Testing for gradation shall be in accordance with TxDOT, Test Method Tex-200-F, latest edition.

The gradation of the material produced shall not vary from the designated grading limits for any sieve size by more than plus or minus 5 percent by weight, based on total mixture, for sieve sizes greater than or equal to the #10 and plus or minus 3 percent for sieve sizes less than the #10. The average asphalt content shall not vary from the optimum asphalt content tolerance determined from the approved job mix design, by more than plus or minus 0.3%.

Laboratory density and stability of the mixture when designed and tested, during production, in accordance with these specifications and the test methods outlined in the latest edition of Texas Department of Transportation's Manual C-14 shall meet the following physical properties:

LAB DENSITY, PERCENT			HVEEM STABILITY
Minimum	Maximum	Optimum	Not less than
94	98	96	35 percent

Stability and density tests are intended for control tests. If the laboratory stability and/or density of the mixture produced has a value lower than that specified and in the opinion of the Engineer is not due to a change in source or quality of materials, production may proceed with consequent changes in the mix until the laboratory stability and density equals or exceeds the specified values. If, in the opinion of the Engineer, there is a change in the source, types, or quality of material from that used in the design

mixture, production will be discontinued until a new design mixture is determined by trial mixes and the Contractor shall pay all costs of redesigning the mix. The Contractor may submit a new mixture-design at any time during the project. The compacted thickness of the mixture or mixtures used shall be as specified by the plans or specifications. The specific test method to be used in this specification is listed in section 250.4. The suppliers daily QA/QC test results shall be forwarded to Harris County's Material Engineer, on a daily basis.

- B. Extraction or Ignition Test: The percentage of asphalt binder in any mixture shall not vary from the proportion established by the job mix formula.

When required by the Engineer, samples of the hot mixture may be taken at the plant or from the trucks or from the finished pavement. The location of sampling of the mixture shall be in accordance with ASTM D979. When tested in accordance with ASTM D2172, or TxDOT's: Tex-236-F and Tex-200-F, the average of the results of the aggregate gradations and asphalt content shall not vary from the values established in the job mix formula. Provide the Engineer with split samples of the mixtures and blank sample used to determine the ignition oven correction factors. TxDOT's Test Method, Tex-236-F should be used to determine the aggregate and asphalt correction factors from ignition oven.

The mix shall be designed in accordance with Texas Department of Transportation Bulletin C-14 and Test Method Tex-204-F "Design of Bituminous Mixtures" to conform with the requirement herein. With the exception that the laboratory density will be determined as a percentage of the mixture Theoretical Maximum Density. The Theoretical Maximum Specific Gravity shall be determined in accordance with Texas Department of Transportation Test Method Tex-227-F "Theoretical Maximum Specific Gravity of Bituminous Mixtures" on trial samples at each asphalt content. The optimum asphalt binder content will correspond to 96% laboratory density provided the mixture satisfies the minimum Hveem Stability of 35%.

- C. Stock Pile Gradations: Once a job mix design has been established in accordance with the latest edition of Texas Department of Transportation Bulletin C-14 and Texas Test Method Tex-204-F "Design of Bituminous Mixtures", the coarse aggregate delivered to the stockpiles shall not vary on any grading size fraction by more than plus or minus 8 percentage points from the percentage found in the samples submitted by the Contractor and upon which the job mix design was based. The intent of this requirement is to insure consistency and uniformity of the asphaltic mixture produced in the drum mix plant. Should the gradation of coarse aggregates in the stockpiles vary by more than the allowed tolerance, the Engineer may stop the production and may require

that new aggregate be furnished to the stockpiles that meet the gradations of the aggregates submitted for the design mix formula.

D. Tolerances:

If the paving mixture produced varies from the job-mix formula gradation and/or asphaltic material content by more than the tolerances and restrictions, proper changes shall be made until the mixture meets the requirements, as directed by the County Engineer.

250.4 Test Methods

Testing of Materials: The Engineer will perform random tests to determine if the materials and construction procedures produce a product which meets the contract documents. The specific test methods for material analysis are outlined in the following Tables.

A. Testing of mineral aggregates shall be in accordance with the following ASTM standard laboratory test procedures:

Property	Test Method
1. Sampling Aggregate	ASTM D-75 "Sampling Aggregates"
2. Sieve Analysis	Texas Test Method Tex-200-F "Sieve Analysis of Fine and Coarse Aggregates"
3. Abrasion Resistance	ASTM C-131 "Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine"
4. Specific Gravity	ASTM C-127 "Specific Gravity and Absorption of Coarse Aggregate" ASTMC-128 "Specific Gravity and Absorption of Fine Aggregate"
5. Sand Equivalent	ASTM D-2419-74 "Test Method for Sand Equivalent Value of Soils and Fine Aggregate" or Texas Test Method Tex-203-F

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| 6. Atterberg Limit | ASTM D-4318-84 "Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils" |
| 7. Deleterious Materials | Texas Test Method Tex-217-F "Separation of Deleterious Material, Part I." |
| 8. Decantation | Texas Test Method Tex-217-F "Decantation, Part II." |

B. Performance Graded Binders, PG binders must be smooth and homogeneous material which will not foam when heated to 350°F and meet the requirements of Section 300.2.J "Performance Graded Binders" of TxDOT Specification Item 300, latest edition.

C. Testing of bituminous mixtures shall be in accordance with the following standard laboratory test procedures:

Property	Test Method
Sampling Bituminous Mixtures	Texas Test Method Tex-222-F "Method of Sampling Bituminous Mixtures" or ASTM D979
Molding of Specimens	Texas Test Method Tex-206-F "Method of Compacting Test Specimens of Bituminous Mixtures"
Height of Specimens	ASTM D-3549-83 "Test Method for Thickness or Height of Compacted Bituminous Paving Mixtures Specimens"
Bulk Density of Specimens	Texas Test Method Tex-207-F "Determination of Density of Compacted Bituminous Mixtures"
HVEEM Stability	Texas Test Method Tex-208-F "Test for

	Stabilometer Value of Bituminous Mixtures"
Maximum Theoretical Density	Texas Test Method Tex-227-F "Theoretical Maximum Specific Gravity of Bituminous Mixtures"
Method of Mix Design	Texas Test Method Tex-204-F "Design of Bituminous Mixtures" <u>TxDOT</u> Construction Bulletin C-14
Extraction and Gradation	Texas Test Method Tex-210-F, "Determining Asphalt Content of Bituminous Mixture", and Texas Test Method Tex-200-F, "Sieve Analysis of Fine and Coarse Aggregates"

250.5 Equipment

- A. Provide equipment to produce, haul, place, and compact asphalt pavement, that complies with requirements of the latest edition of Item 320, "Equipment for Asphalt Pavement" and herein after specified in the Texas Department of Transportation's "Standard Specifications for Construction of Highways, Streets and Bridges".

The Engineer, or his authorized representative, shall have access at any time to all parts of the paving plant.

250.6 Heating and Discharge of Materials

- A. Heating of Materials: Do not heat the asphalt binder above the temperatures specified in Item 300, "Asphalts, Oils, and Emulsions", of TxDOT's Specifications, latest edition; or outside the manufacturer's recommended values. On a daily basis, provide the engineer with records of asphalt binder and hot-mix asphalt discharge temperatures in accordance with Item 320, "Equipment for Asphalt Concrete Pavement", of TxDOT's Specifications, latest edition.
- B. Mixing and Discharge of Materials: Notify the Engineer of the target discharge temperature and produce the mixture within 25°F of the target. Monitor the temperature of the material in the truck before shipping to ensure that it does not exceed 350°F. Harris

County will not pay for or allow placement of any mixture produced at more than 350°F.

Control the mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant. If requested, determine the moisture content by oven drying in accordance with Texas Test Method, Tex-212-F, Part II, and verify that the mixture contains no more than 0.2% of moisture by weight. Obtain the sample immediately after discharging the mixture into the truck, and perform the test promptly.

250.7 Asphalt Mixing Plants

A. Mixing plants may be either the weigh batch type, or the drum mix type. Both types of plants shall be equipped with satisfactory conveyors, power units, aggregate handling equipment, bins and dust collectors, etc. and comply with the requirements of the latest edition of TxDOT's, Specification Item 320, "Equipment for Asphalt Concrete Pavement".

250.8 Spreading and Finishing Machine. The spreading and finishing machine shall conform to the requirements of the latest edition of TxDOT's Specification, Item 320, "Equipment for Asphalt Concrete Pavement", and as specified herein:

The spreading and finishing machine shall be of a type approved by the Engineer and shall be capable of producing a surface that will meet the requirements of the typical cross section and the surface test, when required by the Engineer, and when the mixture is dumped directly into the finishing machine shall have adequate power to propel the delivery vehicles in a satisfactory manner. The finishing machine shall be equipped with a flexible spring and/or hydraulic type hitch sufficient in design and capacity to maintain contact between the rear wheel of the hauling equipment and the pusher rollers of the finishing machine while the mixture is being unloaded. The paver shall have a receiving hopper of 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. The screed or strike-off assembly shall produce a surface of the required evenness and texture without tearing, shoving, gouging or displacing the mixture.

The use of any vehicle which requires dumping directly into the finishing machine and which the finishing machine cannot push or propel in such a manner as to obtain the desired lines and grades without resorting to hand finishing will not be allowed. Unless waived by the Engineer, automatic screed controls will be required for asphaltic concrete spreading and finishing machines.

Asphaltic-concrete spreading and finishing machines shall be equipped with an approved automatic dual longitudinal screed control system and a transverse screed control system. The longitudinal controls shall be capable of operating from any longitudinal grade reference including a stringline, 40-foot ski, mobile stringline or matching shoe. The asphaltic concrete spreading and finishing machine shall be equipped with a screed heater and vibrator.

The Contractor shall furnish all equipment required for grade reference. It shall be maintained in good operating condition by personnel trained in the use of this type of equipment. The equipment shall be capable of constructing a finished surface within specified tolerances.

The automatic grade control device shall produce a finished surface meeting the requirements of the surface test on the items of work for which a spreading and finishing machine is required. Skin-patching will not be permitted unless approved by the Engineer and any section of pavement not meeting the minimum tolerance shall be corrected at the Contractor's expense.

The spreader shall be capable of spreading and finishing courses of bituminous plant mix material in lanes not less than 10-feet in width and shall be capable of operating at forward speeds consistent with the satisfactory laying of the mixture.

The asphaltic mixture, when placed with a spreading and finishing machine, shall not be placed unless the air temperature is at least 40° F. and rising. The air temperature shall be taken in the shade away from artificial heat. Asphalt shall not be placed when the temperature of the surface on which the mat is to be placed is below 60° F.

It is further provided that the asphaltic mixture shall be placed only when the humidity, general weather conditions and temperature and moisture condition of the base, in the opinion of the Engineer, are suitable.

250.9 Transporting Asphaltic Concrete

The asphaltic concrete mixture, heated and prepared as specified, shall be hauled to the work site in tight vehicles previously cleaned of all foreign material.

The dispatching of the vehicles shall be arranged so that all material delivered may be placed and all rolling shall be completed during daylight hours. Cover each truck load of mixture with waterproof tarpaulins. The inside of the trucks body may be given a light coating of, lime slurry or other approved release agent to prevent the mixture from adhering to the body. A hole for inserting a thermometer shall be installed in the truck body. Truck beds shall be clean before they are loaded with asphalt. If, in the opinion of the Engineer, the truck bed is damaged, it shall be removed from the project.

250.10

Lay-Down Operations

- A. Minimum Mixture Placement Temperatures. Use Table below for suggested minimum mixture placement temperatures.

Suggested Minimum Mixture Placement Temperature

High-Temperature Binder Grade	Minimum Placement Temperature (Before Entering Paver)
PG 64 or lower	260°F
PG 70	270°F
PG 76	280°F
PG 82 Or higher	290°F

- B. Windrow Operations. When hot mix is placed in windrows, operate windrow pickup equipment so that substantially all the mixture deposited on the roadbed is picked up and loaded into the paver.

- C. Placing

Tack Coat, if necessary, will be applied in accordance with Item 340.10.

The asphaltic mixture shall be dumped and spread on the approved prepared surface with the specified spreading and finishing machine, in such a manner that when properly compacted the finished pavement will be smooth, of the required density and will meet the requirements of the typical cross-sections and the surface tests. During the application of asphaltic material, care shall be taken to prevent splattering of adjacent pavement, curb and gutter and structures.

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, provided a satisfactory surface can be obtained by other approved methods.

Adjacent to flush curbs, gutters, liners and structures, the surfaces shall be finished uniformly high so that when compacted it will be slightly above the edge of the gutter and flush to the structure.

250.11

Compacting

The pavement shall be compacted thoroughly and uniformly with the necessary rollers to obtain the density, stability and cross-section of the finished paving mixture meeting the requirements of the plans and specifications.

Rolling equipment shall consist of pneumatic tire and steel wheel rollers. Breakdown rolling shall be accomplished immediately after placing, using steel wheel rollers. Vibratory rollers will not be permitted unless prior

approval is obtained from the Engineer and unless the equipment is operated by personnel who are properly certified to operate this equipment.

All equipment shall be in good mechanical condition, properly adjusted and free from wear that would impair the quality of the work. Necessary precautions shall be taken to prevent the dropping of gasoline, oil, grease or other foreign matter on the pavement, by the compaction, or any equipment.

Pneumatic tired rollers shall have tires of equal size and diameter capable of exerting an average contact pressure varying from 40 to 90 psi, by adjusting ballast and/or tire pressure. All tires shall have equal pressure. The wheels will be placed so that one pass will accomplish one complete coverage equal to the width of the roller with a minimum of 1/4-inch overlap. The wheels shall not wobble. The operating weight and tire pressure shall be as such as to provide the required density. The rollers shall be in the best mechanical condition. Pneumatic tire rollers shall be equipped with water systems and fiber mats.

Steel wheel rollers shall be a three wheel two-axle tandem (bull wheel) or three-axle tandem roller weighing not less than eight (8) tons and developing compression in the rear wheels of not less than 250 pounds per inch of roller width. The rollers shall have power units and be equipped with scrapers to keep the wheels clean and with the means of keeping the wheels wet, to prevent mixes from sticking to the rollers.

Vibratory rollers shall have a minimum of one vibratory drum weighing no less than eight (8) tons. The vibratory roller shall be capable of obtaining frequency and amplitude combinations that will produce an impact spacing smaller than the thickness of the mat, or a minimum of 8 to 10 blows per foot.

All rolling with any type of roller shall be done as directed by the Engineer. Breakdown (initial pass) rolling shall be conducted with a steel wheel roller or vibratory roller, intermediate rolling shall be conducted with a steel-wheel roller or pneumatic-tired roller and finished rolling shall be conducted with a steel wheel roller or pneumatic-tired roller unless directed otherwise by the Engineer. When rolling with vibratory steel wheel rollers, the manufacturer's recommendation shall be followed, unless otherwise directed by the Engineer.

The specific rollers used in sequence to obtain the required compaction shall be approved by the Engineer. The ambient temperature, humidity, wind velocity, temperature of existing surface, mat thickness, and temperature of paving mixture shall be considered by the Engineer in determining the type and amount of rollers needed to achieve the required compaction. Approval of the Engineer will not relieve the Contractor of his responsibility to produce the required density.

Rolling pattern shall be established daily and verified as outlined in Test Method Tex-207-F, Part IV and III respectively, to achieve the required air void content. The daily established rolling pattern used is subject to approval by the Engineer. The daily established rolling pattern shall be followed unless changes in the mixture or placement conditions occur which affect compaction. A new rolling pattern will be established at this time. If required, test strips approximately 300-500 feet in length shall be established to determine proper rolling patterns. A maximum of two strips will be allowed. If the required rolling patterns cannot be determined that will give the required density with two strips, the first two strips will be removed, before the third strip is constructed.

The mixture shall be placed at a temperature of between 260° and 325° F. Rolling shall begin as soon as the paving mixture will not be displaced laterally by the weight of the roller. When rolling with the steel-wheel, pneumatic-tired roller or vibratory roller, longitudinal joints shall be rolled initially, however rolling shall begin at the low side of the pavement and proceed toward the higher side of the pavement, overlapping on successive trips by at least half the width of the rear wheel unless otherwise directed by the Engineer. Alternate trips of the roller shall be a minimum of six inches difference in length. The motion of the roller shall be slow enough at all times to avoid displacement of the mixture. To prevent adhesion of the surface mixture to the roller, the rollers shall be kept thoroughly moistened with water, but an excess of water will not be permitted. The roller shall not be allowed to stand on pavement which has not been fully compacted. If any displacement occurs, it shall be repaired at once by the use of rakes, and fresh mixture where required, any repair is subject to the Engineer's approval.

The maximum roller speed for any compaction equipment shall comply with the following table unless directed otherwise by the Engineer. The speed of the roller shall, at all times, be slow enough to avoid displacement of the hot mixture and shall not be greater than the speed indicated below.

MAXIMUM ROLLING SPEEDS

Compactor	Type of Rolling		
	Breakdown (miles/hr)	Intermediate (miles/hr)	Finish (miles/hr)
Steel Wheel Roller	2	3	3
Pneumatic-tired Roller	--	3	5
Vibratory Roller	3	3	3

Rolling shall be continued until required compaction can be obtained and all roller marks are eliminated. Regardless of the method of compaction

control followed, all rolling shall be completed before the mixture temperature measured at the surface drops below 175° F.

Rolling with a trench type roller will be required on widening areas in trenches and other limited areas where satisfactory compaction cannot be obtained with the rollers specified or approved.

The roller must not stand on the compacted pavement which has not cooled to normal atmospheric temperature. To prevent adhesion of the paving mixtures to the rollers, the wheels shall be kept properly moistened with water, however, excess water will not be permitted.

If, in the opinion of the Engineer, the asphaltic concrete surface course is not being properly compacted, specimens shall be taken to determine the density of the asphaltic concrete at various locations.

Density of the completed asphaltic concrete shall be uniform over the entire roadway area. The Engineer may have the material (part or all) removed and replaced on areas where density is found not to be that specified, when tested. The entire cost of removing and replacing material from areas because of unacceptable density variations shall be borne by the Contractor and at no cost to the County.

The Contractor shall have the option of placing material in either one or more lifts, in order to maintain uniform compaction. Lifts shall not exceed 4-inches in thickness.

Hand Tamping: The edges of the pavement along curbs, headers and similar structures, and all places not accessible to the roller, or in such positions as will not allow thorough compaction with the rollers, shall be thoroughly compacted with lightly oiled tamps.

250.12 Compaction Criteria

In place compaction methods used to obtain the required density necessary to gain the Engineer's approval shall be divided into Type A or Type B construction.

Type A construction shall represent asphalt being laid over New Construction, that is, all phases of construction beginning at the sub-base level and ending with the asphalt surface mix shall be New Construction.

Type B construction shall represent asphalt being laid over in-situ material or base repair, that is, all asphalt overlay, level-up, base repair, cold in-placed recycled asphalt or hot in-placed recycled asphalt. For all base repair used to construct an asphalt overlay and level-up the gradation of composite aggregate shall be as shown in Table III. However, all base repair used to construct hot in-placed recycled asphalt, the gradation of the composite aggregate shall be as shown in Table IV.

Type A:

In place compaction control is required of all paving mixtures. Asphaltic concrete shall be placed and compacted to obtain from 3 to 8 percent air voids. Do not increase the asphalt content of the mixture to reduce pavement air voids. In no case shall the compacted roadway specimen have air voids in excess of 8 percent. The Contractor shall establish a rolling pattern as outlined in Test Method Tex-207-F, Part IV, to achieve the required air void content. The Contractor shall confirm compaction as outlined in Test Method Tex-207-F, Part III, through nuclear density testing supplied by the laboratory retained by Harris County. The target density can be established daily and verified with a nuclear density gauge as outlined in Tex-207-F, Part IV and III, respectively. It is recommended that the Thin Lift Asphalt Gauge be used, however other nuclear equipment may be used with prior approval of the Engineer as long as proper correlation is performed and correlation proof is maintained and kept with the gauge at all times. The Contractor shall understand that all nuclear density testing is performed only as an aid to construction, and the Engineer's approval will not relieve the Contractor of his responsibility to produce the required density. Acceptance of the asphalt by Harris County shall be by the acceptable core density and other methods of determining in-place density, which correlate satisfactory with results obtained from roadway specimens, may also be used when approved by the Engineer. Correlation of average nuclear gauge readings to core density results shall be performed after each day's production, as outlined herein after. The Laboratory Technician shall continue to check and verify the rolling pattern by use of nuclear equipment every 100 feet, at a minimum and mark core locations every 500 feet, at center of alternate lane. For Parking Lots, every 1,100 square yards, take four (4) nuclear gauge readings at each marked core location. Cores shall be taken the same day, or no later than the beginning of the next day. Core locations must be back filled and compacted with similar pavement material. The in-place density and air void shall be measured in accordance with Test Methods Tex-207-F and Tex-227-F. Correlation of average nuclear gauge density reading to core density results shall be established for the cores taken daily and forwarded to Harris County on a daily basis. This process will continue for each day's placement, until the Engineer determines that a good bias has been established for that nuclear gauge. Then the same nuclear gauge should be utilized to establish and verify the in-place densities afterward. The specific rolling pattern used is subject to approval by the Engineer. The daily established rolling pattern shall be followed unless changes in the mixture or placement conditions occur which affect compaction. A new rolling pattern will be established at this time. If required, test strips approximately 300-500 feet in length shall be established to determine proper rolling patterns. A maximum of two strips will be allowed. If the required rolling patterns cannot be determined that will give the required density, with two strips, then the first two strips will be removed, before the third strip is constructed.

Type B:

The Contractor shall establish a rolling pattern as outlined in Test Method Tex-207-F, Part IV, to achieve an acceptable density. The Contractor shall confirm compaction as outlined in Test Method Tex-207-F, Part III, through nuclear density testing supplied by the Laboratory retained by Harris County. The target density shall be established and controlled with a nuclear gauge as outlined in Tex-207-F, Part IV and III respectively. It is recommended that the Thin Lift Asphalt Gauge be used, however other nuclear equipment may be used with prior approval of the Engineer. The Laboratory Technician shall continue to check and verify the rolling pattern by use of nuclear equipment, at a minimum of every 100 feet per lane. Acceptance of the asphalt by Harris County shall be upon receiving final reports from the Material Engineer verifying Mix Design and Conformance to the Rolling Pattern. Cores shall not be taken for densities unless otherwise directed by the Engineer. Cores will be used to verify depth as required. The daily established rolling pattern used is subject to approval by the Engineer. The daily established rolling pattern shall be followed unless changes in the mixture or placement conditions occur which affect compaction. A new rolling pattern will be established at this time.

250.13 Construction Joints:

Placing of the surface course shall be as nearly continuous as possible, and the roller shall pass over the unprotected end of the freshly laid mixture only when the laying of the course is discontinued for such length of time as to permit the mixture to become chilled. In all such cases, when the work is resumed, the material laid shall be cut back so as to produce a slightly beveled edge for the full thickness of the course.

The old material which has been cut away shall be removed from the work site, and the new mix laid against the fresh cut.

When the work is resumed, the materials laid shall be cut back to a point where material is full depth, which will be removed altogether with the surplus material, and the fresh mix laid against the joint thus formed.

Hot smoothing irons may be used for sealing joints, but in such cases extreme care shall be exercised to avoid burning the surface. Any unevenness indicated by a 10-foot straight edge laid perpendicular to the joint, immediately after final rolling, shall be corrected at that time.

250.14 Irregularities. Immediately take corrective action if surface irregularities, including but not limited to segregation, rutting, raveling, flushing, fat spots, mat slippage, color, texture, roller marks, tears, gouges, streaks, or uncoated aggregate particles, are detected. The Engineer may suspend production or placement operations until the problem is corrected. At the expense of the Contractor and to the satisfaction of Engineer, remove and replace any mixture that does not

bond to the existing pavement or that has other surface irregularities identified above.

250.15 Surface Requirements

The final surface of the pavement after compaction shall be smooth and true to the established line and grade and typical cross sections shown on the plans and, when tested with a standard 10-foot or 16-foot straight-edge laid parallel to the centerline of the roadway, shall have no deviation in excess of 1/8-inch per foot for a 16-foot straight edge or 1/16 inch/foot for a 10-foot straight edge from the nearest point of contact and the maximum ordinate measured from the face of the straight-edge shall not exceed 1/4-inch at any point. Any areas of the surface not meeting these requirements shall be immediately corrected as directed. Tests shall be made at transverse construction joints out at randomly selected locations.

250.16 Opening to Traffic

Allow the compacted pavement to cool before opening to traffic unless directed by the Engineer. If the surface ravel or deteriorates in any manner, it will be the Contractor's responsibility to correct this condition at his expense.

250.17 Measuring Devices. All templates, straight edges, and measuring devices necessary for the proper construction and checking of the work shall be furnished, operated and maintained by the Contractor at his entire expense.

250.18 Quality Assurance. The County will engage a Testing Firm to provide quality assurance services for Hot Mix Asphaltic Concrete (Black Base). The Testing Firm will sample and test stockpiles for gradation, in accordance with TxDOT Test Method Tex-200-F and deleterious materials and decantation in accordance with TxDOT Test Method Tex-217-F (Parts I and II) for each 3,000 tons production. The abrasion loss of the material shall be determined in accordance with ASTM C 131, for each 4,000 tons of production.

Asphalt binder will not be sampled and tested, provided that the supplier will provide copies of test results for PG-grade binder used for the project. Undocumented asphalt binder will require sampling and testing in accordance with ASTM D3381 and AASHTO Method T-102 or Tex-540-G and shall meet the requirements of Section J, "Performance Graded Binder", Item 300 of TxDOT's Specifications, latest edition. The Contractor will be responsible for the cost of these tests. The Engineer may verify the quality of the asphalt binder at any time, by sampling and testing, in accordance with the aforementioned methods.

The mixture shall be sampled, for each 400 (cumulative) tons of production and the following tests will be made for each sample of the mixture.

Test	Designation
Laboratory Density	Tex-207-F
Maximum Theoretical Density	Tex-227-F
Hveem Stability	Tex-227-F
Extraction and Gradation	Tex-210-F

Based on daily and total production, Harris County may waive the sampling and laboratory testing.

Type A:

Following compaction of the mixture in the pavement, the Laboratory representative shall sample the pavement by cutting cores and determining the in-place density in accordance with TxDOT Method Tex-207-F, and air voids as outlined in section 250.12 of this specification. Additional samples and/or tests will be taken to provide quality assurance only when approved by the Engineer.

Type B construction shall be acceptable by Harris County upon receiving final reports from the Materials Engineer verifying Mix Design and conformance to the rolling pattern.

250.19 Truck Scales. A set of standard platform truck scales will be placed at the plant and shall be provided with a suitable weigh office adjacent to the scales for the use of the trucks weigher. Scales which are not accurate to within four (4) pounds per one thousand (1,000) pounds total load shall not be used. Scales shall meet the requirements of the Item, Weighing and Measuring Equipment.

250.20 Measurement. Hot mix asphaltic concrete base course, as specified by this item, shall be measured by the ton of 2,000 pounds. Measurement by weight shall be made on truck scales as previously specified. Records shall be kept on the tare weight, total weight and net weight of asphaltic concrete for each load of same. A dray ticket shall accompany each load to the job site, indicating the net weight, gross weight, tare weight, and road name. The asphaltic material for prime coat will be measured at the point of delivery on the road in gallons at the applied temperature. The quantity to be paid for shall be the number of gallons used, as directed, in the accepted prime coat or tack coat.

250.21 Payment shall be made as follows:

- A. Where the bid sheet specifies fob the job site, the asphaltic concrete shall be transported to the job site in Harris County specified on the bid sheet, and unloaded at the location indicated.

- B. Where the bid sheet specifies for the plant, the material shall be loaded on Harris County vehicles.
- C. The "Hot Mix Asphaltic Concrete Base Course" furnished and placed as prescribed by this item and measured as provided under "measurement" will be paid for at the unit price bid for "Hot Mix Asphaltic Concrete Base Course", which price shall be full compensation for furnishing all materials, for all freight involved, for all heating, mixing, hauling, cleaning the subgrade, placing asphaltic concrete mixture, rolling and finishing; for all manipulations, labor, tools, equipment and incidentals necessary to complete the work, including prime coat, where required.
- D. The work performed and materials furnished for "Prime Coat" or "Tack Coat" and measured as provided for under measurement will be paid for at the contract unit price bid for "Prime Coat" or "Tack Coat", of the type specified, which price shall be full compensation for cleaning the area and/or subgrade; for furnishing, heating, hauling and distributing the asphaltic material as specified; for all freight involved; for all manipulation, labor, tools, equipment and incidentals necessary to complete the work.

There are line code(s), description(s), and unit(s) for this item.

END OF ITEM 250