SECTION 02800
ASPHALT PAVING

PART I: GENERAL

1.1 GENERAL REQUIREMENTS
- A. Surface course of compacted mixture of coarse and fine aggregates and asphaltic binder.

1.2 MEASUREMENT AND PAYMENT
- A. Unit Prices:
  1. Payment for hot-mix asphalt concrete pavement is on a per ton basis. Separate pay items are used for each different required thickness of pavement.
  2. Payment for hot-mix asphalt concrete pavement includes payment for associated work performed in accordance with Section 02735 – Tack Coat.
  3. Measurement for utility projects: Match actual pavement replaced but no greater than a maximum pavement replacement limits shown on the Drawings.
  4. Measurement for utility projects:
     a. Actual pavement replaced but not beyond the maximum pavement replacement limits shown on the Drawings.
     b. Include installed hot-mix asphaltic base course material that extends one foot (1 Ft) beyond outside edge of pavement to be replaced, except where proposed pavement section shares common edge with existing pavement section.
  5. Payment for speed humps is on linear foot basis and includes milling of existing pavement, tack coat and placement and compaction of asphalt. Measurement of speed hump is along length of twelve foot (12 Ft) wide speed hump, measured transverse to centerline of road. Separate payment is made for thermoplastic markings applied to speed hump.
  6. Refer to Section 01270 – Measurement and Payment for unit price procedures.
- B. Stipulated Price (Lump Sum):
  1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES
- A. ASTM – American Standards for Testing and Materials.
  1. ASTM C33 – Standard Specification for Concrete Aggregates.
  2. ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

B. CFTS – City of Friendswood Technical Specifications.
C. TxDOT – Texas Department of Transportation.
   1. TxDOT Tex-106-E – Calculating the Plasticity Index of Soils
   2. TxDOT Tex-126-E – Molding, Testing and Evaluating Bituminous Black Base Material.
   3. TxDOT Tex-200-F – Sieve Analysis of Fine and Course Aggregates.
   4. TxDOT Tex-203-F – Sand Equivalent Test.
   5. TxDOT Tex-204-F – Design of Bituminous Mixtures.
   6. TxDOT Tex-206-F – Compacting Test Specimens of Bituminous Mixtures.
   7. TxDOT Tex-207-F – Determining Density of Compacted Bituminous Mixtures.
   8. TxDOT Tex-208-F – Test for Stabilometer Value of Bituminous Mixtures.
   9. TxDOT Tex-217-F – Determining Deleterious Material and Decantation Test for Coarse Aggregates.
   10. TxDOT Tex-227-F – Theoretical Maximum Specific Gravity of Bituminous Mixtures.
   11. TxDOT Tex-530-C – Effect of Water on Bituminous Paving Mixtures.
   12. TxDOT Tex-531-C – Prediction of Moisture Induced Damage to Bituminous Paving Materials Using Molded Specimens.

1.4 SUBMITTALS
A. Conform to requirements of Section 01330 – Submittal Procedures.
B. Submit certificates that asphalt materials and aggregates meet requirements of Paragraph 2.1 Materials.
C. Submit proposed design mix and test data for surface course.
D. Submit manufacturer's description and characteristics of spreading and finishing machine for approval.

PART II: PRODUCTS

2.1 MATERIALS
A. Coarse Aggregate:

   1. Use gravel, crushed stone or combination thereof that is retained on No. 10 sieve, uniform in quality throughout and free from dirt, organic or other injurious matter occurring either free or as coating on aggregate. Use aggregate conforming to ASTM C33 except for gradation. Furnish rock or gravel with Los Angeles abrasion loss not to exceed forty percent (40%) by weight when tested in accordance with ASTM C131.
   2. Aggregate by weight shall not contain more than one and one half percent (1.5%) by weight of fine dust, claylike particles or silt when tested in accordance with Tex-217-F, Part II.

B. Fine Aggregate: Sand, stone screenings or combination of both passing No. 10 sieve. Use aggregate conforming to ASTM C33 except for gradation. Use sand composed of sound, durable stone particles free from loams or other injurious foreign matter. Furnish screenings of same or similar material as specified for coarse aggregate. Plasticity index of that part of fine aggregate passing No. 40 sieve shall be not more than ten (10) when tested by TxDOT Tex-106-E. Sand equivalent shall have a minimum value of forty (40) x when tested by TxDOT Tex-203-F.

C. Composite Aggregate: Conform to limits when graded in accordance with TxDOT Tex-200-F as specified in TABLE 4.1 – GRADATION OF COMPOSITE AGGREGATE in this Section. Use type specified on the Drawings.

D. Asphalt Binder: Moisture-free homogeneous material which shall not foam when heated to three hundred forty-seven degrees Fahrenheit (347° F), meeting the requirements specified in TABLE 4.2 – PERFORMANCE GRADED BINDERS in this Section.

E. Anti-stripping Agent:
   1. Evaluate mixture of aggregate, asphalt and additives proposed for use for moisture susceptibility and requirement for anti-stripping agents. To substantiate mix design, produce and test trial mixtures using proposed project materials and equipment prior to placement. Test for susceptibility to moisture and trial mixture may be waived by the Project Manager when similar designs using same material have previously proven satisfactory.
   2. Liquid Anti-stripping Agent: Use anti-stripping agent with uniform liquid with no evidence of crystallization, settling or separation of components. Submit sample of antistripping agent proposed for use and manufacturer's product data, including recommended dosage range, handling and storage and application instructions.

F. Pavement markings for speed humps: Conform to requirements of Section 02860 – Thermoplastic Pavement Markings.

2.2 EQUIPMENT

A. Mixing Plant: Weight-batching or drum mix plant with capacity for producing continuous mixtures meeting specifications. With exception of a drum mix plant, plant shall have satisfactory conveyors, power units, aggregate handling equipment, hot aggregate screens and bins and dust collectors.

B. Provide equipment to supply materials adequately in accordance with rated capacity of plant and produce finished material within specified tolerances. Following equipment is essential:
   1. Cold aggregate bins and proportioning device.
   2. Dryer.
   3. Screens.
   4. Aggregate weight box and batching scales.
   5. Mixer.

6. Asphalt storage and heating devices.
7. Asphalt measuring devices.
8. Truck scales.

B. Bins: Separate aggregate into a minimum of four (4) bins to produce consistently uniform grading and asphalt content in completed mix. Provide one (1) cold feed bin per stockpile.

2.3 MIXES

A. Employ certified testing laboratory to prepare design mixes. Test in accordance with TxDOT Tex-126-E or Tex-204-F, Tex-206-F, Tex-208-F, Tex-530-C and Tex-531-C.

B. Density, Stability and Air Void Requirements as stated in TABLE 4.3 – DENSITY, STABILITY AND AIR VOID REQUIREMENTS in this Section.

PART III: EXECUTION

3.1 EXAMINATION

A. Verify compacted base course is ready to support imposed loads.

B. Verify lines and grades are correct.

3.2 PREPARATION

A. Prepare subgrade in accordance with requirements of Section 02700 – Cement-Stabilized Base Course, Section 02705 – Crushed Concrete Base Course or Section 02715 – Hot-Mix Asphaltic Base Course.

B. Tack Coat: Conform to requirements of Section 02735 – Tack Coat. Where mixture shall adhere to surface on which it is to be placed without use of tack coat, tack coat may be eliminated when approved by the Project Manager.

C. Thoroughly clean base course surface of loose material by hand brooming or mechanical sweeping prior to application of tack coat or surface course. Prepare subgrade in advance of asphaltic concrete paving operation.

D. Perform pavement repair and resurfacing as indicated in Section 02845 – Pavement Repair and Resurfacing.

E. Do not use cutback asphalt.

G. Milling of pavement for speed humps: Mill pavement (concrete or asphalt) to depth of one inch (1 In) and width between eighteen inches (18 In) and twenty-four inches (24 In) around entire perimeter of proposed hump, as shown in detail for speed hump design.

3.3 PLACEMENT

A. Do not place asphaltic pavement less than two inches (2 In) thick when surface temperature taken in shade and away from artificial heat is below fifty degrees Fahrenheit (50° F) and falling. Asphalt may be placed when temperature as measured above is above forty degrees Fahrenheit (40° F) and rising.

B. Haul prepared and heated asphaltic concrete mixture to project in tight

vehicles previously cleaned of foreign material. Mixture temperature shall be between two hundred fifty degrees Fahrenheit (250° F) and three hundred twenty-five degrees Fahrenheit (325° F) when laid.

C. Spread material into place with approved mechanical spreading and finishing machine of screening or tamping type.

D. Surface Course Material: Surface course two inches (2 In) or less in thickness may be spread in one (1) lift. Spread lifts in such a manner that, when compacted, finished course shall be smooth, of uniform density and shall be to section, line and grade as shown. Place construction joints on surface courses to coincide with lane lines or as directed by the Project Manager.

E. Joints: Pass roller over unprotected ends of freshly laid mixture only when mixture has cooled. When work is resumed, cut back laid material to produce slightly beveled edge for full thickness of course. Remove old material which has been cut away and lay new mix against fresh cut.

F. When new asphalt is laid against existing or old asphalt, saw cut existing or old asphalt to full depth to provide straight smooth joint.

G. In smaller restricted areas where use of paver is impractical spread material by hand. Compact asphalt by mechanical means. Carefully place materials to avoid segregation of mix. Do not broadcast material. Remove lumps that do not break down readily.

3.4 COMPACTION

A. Construct test strip to identify correct type, number and sequence of rollers necessary to obtain specified in-place density or air-voids when directed by the Project Manager. Prepare test strip at least one thousand feet (1000 Ft) in length, comparable to placement and compaction conditions for Project.

B. Begin rolling while pavement is still hot and as soon as it shall bear roller without shoving, displacement or hair cracking. Keep wheels properly moistened with water to prevent adhesion of surface mixture. Do not use excessive water or petroleum by-products.

C. Compact surface thoroughly and uniformly, first with power-driven, three (3) wheel or tandem rollers weighing a minimum of eight tons (8 Tn). Obtain subsequent compression by starting at side and rolling longitudinally toward center of pavement, overlapping on successive trips by at least one-half (1/2) width of rear wheels. Make alternate trips slightly different in length. Continue rolling until no further compression can be obtained and rolling marks are eliminated. Complete rolling before mat temperature drops below one hundred eighty-five degrees Fahrenheit (185° F).

D. Use tandem roller for final rolling. Double coverage with approved pneumatic roller on asphaltic concrete surface is acceptable after flat wheel and tandem rolling has been completed.

E. Along walls, curbs, headers and similar structures and in locations not accessible to rollers, compact mixture thoroughly with lightly oiled tamps.

F. Compact binder course and surface course to a minimum density of

ninety-one percent (91%) of maximum possible density of voidless mixture composed of same materials in like proportions.

3.5 TOLERANCES

A. Furnish templates for checking surface in finished sections. A maximum deflection of templates, when supported at center, shall not exceed one-eighth inch (1/8 In).

B. Completed surface, when tested with ten foot (10 Ft) straightedge laid parallel to center line of pavement, shall show no deviation in excess of one-eighth inch (1/8 In) in ten feet (10 Ft). Correct surface not meeting this requirement.

C. Dimensions of speed humps shall conform to details for speed hump design and speed hump height tolerances.

3.6 QUALITY CONTROL

A. Testing shall be performed under provisions of Section 02845 – Pavement Repair and Resurfacing.

B. For in-place depth and density, take a minimum of one (1) core at random locations for each one thousand feet (1000 Ft) of single lane pavement. On a two (2) lane pavement, take samples at random every five hundred feet (500 Ft) from alternating lanes. Take cores for parking lots every five hundred square yards (500 Sy) of base to determine in-place depth and density. If cul-de sac or streets are less than five hundred feet (500 Ft), a minimum of two (2) cores [one (1) per lane] shall be procured. On small projects, take a minimum of two (2) cores for each day's placement. For first days placement and prior to coring, a minimum of five (5) nuclear gauge readings shall be performed at each core location to establish correlation between nuclear gauge (wet density reading) and core (bulk density). This process shall continue for each day's placement until the Project Manager determines that a good basis has been established for the nuclear gauge.

C. Determine in-place density in accordance with TxDOT Tex-207-F and Tex-227-F from cores or sections. Other methods of determining in-place density, which correlate satisfactorily with results obtained from roadway specimens, may be used when approved by the Project Manager. Average densities for each street placed in a single day to determine compliance.

D. The Contractor may request three (3) additional cores in vicinity of cores indicating nonconforming in-place depths or density at no additional cost to the City. In-place depth and density at these locations shall be average of four (4) cores.

E. Fill cores and density test sections with new compacted asphaltic concrete.

3.7 NONCONFORMING PAVEMENT

A. Recompact and retest nonconforming street sections not meeting surface test requirements or having unacceptable surface texture. Patch asphalt pavement sections in accordance with procedures established by Asphalt Institute. Retesting shall be at no additional cost to the City.

B. Remove and replace areas of asphalt surface found deficient in thickness by more than ten percent (10%). Use new asphaltic surface of thickness shown on the Drawings. Remove and replace areas of asphalt surface found deficient in average density.

C. Replace speed humps which do not conform to requirements of details or which are rejected by the Project Manager.

3.8 PROTECTION

A. Do not open pavement to traffic until completion of rolling and temperature has cooled to set asphaltic concrete surface or as shown on the Drawings.

B. Maintain asphalt pavement in good condition until completion of the Work.

C. Repair defects immediately by replacing asphalt pavement to full depth.

3.9 PAVEMENT MARKINGS FOR SPEED HUMPS

A. Apply pavement markings to speed humps in conformance with dimensions shown on detail for speed hump design.

PART IV: TABLES

4.1 GRADATION OF COMPOSITE AGGREGATE

GRADATION OF COMPOSITE AGGREGATE		
	PERCENT PASSING	
SIEVE SIZE	Course Surface (TxDOT Type C)	Fine Surface (TxDOT Type D)
7/8”	100	-
5/8”	95 to 100	-
1/2"	-	100
3/8”	70 to 85	85 to 100
#4	43 to 63	50 to 70
#10	30 to 40	32 to 42
#40	10 to 25	11 to 26
#80	3 to 13	4 to 14
#200	1 to 6*	1 to 6*
VMA % Minimum	13	14

* 2 to 8 when Test Method Tes-200-F, Part II (Washed Sieve Analysis) is used.

4.2 PERFORMANCE GRADED BINDERS

PERFORMACE GRADED BINDER	
CRITERIA/TEST	PERFORMANCE GRADE (PG64-22)
Average 7-day Maximum Pavement Design Temperature, C	< 64
Minimum Pavement Design Temperature, C	> -22
ORIGINAL BINDER	
Flash Point Temperature, T48; Minimum C	230
Viscosity, ASTM D 4402; Maximum, 3Pa*s(3000 cp) Test Temperature, C	135
Dynamic Shear, TP5; G*/sin[ ], Minimum, 1.00 kPa Test Temperature @ 10 rad/sec., C	64
ROLLING THIN FILM OVEN (T240) OR THIN FILM OVEN (T179) RESIDUE	
Mass Loss, Maximum, %	1.00
Dynamic Shear, TP5; G*/sin[ ], Minimum, 2.20 kPa Test Temperature @ 10 rad/sec., C	64
PRESSURE AGING VESSEL RESIDUE (PP1)	
PAV Aging Temperature, C	100
Dynamic Shear, TP5; G*/sin[ ], Minimum, 5000 kPa Test Temperature @ 10/rad/sec., C	25
Physical Hardening	Report
Creep Stiffness, TP1; S. Maximum, 300 Mpa –value, Minimum, 0.300 Test Temperature @ 60 sec., C	-12
Direct Tension, TP3; Failure Strain, Minimum, 1.0% Test Temperature @ 1.0 mm/min., C	-12

4.3 DENSITY, STABILITY AND AIR VOID REQUIREMENTS

PERCENT DENSITY		PERCENT OPTIMUM	HVEEM Stability Percent Not Less Than
Min	Max		
94	97	96	35

END OF SECTION