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 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, 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 certified technician available to the plant operator who is capable of designing asphaltic concrete mixes, making 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 qualified technician present.

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.

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 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 submitted 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.

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: 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 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%

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 THD 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 Cement: The grade of asphalt shall be as designated by the Engineer. If more than one type of asphaltic concrete mixture is specified for the project, only one grade of asphalt shall be required for all types of mixtures.

The material shall be homogeneous, shall be free from water, shall not foam when heated to 350° F., and shall meet the following requirements:

Table II

VISCOSITY GRADE

	AC-10		AC-20	
	Min.	Max.	Min.	Max.
Viscosity, 140 F. stokes	1000	± 200	2000	± 400
Viscosity, 275 F. stokes	1.9	...	2.5	...
Penetration, 77 F., 100g., 5 sec.	85	...	2.5	...
Flash Point, C.O.C., F.	450	...	55	...
Solubility in Trichloroethylene, Percent	99.0	...	99.0	...
Tests on Residues from thin film oven test Viscosity, 140 F, Stokes	...	3000	...	6000
Ductility, 77 F, 5 cms per min, cms	70	...	50	...

Spot Test Negative for all grades.

A notarized certificate of analysis is to be furnished by the supplier of the asphalt. Asphalt testing shall be in accordance with the methods of sampling and testing outlined in, ASTM D3381 and AASHTO Method T-102.

C. Prime Coat: Asphaltic material for Prime Coat shall be in accordance with the Item, 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", 1993 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.

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. The supplier of the black base shall submit a proposed mix design, which conforms to all the requirements of this specification, for verification by the Engineer. Approval of the proposed design, by the City, 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	**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 THD Test Method Tex-200-F.

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 methods outlined in the 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	99	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 compacted thickness of the mixture or mixtures used shall be as specified by the plans or specifications.

B. Extraction Test: The percentage of asphalt cement 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 from the trucks or from the finished pavement. The location of sampling of the mixture shall be in accordance with ASTM Method D979. When tested in accordance with ASTM Method D2172, the average of the results of the aggregate gradations and asphalt content shall not vary from the values established in the job mix formula.

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 cement 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 Texas Highway Department Construction 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 City 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	ASTM
1. Sampling Aggregate	D-75 "Sampling Aggregates"
2. Sieve Analysis	Texas Test Method Tex-200-F"Sieve Analysis of Fine and Coarse Aggregates"
3. Abrasion Resistance	C-131 "Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine"
4. Specific Gravity	C-127 "Specific Gravity and Absorption of Coarse Aggregate" C-128 "Specific Gravity and Absorption of Fine Aggregate"

B. Testing of asphalt cement shall be in accordance with the following ASTM standard laboratory test procedures:

Property	ASTM
Viscosity, 140° F	D-2171-85 "Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer"
Viscosity, 275° F	D-2170-85 "Test Method for Kinematic Viscosity of Asphalts (Bitumens)"
Penetration, 77° F	D-5-83 "Test Method of Penetration of Bituminous Materials
Flash Point	D-92-85 "Test Method for Flash and Fire Points by Cleveland Open Cup"
Solubility in Trichloroethylene	D-2042-81 "Test Method for Solubility of Asphalt Materials in Trichloroethylene"
Ductility	D-113-85 "Test Method for Ductility of Bituminous Materials"
Spot Test	AASHTO T-102 "Spot Test of Asphaltic Materials"

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

Property	ASTM
Sampling Bituminous Mixtures	Texas Test Method Tex-222-F "Method of Sampling Bituminous Mixtures"
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" Texas Highway Department Construction Bulletin C-14
Extraction and Gradation	Texas Test Method Tex-210-F "Determination of Asphalt Cement of Bituminous Mixtures by Extraction"

250.5 Proportioning and Feeding

A. The proportioning of the various materials shall be as directed by the Engineer and in accordance with these specifications. The Engineer, or his authorized representative, shall have access at any time to all parts of the paving plant. Satisfactory equipment and construction methods shall be used as hereinafter specified.

B. Feeding Mineral Aggregate: The various sizes of mineral aggregate as received shall be stored or stockpiled separately and the feeding of all the various sizes of mineral aggregate to the dryer shall be done by some mechanical device that will give a uniform and constant feed of each of the sizes incorporated, in order to give a control of the temperature and grading of the mineral aggregate. If RAP is used, a separate cold bin shall be required. The RAP feed system shall be equipped with a scalping screen to remove particles over 2 inches in size. The cold bin system shall supply a uniform and proper amount of RAP to the mixture. The RAP shall be added to the hot aggregate either prior to or at the weigh box. If added prior to the weigh box, the system shall include means acceptable to the Engineer to verify that the correct amount of RAP is continuously being fed.

C. Drying: The drying of mineral aggregate shall be done in such a manner that finer particles will not escape with the furnace gases. If a forced draft is used, a dust collector system will be required. If a

natural draft is used, the Engineer may require a dust through the stack. The aggregate shall be heated in a suitable apparatus in which the aggregate shall be continuously agitated during heating and in which the aggregate shall be continuously agitated during heating and in which the temperature can be efficiently and positively controlled so that the aggregate will not be damaged and the mixture produced will have a temperature between 250° and 375° F. A recording thermometer will be provided which will record the temperature of the aggregate as it leaves the dryer (batch plant only).

D. Recording Thermometer: The recording temperature will be provided with a 24 hour chart and shall be equipped with a double-pen in order to record both the temperature of the aggregate and the temperature of the asphalt incorporated in the batch. The dryer or dryers shall be of sufficient size to dry and heat the amount of aggregate required to keep the plant in continuous operation.

250.6 Screening and Storing

A. Screening: The screening capacity and size of the bins shall be sufficient to screen and store the amount of aggregate to properly operate the plant and keep the plant in continuous operation at full capacity. The hot bins shall be constructed so that oversize and overload material will be discarded through overflow chutes. Provisions shall be made to enable inspection forces to have easy and safe access to the proper location on the mixing plant where representative samples may be taken from the hot bins for testing.

The bins shall contain the following sizes of aggregate:

Bin No. 1 will contain aggregate, 90 to 100 percent of which will pass a 10 mesh sieve.

Bin No. 2 will contain aggregate all of which will pass a 3/8 inch sieve and 80 to 100 percent of which will be retained on a 10 mesh sieve.

Bin No. 3 will contain aggregate all of which will pass a 1 inch sieve and 85 to 100 percent of which will be retained on a 3/8 inch sieve.

Bin No. 4 will contain aggregate all of which will be retained on a 1-inch sieve.

B. Weigh Box: Bin storage shall be provided with tight cut-off gates, so that there will be no leakage of the mineral aggregate into the weigh box. The weigh box for the mineral aggregate shall be of sufficient capacity to hold a complete batch of aggregate and shall be so designed that the entire batch will quickly discharge into the mixer.

This weigh box shall be open at the top so that, if in charging, an excess of one size of mineral aggregate is introduced into the box, it may be removed by the operator. This weigh box shall be provided with a close fitting and quick operating cut-off gate so that there will be no leakage of the mineral aggregate into the mixer.

If RAP is used, a separate cold bin shall be required. The RAP feed system shall be equipped with a scalping screen to remove particles over 2 inches in size prior to the weighing device. There shall be adequate cold bin controls to provide a uniform amount of RAP to the mixture.

When RAP is used, positive weight measurement of RAP shall be provided by the use of belt scales or other approved devices.

C. Scales: The scales used for weighing the different grades of mineral aggregate may be either of the springless dial type or the multi-beam type. Of the springless dial type, an adjustable indicating pointer shall be provided for each grade of the mineral aggregate allowing accurate weighing of the various sizes.

If the scales are of the multi-beam type, they shall have sufficient weighing beams to weigh each grade of aggregate separately.

All scales shall have a tare beam for balancing. The beam scales must also be equipped with a tell-tale dial indicating over and under load of at least 50 pounds. Scales that are not accurate within four (4) pounds per one thousand (1000) pounds net load will not be considered satisfactory. In case vibration of the plant interferes with accurate weighing, the scales shall be satisfactorily insulated against shock or vibration.

250.7 Heating and Weighing Asphalt

The asphalt cement storage shall be ample to meet the production requirements. Asphalt cement in storage shall be heated by steam coils, absolutely tight to prevent leakage of the moisture into the asphalt, and steam for heating shall not be at a temperature in excess of 375o F. No direct fire heating of asphalt will be permitted. Agitation of asphalt with steam or air will not be permitted.

The steam heating system shall be such as to insure the maintaining of the asphalt cement at a uniform draw-off heat at the asphalt cement bucket of between 275° and 375° F. The temperature shall be maintained with an efficient and positive control of the heat at all times. All asphalt cement heated above 375° F., either before or during the mixture with the mineral aggregate shall be rejected.

The draw-off valve at the asphalt cement bucket shall be of quick cut-off type that will not leak any asphalt into the bucket after the required weigh of the asphalt cement has been drawn. The asphalt supply line must be of circulating type and must be equipped with a recording thermometer indicating the temperature of the asphalt at the draw-off valve. This recording thermometer may be combined with the one used in recording the temperature of the aggregate by using a double pen recorder.

The asphalt cement weigh bucket shall be of an approved type from which the asphalt will flow into the mixer for approximately the full width of the mixer, so as to deposit the asphalt cement in a uniform and continuous manner. The scales shall be of the springless dial type that can be arranged for quick adjustment to zero to provide for a change in tare. A pointer shall be provided to indicate the weight of the asphalt cement required in one batch.

250.8 Mixing Plants

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 and shall consist of the following essential pieces of equipment.

A. Weigh Batch Type:

1. Cold Aggregate Bin and Proportioning Device: The cold aggregate bin shall have at least four compartments of sufficient size to store the amount of aggregate required to keep the plant in continuous operation and of proper design to prevent overflow of material from one compartment to another. The proportioning device shall be such as will provide a uniform and continuous flow of aggregate in the desired proportion to the dryer. Each aggregate shall be proportioned in a separate compartment.

   If RAP is used, a separate cold bin shall be required. The RAP feed system shall be equipped with a scalping screen to remove particles over 2 inches in size. The cold bin system shall supply a uniform and proper amount of RAP to the mixture. The RAP shall be added to the hot aggregate either prior to or at the weigh box. If added prior to the weight box, the system shall include means acceptable to the Engineer to verify that the correct amount of RAP is continuously being fed.

2. Dryer: The dryer shall be of the type that continually agitates the aggregate during heating and in which the temperature can be so controlled that the aggregate will not be injured in the

necessary drying and heating operations required to obtain a mixture at the specified temperature. The burner, or combination of burners and type of fuel used shall be such that in the process of heating the aggregate to the desired or specified temperature, no residue from the fuel shall adhere to the heated aggregate. A recording thermometer shall be provided which will record the temperature of the aggregate prior to the mixing operation. The dryer will be of sufficient size to keep the plant in continuous operation.

3. Screening and Proportioning: The screening capacity and size of the hot aggregate bins shall be sufficient to screen and store the amount of aggregate required to properly operate the plant and keep the plant in continuous operation at full capacity. The hot bins shall be constructed so that oversize and overloaded material will be discarded through overflow chutes. Provisions shall be made to enable inspection forces to have easy and safe access to the proper location on the mixing plant where representative samples may be taken from the hot bins for testing. The aggregates shall be separated into at least three bins.

4. Aggregate Weigh Box and Batching Scale: The aggregate weigh box and batching scales shall be of sufficient capacity to hold and weigh a complete batch of aggregate. The weigh box and scales shall conform to the requirements of these specifications.

5. Asphaltic Material Bucket and Scales: The asphaltic material bucket and scales shall be of sufficient capacity to hold and weigh the necessary asphaltic material for one batch. The bucket and scales shall conform to the requirements of these specifications.

6. Mixer: The mixer shall be of the twin-pug mill type and shall have a capacity of not less than 4,000 pounds in a single batch. The number and position of the blades shall provide a uniform mix. Any mixer that has a tendency to segregate aggregate or fails to secure a thorough and uniform mixing with the asphalt and filler dust will be deemed inadequate and shall be rejected. This determination will be made by mixing the standard batch for the required time and then dumping the batch and taking samples from different parts of the batch. These will be tested by the extraction test and must show that the batch is uniform throughout. All mixers shall be provided with an automatic time lock that will lock the discharge doors of the mixer for the required mixing period. The dump door or doors and the shaft seals of the mixer shall be tight enough to prevent spilling of the aggregate or mixture from the pug mill.

7. Surge-Storage System: A surge-storage system may be used. It shall be adequate to minimize production interruptions during the normal day's operations. A device such as a gob hopper or other similar device approved by the Engineer to prevent segregation in the surge-storage bin will be required.

B. Drum Mix Type:

The Contractor may, at his option, elect to use the drum-mixing process in the mixing of asphaltic concrete material. The plant shall be adequately designed and constructed for the process of mixing aggregates and asphalt in the drum mixer without pre-heating the aggregates. The plant shall be equipped with satisfactory conveyors, power units, aggregate handling equipment, feed controls. and shall consist of the following essential pieces of equipment.

1. Cold-Aggregate Bin and Feed System: The cold aggregate bin shall be of sufficient size to store the amount of aggregate required to keep the plant in continuous operation and of proper design to prevent overflow of material from one compartment to another. The feed system shall provide a uniform and continuous flow of the aggregate in the desired proportion to the drum mixer. A sampling location shall be at the cold feed and shall be made available to the Engineer.

   The system shall provide positive weight measurement of the combined cold-aggregate feed by use of belt scales or other approved devices.

   If RAP is used, a separate cold bin shall be required. The RAP feed system shall be equipped with a scalping screen to remove particles over 2 inches in size prior to the weighing device. There shall be adequate cold bin controls to provide a uniform amount of RAP to the mixture.

   When RAP is used, positive weight measurement of RAP shall be provided by the use of belt scales or other approved devices.

2. Scalping Screen: A scalping screen shall be required and shall be located ahead of any weighing device.

3. Asphaltic Material Measuring System: An asphaltic material measuring device shall be placed in the asphalt line leading to the drum mixer so that the cumulative amount of asphalt used can be accurately determined. Provisions of a permanent nature shall be made for checking the accuracy of the

measuring device output. The asphalt measuring device and line to the measuring device shall be protected with an adjacent of hot oil or other approved means to maintain the temperature of the line and measuring device near the temperature specified for the asphaltic material. The temperature of the asphaltic material entering the measuring device shall be maintained at 10° F. of the temperature at which the asphalt measuring device was calibrated and set.

4. Synchronization Equipment for Feed-Control Systems: The asphaltic material feed-control shall be coupled with the total aggregate weigh measuring device in such a manner as to automatically vary the asphalt-feed rate as required to maintain the required proportion.

5. Drum Mix System: The drum mix system shall be of the type that continuously agitates the aggregate and asphalt mixture during heating and in which the temperature can be so controlled that the aggregate and asphalt will not be damaged in the necessary drying and heating operations required to obtain a mixture of the specified temperature. A continuously recording thermometer shall be provided which will indicate the temperature of the mixture as it leaves the drum mixer.

6. Surge-Storage System: A surge-storage system will be required. It shall be adequate to minimize the production interruptions during the normal day's operations and shall be constructed to minimize segregation. A device such as a gob-hopper or other similar device to prevent segregation in the surge-storage bin will be required.

250.9 Spreading and Finishing Machine

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 hoper 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 50° 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.

250.10 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. In cool weather or for long hauls, canvas covers and insulating of the truck bodies may be required. The inside of the trucks body may be given a light coating of oil, lime slurry or other material necessary 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.

250.11 Placing

Tack Coat, if necessary, will be applied in accordance with Item 340.11.

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.

250.12 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 as outlined in Test Method Tex-207-F, Part III, to achieve the required air void content. The specific rolling pattern used is subject to approval by the Engineer. The selected 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 250º and 325º 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 the roller, the wheel 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

Type of Rolling

Compactor (miles/hr)	**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 City.

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.

250.13 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. Specimens from the roadway, which shall be either cores or sections of

asphaltic pavement shall be taken from each lot as determined by the Engineer. The percent air voids shall be calculated in accordance with the following equation. Percent air voids equals:

Theoretical Max. Specific Gravity-Bulk Spec.Gravity

Theoretical Maximum Specific Gravity x100

The theoretical maximum specific gravity of the roadway specimen shall be determined in accordance with Test Method Tex-227-F. The bulk specific gravity of the compacted roadway specimen shall be determined in accordance with Test Method Tex-207-F. In no case shall the compacted roadway specimens have air voids in excess of 8 percent.

The nuclear-density device may be used with results obtained from project roadway specimens when approved by the Engineer. The target density can be established with a nuclear density gauge as outlined in Test Method Tex-207-F, Part III.

Type B:

The contractor shall establish a rolling pattern as outlined in Test Method Tex-207-F, Part III, to achieve an acceptable density. The contractor shall confirm compaction through nuclear density testing supplied by the Laboratory retained by the City of Deer Park. The target density shall be established and controlled with a nuclear gauge as outlined in Tex-207-F, Part III. 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 every 250 feet per lane. Acceptance of the asphalt by the City of Deer Park shall be upon receiving final reports from the Materials 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 specific rolling pattern used is subject to approval by the Engineer. The selected 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.

250.14 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.

250.15 Surface Requirements

The final surface of the pavement after compression 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

The pavement shall be opened to the traffic when directed by the Engineer. If the surface ravels 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 City will engage a Materials Engineer to provide quality assurance services at the plant for Hot Mix Asphaltic Concrete (Black Base). The Materials Engineer will sample and test stockpiles for gradation, in accordance with THD Test Method Tex-200-F and deleterious materials and decantation in accordance with THD Test Method Tex-217-F (Parts I and II O) for each 3,000 tons production. The abrasion loss of the material shall

be determined in accordance with ASTM Method C 131, for each 4,000 tons of production.

Asphalt cement will not be sampled and tested, provided that the supplier will provide certified copies of mill test certificates for materials used for the project. Undocumented asphalt cement will require sampling and testing in accordance with ASTM Method D3381 and AASHTO Method T-102. The Contractor will be responsible for the cost of these tests. The Engineer may verify the quality of the asphalt cement at any time, by sampling and testing, in accordance with the aforementioned methods.

The mixture shall be sampled, at the plant, for each 300 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 Designation	Tex-210-F

Type A:
Following compaction of the mixture in the pavement, the Materials Engineer will sample the pavement by cutting cores and determining the in-place density in accordance with THD Method Tex-207-F. Each lot of 1,000 feet per lane of pavement should be subdivided into two (2) subsections and samples obtained within each subsection at locations based on random selection. For roads or streets length of less than 1,000 feet, no less than two (2) samples shall be obtained. Additional samples and/or tests shall be taken to provide quality assurance only when approved by the Engineer.

The Engineer shall report the results of the in-place density tests in pounds per cubic feet and the Percent of Theoretical Density.

Type B construction shall be acceptable by the City of Deer Park 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 the City of Deer Park specified on the bid sheet, and unloaded at the location indicated.

B. Where the bid sheet specifies fob the plant, the material shall be loaded on City of Deer Park 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.

END OF ITEM 250