

ITEM 340

HOT MIX-HOT LAID ASPHALTIC CONCRETE

340.1 Description. This item shall consist of a leveling up course, a surface course, or any combination of these courses, each to be composed of a compacted mixture of mineral aggregate and asphaltic material. The pavement shall be constructed on the previously approved subgrade, base, existing wearing surface or in the case of a bridge, on the prepared slab or as otherwise specified herein and in accordance with the details shown on the drawings.

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 consistent 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 level II specialist certified by TxDOT, in their approved hot mix asphalt certification program or his designated representative, available to the plant operator who is capable of designing asphaltic concrete mixes, performing tests and analysis to put the plant into operation and producing a mixture meeting the specifications. The daily operations at the plant will not begin without the certified 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 and he should conduct such tests as are necessary to design, control and place mixtures within the limits of this specification.

340.2 Materials. Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer before changing any material source or formulation. When the Contractor makes a source or formulation change, a Mix-Design using the new

material satisfying the requirements of this specification must be submitted for review and approval prior to production. The Engineer may sample and test project materials at any time during the project to verify compliance.

A. Mineral Aggregate: The mineral aggregate shall be composed of a coarse aggregate and a fine aggregate and, if required, mineral filler and may include reclaimed asphalt pavement (RAP) that meets the requirements of this specification. The use of RAP may be required on the plans. RAP use will be allowed in all mixtures except as specifically excluded herein or on the plans. 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 quality test results stated herein after shall be submitted with the 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. Coarse aggregate from each source of supply shall meet the physical requirements outlined herein. The coarse aggregate will meet the grading requirements herein. The aggregate contained in RAP will not be required to meet these requirements except as shown on the plans. The polish value of RAP aggregate will not be used in any determination of polish value specification compliance.
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. Unless otherwise shown on the plans, stockpiled, crushed RAP must have either a decantation of no more than 5 percent or a plasticity index of no more than 8, 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.

RAP sources that are designated on the plans will be available for use by the Contractor. Only RAP from designated sources will be allowed in mixes using more than

10 percent RAP, unless otherwise shown on the plans. When RAP sources are designated, either in stockpile or existing pavements, the approximate gradation, asphalt content, and asphalt cement properties of this material will be shown on the plans.

Only RAP from Harris County or other designated sources may be used in surface courses.

RAP designated for use in surface courses shall not exceed 15 per cent by weight.

3. Fine Aggregate: Fine aggregates consist of manufactured sands, screenings, and field sands. Fine aggregate stockpiles must meet the gradation requirements herein after specified. Supply fine aggregates that are free from organic impurities. The fine aggregate should be tested in accordance with Tex-408-A to verify the material is free from organic impurities. At most 15% of the total aggregate may be field sand or other uncrushed fine aggregate. With the exception of field sand, use fine aggregate from coarse aggregate sources that meet the requirements herein after specified or otherwise approved.

Fine aggregate from each source shall satisfy the requirements outlined herein. The fine aggregate will meet the grading herein.

#### Physical Requirements of Coarse Aggregate

<u>Test</u>	<u>Requirement</u>
Abrasion Loss	Not more than 40%
Deleterious Material	Less than 2.0%
Decantation	Less than 2.0%

#### Physical Requirements of Fine Aggregate

<u>Test</u>	<u>Requirement</u>
Plasticity Index	Not more than 6%
Sand Equivalent Value	Not less than 45

#### Individual Aggregate Grading Requirements

When tested by Test Method Tex-200-F it shall meet the following requirements:

<u>Coarse Aggregates</u>	<u>Percent by Weight</u>
Passing 1/2" sieve	100
Passing No. 10 sieve	Not more than 15%
<u>Fine Aggregates</u>	<u>Percent by Weight</u>
Passing a 3/8" sieve	100
Retained on No. 10 sieve	Not more than 20%
Passing No. 200 sieve	Not more than 18%

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	65

#### B. Bituminous Material:

1. Asphalt Binder: Unless otherwise shown on the plans, the asphalt binder shall be PG 64-22, Performance Grade. The performance graded (PG) asphalt binder specified herein or on the plans shall conform to the requirements of TxDOT Item 300, Section 300.2.J, "Performance Graded Binder", latest edition.

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

2. Additives: Additives to facilitate mixing and/or improve the quality of the asphaltic mixture shall be used when noted on the plans or specifications or may be used upon written permission by the Engineer. If lime or a liquid antistripping agent is used, add in accordance with the latest edition of TxDOT specification Item 301, "Asphalt Antistripping Agents".

### 340.3 Mixtures

- A. General: The paving mixture shall consist of a uniform mixture of coarse aggregate, fine aggregate, mineral filler, if required, and asphalt binder. The supplier of the asphaltic material 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 to 0.45 power. This plot must show that the gradation of the proposed job-mix formula is within the limits of master gradation.
  - Results of all applicable tests.
  - Signature of the Level II Specialist who performed the design.
  - Date the mixture design was performed, with 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 asphaltic concrete shall follow the established job mix formula both as to asphalt content and gradation.

Extraction and Ignition Test: The percentage of asphalt binder in any mixture shall not vary from the proportion established by the job mixture design.

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 the sampling of the mixture shall be in accordance with ASTM D979. When tested in accordance with ASTM D2172 or TxDOT's Test Method 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, by allowable tolerance established herein.

Provide the Engineer with split samples of the mixtures and blank samples used to determine the Ignition Oven correction factors. TxDOT Test Method Tex-236-F should be used to determine the aggregate and asphalt correction factors

The mix shall be designed 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" 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 40%.

The average asphalt content shall not vary by more than plus or minus 0.3 percent by weight (based on total mixture), from the optimum asphalt binder content determined by the approved job mix formula. However, in no case shall the asphalt binder be less than 4.7 percent of the mixture by weight.

- B. Stockpile Gradations: Once a job mix design has been established in accordance with the latest edition of Texas Department of Transportation's 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.
- C. The grading of each constituent shall be such as to produce, when properly proportioned, a mixture conforming to the master limitations listed herein. The exact proportions of each constituent shall produce the total aggregate blend within these limits.

Fine Graded (Type D) Surface Course Paving Mixture Master Grading Limits

HCPID-ED Item 340	Percent Aggregate by Weight or Volume
Passing 1/2" Sieve	100%

Passing 1/2" Retained on 3/8" Sieve	0% to 10%
Passing 3/8" Retained No. 4 Sieve	25% to 50%
Passing No. 4 Sieve Retained No. 10 Sieve	15% to 35%
Total Retained on No. 10 Sieve	50% to 70%
Passing No. 10 Sieve Retained No. 40 Sieve	4% to 25%
Passing No. 40 Sieve Retained No. 80 Sieve	4% to 25%
Passing No. 80 Sieve, Retained on No. 200 Sieve	4% to 25%
Passing No. 200 Sieve	2% to 8%

Extra Fine graded 'Type F' (Refer to TxDOT's latest edition, gradation table) Surface Course may be used, as approved by the Engineer.

- D. Tolerances: The aggregate portion of the paving mixture produced shall not vary from the design gradation by more than the tolerances allowed herein. The material is further restricted to conform to the limitations of the master grading for the type specified. The asphaltic material portion of the paving mixture shall not vary from the design amount by more than the allowed tolerance and is also restricted to conform to the master limits. The test method for determining the aggregate gradation and asphalt content of the mixture is listed in Section 340.4.

	Percent by Weight/Volume
Pass 1/2 to Retained 3/8	Plus or Minus 5
Pass 3/8 to Retained No. 4	Plus or Minus 5
Pass No. 4 to Retained No.10	Plus or Minus 5
Total Retained No. 10	Plus or Minus 5
Pass No. 10 to Retained No. 40	Plus or Minus 3
Pass No. 40 to Retained No. 80	Plus or Minus 3
Pass No. 80 to Retained No.200	Plus or Minus 3

Passing No. 200

Plus or Minus 3

Asphaltic Material

Plus or Minus 0.3

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 type mixture meets the requirements, as directed by the Engineer.

Laboratory density and stability of the mixture when designed and tested during production, in accordance with these specifications and the test methods outlined in Section 340.4 shall meet the following physical properties.

Laboratory Density, Percent			HVEEM Stability, Percent	
Minimum	Maximum	Optimum	Minimum	Maximum
94	98	96	40	57

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, type 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 anytime 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 for determining laboratory density, HVEEM Stability and compacted thickness is listed in Section 340.4. The Supplier's daily QA/QC test results shall be forwarded to Harris County's Materials Engineer on a daily basis.

340.4 Test Methods

Testing of Materials: The Testing Laboratory's representative 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<br>Tex-200-F "Sieve Analysis<br>of Fine and Coarse<br>Aggregates"                                                  |
| 3. | Abrasion Resistance   | C-131 "Resistance to<br>Degradation of Small Size<br>Coarse Aggregate by<br>Abrasion and Impact in<br>the Los Angeles Machine"       |
| 4. | Specific Gravity      | C-127 "Specific Gravity<br>and Absorption of Coarse<br>Aggregate" C-128<br>"Specific Gravity and<br>Absorption of Fine<br>Aggregate" |
| 5. | Sand Equivalent       | D-2419-74 "Test Method<br>for Sand Equivalent Value<br>of Soils and Fine<br>Aggregate" or Tex-203F                                   |
| 6. | Atterberg Limit       | D-4318-84 "Test Method<br>for Liquid Limit, Plastic<br>Limit, and Plasticity<br>Index of Soils"                                      |
| 7. | Deleterious Materials | Texas Test Method<br>Tex-217-F "Separation of<br>Deleterious Material,<br>Part I."                                                   |
| 8. | Decantation           | Texas Test Method<br>Tex-217-F "Decantation,<br>Part II."                                                                            |
- B. 1) Performance Graded Binders. PG binders must be smooth and homogenous material which will not foam when heated to 350° F and meet the requirements of TxDOT's Specification Item 300, latest edition.
- 2) Testing of asphalt binder shall be in accordance with the following ASTM standard laboratory test procedures:

Property	Test Method
Viscosity, 140° F.	D-2171-85 "Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer"

Viscosity, 135° C	D-4402 "Standard Test Method for Viscosity Determination"
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:

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 Construction Bulletin C-14</u>
Extraction/Gradation	Texas Test Method Tex-210-F, "Determining Asphalt Content of Bituminous Mixture", and Tex-200-F, "Sieve Analysis of Fine and Coarse Aggregate"

340.5 Equipment

- A. Provide equipment to produce, haul, place, and compact that complies with the requirements of the latest edition of TxDOT's Specification Item 320, "Equipment for Asphalt Concrete Pavement", and herein after specified.

340.6 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 the 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 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.

340.7 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".

340.8 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, equipped with a vibrating screed and heater.

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 required 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 restoring 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 40° F. and rising, or 50° and dropping. 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.

If, after being discharged from the mixer at the plant and prior to placing, the asphaltic mixture is 25° F. or more below the temperature established by the Engineer, or a minimum of 260° all or any part of the load may be rejected and payment will not be made for the rejected material.

#### 340.9 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 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 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 of debris or material that is damaging to the asphalt being hauled 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.

340.10 Tack Coat

Unless otherwise shown on the plans or approved, furnish CSS-1H, SS-1H, or a PG binder with a minimum high-temperature grade of PG-58 for tack coat binder in accordance with the latest edition of TxDOT's Specification, Item 300, "Asphalts Oils, and Emulsions".

Asphalt for tack coat shall meet the requirements of the specification Item, "Asphalts, Oils and Emulsions", as published by the Texas Department of Transportation's "Standard Specifications for Construction of Highways, Streets and Bridges", latest edition.

Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use. If required, verify that emulsified asphalt proposed for use meets the minimum residual asphalt percentage specified in the latest edition of TxDOT's specification, Item 300, "Asphalts, Oils, and Emulsions". The diluted emulsion shall be applied at an approximate rate of 0.05 to 0.15 gal./sq. yd., evenly and smoothly under a pressure necessary for proper distribution. No more shall be placed than can be covered in one day.

Before the asphaltic surface course is laid, the surface of the base, or the surface of the concrete bridge, as the case may be, shall be thoroughly broomed to the satisfaction of the Engineer. When an application of tack coat is required, the base shall be coated with an application of diluted emulsion or, as directed, with an approved distributor and at the application rate indicated by the Design Engineer.

Tack coat shall not be applied when the air temperature is below 50° F. and falling, but may be applied when the air temperature is above 50° F. and rising. Tack coat shall not be placed when the temperature of the surface on which the asphalt is to be placed is below 60° F.

340.11 Lay Down Operations

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

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

340.12 Placing

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.

340.13 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.

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 tire 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. The Contractor shall provide a second steel wheel roll for wipe of pneumatic tire roller marks on all overlay projects.

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 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 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

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 the specified 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 or other approved method, 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 2-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.

#### 340.14 Compaction Criteria

In place compaction methods used to obtain the required density necessary to achieve Engineers 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 insitu material, that is, all Asphalt Overlays, Hot In-Place Recycled Asphalts, or other similar construction that places a surface asphalt on top of an existing roadway.

##### 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 specimens 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, 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. 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 at minimum every 100 feet and mark core locations every 500 feet, at center of alternate lane. 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. 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. For Parking Lots, every 1100 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, as the asphalt is laid. 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 the 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, afterwards. 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, 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 minimum 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.

#### 340.15 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.

A 10-foot straight edge shall be used immediately after final rolling and any unevenness shall be corrected at that time.

Hot smoothing irons may be used for sealing joints, but in such cases extreme care shall be exercised to avoid burning the surface.

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 the Engineer, remove and replace any mixture that does not bond to the existing pavement or that has other surface irregularities identified above.

#### 340.16 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 per 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. Any unevenness indicated by a 10-foot straight edge laid perpendicular to the job, immediately after final rolling, shall be corrected at that time.

#### 340.17 Opening to Traffic

Allow the compacted pavement to cool before opening to traffic unless otherwise 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.

#### 340.18 Measuring Devices

All templates, straight edges, and other 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.

340.19 Quality Assurance

The County will engage a Testing Firm to provide quality assurance services for the Hot Mix Hot Laid Asphaltic Concrete. 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 O) for each 3,000 tons of production. The abrasion loss of the material shall be determined in accordance with ASTM C131, 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 AASHTO Method T-102 or Tex-540-C and shall meet the requirements of the latest edition, of TxDOT Specification Item 300. 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 performed on each sample of the mixture.

Test	Designation
Laboratory Density	Tex-207-F
Maximum Theoretical Density	Tex-227-F
Hveem Stability	Tex-208-F
Extraction and Gradation	Tex-210-F

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

Following compaction of the mixture in the pavement, the Laboratory will sample the pavement represented by Type A Construction by cutting cores and determining the in-place density and air voids as outlined in accordance with TxDOT Method Tex-207-F and in Section 340.14 of this specification. Additional samples and/or tests shall 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 Engineer verifying Mix Design and conformance to the rolling pattern.

340.20 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 truck weighers. Scales which are not accurate to within four (4)

pounds per one thousand (1,000) pounds total load shall not be used. Dray tickets shall accompany each load indicating the tare load, gross load, net load, and road name of asphaltic concrete. The Engineer shall have access to the weigh office as well as all other parts of the mixing plant. Scales shall meet the requirements of the Item, "Weighing and Measuring Equipment".

340.21 Measurement

Hot mix-hot laid asphaltic concrete surfacing of the types specified to the thickness shown on the plans will be measured by the ton of 2,000 pounds. Measurement by weight shall be made on truck scales as previously specified. Dray tickets shall be kept on the tare load, total load, net load, and road name of asphaltic concrete for each load of same. Cut back asphalt used in the tack coat or prime coat will be measured by the gallon of material actually used for this purpose and shall be based on measurement at the point of delivery and at the applied temperature.

340.22 Payment

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 FOB the plant, the material shall be loaded on Harris County vehicles.
- C. The "Hot Mix-Hot Laid Asphaltic Concrete Surfacing" 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-Hot Laid Asphaltic Concrete Surfacing", which price shall be full compensation for furnishing all materials, for all freight involved, for all heating, mixing, hauling, cleaning the base, placing asphaltic concrete mixture, rolling and finishing; for all manipulations, labor, tools, equipment and incidentals necessary to complete the work. The "Hot Mix-Hot Laid Asphaltic Concrete Surfacing" material, furnished and placed, as used for partial level-up (low areas) on some roads and feathering intersections and driveways on all roads to be resurfaced, shall be paid for by a separate bid item, as variable material thickness is required for these transitional surface applications of HMHL, asphaltic concrete.

Hot Mix-Hot Laid Asphaltic Concrete Surfacing will be paid by the ton in four separate bid items, and/or as additionally described, as follows:

- Hot Mix Hot Laid Asphaltic Concrete Surfacing, furnished and placed (specify thickness);
- Asphaltic Concrete Surfacing for feathering driveways;
- Asphaltic Concrete Surfacing for feathering intersections; and

- Asphaltic Concrete Surfacing for level up course (specify thickness).
- D. All work and materials incidental to the above application of the tack coats or prime coats performed and measured as prescribed above will be paid for at the contract unit price bid per gallon for tack coat or prime coat, which price shall be full compensation for the preparation of existing base course or pavement, furnishing all materials, all hauling, heating, manipulations and for all labor, tools, equipment and incidentals necessary to satisfactorily apply the tack coat or prime coat.

Records shall be kept of the tare weight and net weight of asphaltic concrete, for each load of same.

Cutback or emulsified asphalt used as the tack coat will be measured by the gallon of material actually used on the street for this purpose and shall be based on measurement taken at the point of delivery on the street and at the applied temperature.

All work and materials incidental to the application of the tack coat performed and measured as prescribed above will be paid for at the contract unit price bid per gallon for tack coat or prime coat, which price shall be full compensation for the preparation of existing base course or pavement, furnishing all materials, all hauling, heating, manipulation and for all labor, tools, equipment and incidentals necessary to satisfactorily apply the tack coat or prime coat.

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

END OF ITEM 340