

- 1) The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid per ton of Hot Mix Asphalt.
- c. The price bid shall include:
- 1) Shaping and fine-grading the roadbed
 - 2) Furnishing, loading, unloading, storing, hauling, and handling all materials including freight and royalty
 - 3) Traffic control for all testing during construction activities.
 - 4) Asphalt, aggregate, and additive
 - 5) Materials and work needed for corrective action
 - 6) Trial batches
 - 7) Tack coat
 - 8) Removal and/or sweeping excess material
3. Asphalt Base Course
- a. Measurement
- 1) Measurement for this Item shall be by the square yard of Asphalt Base Course completed and accepted in its final position for:
 - a) Various thicknesses
 - b) Various types
- b. Payment
- 1) The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid per square yard of Asphalt Base Course.
- c. The price bid shall include:
- 1) Shaping and fine-grading the roadbed
 - 2) Furnishing, loading, unloading, storing, hauling, and handling all materials including freight and royalty
 - 3) Traffic control for all testing during construction activities.
 - 4) Asphalt, aggregate, and additive
 - 5) Materials and work needed for corrective action
 - 6) Trial batches
 - 7) Tack coat
 - 8) Removal and/or sweeping excess material
4. H.M.A.C. Pavement Level Up
- a. Measurement
- 1) Measurement for this Item shall be by the ton of H.M.A.C. completed and accepted in its final position.
- b. Payment
- 1) The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid per ton of H.M.A.C.
- c. The price bid shall include:
- 1) Shaping and fine-grading the roadbed
 - 2) Furnishing, loading, unloading, storing, hauling, and handling all materials including freight and royalty
 - 3) Traffic control for all testing during construction activities.
 - 4) Asphalt, aggregate, and additive
 - 5) Materials and work needed for corrective action
 - 6) Trial batches

- 1 7) Tack coat
- 2 8) Removal and/or sweeping excess material
- 3 5. H.M.A.C. Speed Cushion
- 4 a. Measurement
- 5 1) Measurement for this Item shall be per each H.M.A.C. Speed Cushion
- 6 installed.
- 7 b. Payment
- 8 1) The work performed and materials furnished in accordance with this Item
- 9 and measured as provided under “Measurement” will be paid for at the unit
- 10 price bid per each H.M.A.C. Speed Cushion installed and accepted in its final
- 11 position.
- 12 c. The price bid shall include:
- 13 1) Shaping and fine-grading the roadbed
- 14 2) Furnishing, loading, unloading, storing, hauling, and handling all materials
- 15 including freight and royalty
- 16 3) Traffic control for all testing during construction activities.
- 17 4) Asphalt, aggregate, and additive
- 18 5) Materials and work needed for corrective action
- 19 6) Trial batches
- 20 7) Tack coat
- 21 8) Removal and/or sweeping excess material

22 **1.3 REFERENCES**

23 A. Abbreviations and Acronyms

- 24 1. RAP (reclaimed asphalt pavement)
- 25 2. SAC (surface aggregate classification)
- 26 3. BRSQC (Bituminous Rated Source Quality Catalog)
- 27 4. AQMP (Aggregate Quality Monitoring Program)
- 28 5. H.M.A.C. (Hot Mix Asphalt Concrete)
- 29 6. WMA (Warm Mix Asphalt)

30 B. Reference Standards

- 31 1. Reference standards cited in this specification refer to the current reference standard
- 32 published at the time of the latest revision date logged at the end of this
- 33 specification unless a date is specifically cited.
- 34 2. National Institute of Standards and Technology (NIST)
- 35 a. Handbook 44 - 2007 Edition: Specifications, Tolerances, and Other Technical
- 36 Requirements for Weighing and Measuring Devices
- 37 3. ASTM International (ASTM):
- 38 a. ASTM D6084 - 06 Standard Test Method for Elastic Recovery of Bituminous
- 39 Materials by Ductilometer
- 40 4. American Association of State Highway and Transportation Officials
- 41 a. MP2 Standard Specification for Superpave Volumetric Mix Design
- 42 b. PP28 Standard Practice for Superpave Volumetric Design for Hot Mix Asphalt
- 43 (HMA)
- 44 c. T 201, Kinematic Viscosity of Asphalts (Bitumens)
- 45 d. T 202 Standard Method of Test for Viscosity of Asphalts by Vacuum Capillary
- 46 Viscometer

- 1 e. T 316 Standard Method of Test for Viscosity Determination of Asphalt Binder
- 2 Using Rotational Viscometer
- 3 f. TP 1-93 Test Method for Determining the Flexural Creep Stiffness of Asphalt
- 4 Binder Using the Bending Beam Rheometer (BBR)
- 5 5. Texas Department of Transportation
- 6 a. Bituminous Rated Source Quality Catalog (BRSQC)
- 7 b. TEX 100-E, Surveying and Sampling Soils for Highways
- 8 c. Tex 106-E, Calculating the Plasticity Index of Soils
- 9 d. Tex 107-E, Determining the Bar Linear Shrinkage of Soils
- 10 e. Tex 200-F, Sieve Analysis of Fine and Coarse Aggregates
- 11 f. Tex 203-F, Sand Equivalent Test
- 12 g. Tex-204-F, Design of Bituminous Mixtures
- 13 h. Tex-207-F, Determining Density of Compacted Bituminous Mixtures
- 14 i. Tex 217-F, Determining Deleterious Material and Decantation Test for Coarse
- 15 Aggregates
- 16 j. Tex-226-F, Indirect Tensile Strength Test
- 17 k. Tex-227-F, Theoretical Maximum Specific Gravity of Bituminous Mixtures
- 18 l. Tex-243-F, Tack Coat Adhesion
- 19 m. Tex-244-F, Thermal profile of Hot Mix Asphalt
- 20 n. Tex 280-F, Determination of Flat and Elongated Particles
- 21 o. Tex 406-A, Material Finer Than 75 μm (No. 200) Sieve in Mineral Aggregates
- 22 (Decantation Test for Concrete Aggregates)
- 23 p. Tex 408-A, Organic Impurities in Fine Aggregate for Concrete
- 24 q. Tex 410-A, Abrasion of Coarse Aggregate using the Los Angeles Machine
- 25 r. Tex 411-A, Soundness of Aggregate by Using Sodium Sulfate or Magnesium
- 26 s. Tex 460-A, Determining Crushed Face Particle Count
- 27 t. Tex 461-A, Degradation of Coarse Aggregate by Micro-Deval Abrasion
- 28 u. Sulfate
- 29 v. Tex-530-C, Effect of Water on Bituminous Paving Mixtures
- 30 w. Tex-540-C, Measurement of Polymer Separation on Heating in Modified
- 31 Asphalt Systems
- 32 x. Tex-541-C, Rolling Thin Film Oven Test for Asphalt Binders
- 33 y. Tex-920-K, Verifying the Accuracy of Drum Mix Plant Belt Scales
- 34 z. Tex-921-K, Verifying the Accuracy of Hot Mix Plant Asphalt Meters
- 35 aa. Tex 923-K, Verifying the Accuracy of Liquid Additive Metering Systems

36 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**

37 **1.5 ACTION SUBMITTALS [NOT USED]**

38 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS**

- 39 A. Asphalt Paving Mix Design: The City will review and approve all mix designs before
- 40 the contractor can begin production of the mix. When submitting mix designs to the City
- 41 for review, include the following items in the report.
- 42 1. The combined aggregate gradation, source, specific gravity, and percent of each
- 43 material used;
- 44 2. Asphalt binder content and grade
- 45 3. Asphalt binder content and aggregate gradation of RAP stockpiles;
- 46 4. the Ndesign level used;

5. Results of all applicable tests;
6. The mixing and molding temperatures;
7. The signature of the person or persons that performed the design;
8. The date the mixture design was performed; and
9. A unique identification number for the mixture design.

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD CONDITIONS

A. Weather Conditions

1. Place mixture when the roadway surface temperature is equal to or higher than the temperatures listed in Table 1.

Table 1
Minimum Pavement Surface Temperatures

Originally Specified High Temperature Binder Grade	Minimum Pavement Surface Temperatures in Degrees Fahrenheit	
	Subsurface Layers or Night Paving Operations	Surface Layers Placed in Daylight Operations
PG64	45	50
PG 70	55 ¹	60 ¹
PG 76	60 ¹	60 ¹

¹Contractors may pave at temperatures 10°F lower than the values shown in Table 1 when utilizing a paving process including WMA or equipment that eliminates thermal segregation. In such cases, the contractor must use either a hand-held thermal camera or a hand-held infrared thermometer operated in accordance with Tex-244-F to demonstrate to the satisfaction of the City that the uncompacted mat has no more than 10° F of thermal segregation.

2. Unless otherwise shown on the Drawings, place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable in the opinion of the City.

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS [NOT USED]

2.2 MATERIALS

A. General

1. Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications.

- 1 2. Notify the City of all material sources.
- 2 3. Notify the City before changing any material source or formulation.
- 3 4. When the Contractor makes a source or formulation change, the City will verify
- 4 that the requirements of this specification are met and may require a new laboratory
- 5 mixture design, trial batch, or both.
- 6 5. The City may sample and test project materials at any time during the project to
- 7 verify compliance.
- 8 6. The depth of the compacted lift should be at least 2 times the nominal maximum
- 9 aggregate size.

10 B. Aggregate

- 11 1. General
- 12 a. Furnish aggregates from sources that conform to the requirements shown in
- 13 Table 2, and as specified in this Section, unless otherwise shown on the
- 14 Drawings.
- 15 b. Provide aggregate stockpiles that meet the definition in this Section for either
- 16 coarse aggregate or fine aggregate.
- 17 c. When reclaimed asphalt pavement (RAP) is allowed by Drawing note, provide
- 18 RAP stockpiles in accordance with this Section.
- 19 d. Aggregate from RAP is not required to meet Table 2 requirements unless
- 20 otherwise shown on the Drawings.
- 21 e. Supply mechanically crushed gravel or stone aggregates that meet the
- 22 definitions in Tex 100 E.
- 23 f. Samples must be from materials produced for the project.
- 24 g. The City will establish the surface aggregate classification (SAC) and perform
- 25 Los Angeles abrasion, magnesium sulfate soundness, and Micro-Deval tests.
- 26 h. Perform all other aggregate quality tests listed in Table 2.
- 27 i. Document all test results on the mixture design report.
- 28 j. The City may perform tests on independent or split samples to verify
- 29 Contractor test results.
- 30 k. Determine aggregate gradations for mixture design and production testing
- 31 based on the washed sieve analysis given in Tex 200 F, Part II.
- 32

Table 2
Aggregate Quality Requirements

Property	Test Method	Requirement
Coarse Aggregate		
SAC	Tex-499-A(AQMP)	As shown on Drawings
Deleterious material, %, max	Tex-217-F, Part I	1.0
Decantation, %, max	Tex-217-F, Part II	1.5
Micro-Deval abrasion, %, max	Tex-461-A	Note 1
Los Angeles abrasion, %, max	Tex-410-A	35
Magnesium sulfate soundness, 5 cycles, %, max	Tex-411-A	25
Crushed face count, %, Min	Tex 460-A, Part I	85 ²
Flat and elongated particles @ 5:1, %, max	Tex-280-F	10
Fine Aggregate		
Linear shrinkage, %, max	Tex-107-E	3
Combined Aggregate³		
Sand equivalent, %, min	Tex-203-F	45

1. Used to estimate the magnesium sulfate soundness loss
2. Only applies to crushed gravel.
3. Aggregates, without mineral filler, RAP, RAS, or additives, combined as used in the job-mix formula (JMF).

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- l. Coarse Aggregate
 - 1) Coarse aggregate stockpiles must have no more than 20 percent material passing the No. 8 sieve.
 - 2) Maximum aggregate size should not be over half of the proposed lift depth to prevent particle on particle contact issues.
 - 3) Provide aggregates from sources listed in the BRSQC.
 - 4) Provide aggregate from unlisted sources only when tested by the City and/or approved before use.
 - 5) Allow 30 calendar days for the City to sample, test, and report results for unlisted sources.
 - 6) Class B aggregate meeting all other requirements in Table 2 may be blended with a Class A aggregate in order to meet requirements for Class A materials.
 - 7) When blending Class A and B aggregates to meet a Class A requirement, ensure that at least 50 percent by weight of the material retained on the No. 4 sieve comes from the Class A aggregate source.
 - 8) Blend by volume if the bulk specific gravities of the Class A and B aggregates differ by more than 0.300.
 - 9) When blending, do not use Class C or D aggregates.
 - 10) For blending purposes, coarse aggregate from RAP will be considered as Class B aggregate.
 - 11) Provide coarse aggregate with at least the minimum SAC shown on the Drawings.
 - 12) SAC requirements apply only to aggregates used on the surface of travel lanes, unless otherwise shown on the Drawings.
 - m. RAP is salvaged, milled, pulverized, broken, or crushed asphalt pavement.
 - 1) No RAP permitted for TxDOT TYPE D H.M.A.C.

- 1 2) Use no more than 15% Fractionated RAP on Superpave surface course
- 2 mixes and 20% Fractionated RAP for base course mixes unless otherwise
- 3 shown on the Drawings. Also, the recycled binder to total binder ratio must
- 4 not exceed 15% for surface courses and 20% for base courses.
- 5 3) Crush or break RAP so that 100 percent of the particles pass the 2-inch
- 6 sieve.
- 7 4) RAP from either Contractor or City, including RAP generated during the
- 8 project, is permitted only when shown on the Drawings.
- 9 5) City-owned RAP, if allowed for use, will be available at the location
- 10 shown on the Drawings.
- 11 6) When RAP is used, determine asphalt content and gradation for mixture
- 12 design purposes.
- 13 7) Perform other tests on RAP when shown on the Drawings.
- 14 8) When RAP is allowed by plan note, use no more than 30 percent RAP in
- 15 Type A or B mixtures unless otherwise shown on the Drawings.
- 16 9) Do not use RAP contaminated with dirt or other objectionable materials.
- 17 10) Do not use the RAP if the decantation value exceeds 5 percent and the
- 18 plasticity index is greater than 8.
- 19 11) Test the stockpiled RAP for decantation in accordance with the laboratory
- 20 method given in Tex-406-A, Part I.
- 21 12) Determine the plasticity index using Tex-106-E if the decantation value
- 22 exceeds 5 percent.
- 23 13) The decantation and plasticity index requirements do not apply to RAP
- 24 samples with asphalt removed by extraction.
- 25 14) Do not intermingle Contractor-owned RAP stockpiles with City-owned
- 26 RAP stockpiles.
- 27 15) Remove unused Contractor-owned RAP material from the project site upon
- 28 completion of the project.
- 29 16) Return unused City-owned RAP to the designated stockpile location.
- 30 n. Fine Aggregate
- 31 1) Fine aggregates consist of manufactured sands, screenings, and field sands.
- 32 2) Fine aggregate stockpiles must meet the gradation requirements in Table 3.
- 33 3) Supply fine aggregates that are free from organic impurities.
- 34 4) The City may test the fine aggregate in accordance with Tex-408-A to
- 35 verify the material is free from organic impurities.
- 36 5) At most 15 percent of the total aggregate may be field sand or other
- 37 uncrushed fine aggregate.
- 38 6) With the exception of field sand, use fine aggregate from coarse aggregate
- 39 sources that meet the requirements shown in Table 2, unless otherwise
- 40 approved.
- 41 7) If 10 percent or more of the stockpile is retained on the No. 4 sieve, test the
- 42 stockpile and verify that it meets the requirements in Table 2 for coarse
- 43 aggregate angularity (Tex-460-A) and flat and elongated particles
- 44 (Tex-280-F).

Table 3
Gradation Requirements for Fine Aggregate

Sieve Size	% Passing by Weight or Volume
3/8"	100
#8	70-100
#200	0-30

- 1
 2 2. Mineral Filler
 3 a. Mineral filler consists of finely divided mineral matter such as agricultural
 4 lime, crusher fines, hydrated lime, cement, or fly ash.
 5 b. Mineral filler is allowed unless otherwise shown on the Drawings.
 6 c. Do not use more than 2 percent hydrated lime or cement, unless otherwise
 7 shown on the Drawings. The Drawings may require or disallow specific
 8 mineral fillers. When used, provide mineral filler that:
 9 1) Is sufficiently dry, free-flowing, and free from clumps and foreign matter;
 10 2) Does not exceed 3 percent linear shrinkage when tested in accordance with
 11 Tex-107-E; and meets the gradation requirements in Table 4.

Table 4
Gradation Requirements for Mineral Filler

Sieve Size	% Passing by Weight or Volume
#8	100
#200	55-100

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 15 3. Baghouse Fines
 16 a. Fines collected by the baghouse or other dust-collecting equipment may be
 17 reintroduced into the mixing drum
 18 4. Asphalt Binder and Mix Types
 19 a) Surface Course: Use TxDOT dense-graded DG-D with virgin PG 70-22
 20 (no recycled materials such as recycled asphalt shingles or reclaimed
 21 asphalt pavement) or Superpave SP-D with PG 70-22 as summarized in
 22 Table 5.
 23 b) Base Course: use PG 64-22 SP-B or TxDOT DG-B mixes for base
 24 courses.
 25 c) Hand Paving: When hand paving is allowed, PG64-22 can be used for
 26 surface courses.
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Table 5
Asphalt Binder and Mixture Requirements

Pavement Layer	Mixture Requirement
Surface Course	PG 70-22 Superpave SP-D
	Virgin PG 70-22 TxDOT DG-D (No recycled material)
Binder Course	PG 64-22 TxDOT DG-B
	PG 64-22 Superpave SP-B

- 1 b. Separation testing is not required if:
- 2 1) A modifier is introduced separately at the mix plant either by injection in
- 3 the asphalt line or mixer,
- 4 2) The binder is blended on site in continuously agitated tanks, or binder
- 5 acceptance is based on field samples taken from an in-line sampling port at
- 6 the hot mix plant after the addition of modifiers.
- 7 5. Tack Coat
- 8 a. Unless otherwise shown on the Drawings or approved, furnish CSS-1H, SS-1H,
- 9 or a PG binder with a minimum high-temperature grade of PG 58 for tack coat
- 10 binder in accordance with Section 2.2.A.5.
- 11 6. Additives
- 12 a. General
- 13 1) When shown on the Drawings, use the type and rate of additive specified.
- 14 2) Other additives that facilitate mixing or improve the quality of the mixture
- 15 may be allowed when approved.
- 16 b. Liquid Antistripping Agent
- 17 1) Furnish and incorporate all required asphalt antistripping agents in asphalt
- 18 concrete paving mixtures and asphalt-stabilized base mixtures to meet
- 19 moisture resistance testing requirements.
- 20 2) Provide a liquid antistripping agent that is uniform and shows no evidence
- 21 of crystallization, settling, or separation.
- 22 3) Ensure that all liquid antistripping agents arrive in:
- 23 a) Properly labeled and unopened containers, as shipped from the
- 24 manufacturer, or
- 25 b) Sealed tank trucks with an invoice to show contents and quantities
- 26 c) Provide product information to the City including:
- 27 (1) Material safety data sheet
- 28 (2) Specific gravity of the agent at the manufacturer's recommended
- 29 addition temperature,
- 30 (3) Manufacturer's recommended dosage range, and
- 31 (4) Handling and storage instructions
- 32 4) Addition of lime or a liquid antistripping agent at the Mix Plant,
- 33 incorporate into the binder as follows:
- 34 a) Handle in accordance with the manufacturer's recommendations.
- 35 b) Add at the manufacturer's recommended addition temperature.
- 36 c) Add into the asphalt line by means of an in-line-metering device.
- 37 c. Liquid Asphalt Additive Meters
- 38 1) Provide a means to check the accuracy of meter output for asphalt primer,
- 39 fluxing material, and liquid additives.
- 40 2) Furnish a meter that reads in increments of 0.1 gal. or less.
- 41 3) Verify accuracy of the meter in accordance with Tex-923-K.
- 42 4) Ensure the accuracy of the meter within 5.0 percent.
- 43 7. Mixes
- 44 a. Design Requirements
- 45 1) Superpave mixes: Use the Superpave design procedure provided in Tex-
- 46 204-F to design the mixture meeting the requirements listed in Tables 2, 3, 4,
- 47 5, 6, 7, and 8.

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- a) Design the mixture at 50 gyrations (N_{design}). Use a target laboratory-molded density of 96.0% to design the mixture; however, adjustments can be made to the N_{design} value as noted in Table 8. The N_{design} level may be reduced to at least 35 gyrations at the Contractor’s discretion.
- b) Provide Hamburg Wheel and indirect tensile strength tests and provide results with the mixture design meeting the requirements in Table 7 and 8.

Table 6
Superpave Mix Master Gradation Limits (% Passing by Weight or Volume) and VMA Requirements for Superpave mixes

Sieve Size	SP-B Intermediate	SP-C Surface	SP-D Fine Mixture
2"	—	—	—
1-1/2"	100.0 ¹	—	—
1"	98.0–100.0	100.0 ¹	—
3/4"	90.0–100.0	98.0–100.0	100.0 ¹
1/2"	Note ²	90.0–100.0	98.0–100.0
3/8"	—	Note ²	90.0–100.0
#4	23.0–90.0	28.0–90.0	32.0–90.0
#8	23.0–34.6	28.0–37.0	32.0–40.0
#16	2.0–28.3	2.0–31.6	2.0–37.6
#30	2.0–20.7	2.0–23.1	2.0–27.5
#50	2.0–13.7	2.0–15.5	2.0–18.7
#200	2.0–8.0	2.0–10.0	2.0–10.0
Design VMA, % Minimum			
	14.0	15.0	16.0
Production (Plant-Produced) VMA, % Minimum			
	13.5	14.5	15.5

- 1. Defined as Ma sieve size. No tolerance allowed.
- 2. Must retain at least 10% cumulative.

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Table 7
Hamburg Wheel Test Requirements

High-Temperature Binder Grade	Test Method	Minimum # of Passes @ 12.5 mm Rut Depth, Tested @ 50°C
PG 64	Tex-242-F	10,000
PG 70		15,000
PG 76		20,000

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Table 8
Laboratory Mixture Design Properties

Mixture Property	Test Method	Requirement
Target laboratory-molded density, %	Tex-207-F	96.0
Design gyrations (N _{design})	Tex-241-F	50 ¹
Indirect tensile strength (dry), psi	Tex-226-F	85–200 ²
Dust/asphalt binder ratio	—	0.6–1.4 ³
Boil test ⁴	Tex-530-C	—

1. Adjust within a range of 35–100 gyrations when shown on the plans or specification or mutually agreed between the Engineer and Contractor.
 2. The City may allow the IDT strength to exceed 200 psi if the corresponding Hamburg Wheel rut depth is greater than 3.0 mm and less than 12.5 mm.
 3. Defined as % passing #200 sieve divided by asphalt binder content (only for Superpave mixes).
 4. Used to establish baseline for comparison to production results. May be waived when approved.
- 2) Dense-Graded Mixes: Use a Superpave Gyratory Compactor to design a dense-graded mixture using the procedure provided in Tex-204-F that meets the requirements listed in Tables 2, 3, 4, 5, 7, 8, and 9.
- a) Design the mixture at 50 gyrations (N_{design}). Use a target laboratory-molded density of 96.0% to design the mixture; however, adjustments can be made to the N_{design} value as noted in Table 8. The N_{design} level may be reduced to at least 35 gyrations at the Contractor’s discretion. The target density may be increased to 97% or 97.5% when shown on the plans or specification.
 - b) A Texas Gyratory Compactor (TGC) may be used when shown on the plans.
 - c) Provide Hamburg Wheel and indirect tensile strength tests and provide results with the mixture design meeting the requirements in Table 7 and 8.

Table 9
Dense-Graded Mix Master Gradation Limits (% Passing by Weight or Volume) and VMA Requirements for dense graded mixes

Sieve Size	DG-B Fine Base	DG-C Coarse Surface	DG-D Fine Surface
2"	–	–	–
1-1/2"	100	–	–
1"	98.0–100.0	100	–
3/4"	84.0–98.0	95.0–100.0	100
1/2"	–	–	98.0–100.0
3/8"	60.0–80.0	70.0–85.0	85.0–100.0
#4	40.0–60.0	43.0–63.0	50.0–70.0
#8	29.0–43.0	32.0–44.0	35.0–46.0
#30	13.0–28.0	14.0–28.0	15.0–29.0
#50	6.0–20.0	7.0–21.0	7.0–20.0
#200	2.0–7.0	2.0–7.0	2.0–7.0
Design VMA¹, % Minimum			
–	13.0	14.0	15.0
Production (Plant-Produced) VMA, % Minimum			
–	12.5	13.5	14.5

8. Warm Mix Asphalt (WMA)
 - a. WMA is defined as additives or processes that allow a reduction in the temperature at which asphalt mixtures are produced and placed.
 - b. WMA is allowed for use at the Contractor’s option unless otherwise shown on the Drawings.
 - c. Produce an asphalt mixture within the temperature range of 215 degrees F and 275 degrees F.

- 1 d. When WMA is not required by Drawings, produce an asphalt mixture within
2 the temperature range of 215 degrees F and 275 degrees F.
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4 **2.3 ACCESSORIES [NOT USED]**

5 **2.4 SOURCE QUALITY CONTROL [NOT USED]**

6 **PART 3 - EXECUTION**

7 **3.1 INSTALLERS [NOT USED]**

8 **3.2 EXAMINATION [NOT USED]**

9 **3.3 PREPARATION**

10 A. Hauling Operations

- 11 1. Before use, clean all truck beds to ensure mixture is not contaminated.
12 2. When a release agent is necessary to coat truck beds, use a release agent approved
13 by the City.
14 3. Petroleum based products, such as diesel fuel, should not be used.
15 4. If wind, rain, temperature or haul distance impacts cooling, insulate truck beds or
16 cover the truck bed with tarpaulin.
17 5. If haul time in project is to be greater than 30 minutes, insulate truck beds or cover
18 the truck bed with tarpaulin.

19 **3.4 INSTALLATION**

20 A. Equipment

- 21 1. General
22 a. Provide required or necessary equipment to produce, haul, place, compact, and
23 core asphalt concrete pavement.
24 b. Ensure weighing and measuring equipment complies with specification.
25 c. Synchronize equipment to produce a mixture meeting the required proportions.
26 2. Production Equipment
27 a. Provide:
28 1) Drum-mix type, weigh-batch, or modified weigh-batch mixing plants that
29 ensure a uniform, continuous production
30 2) Automatic proportioning and measuring devices with interlock cut-off
31 circuits that stop operations if the control system malfunctions
32 3) Visible readouts indicating the weight or volume of asphalt and aggregate
33 proportions
34 4) Safe and accurate means to take required samples by inspection forces
35 5) Permanent means to check the output of metering devices and to perform
36 calibration and weight checks
37 6) Additive-feed systems to ensure a uniform, continuous material flow in the
38 desired proportion
39 3. Weighing and Measuring Equipment
40 a. General
41 1) Provide weighing and measuring equipment for materials measured or
42 proportioned by weight or volume.

- 1 2) Provide certified scales, scale installations, and measuring equipment
2 meeting the requirements of NIST Handbook 44, except that the required
3 accuracy must be 0.4 percent of the material being weighed or measured.
- 4 3) Furnish leak-free weighing containers large enough to hold a complete
5 batch of the material being measured.
- 6 b. Truck Scales
- 7 1) Furnish platform truck scales capable of weighing the entire truck or truck-
8 trailer combination in a single draft.
- 9 c. Aggregate Batching Scales
- 10 1) Equip scales used for weighing aggregate with a quick adjustment at zero
11 that provides for any change in tare.
- 12 2) Provide a visual means that indicates the required weight for each
13 aggregate.
- 14 d. Suspended Hopper
- 15 1) Provide a means for the addition or the removal of small amounts of
16 material to adjust the quantity to the exact weight per batch.
- 17 2) Ensure the scale equipment is level.
- 18 e. Belt Scales
- 19 1) Use belt scales for proportioning aggregate that are accurate to within 1.0
20 percent based on the average of 3 test runs, where no individual test run
21 exceeds 2.0 percent when checked in accordance with Tex-920-K.
- 22 f. Asphalt Material Meter
- 23 1) Provide an asphalt material meter with an automatic digital display of the
24 volume or weight of asphalt material.
- 25 2) Verify the accuracy of the meter in accordance with Tex-921-K.
- 26 3) When using the asphalt meter for payment purposes, ensure the accuracy of
27 the meter is within 0.4 percent.
- 28 4) When used to measure component materials only and not for payment,
29 ensure the accuracy of the meter is within 1.0 percent.
- 30 g. Liquid Asphalt Additive Meters
- 31 1) Provide a means to check the accuracy of meter output for asphalt primer,
32 fluxing material, and liquid additives.
- 33 2) Furnish a meter that reads in increments of 0.1 gallon or less.
- 34 3) Verify accuracy of the meter in accordance with Tex-923-K.
- 35 4) Ensure the accuracy of the meter within 5.0 percent.
- 36 4. Drum-Mix Plants. Provide a mixing plant that complies with the requirements
37 below.
- 38 a. Aggregate Feed System
- 39 1) Provide:
- 40 a) A minimum of 1 cold aggregate bin for each stockpile of individual
41 materials used to produce the mix
- 42 b) Bins designed to prevent overflow of material
- 43 c) Scalping screens or other approved methods to remove any oversized
44 material, roots, or other objectionable materials
- 45 d) A feed system to ensure a uniform, continuous material flow in the
46 desired proportion to the dryer
- 47 e) An integrated means for moisture compensation
- 48 f) Belt scales, weigh box, or other approved devices to measure the
49 weight of the combined aggregate

- 1 g) Cold aggregate bin flow indicators that automatically signal interrupted
2 material flow
- 3 b. Reclaimed Asphalt Pavement (RAP) Feed System
- 4 1) Provide a separate system to weigh and feed RAP into the hot mix plant.
- 5 c. Mineral Filler Feed System
- 6 1) Provide a closed system for mineral filler that maintains a constant supply
7 with minimal loss of material through the exhaust system.
- 8 2) Interlock the measuring device into the automatic plant controls to
9 automatically adjust the supply of mineral filler to plant production and
10 provide a consistent percentage to the mixture.
- 11 d. Heating, Drying, and Mixing Systems
- 12 1) Provide:
- 13 a) A dryer or mixing system to agitate the aggregate during heating
- 14 b) A heating system that controls the temperature during production to
15 prevent aggregate and asphalt binder damage
- 16 c) A heating system that completely burns fuel and leaves no residue
- 17 d) A recording thermometer that continuously measures and records the
18 mixture discharge temperature
- 19 e) Dust collection system to collect excess dust escaping from the drum.
- 20 e. Asphalt Binder Equipment
- 21 1) Supply equipment to heat binder to the required temperature.
- 22 2) Equip the heating apparatus with a continuously recording thermometer
23 located at the highest temperature point.
- 24 3) Produce a 24 hour chart of the recorded temperature.
- 25 4) Place a device with automatic temperature compensation that accurately
26 meters the binder in the line leading to the mixer.
- 27 5) Furnish a sampling port on the line between the storage tank and mixer.
28 Supply an additional sampling port between any additive blending device and
29 mixer.
- 30 f. Mixture Storage and Discharge
- 31 1) Provide a surge-storage system to minimize interruptions during operations
32 unless otherwise approved.
- 33 2) Furnish a gob hopper or other device to minimize segregation in the bin.
- 34 3) Provide an automated system that weighs the mixture upon discharge and
35 produces a ticket showing:
- 36 a) Date
- 37 b) Project identification number
- 38 c) Plant identification
- 39 d) Mix identification
- 40 e) Vehicle identification
- 41 f) Total weight of the load
- 42 g) Tare weight of the vehicle
- 43 h) Weight of mixture in each load
- 44 i) Load number or sequential ticket number for the day
- 45 g. Truck Scales
- 46 1) Provide standard platform scales at an approved location.
- 47 5. Weigh-Batch Plants. Provide a mixing plant that complies with Section 2.2.B.4
48 "Drum-Mix Plants," except as required below:
- 49 a. Screening and Proportioning

- 1) Provide enough hot bins to separate the aggregate and to control proportioning of the mixture type specified.
 - a) Supply bins that discard excessive and oversized material through overflow chutes.
 - b) Provide safe access for inspectors to obtain samples from the hot bins.
- b. Aggregate Weigh Box and Batching Scales
 - 1) Provide a weigh box and batching scales to hold and weigh a complete batch of aggregate.
 - 2) Provide an automatic proportioning system with low bin indicators that automatically stop when material level in any bin is not sufficient to complete the batch.
- c. Asphalt Binder Measuring System
 - 1) Provide bucket and scales of sufficient capacity to hold and weigh binder for 1 batch.
- d. Mixer
 - 1) Equipment mixers with an adjustable automatic timer that controls the dry and wet mixing period and locks the discharge doors for the required mixing period
 - 2) Furnish a pug mill with a mixing chamber large enough to prevent spillage.
6. Modified Weigh-Batch Plants. Provide a mixing plant that complies with Section 2.2.B.5. "Weigh-Batch Plants," except as specifically described below.
 - a. Aggregate Feeds
 - 1) Aggregate control is required at the cold feeds. Hot bin screens are not required.
 - b. Surge Bins
 - 1) Provide 1 or more bins large enough to produce 1 complete batch of mixture.
 - c. Hauling Equipment
 - 1) Provide trucks with enclosed sides to prevent asphalt mixture loss.
 - 2) Cover each load of mixture with waterproof tarpaulins.
 - 3) Before use, clean all truck beds to ensure the mixture is not contaminated.
 - 4) When necessary, coat the inside truck beds with an approved release agent from the City.
 - d. Placement and Compaction Equipment
 - 1) Provide equipment that does not damage underlying pavement.
 - 2) Comply with laws and regulations concerning overweight vehicles.
 - 3) When permitted, other equipment that will consistently produce satisfactory results may be used.
7. Asphalt Paver
 - a. General
 - 1) Furnish a paver that will produce a finished surface that meets longitudinal and transverse profile, typical section, and placement requirements.
 - 2) Ensure the paver does not support the weight of any portion of hauling equipment other than the connection.
 - 3) Provide loading equipment that does not transmit vibrations or other motions to the paver that adversely affect the finished pavement quality.
 - 4) Equip the paver with an automatic, dual, longitudinal-grade control system and an automatic, transverse-grade control system.
 - b. Tractor Unit

- 1) Supply a tractor unit that can push or propel vehicles, dumping directly into the finishing machine to obtain the desired lines and grades to eliminate any hand finishing.
- 2) Equip the unit with a hitch sufficient to maintain contact between the hauling equipment's rear wheels and the finishing machine's pusher rollers while mixture is unloaded.
- c. Screed
 - 1) Provide a heated compacting screed that will produce a finished surface that meets longitudinal and transverse profile, typical section, and placement requirements.
 - 2) Screed extensions must provide the same compacting action and heating as the main unit unless otherwise approved.
- d. Grade Reference
 - 1) Provide a grade reference with enough support that the maximum deflection does not exceed 1/16 inch between supports.
 - 2) Ensure that the longitudinal controls can operate from any longitudinal grade reference including a string line, ski, mobile string line, or matching shoes.
 - 3) Furnish paver skis or mobile string line at least 40 feet long unless otherwise approved.
8. Material Transfer Devices
 - a. Provide the specified type of device when shown on the Drawings.
 - b. Ensure the devices provide a continuous, uniform mixture flow to the asphalt paver.
 - c. When used, provide windrow pick-up equipment constructed to pick up substantially all roadway mixture placed in the windrow.
9. Remixing Equipment
 - a. When required, provide equipment that includes a pug mill, variable pitch augers, or variable diameter augers operating under a storage unit with a minimum capacity of 8 tons.
10. Motor Grader
 - a. When allowed, provide a self-propelled grader with a blade length of at least 12 feet and a wheelbase of at least 16 feet.
11. Handheld Infrared Thermometer
 - a. Provide a handheld infrared thermometer meeting the requirements of Tex-244-F.
12. Rollers
 - a. The Contractor may use any type of roller to meet the production rates and quality requirements of the Contract unless otherwise shown on the Drawings or directed.
 - b. When specific types of equipment are required, use equipment that meets the specified requirements.
 - c. Alternate Equipment
 - 1) Instead of the specified equipment, the Contractor may, as approved, operate other compaction equipment that produces equivalent results.
 - 2) Discontinue the use of the alternate equipment and furnish the specified equipment if the desired results are not achieved.
 - d. City may require Contractor to substitute equipment if production rate and quality requirements of the Contract are not met.

- 1 13. Straightedges and Templates. Furnish 10-foot straightedges and other templates as
2 required or approved.
- 3 14. Distributor vehicles
- 4 a. Furnish vehicle that can achieve a uniform tack coat placement.
- 5 b. The nozzle patterns, spray bar height and distribution pressure must work
6 together to produce uniform application.
- 7 c. The vehicle should be set to provide a “double lap” or “triple lap” coverage.
- 8 d. Nozzle spray patterns should be identical to one another along the distributor
9 spray bar.
- 10 e. Spray bar height should remain constant.
- 11 f. Pressure within the distributor must be capable of forcing the tack coat material
12 out of spray nozzles at a constant rate.
- 13 15. Coring Equipment
- 14 a. When coring is required, provide equipment suitable to obtain a pavement
15 specimen meeting the dimensions for testing.
- 16 B. Construction
- 17 1. Design, produce, store, transport, place, and compact the specified paving mixture
18 in accordance with the requirements of this Section.
- 19 2. Unless otherwise shown on the Drawings, provide the mix design.
- 20 3. The City will perform quality assurance (QA) testing.
- 21 4. Provide quality control (QC) testing as needed to meet the requirements of this
22 Section.
- 23 C. Production Operations
- 24 1. General
- 25 a. The City may suspend production for noncompliance with this Section.
- 26 b. Take corrective action and obtain approval to proceed after any production
27 suspension for noncompliance.
- 28 2. Operational Tolerances
- 29 a. Stop production if testing indicates tolerances are exceeded on any of the
30 following:
- 31 1) 3 consecutive tests on any individual sieve
- 32 2) 4 consecutive tests on any of the sieves
- 33 3) 2 consecutive tests on asphalt content
- 34 b. Begin production only when test results or other information indicate, to the
35 satisfaction of the City, that the next mixture produced will be within Table 11
36 tolerances.
- 37 3. Storage and Heating of Materials
- 38 a. Do not heat the asphalt binder above the temperatures specified in Section
39 2.2.A. or outside the manufacturer’s recommended values.
- 40 b. On a daily basis, provide the City with the records of asphalt binder and hot-
41 mix asphalt discharge temperatures in accordance with Table 10.
- 42 c. Unless otherwise approved, do not store mixture for a period long enough to
43 affect the quality of the mixture, nor in any case longer than 12 hours.
- 44 4. Mixing and Discharge of Materials
- 45 a. Notify the City of the target discharge temperature and produce the mixture
46 within 25 degrees F of the target.

- b. Monitor the temperature of the material in the truck before shipping to ensure that it does not exceed the maximum production temperatures listed in Table 10. The City will not pay for or allow placement of any mixture produced above the maximum production temperatures listed in Table 10.
- c. Control the mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant.

Table 10
Maximum Production Temperature

High-Temperature Binder Grade ¹	Maximum Production Temperature
PG 64	325°F
PG 70	335°F
PG 76	345°F

- 1. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.

D. Placement Operations

- 1. Place the mixture to meet the typical section requirements and produce a smooth, finished surface or base course with a uniform appearance and texture.
- 2. Offset longitudinal joints of successive courses of hot mix by at least 6 inches.
- 3. Place mixture so longitudinal joints on the surface course coincide with lane lines, or as directed. Ensure that all finished surfaces will drain properly.
- 4. When End Dump Trucks are used, ensure the bed does not contact the paver when raised.
- 5. Placement can be performed by hand in situations where the paver cannot place it adequately due to space restrictions.
- 6. Hand-placing should be minimized to prevent aggregate segregation and surface texture issues.
- 7. All hand placement shall be checked with a straightedge or template before rolling to ensure uniformity.
- 8. Place mixture within the compacted lift thickness shown in Table 11, unless otherwise shown on the Drawings or otherwise directed.

Table 11
Compacted Lift Thickness and Required Core Height

Mixture Type	Compacted Lift Thickness		Minimum Untrimmed Core Height (in.) Eligible for Testing
	Minimum (in.)	Maximum (in.)	
SP-B	2.50	4.0	2.00
SP-C	2.00	3.00	1.25
SP-D	1.25	2.00	1.25
DG-B	2.5	5.00	1.75
DG-D	1.5	3.0	1.25

9. Tack Coat

- a. Clean the surface before placing the tack coat. Unless otherwise approved, apply tack coat uniformly at the rate directed by the City.

- 1 b. The City will set the rate between 0.04 and 0.10 gallons of residual asphalt per
- 2 square yard of surface area.
- 3 c. Apply a thin, uniform tack coat to all contact surfaces of curbs, structures, and
- 4 all joints.
- 5 d. Prevent splattering of tack coat when placed adjacent to curb, gutter, metal
- 6 beam guard fence and structures.
- 7 e. The City may use Tex-243-F to verify that the tack coat has adequate adhesive
- 8 properties.
- 9 f. The City may suspend paving operations until there is adequate adhesion.
- 10 g. The tack coat should be placed with enough time to break or set before
- 11 applying hot mix asphalt layers.
- 12 h. Traffic should not be allowed on tack coats.
- 13 i. When a tacked road surface must be opened to traffic, they should be covered
- 14 with sand to provide friction and prevent pick-up.
- 15 j. A typical rate for applying a sand cover is 4 to 8 lbs/square yard.
- 16 10. General placement requirements
- 17 a. Material should be delivered to maintain a relatively constant head of material
- 18 in front of the screed.
- 19 b. The hopper should never be allowed to empty during paving.
- 20 c. Dumping wings between trucks not allowed. Dispose of at end of days
- 21 production.
- 22 E. Lay-Down Operation
- 23 1. Minimum Mixture Placement Temperatures. Use Table 12 for minimum mixture
- 24 placement temperatures.
- 25 2. Windrow Operations. When hot mix is placed in windrows, operate windrow
- 26 pickup equipment so that substantially all the mixture deposited on the roadbed is
- 27 picked up and loaded into the paver.

28 **Table 12**
29 **Suggested Minimum Mixture Placement Temperature**

High-Temperature Binder Grade	Minimum Placement Temperature (Before Entering Paver)
PG 64	260°F
PG 70	270°F
PG 76	280°F

- 30 F. Compaction
- 31 1. Use air void control unless ordinary compaction control is specified on the
- 32 Drawings.
- 33 2. Avoid displacement of the mixture. If displacement occurs, correct to the
- 34 satisfaction of the City.
- 35 3. Ensure pavement is fully compacted before allowing rollers to stand on the
- 36 pavement.
- 37 4. Unless otherwise directed, use only water or an approved release agent on rollers,
- 38 tamps, and other compaction equipment.
- 39 5. Keep diesel, gasoline, oil, grease, and other foreign matter off the mixture.
- 40 6. Unless otherwise directed, operate vibratory rollers in static mode when not
- 41 compacting, when changing directions, or when the plan depth of the pavement mat
- 42 is less than 1-1/2 inches.

- 1 7. Use tamps to thoroughly compact the edges of the pavement along curbs, headers,
2 and similar structures and in locations that will not allow thorough compaction with
3 the rollers.
- 4 8. The City may require rolling with a trench roller on widened areas, in trenches, and
5 in other limited areas.
- 6 9. Allow the compacted pavement to cool to 160 degrees F or lower before opening to
7 traffic unless otherwise directed.
- 8 10. When directed, sprinkle the finished mat with water or limewater to expedite
9 opening the roadway to traffic.
- 10 11. Air Void Control
- 11 a. General
- 12 1) Compact dense-graded hot-mix asphalt to contain from 5 percent to 9
13 percent in-place air voids.
- 14 2) Do not increase the asphalt content of the mixture to reduce pavement air
15 voids.
- 16 b. Rollers
- 17 1) Furnish the type, size, and number of rollers required for compaction, as
18 approved.
- 19 2) Use a pneumatic-tire roller to seal the surface, unless otherwise shown on
20 the Drawings.
- 21 3) Use additional rollers as required to remove any roller marks.
- 22 c. Air Void Determination
- 23 1) Unless otherwise shown on the Drawings, obtain 2 roadway specimens at
24 each location selected by the City for in-place air void determination.
- 25 2) The City will measure air voids in accordance with Tex-207-F and
26 Tex-227-F.
- 27 3) Before drying to a constant weight, cores may be predried using a Corelok
28 or similar vacuum device to remove excess moisture.
- 29 4) The City will use the average air void content of the 2 cores to calculate the
30 in-place air voids at the selected location.
- 31 12. Ordinary Compaction Control
- 32 a. Furnish the type, size, and number of rollers required for compaction, as
33 approved. Furnish at least 1 medium pneumatic-tire roller (minimum 12-ton
34 weight).
- 35 b. Use the control strip method given in Tex-207-F, Part IV, to establish rolling
36 patterns that achieve maximum compaction.
- 37 c. Follow the selected rolling pattern unless changes that affect compaction occur
38 in the mixture or placement conditions.
- 39 d. When such changes occur, establish a new rolling pattern.
- 40 e. Compact the pavement to meet the requirements of the Drawings and
41 specifications.
- 42 f. When rolling with the 3-wheel, tandem or vibratory rollers, start by first rolling
43 the joint with the adjacent pavement and then continue by rolling longitudinally
44 at the sides.
- 45 g. Proceed toward the center of the pavement, overlapping on successive trips by
46 at least 1 ft., unless otherwise directed.
- 47 h. Make alternate trips of the roller slightly different in length.
- 48 i. On superelevated curves, begin rolling at the low side and progress toward the
49 high side unless otherwise directed.

1 G. Irregularities

- 2 1. Identify and correct irregularities including, but not limited to segregation, rutting,
3 raveling, flushing, fat spots, mat slippage, irregular color, irregular texture, roller
4 marks, tears, gouges, streaks, uncoated aggregate particles, or broken aggregate
5 particles.
- 6 2. The City may also identify irregularities, and in such cases, the City shall promptly
7 notify the Contractor.
- 8 3. If the City determines that the irregularity will adversely affect pavement
9 performance, the City may require the Contractor to remove and replace (at the
10 Contractor's expense) areas of the pavement that contain the irregularities and areas
11 where the mixture does not bond to the existing pavement.
- 12 4. If irregularities are detected, the City may require the Contractor to immediately
13 suspend operations or may allow the Contractor to continue operations for no more
14 than 1 day while the Contractor is taking appropriate corrective action.
- 15 5. The City may suspend production or placement operations until the problem is
16 corrected.
- 17 6. At the expense of the Contractor and to the satisfaction of the City, remove and
18 replace any mixture that does not bond to the existing pavement or that has other
19 surface irregularities identified above.

20 **3.5 REPAIR**

- 21 A. See Section 32 01 17.

22 **3.6 QUALITY CONTROL**

23 A. Production Testing

- 24 1. Perform production tests to verify asphalt paving meets the performance standard
25 required in the plans and specifications. Lab technicians need to obtain Level 1A
26 certification provided by the Hot Mix Asphalt Center certification program to
27 perform production testing
- 28 a. Perform one (1) theoretical maximum specific (rice) gravity test (using Tex-
29 227-F test method) per day per mix type.
- 30 b. City may perform aggregate gradation & asphalt binder content tests (using
31 Tex-236-F test method). The aggregate gradation must be within the master
32 gradation limits in Table 6 for Superpave mixes and Table 9 for dense graded
33 mixes, and the asphalt binder must be within 0.5% of the job mix formula
34 target.

35 B. In-place Density Testing

- 36 1. In-place Density Testing using the Nuclear Gauge
- 37 a. Compact the pavement uniformly to an in-place density of 92.5% to 96.3%.
- 38 b. City performs density testing every 200 linear feet at random locations. A
39 pavement section not meeting the specified density shall be subject to monetary
40 penalties or removal and replacement at the Contractor's expense as shown in
41 Table 13. However, cores can be obtained in areas under deficient compaction
42 to measure in-place density at the contractor's expense and override nuclear
43 gauge in-place density test results.
- 44 c. City may choose to use pavement core samples in lieu of nuclear gauges to
45 measure in-place density of asphalt pavement.

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Table 13
Density Payment Schedule

% Compaction	Percent of Contract Price Allowed
below 91	remove and replace at the entire cost and expense of Contractor as directed by City.
91-92.4	80%
92.5-96.3	100%
96.4-97.3	80%
Over 97.3	remove and replace at the entire cost and expense of Contractor as directed by City.

d. The amount of penalty shall be deducted from payment due to Contractor.

C. Pavement Thickness Test

1. City to core asphalt paving from the normal thickness of section once acceptable density achieved. City identifies location of cores.
 - a. City performs HMAC coring every 200 linear feet at random locations to measure pavement thickness. However, location adjustments are important as cores taken near pavement edges or longitudinal joints may not be an accurate representation of the pavement thickness. Cores, 4 in. (100 mm) in diameter, shall be taken for the full depth of the HMAC pavement. Cores are not to be taken within 6-in. of the edge of pavement, within 3-in. of longitudinal joints, and at or near tie-ins at either end of the mat. Immediately after obtaining the cores, the testing lab should dry the core holes, fill the holes with the appropriate asphalt mixture, and compact them properly.
 - b. City measures each core thickness by averaging at least 3 measurements.
 - c. In the event a deficiency in the thickness of pavement is revealed during testing, subsequent tests necessary to isolate the deficiency shall be at the Contractor's expense.
 - d. The cost for additional coring tests shall be at the same rate charged by commercial laboratories.
 - e. Where the average thickness of pavement in the area found to be deficient, payment shall be made at an adjusted price as specified in Table 14.

**Table 14
 Thickness Deficiency Penalties**

Deficiency in Thickness Determined by Cores	Proportional Part Of Contract Price
Greater Than 0 percent - Not More than 10 percent	90 percent
Greater Than 10 percent - Not More than 15 percent	80 percent
Greater Than 15 percent	remove and replace at the entire cost and expense of Contractor as directed by City.

2. If, in the judgment of the City, the area of such deficiency warrants removal, the area shall be removed and replaced, at the Contractor’s entire expense, with asphalt paving of the thickness shown on the Drawings.
3. No additional payment over the contract unit price shall be made for any pavement of a thickness exceeding that required by the Drawings.

3.7 FIELD QUALITY CONTROL [NOT USED]

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

3.14 ATTACHMENTS [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
12/20/2012	D. Johnson	1.2.A – Modified items to be included in price bid
06/07/2024	M Owen	1.2 - Made minor revisions for clarification 1.6 – Updated section related to City review and approval of mix design 1.11 – Updated Table 1 related to temperature requirements 2.2 – Updated Table 2, 3 & 4, revised requirements fir Asphalt Binder/Mix Designs, replaced Table 5, included Mix – design requirements, added Table 6, 7, 8 and 9 3.4 – Added Table 10 and 11and updated Table 12and deleted sections related to Air Voids Out of Range and Test Section 3.6 – Revised Quality Control requirements