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ADDENDUM NO. 1

Date: February 26, 2026
Project Name: Airfield Pavement Rehabilitation
Airport: Gillespie County Airport (T82)
TxDOT CSJ No.: 2614FREDB
Garver Project No. 23A06150

This addendum shall be a part of the Plans, Contract Documents and Specifications to the same extent as though it were originally included therein, and it shall supersede anything contained in the Plans, Contract Documents, and Specifications with which it might conflict. Acknowledgement of receipt of this addendum must be noted in the appropriate section of the Bid Form included in the Contract Documents.

The Pre-bid meeting minutes and sign-in sheet have been included. The Pre-bid meeting minutes include all questions received by to the date of publishing this Addendum No. 1.

Bidders can obtain the revised bid form Addendum No. 1 on the TxDOT Website “Plans Online”.

Bidders must fill out the bid form electronically, print, sign and submit a hardcopy as part of their bid package.

Revisions or additions made to the Contract Documents and Plans:

- A. Modifications to the Notice to Bidders:
 - 1. Bids will be received until 1:00PM on **March 19, 2026**, then publicly opened and read.
- B. SPECIFICATIONS
 - 1. Remove the following specifications sections in their entirety, and replace with the same, attached hereto:
 - a. Specifications Table of Contents
 - b. Specification TX-216 – Standard Highway Specification for Proof Rolling Included – Contractor to observe modifications provided in TX-216-MOD
 - c. Specification TX-247 – Standard Highway Specification for Flexible Base Included - Contractor to observe modifications provided in TX-247-MOD
 - d. Specification TX-341 – Standard Highway Specification for Dense-Graded Hot-Mix Asphalt Included - Contractor to observe modifications provided in TX-341-MOD

ADDENDUM NO. 1

- e. Specification TX-460 – Standard Highway Specification for Corrugated Metal Pipe Included - Contractor to observe modifications provided in TX-460-MOD
 - f. Specification TX-467 – Standard Highway Specification for Safety End Treatments Included - Contractor to observe modifications provided in TX-467-MOD
2. The following specifications are to be added to the Bidding Documents:
- a. Tx-250 – Geogrid Base Reinforcement
 - b. Tx-251 – Reworking of Base Courses

C. PLANS

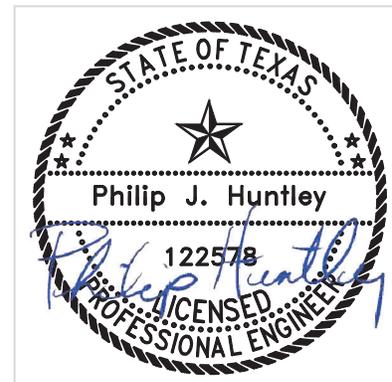
1. Remove the following drawings in their entirety, and replace with the same, attached hereto:
- a. Drawing No. GI-002 (Sheet 2)
 - b. Drawing No. GC-100 (Sheet 7)
 - c. Drawing No. CD-501 (Sheet 33)
 - d. Drawing No. CP-002 (Sheet 35)

D. BID FORM

1. Revised Bid form.

By: 

Philip Huntley, P.E.
Project Manager



Attachments:

- A. Pre-bid meeting minutes
- B. TxDOT Bid Form 2506 for 2614FREDB
- C. Specifications
 - 1. Specifications Table of Contents
 - 2. TX-216
 - 3. TX-247
 - 4. TX-250
 - 5. TX-251
 - 6. TX-341
 - 7. TX-460
 - 8. TX-467
- D. Plans
 - 1. GI-002
 - 2. GC-100
 - 3. CD-501
 - 4. CP-002

END OF ADDENDUM NO. 1



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Gillespie County Airport Airfield Pavement Rehabilitation TxDOT CSJ NO. 2614FREDB Pre-Bid Meeting Minutes

10:00 a.m. February 12, 2026

1. Introductions & Roles:

Gillespie County / Gillespie County Airport (Sponsor)
Tony Lombardi – Airport Manager
TxDOT Aviation (Agent)
Ed Mayle – Project Manager
Garver (Engineer)
Philip Huntley, PE – Project Manager
Michael Clayton, EIT – Project Engineer

2. Bidding Procedures

- a) Sealed bids need to be addressed and delivered to Sheri Quinlan, TxDOT Aviation Division, 6230 E. Stassney Lane, 2nd Floor, Austin, Texas 78744. Package must be clearly marked as “Bid Proposal.” Bids will be received until 1:00 PM on March 12, 2026, then publicly opened and read aloud virtually.
- b) Technical questions concerning the plans and specifications should be directed to Philip Huntley, PE at PJHuntley@GarverUSA.com or 512-485-0026
- c) Deadline for questions is 5:00pm on Tuesday, February 24, 2026. Answers will be provided via addendum by 5:00pm on Thursday, February 26, 2026.
- d) **Notice to Bidders:**
 - i. Documents to be submitted with bid proposal:
 - Bid Form
 - **Contract Time:**
 - **Base Bid: 200 Calendar Days**
 - **Additive Alternate I: 15 Calendar Days**
 - **Additive Alternate II: No Additional Time**
 - **Additive Alternate III: No Additional Time**
 - **Additive Alternate IV: No Additional Time**
 - \$1,700 Liquidated Damages per calendar day
 - Acknowledgment of Addendums
 - No. 1 will include minutes from pre-bid meeting and answers to questions.
 - Bid Bond (Must include the Power Attorney and claim notice page)
 - Required Language in Proposals for AIP Contracts
 - Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
 - Buy American Certification
 - Certification of Non-Segregated Facilities
 - DBE Participation Plan
 - The Bidder must submit an acceptable DBE plan and commitment or good faith effort no later than **5 calendar days after bid opening** as a matter of responsibility, even if bidder

is not the apparent low bidder.

▪ **March 19, 2026 by 5:00 pm**

- Bidder Qualifications

3. Federal Provisions

- a) The DBE goal is **0.0%**
 - i. Questions regarding goals and Good Faith Efforts should be directed to Eli Lopez of TxDOT Aviation at (512)416-4506
 - ii. *No DBE Plan is necessary for purposes of bidding as the DBE goal for project is 0%. However, selected bidder will still need to submit list of proposed subcontractors.*
- b) Contractor shall follow all Davis Bacon Wage Rate Requirements
- c) Contractor shall follow all Buy American Provision.

4. TxDOT Aviation General Construction Provisions

- a) General Provisions are provided in a standalone publication entitled General Construction Provisions.
- b) Electronic copies are available on TxDOT Aviation website.
 - i. <http://www.txdot.gov/inside-txdot/division/aviation/general-provisions.html>
- c) Contractors shall pay close attention to Section 100 in the General Provisions regarding Contractor Quality Control Program and Contractor Quality Control Testing.
 - i. The contractor is required to prepare a quality control program following the specifications where it is required.
 - ii. Owner will perform quality assurance (QA) testing on all materials.
 - Any failed tests performed by the QA lab will be deducted from the contractor.

5. Contract Documents

- a) Construction Plans
- b) Federal Provisions
- c) TxDOT General Provisions
- d) Technical Specifications

6. Site Visit

7. Questions and Answers

- a) Q: On the Bid Form, Bid Alternate 1- Pavement Markings Without Reflective Media shows unit at S.Y., confirm whether this is correct or if it is intended to be S.F.?
A: Intended to be S.F. See revised Bid Form for correction.
- b) Q: Contract time – Additive Alternates. The bid form references 200 Calendar Days with an additional 15 days if Additive Alternate 1 is awarded. Sheet GC-100 notes an additional 30 Calendar Days if Additive Alternate 3 or 4 is awarded. Please clarify which contract time is correct.
A: Notes on GC-100 have been clarified such that in the event that Additive Alternate 3 or 4 is awarded, Phase 5 work should be completed in conjunction with Phase 2 work. Time to complete Phase 5 will be extended 30 days, and be completed in 60 days allotted for Phase 2. Please see revised GC-100.
- c) Q: Is there a location on-site to stockpile millings and excavated materials or will the Contractor be required to haul this material off the project site?

A: There are disposal areas on-site. Airport Manager has noted the northeast corner of the airport property (near Tivydale Road) as an on-site disposal area. The Contractor may elect to utilize compacted FDR trimmings with geogrid base reinforcement on compacted subgrade for base material on the Taxiway A and D fillet areas in lieu of TxDOT 247 Crushed aggregate base course. For bidding purposes the Contractor shall utilize 315 Cubic Yards of FDR trimmings for these areas (this assumes 9-inches of FDR trimmings over the square footage of new pavement constructed). For the Terminal Apron areas of reconstruction, FDR trimmings to a depth of 9-inches on geogrid base reinforcement can be utilized in lieu of TxDOT 247 Crushed aggregate base course. For bidding purposes, the Contractor shall utilize 1,250 Cubic Yards of FDR trimmings for these areas. For Additive Alternate 3 and 4 areas, 625-cubic yards and 1,225-cubic yards, respectively, FDR trimmings can be utilized.

d) Q: Will low-profile barricades be turned over to airport at conclusion of project or remain Contractors?

A: Low-profile barricades will remain property of Contractor at conclusion of project.

e) Q: What is the extent of removal and / or replacement of green centerline reflectors and blue solar reflectors currently installed on taxiway pavement.

A: Green centerline reflectors and blue solar edge reflectors are to be removed and disposed of.

f) Q: Item P-207 In-Place Full Depth Reclamation (FDR) Recycled Asphalt Aggregate Base Course, will this item get cement and emulsion? There is currently not a bid item for emulsion.

A: Current plan is cement additive only in the FDR process for pavement.

g) Q: The apron and fillet pavement section details (sheet 35) show geogrid. There is not a pay item for geogrid.

A: See Addendum #1 for Addition of TxDOT Item 250 Specification and revised bid form

h) Q: For Additive Alternate 2, would you clarify the 2 Dense Grade HMA TY D items?

A: TX-341-6.1 is for proposed fillet area. TX-341-6.2 is for the 2-ft transition area into the existing taxiway connector pavement. See details 2 and 4 on sheet CP-002 for typical section information.

i) Q: Phase 3B shown on sheets GC-103 and typical section CP-002 shows 6" of TX 341 TY B mix @ 6". There is not a pay item for this.

A: See Revised Bid Form for addition of 6" TX 341 TY B Mix and TX 341 – Mod Specification for added pay item.

j) Q: For Additive Alternate 3, the quantity of TY D HMA does not match the additional area of the apron replacement. Please clarify.

A: Quantities TY D HMA have been updated accordingly for Additive Alternate 3 and 4. Please see revised Bid Form.

k) Q: The proposed pavement section on Sheet CD-501 is different than what is shown on sheet CP-002. Which is correct?

A: Contractor shall utilize the sections shown on CP-002. CD-501 has been revised to reference the pavement sections on CP-002.



Pre-Bid Meeting
 February 12, 2026, 10:00 am

SIGN-IN SHEET

Name	Representing	Phone #	Email
Ed Mayle	TxDOT, AVX	512-416-4528	ed.mayle@txdot.gov
Philip Huntley	GARVER	512-485-0026	PHUNTLEY@GARVERUSA.COM
Tony Lombardi	T&Z	830-990-5764	tlombardi@gillespierecountytexas.org
Caleb Ripple	ARL	830-322-7312	CS.RIPPLE@ARLCE.COM
PAUL GYARDY	APK	210-488-3533	PAULGYARDY@AR6CE.COM
Gus Flores	J.A. Ramos Demco	210- 825 -1583	gus@j.a.ramosdemco.com
CLAY ZUBER	ALLEN KELLER	830-377-7691	CZUBERG@ALLENKELLERCO.COM
JASWANTA ANAND	ALLEN KELLER	682-392-3153	JANAND@ALLENKELLERCO.COM
Garrett Kleypas	J3 CO	830-955-2247	garrett.kleypas@j3co.com

GILLESPIE COUNTY AIRPORT
AIRFIELD PAVEMENT REHABILITATION
(TXDOT CSJ NO. 2614FREDB)

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Gillespie County Airport

Airfield Pavement Rehabilitation

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GEOTECHNICAL REPORT

Item 216

Proof Rolling



1. DESCRIPTION

Proof-roll earthwork, base, or both to locate unstable areas.

2. EQUIPMENT

- 2.1. **Specified Equipment.** Furnish rollers that weigh at least 25 ton when loaded. The maximum acceptable load is 50 ton. Provide rollers that meet the requirements of Section 210.2.4., "Pneumatic Tire Rollers."
- 2.2. **Alternative Equipment.** The Contractor may use alternate compaction equipment that produces results equivalent to the specified equipment in the same period of time as approved. Discontinue the use of the alternative equipment and furnish the specified equipment if the desired results are not achieved.

3. CONSTRUCTION

Perform proof rolling as directed. Adjust the load and tire inflation pressures within the range of the manufacturer's charts or tabulations, as directed. Make at least two coverages with the proof roller. Offset each trip of the roller by at most one tire width. Operate rollers at a speed between 2 and 6 mph, as directed. Correct unstable or nonuniform areas, if found, in conformance with the applicable Item.

4. MEASUREMENT

Rolling will be measured by the hour operated on surfaces being tested.

5. PAYMENT

The work performed and equipment furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Proof Rolling." This price is full compensation for furnishing and operating equipment and for labor, materials, tools, and incidentals.

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Item 247

Flexible Base



1. DESCRIPTION

Construct a foundation course composed of flexible base.

2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications. Notify the Engineer of the proposed material sources and of changes to material sources. The Engineer may sample and test project materials at any time before compaction throughout the duration of the project to assure specification compliance. Use [Tex-100-E](#) material definitions.

- 2.1. **Aggregate.** Furnish aggregate of the type and grade shown on the plans and meeting the requirements of Table 1. Each source must meet Table 1 requirements for liquid limit, plasticity index, and wet ball mill for the grade specified. Do not use additives, such as but not limited to lime, cement, or fly ash to modify aggregates to meet the requirements of Table 1 unless shown on the plans.

Table 1
Material Requirements

Property	Test Method	Grade 1-2	Grade 3	Grade 4 ²	Grade 5
Sampling	Tex-400-A				
Master gradation sieve size (cumulative % retained)	Tex-110-E			As shown on the plans	
2-1/2"		0	0		0
1-3/4"		0-10	0-10		0-5
7/8"		10-35	-		10-35
3/8"		30-65	-		35-65
#4		45-75	45-75		45-75
#40		65-90	50-85		70-90
Liquid Limit, % Max	Tex-104-E	40	40	As shown on the plans	35
Plasticity Index, Max ¹	Tex-106-E	10	12	As shown on the plans	10
Plasticity index, Min ¹		As shown on the plans			
Wet ball mill, % Max	Tex-116-E	40	-	As shown on the plans	40
Wet ball mill, % Max increase passing the #40 sieve		20	-	As shown on the plans	20
Min compressive strength, psi	Tex-117-E			As shown on the plans	
lateral pressure 0 psi		35	-		-
lateral pressure 3 psi		-	-		90
lateral pressure 15 psi		175	-		175

- Determine plastic index in accordance with [Tex-107-E](#) (linear shrinkage) when liquid limit is unattainable as defined in [Tex-104-E](#).
- Grade 4 may be further designated as Grade 4A, Grade 4B, etc.

- 2.1.1. **Material Tolerances.** The Engineer may accept material if no more than 1 of the 5 most recent gradation tests has an individual sieve outside the specified limits of the gradation.

When target grading is required by the plans, no single failing test may exceed the master grading by more than 5 percentage points on sieves No. 4 and larger or 3 percentage points on sieves smaller than No. 4.

The Engineer may accept material if no more than 1 of the 5 most recent plasticity index tests is outside the specified limit. No single failing test may exceed the allowable limit by more than 2 points.

- 2.1.2. **Material Types.** Do not use fillers or binders unless approved. Furnish the type specified on the plans in accordance with the following:
- 2.1.2.1. **Type A.** Crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source. Do not use gravel or multiple sources.
- 2.1.2.2. **Type B.** Crushed or uncrushed gravel. Blending of 2 or more sources is allowed.
- 2.1.2.3. **Type C.** Crushed gravel with a minimum of 60% of the particles retained on a No. 4 sieve with 2 or more crushed faces as determined by [Tex-460-A](#), Part I. Blending of 2 or more sources is allowed.
- 2.1.2.4. **Type D.** Type A material or crushed concrete. Crushed concrete containing gravel will be considered Type D material. Crushed concrete must meet the requirements in Section 247.2.1.3.2., "Recycled Material (Including Crushed Concrete) Requirements," and be managed in a way to provide for uniform quality. The Engineer may require separate dedicated stockpiles in order to verify compliance.
- 2.1.2.5. **Type E.** Caliche, iron ore or as otherwise shown on the plans.
- 2.1.3. **Recycled Material.** Reclaimed asphalt pavement (RAP) and other recycled materials may be used when shown on the plans. Request approval to blend 2 or more sources of recycled materials.
- 2.1.3.1. **Limits on Percentage.** Do not exceed 20% RAP by weight, when RAP is allowed, unless otherwise shown on the plans. The percentage limitations for other recycled materials will be as shown on the plans.
- 2.1.3.2. **Recycled Material (Including Crushed Concrete) Requirements.**
- 2.1.3.2.1. **Contractor-Furnished Recycled Materials.** Provide recycled materials, other than RAP, that have a maximum sulfate content of 3,000 ppm when tested in accordance with [Tex-145-E](#). When the Contractor furnishes the recycled materials, including crushed concrete, the final product will be subject to the requirements of Table 1 for the grade specified. Certify compliance with [DMS-11000](#), "Evaluating and Using Nonhazardous Recyclable Materials Guidelines," for Contractor furnished recycled materials. In addition, recycled materials must be free from reinforcing steel and other objectionable material and have at most 1.5% deleterious material when tested in accordance with [Tex-413-A](#). For RAP, do not exceed a maximum percent loss from decantation of 5.0% when tested in accordance with [Tex-406-A](#). Test RAP without removing the asphalt.
- 2.1.3.2.2. **Department-Furnished Required Recycled Materials.** When the Department furnishes and requires the use of recycled materials, unless otherwise shown on the plans:
- Department-required recycled material will not be subject to the requirements in Table 1,
 - Contractor-furnished materials are subject to the requirements in Table 1 and this Item,
 - the final product, blended, will be subject to the requirements in Table 1, and
 - for final product, unblended (100% Department-furnished required recycled material), the liquid limit, plasticity index, wet ball mill, and compressive strength is waived.
- Crush Department-furnished RAP so that 100% passes the 2 in. sieve. The Contractor is responsible for uniformly blending to meet the percentage required.
- 2.1.3.2.3. **Department-Furnished and Allowed Recycled Materials.** When the Department furnishes and allows the use of recycled materials or allows the Contractor to furnish recycled materials, the final blended product is subject to the requirements of Table 1 and the plans.

- 2.1.3.3. **Recycled Material Sources.** Department-owned recycled material is available to the Contractor only when shown on the plans. Return unused Department-owned recycled materials to the Department stockpile location designated by the Engineer unless otherwise shown on the plans.

The use of Contractor-owned recycled materials is allowed when shown on the plans. Contractor-owned surplus recycled materials remain the property of the Contractor. Remove Contractor-owned recycled materials from the project and dispose of them in accordance with federal, state, and local regulations before project acceptance. Do not intermingle Contractor-owned recycled material with Department-owned recycled material unless approved.

- 2.2. **Water.** Furnish water free of industrial wastes and other objectionable matter.
- 2.3. **Material Sources.** Expose the vertical faces of all strata of material proposed for use when non-commercial sources are used. Secure and process the material by successive vertical cuts extending through all exposed strata, when directed.

3. EQUIPMENT

Provide machinery, tools, and equipment necessary for proper execution of the work.

- 3.1. Provide rollers in accordance with Item 210, "Rolling." Provide proof rollers in accordance with Item 216, "Proof Rolling," when required.
- 3.2. When ride quality measurement is required, provide a high speed or lightweight inertial profiler certified at the Texas A&M Transportation Institute. Provide equipment certification documentation. Display a current decal on the equipment indicating the certification expiration date.

4. CONSTRUCTION

Construct each layer uniformly, free of loose or segregated areas, and with the required density and moisture content. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the plans or as directed.

Stockpile base material temporarily at an approved location before delivery to the roadway. Build stockpiles in layers no greater than 2 ft. thick. Stockpiles must have a total height between 10 and 16 ft. unless otherwise approved. After construction and acceptance of the stockpile, loading from the stockpile for delivery is allowed. Load by making successive vertical cuts through the entire depth of the stockpile.

Do not add or remove material from temporary stockpiles that require sampling and testing before delivery unless otherwise approved. Charges for additional sampling and testing required as a result of adding or removing material will be deducted from the Contractor's estimates.

Haul approved flexible base in clean trucks. Deliver the required quantity to each 100-ft. station or designated stockpile site as shown on the plans. Prepare stockpile sites as directed. When delivery is to the 100-ft. station, manipulate in accordance with the applicable Items.

- 4.1. **Preparation of Subgrade or Existing Base.** Remove or scarify existing asphalt concrete pavement in accordance with Item 105, "Removing Treated and Untreated Base and Asphalt Pavement," when shown on the plans or as directed. Shape the subgrade or existing base to conform to the typical sections shown on the plans or as directed.

When new base is required to be mixed with existing base, deliver, place, and spread the new flexible base in the required amount per station. Manipulate and thoroughly mix the new base with existing material to provide a uniform mixture to the specified depth before shaping.

Proof roll the roadbed in accordance with Item 216, "Proof Rolling," before pulverizing or scarifying when shown on the plans or directed. Correct soft spots as directed.

- 4.2. **Placing.** Spread and shape flexible base into a uniform layer with an approved spreader the same day as delivered unless otherwise approved. Construct layers to the thickness shown on the plans. Maintain the shape of the course. Control dust by sprinkling, as directed. Correct or replace segregated areas as directed, at no additional expense to the Department.

Place successive base courses and finish courses using the same construction methods required for the first course.

- 4.3. **Compaction.** Compact using density control unless otherwise shown on the plans. Multiple lifts are permitted when shown on the plans or approved. Bring each layer to the moisture content directed. When necessary, sprinkle the material in accordance with Item 204, "Sprinkling."

Begin rolling longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 the width of the roller unit. Begin rolling at the low side and progress toward the high side on superelevated curves. Offset alternate trips of the roller. Operate rollers at a speed between 2 and 6 mph as directed.

Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish requirements before the next course is placed or the project is accepted. Continue work until specification requirements are met. Perform the work at no additional expense to the Department.

Before final acceptance, the Engineer will select the locations of tests and measure the flexible base depth in accordance with [Tex-140-E](#). Correct areas deficient by more than 1/2 in. in thickness by scarifying, adding material as required, reshaping, recompacting, and refinishing at the Contractor's expense.

- 4.3.1. **Ordinary Compaction.** Roll with approved compaction equipment as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing approved material as required, reshaping, and recompacting.

- 4.3.2. **Density Control.** Compact to at least 100% of the maximum dry density determined by [Tex-113-E](#), unless otherwise shown on the plans. Maintain moisture during compaction within ± 2 percentage points of the optimum moisture content as determined by [Tex-113-E](#). Measure the moisture content of the material in accordance with [Tex-115-E](#) or [Tex-103-E](#) during compaction daily and report the results the same day to the Engineer, unless otherwise shown on the plans or directed. Do not achieve density by drying the material after compaction.

The Engineer will determine roadway density and moisture content of completed sections in accordance with [Tex-115-E](#). The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

- 4.4. **Finishing.** After completing compaction, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove loosened material and dispose of it at an approved location. Seal the clipped surface immediately by rolling with a pneumatic tire roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades as shown on the plans or as directed.

Correct grade deviations greater than 1/4 in. in 16 feet measured longitudinally or greater than 1/4 in. over the entire width of the cross-section in areas where surfacing is to be placed. Correct by loosening and adding, or removing material. Reshape and re-compact in accordance with Section 247.4.3., "Compaction."

- 4.5. **Curing.** Cure the finished section until the moisture content is at least 2 percentage points below optimum or as directed before applying the next successive course or prime coat.

- 4.6. **Ride Quality.** This section applies to the final travel lanes that receive a 1 or 2 course surface treatment for the final surface, unless otherwise shown on the plans. Measure ride quality of the base course after placement of the prime coat and before placement of the surface treatment, unless otherwise approved. Use a certified profiler operator from the Department's MPL. When requested, furnish the Engineer documentation for the person certified to operate the profiler.

Provide all profile measurements to the Engineer in electronic data files within 3 days after placement of the prime coat using the format specified in [Tex-1001-S](#). The Engineer will use Department software to evaluate longitudinal profiles to determine areas requiring corrective action. Correct 0.1-mi.sections having an average international roughness index (IRI) value greater than 100.0 in. per mile to an IRI value of 100.0 in. per mile or less for each wheel path, unless otherwise shown on the plans.

Re-profile and correct sections that fail to maintain ride quality until placement of the next course, as directed. Correct re-profiled sections until specification requirements are met, as approved. Perform this work at no additional expense to the Department.

5. MEASUREMENT

Flexible base will be measured as follows:

- **Flexible Base (Complete In Place).** The ton, square yard, or any cubic yard method.
- **Flexible Base (Roadway Delivery).** The ton or any cubic yard method.
- **Flexible Base (Stockpile Delivery).** The ton, cubic yard in vehicle, or cubic yard in stockpile.

Measurement by the cubic yard in final position and square yard is a plans quantity measurement. The quantity to be paid for is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

Measurement is further defined for payment as follows.

- 5.1. **Cubic Yard in Vehicle.** By the cubic yard in vehicles of uniform capacity at the point of delivery.
- 5.2. **Cubic Yard in Stockpile.** By the cubic yard in the final stockpile position by the method of average end areas.
- 5.3. **Cubic Yard in Final Position.** By the cubic yard in the completed and accepted final position. The volume of base course is computed in place by the method of average end areas between the original subgrade or existing base surfaces and the lines, grades, and slopes of the accepted base course as shown on the plans.
- 5.4. **Square Yard.** By the square yard of surface area in the completed and accepted final position. The surface area of the base course is based on the width of flexible base as shown on the plans.
- 5.5. **Ton.** By the ton of dry weight in vehicles as delivered. The dry weight is determined by deducting the weight of the moisture in the material at the time of weighing from the gross weight of the material. The Engineer will determine the moisture content in the material in accordance with [Tex-103-E](#) from samples taken at the time of weighing.

When material is measured in trucks, the weight of the material will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved by the Engineer. Scales must conform to the requirements of Item 520, "Weighing and Measuring Equipment."

6. PAYMENT

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 for the types of work shown below. No additional payment will be made for thickness or width exceeding that shown on the typical section or provided on the plans for cubic yard in the final position or square yard measurement.

Sprinkling and rolling, except proof rolling, will not be paid for directly but will be subsidiary to this Item unless otherwise shown on the plans. When proof rolling is shown on the plans or directed, it will be paid for in accordance with Item 216, "Proof Rolling."

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade will be paid in accordance with pertinent Items or Article 4.4., "Changes in the Work."

- 6.1. **Flexible Base (Complete In Place).** Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle," "In Stockpile," or "In Final Position" will be specified. For square yard measurement, a depth will be specified. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, spreading, blading, mixing, shaping, placing, compacting, reworking, finishing, correcting locations where thickness is deficient, curing, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.
- 6.2. **Flexible Base (Roadway Delivery).** Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle," "In Stockpile," or "In Final Position" will be specified. The unit price bid will not include processing at the roadway. This price is full compensation for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.
- 6.3. **Flexible Base (Stockpile Delivery).** Payment will be made for the type and grade specified. For cubic yard measurement, "In Vehicle" or "In Stockpile" will be specified. The unit price bid will not include processing at the roadway. This price is full compensation for furnishing and disposing of materials, preparing the stockpile area, temporary or permanent stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials to the stockpile, furnishing scales and labor for weighing and measuring, and equipment, labor, tools, and incidentals.

Item 250

Geogrid Base Reinforcement



1. DESCRIPTION

Use geogrid to reinforce flexible base placed on embankment material. Geogrid consists of a synthetic planar structure formed by a regular network of integrally connected polymeric tensile elements with apertures designed to interlock with the base and the underlying material.

2. MATERIALS

Furnish geogrid of the type shown on the plans meeting the requirements of [DMS-6240](#), "Geogrid for Base/Embankment Reinforcement." When directed, randomly select a roll from those delivered to the project and sample a piece of geogrid from the roll in accordance with [Tex-735-I](#). Do not sample from an area of the roll that is damaged or distorted. The Engineer must witness the sampling. The Materials and Tests Division (MTD) will test the geogrid sample to determine whether it meets the material requirements of [DMS-6240](#).

When test results fail to meet any of the minimum requirements, the Engineer may reject the roll and may randomly select an additional roll to sample and test. If the additional sample fails to meet any of the material requirements, the Engineer may reject the entire quantity of rolls represented by the samples tested.

2.1. **Packaging.** Package geogrid in rolls of the length and width shown on the plans or as approved. Package each roll in one continuous piece in a suitable sheath, wrapper, or container to protect the geogrid from damage due to ultraviolet light, moisture, storage, and handling.

2.2. **Identification.** Identify each roll with a tag or label securely affixed to the outside of one end of the roll. List the following information on the label:

- manufacturer's roll number,
- manufacturer's lot or control number,
- name of manufacturer and supplier,
- style or catalog description of product, and
- roll width and length.

3. CONSTRUCTION

Install geogrid in accordance with the lines and grades as shown on the plans. Do not operate tracked construction equipment on the geogrid until a minimum cover of 6 in. of flexible base backfill material is placed on the geogrid. Install the geogrid to avoid any deformation or damage to the underlying, compacted material below the geogrid. When the underlying, compacted material below the geogrid is damaged during installation, correct all areas to the satisfaction of the Engineer.

3.1. **Geogrid Placement.** Orient the geogrid length as unrolled parallel to the direction of roadway. Overlap geogrid sections as shown on the plans or as directed. Use plastic zip-ties at overlap joints or as directed. When placing geogrid around corners, cutting and diagonal lapping may be required. Pin geogrid at the beginning of the backfill section as directed. Keep the geogrid taut and flat throughout backfilling, but not restrained from stretching or flattening. Use a track loader to place the flexible base material by cascading it onto the geogrid to a minimum depth of 6 in. Spread, shape, and use ordinary compaction to compact the flexible base material into a uniform layer.

Avoid direct contact by equipment with the geogrid. When approved, rubber-tired equipment may be operated directly on the geogrid. When approved, operate the rubber-tired equipment at a maximum of 5 mph, do not turn tires on the geogrid, do not make sudden stops and starts on the geogrid, and do not distort the geogrid to create excessive deformation waves. Correct areas with distorted and excessive deformation waves to the satisfaction of the Engineer. When directed by the Engineer, adjust the geogrid installation and construction methods to minimize any distortion and deformation waves.

- 3.1.1. **Longitudinal Joints.** Overlap longitudinal joints by a minimum of 1 ft. Space longitudinal zip-ties 10–20 ft. or as directed.
- 3.1.2. **Transverse Joints.** Overlap transverse joints by a minimum of 1 ft. Space transverse zip-ties 4–5 ft. or as directed.
- 3.2. **Damage Repair.** Remove and replace Contractor-damaged or excessively deformed areas as directed at no additional cost to the Department. Lap repair areas a minimum of 3 ft. in all directions. Tie each side of repair grid in at least three locations, but do not exceed normal construction spacing. The tie spacing for odd shapes will be as directed. Repair excessively deformed materials underlying the grid as directed.

4. MEASUREMENT

Geogrid base reinforcement will be measured by the square yard of roadway placement as shown on the plans with no allowance for overlapping at transverse and longitudinal joints.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit bid price for “Geogrid Base Reinforcement” of the type specified. This price is full compensation for furnishing, preparing, hauling, and placing materials, including labor, materials, freight, tools, equipment, and incidentals.

Item 251

Reworking Base Courses



1. DESCRIPTION

Refinish or rework existing base material with or without asphaltic concrete pavement. Incorporate new base material when shown on the plans.

2. MATERIALS

Furnish uncontaminated materials of uniform quality that meet the requirements shown on the plans and in conformance with specifications. Notify the Engineer of the proposed material sources and of changes to material sources. The Engineer will verify that the specification requirements are met before the sources may be used. The Engineer may sample and test project materials at any time before compaction. Use [Tex-100-E](#) for material definitions.

2.1. **Flexible Base.** Furnish new base material that meets the requirements of Item 247, "Flexible Base," for the type and grade shown on the plans.

2.2. **Water.** Furnish water free of industrial wastes and other objectionable matter.

3. EQUIPMENT

Provide machinery, tools, and equipment necessary for proper execution of the work.

3.1. **Compaction Equipment.** Provide rollers in accordance with Item 210, "Rolling." Provide rollers in accordance with Item 216, "Proof Rolling," when required.

3.2. **Pulverization Equipment.** Provide pulverization equipment that:

- cuts and pulverizes material uniformly to the proper depth using cutters that plane to a uniform surface over the entire width of the cut,
- provides a visible indication of the depth of cut at all times, and
- uniformly mixes the materials.

4. CONSTRUCTION

Perform work to the width and depth shown on the typical sections for the type of work shown on the plans. Construct and shape exposed subgrade to conform to typical sections shown on the plans or as directed. Proof roll in accordance with Item 216 when shown on the plans. Correct soft spots as directed.

Before scarifying, clean the existing base of objectionable materials by blading, brooming, or other approved methods, unless otherwise shown on the plans. Perform this work in accordance with applicable Items.

4.1. **Types of Work.**

4.1.1. **Type A.** Scarifying only.

- 4.1.2. **Type B.** Scarifying, salvaging, and re-laying.
- 4.1.3. **Type C.** Scarifying and reshaping.
- 4.1.4. **Type D.** Refinishing.
- 4.2. **Performance of Work.**
- 4.2.1. **Scarifying.** Loosen and break existing base material, with or without existing asphaltic concrete pavement. Remove asphalt concrete pavement, surface treatment, plant mix seal, and micro-surfacing when shown on the plans and in conformance with applicable Items. Prevent contamination of asphalt material during and after removal. When the existing pavement consists of only a surface treatment, do not remove before scarifying. Scarify existing material for its full width and depth unless otherwise shown on the plans. Do not disturb the underlying subgrade. Break material into particles of not more than 2-1/2 in., unless otherwise shown on the plans.
- 4.2.2. **Salvaging.** Remove the existing base material and stockpile. Windrow if allowed. Perform salvage operations without interfering with traffic, proper drainage, or the general requirements of the work. Remove scarified material using an approved method. Keep material free of contamination.
- 4.2.3. **Re-Laying.** Prepare subgrade as shown on the plans or as directed before relaying salvaged material. Proof roll in accordance with Item 216, when shown on the plans. Correct soft spots as directed.
- Return and rework salvaged base material, with or without additional new base material, on the prepared roadbed. Place salvaged material on the prepared subgrade and sprinkle, blade, and shape the base to conform to the typical sections shown on the plans or as directed. Place new base material and uniformly mix with salvaged material when shown on the plans. Correct, or remove and replace, segregated material with satisfactory material, as directed.
- 4.2.4. **Reshaping.** Rework scarified base material with or without additional new base material. Mix and shape scarified base to conform to the typical sections shown on the plans. When shown on the plans, furnish new base material and uniformly mix with scarified material before shaping. Do not disturb the underlying subgrade. Correct, or remove and replace, segregated material with satisfactory material as directed.
- 4.2.5. **Refinishing.** Blade existing base surface to remove irregularities. Cure before placing the pavement on the refinished base, as shown on the plans or as directed.
- 4.3. **Compaction.** Compact using ordinary compaction or density control as shown on the plans. Bring each layer to the moisture content directed. When necessary, sprinkle the material in accordance with Item 204, "Sprinkling." Maintain moisture during compaction within $\pm 2\%$ of the optimum moisture content as determined in accordance with [Tex-113-E](#).
- Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least one-half the width of the roller unit. On superelevated curves, begin rolling at the low side and progress toward the high side. Offset alternating trips of the roller. Operate rollers at a speed between 2 and 6 mph, as directed.
- Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted. Continue work until specification requirements are met. Perform the work at no additional expense to the Department.
- 4.3.1. **Ordinary Compaction.** Roll using approved compaction equipment as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing approved

material as required, reshaping, and recompacting.

- 4.3.2. **Density and Moisture Control.** Compact to a minimum of 98% of the maximum dry density and within $\pm 2\%$ of the optimum moisture content as determined in accordance with [Tex-113-E](#), unless otherwise shown on the plans. Provide the Engineer with the beginning and ending station numbers of the area completed for testing. The Engineer will determine roadway density and moisture content of completed sections in accordance with [Tex-115-E](#), Part I. The Engineer will determine random locations for testing in accordance with [Tex-115-E](#), Part IV. Do not achieve density by drying the material after compaction.

When the density is less than 98% of the maximum dry density, the Engineer may perform additional testing to determine the extent of the area to correct. The Engineer may accept the section if no more than one of the five most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

- 4.4. **Miscellaneous and Small Areas.** Miscellaneous areas are those that typically involve handwork or discontinuous paving operations, such as temporary detours, driveways, mailbox turnouts, crossovers, gores, spot level-up areas, and other similar areas. Miscellaneous and small areas are not subject to density testing but may be tested as directed.

- 4.5. **Finishing.** Immediately after completing compaction, clip, skin, or tight-blade the surface using a maintainer or subgrade trimmer to a depth of approximately 1/4 in. Remove and dispose of loosened material at an approved location. Seal the clipped surface immediately by rolling using a pneumatic tire roller until a smooth surface is attained. Add small amounts of water as needed during rolling. Shape and maintain the course and surface in conformance with the typical sections, lines, and grades shown on the plans or as directed.

In areas where surfacing is to be placed, correct grade deviations in excess of 1/4 in. in 16 ft. measured longitudinally for the entire width of the cross-section. Correct by loosening, adding, or removing material. Reshape and recompact in accordance with Section 251.4.3., "Compaction."

- 4.6. **Curing.** Cure the finished section until the moisture content is at least 2% below optimum or as directed before applying the next successive course or prime coat.

5. MEASUREMENT

This Item will be measured by the station, square yard, cubic yard, or ton.

Square yard and cubic yard in original position measurement will be established by the widths and depths shown on the plans and the lengths measured in the field.

When material is measured in trucks, the weight of the material will be determined on certified scales, or the Contractor must provide a set of standard platform truck scales at a location approved. Scales must meet the requirements of Item 520, "Weighing and Measuring Equipment."

Measurement is further defined for payment as follows.

- 5.1. **Station.** By the 100-ft. station measured along the centerline of each roadbed.
- 5.2. **Square Yard.** By the square yard of existing base or pavement in its original position. When square yard measurement is used, limits of measurement will be as shown on the plans.
- 5.3. **Cubic Yard in Vehicle.** By the cubic yard of salvaged material in vehicles as delivered at the stockpile.
- 5.4. **Cubic Yard in Stockpile.** By the cubic yard of salvaged material in the final stockpile position by the method

of average end areas or as shown on the plans.

5.5. **Cubic Yard in Original Position.** By the cubic yard in its original position measured by the method of average end areas or as shown on the plans.

5.6. **Ton.** By the ton of dry weight in the trucks as delivered at the stockpile. The dry weight is determined by deducting the weight of the moisture in the material at the time of weighing from the gross weight of the material. The Engineer will determine the moisture content in the material in accordance with [Tex-103-E](#) from samples taken at the time of truck weighing.

6. PAYMENT

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 for "Reworking Base Material" for the type, scarified depth, and compaction method shown on the plans. For cubic yard measurements, the measurement location (vehicle, stockpile, or original position) will be specified. No additional payment will be made for thickness or width exceeding that shown on the typical sections or provided on the plans for station, square yard, and cubic yard in the original position measurement. This price is full compensation for furnishing and disposing of materials, blading, brooming, scarifying, salvaging, replacing, stockpiling, reshaping, refinishing, compacting, finishing, curing, equipment, labor, tools, and incidentals.

Furnishing and delivering new base will be paid for in accordance with Section 247.6.2., "Flexible Base (Roadway Delivery)." Mixing, spreading, blading, shaping, compacting, and finishing new or existing base material will not be paid for directly, but will be subsidiary to this Item.

Sprinkling and rolling, except proof rolling, will not be paid for directly, but will be subsidiary to this Item, unless otherwise shown on the plans. When proof rolling is shown on the plans or directed, it will be paid for in accordance with Item 216.

Where subgrade is constructed under this Contract, correction of soft spots in the subgrade or existing base will be at the Contractor's expense. Where subgrade is not constructed under this Contract, correction of soft spots in the subgrade or existing base will be in conformance with pertinent Items or in accordance with Article 4.4., "Changes in the Work."

Removal of existing asphalt concrete pavement will be paid for in conformance with pertinent Items or in accordance with Article 4.4., "Changes in the Work."

Additional restrictions for measurement and payment are as follows.

- **Type A.** Work will be restricted to station and square yard measurement.
- **Type B.** Work will be restricted to station, square yard, and cubic yard in the original position measurement.
- **Type C.** Work will be restricted to station, square yard, and cubic yard in the original position measurement.
- **Type D.** Work will be restricted to station and square yard measurement.

Item 341

Dense-Graded Hot-Mix Asphalt



1. DESCRIPTION

Construct a hot-mix asphalt (HMA) pavement layer composed of a compacted, dense-graded mixture of aggregate, asphalt binder, and additives mixed hot in a mixing plant. Payment adjustments will apply to HMA placed under this Specification unless the HMA is deemed exempt in accordance with Section 341.4.9.4., "Exempt Production."

2. MATERIALS

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

Notify the Engineer of all material sources and before changing any material source or formulation. The Engineer will verify that the specification requirements are met and document all material source changes when the Contractor makes a source or formulation change. The Engineer may sample and test project materials anytime during the project to verify specification compliance in accordance with Item 6, "Control of Materials."

2.1. **Aggregate.** Furnish aggregates from sources that conform to the requirements shown in Table 1 and this Section. Aggregate requirements in this Section, including those shown in Table 1, may be modified or eliminated when shown on the plans. Additional aggregate requirements may be specified when shown on the plans. Provide aggregate stockpiles that meet the definitions in this Section for coarse, intermediate, or fine aggregate. Aggregate from reclaimed asphalt pavement (RAP) is not required to meet Table 1 requirements unless otherwise shown on the plans. Supply aggregates that meet the definitions in [Tex-100-E](#) for crushed gravel or crushed stone. The Engineer will designate the plant or the quarry as the sampling location. Provide samples from materials produced for the project. The Engineer will establish the Surface Aggregate Classification (SAC) and perform Los Angeles abrasion, magnesium sulfate soundness, and Micro-Deval tests. Perform all other aggregate quality tests shown in Table 1. Document all test results in the mixture design report. The Engineer may perform tests on independent or split samples to verify Contractor test results. Stockpile aggregates for each source and type separately. Determine aggregate gradations for mixture design and production testing based on the washed sieve analysis in accordance with [Tex-200-F](#), Part II.

2.1.1. **Coarse Aggregate.** Coarse aggregate stockpiles must have no more than 20% material passing the No. 8 sieve. Aggregates from sources listed in the Department's *Bituminous Rated Source Quality Catalog* (BRSQC) are preapproved for use. Use only the rated values for HMA listed in the BRSQC. Rated values for surface treatment (ST) do not apply to coarse aggregate sources used in HMA.

For sources not listed in the Department's BRSQC:

- build an individual stockpile for each material;
- request the Department test the stockpile for specification compliance;
- allow 30 calendar days for the Engineer to sample, test, and report results;
- use only when tested and approved; and
- once approved, do not add additional material to the stockpile unless otherwise allowed by the Engineer.

Provide coarse aggregate with at least the minimum SAC shown on the plans. SAC requirements apply only to aggregates used on the surface of travel lanes, unless otherwise shown on the plans. The SAC for sources in the Department's *Aggregate Quality Monitoring Program (AQMP)* ([Tex-499-A](#)) is listed in the BRSQC.

- 2.1.1.1. **Blending Class A and Class B Aggregates.** Class B aggregate meeting all other requirements shown in Table 1 may be blended with a Class A aggregate to meet requirements for Class A materials, unless otherwise shown on the plans. When blending Class A and Class B aggregates to meet a Class A requirement, ensure that at least 50% by weight, or volume if required, of the material retained on the No. 4 sieve comes from the Class A aggregate source, unless otherwise shown on the plans. Blend by volume if the bulk specific gravities of the Class A and Class B aggregates differ by more than 0.300. Coarse aggregate from RAP and recycled asphalt shingles (RAS) will be considered as Class B aggregate for blending purposes.

The Engineer may perform tests anytime during production, when the Contractor blends Class A and Class B aggregates to meet a Class A requirement. The Engineer will use the Department's mix design template, when electing to verify conformance, to calculate the percent of Class A aggregate retained on the No. 4 sieve by inputting the bin percentages shown from readouts in the control room at the time of production and stockpile gradations measured at the time of production. The Engineer may determine the gradations based on either washed or dry sieve analysis from samples obtained from individual aggregate cold feed bins or aggregate stockpiles. The Engineer may perform spot checks to verify the percent of Class A aggregate retained on the No. 4 sieve. The Engineer will use the gradations supplied by the Contractor in the mixture design report as an input for the template. A failing spot check will require confirmation with a stockpile gradation determined by the Engineer.

- 2.1.1.2. **Micro-Deval Abrasion.** The Engineer will perform at least one Micro-Deval abrasion test in accordance with [Tex-461-A](#) for each coarse aggregate source used in the mixture design that has a rated source soundness magnesium (RSSM) loss value greater than 15 as listed in the BRSQC. The Engineer will perform testing before the start of production and may perform additional testing anytime during production. The Engineer may obtain the coarse aggregate samples from each coarse aggregate source or may require the Contractor to obtain the samples. The Engineer may waive all Micro-Deval testing based on a satisfactory test history of the same aggregate source.

The Engineer will estimate the magnesium sulfate soundness loss for each coarse aggregate source, when tested, using the following formula:

$$Mg_{est.} = (RSSM)(MD_{act.}/RSMD)$$

where:

$Mg_{est.}$ = magnesium sulfate soundness loss
 $RSSM$ = rated source soundness magnesium
 $MD_{act.}$ = actual Micro-Deval percent loss
 $RSMD$ = rated source Micro-Deval

When the estimated magnesium sulfate soundness loss is greater than the maximum magnesium sulfate soundness loss specified, the coarse aggregate source will not be allowed for use unless otherwise approved. The Engineer will consult the Materials and Tests Division, and additional testing may be required before granting approval.

- 2.1.2. **Intermediate Aggregate.** Aggregates not meeting the definition of coarse or fine aggregate will be defined as intermediate aggregate. Supply intermediate aggregates, when used, that are free of organic impurities. Supply intermediate aggregate from coarse aggregate sources, when used, that meet the requirements shown in Table 1, unless otherwise approved.

Test the stockpile if 10% or more of the stockpile is retained on the No. 4 sieve, and verify that it meets the requirements in Table 1 for crushed face count ([Tex-460-A](#)) and flat and elongated particles ([Tex-280-F](#)).

2.1.3. **Fine Aggregate.** Fine aggregates consist of manufactured sands, screenings, and field sands. Fine aggregate stockpiles must meet the fine aggregate properties in accordance with Table 1 and the gradation requirements in accordance with Table 2. Supply fine aggregates that are free of organic impurities. The Engineer may test the fine aggregate in accordance with [Tex-408-A](#) to verify the material is free of organic impurities. Unless otherwise shown on the plans, at most 10% of the total aggregate may be field sand or other uncrushed fine aggregate. Use fine aggregate, except field sand, from coarse aggregate sources that meet the requirements shown in Table 1, unless otherwise approved.

Test the stockpile if 10% or more of the stockpile is retained on the No. 4 sieve and verify that it meets the requirements in Table 1 for crushed face count ([Tex-460-A](#)) and flat and elongated particles ([Tex-280-F](#)).

Table 1
Aggregate Quality Requirements

Property	Test Method	Requirement
Coarse Aggregate		
SAC	Tex-499-A (AQMP)	As shown on the plans
Deleterious material, %, Max	Tex-217-F , Part I	1.5
Decantation, %, Max	Tex-217-F , Part II	1.5
Micro-Deval abrasion, %	Tex-461-A	Note ¹
Los Angeles abrasion, %, Max	Tex-410-A	40
Magnesium sulfate soundness, 5 cycles, %, Max	Tex-411-A	30
Crushed face count, ² %, Min	Tex-460-A , Part I	85
Flat and elongated particles @ 5:1, %, Max	Tex-280-F	10
Fine Aggregate		
Linear shrinkage, %, Max	Tex-107-E	3
Sand equivalent, %, Min	Tex-203-F	45 ³
Organic impurities	Tex-408-A	Note ⁴

1. Used to estimate the magnesium sulfate soundness loss in accordance with Section 341.2.1.1.2., "Micro-Deval Abrasion."
2. Only applies to crushed gravel.
3. The Department may perform [Tex-252-F](#) on fine aggregates not meeting this minimum requirement. Fine aggregates with a methylene blue value of 10.0 mg/g or less may be used.
4. Optional test.

Table 2
Gradation Requirements for Fine Aggregate

Sieve Size	% Passing by Wt. Or Volume
3/8"	100
#8	70-100
#200	0-30

2.2. **Mineral Filler.** Mineral filler consists of finely divided mineral matter such as agricultural lime, crusher fines, hydrated lime, or fly ash. Mineral filler is allowed unless otherwise shown on the plans. Use no more than 2% hydrated lime or fly ash, unless otherwise shown on the plans. Use no more than 1% hydrated lime if a substitute binder is used, unless otherwise shown on the plans or allowed. Test all mineral fillers except hydrated lime and fly ash in accordance with [Tex-107-E](#) to ensure specification compliance. The plans may require or disallow specific mineral fillers. Provide mineral filler, when used, that:

- is dry enough, free-flowing, and free of clumps and foreign matter as determined by the Engineer;
- does not exceed 3% linear shrinkage when tested in accordance with [Tex-107-E](#); and
- meets the gradation requirements shown in Table 3, unless otherwise shown on the plans.

Table 3
Gradation Requirements for Mineral Filler

Sieve Size	% Passing by Wt. or Volume
#8	100
#200	55–100

- 2.3. **Baghouse Fines.** Fines collected by the baghouse or other dust-collecting equipment may be reintroduced into the mixing drum.
- 2.4. **Asphalt Binder.** Furnish the type and grade of performance-graded (PG) asphalt binder shown on the plans that meets the requirements of Item 300, "Asphalts, Oils, and Emulsions."
- 2.5. **Tack Coat.** Furnish CSS-1H, SS-1H, EBL, or a PG binder with a minimum high-temperature grade of PG 58 for tack coat binder in accordance with Item 300. Specialized tack coat materials on the MPL for *Tracking Resistant Asphalt Interlayer (TRAIL)* will be allowed or required when shown on the plans. Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use, unless required in conformance with the manufacturer's recommendation for approved TRAIL products on the MPL.
- 2.6. **Additives.** Use the type of additive specified when shown on the plans. Use the rate of additive specified in conformance with the manufacturer's recommendation. Additives that facilitate mixing and compaction or improve the quality of the mixture are allowed when approved. Provide the Engineer with documentation such as the bill of lading showing the quantity of additives used in the project unless otherwise directed.
- 2.6.1. **Lime and Liquid Antistripping Agent.** Lime or liquid antistripping agent is required when shown on the plans. When lime or a liquid antistripping agent is used, add in accordance with Item 301, "Asphalt Antistripping Agents." Do not add lime directly into the mixing drum of any plant where lime is removed through the exhaust stream unless the plant has a baghouse or dust collection system that reintroduces the lime into the drum.
- 2.6.2. **Warm-Mix Asphalt (WMA).** WMA is defined as HMA that is produced within a target temperature discharge range of 215°F and 275°F using approved WMA additives or processes from the MPL.
- WMA is allowed for use on all projects and is required when shown on the plans. When WMA is required, the maximum placement or target discharge temperature for WMA will be set at a value at or below 275°F.
- Department-approved WMA additives or processes may be used to facilitate mixing and compaction of HMA produced at target discharge temperatures above 275°F; however, such mixtures will not be defined as WMA.
- 2.6.3. **Compaction Aid.** Compaction aid is defined as a Department-approved chemical warm-mix additive, denoted as "chemical additive" on the MPL, that is used to facilitate mixing and compaction of HMA at a discharge temperature greater than 275°F.
- Compaction aid is allowed for use on all projects. Compaction aid is required when shown on the plans or as required in Section 341.4.7.1., "Weather Conditions."
- Warm-mix foaming processes, denoted as "foaming process" on the MPL, may be used to facilitate mixing and compaction of HMA at target discharge temperatures greater than 275°F; however, warm-mix foaming processes are not defined as a compaction aid.
- 2.7. **Recycled Materials.** Use of RAP and RAS is permitted unless otherwise shown on the plans. Use of RAS is restricted to only intermediate and base mixes unless otherwise shown on the plans. Do not exceed the maximum allowable percentages of RAP and RAS in accordance with Table 4. The allowable percentages in accordance with Table 4 may be decreased or increased when shown on the plans. Determine the asphalt binder content and gradation of the RAP and RAS stockpiles for mixture design purposes in accordance with [Tex-236-F](#), Part I. The Engineer may verify the asphalt binder content of the stockpiles anytime during

production. Perform other tests on RAP and RAS when shown on the plans. Asphalt binder from RAP and RAS is designated as recycled asphalt binder. Calculate and ensure that the ratio of the recycled asphalt binder to total binder does not exceed the percentages in accordance with Table 5 during mixture design and HMA production when RAP or RAS is used. Use a separate cold feed bin for each stockpile of RAP and RAS during HMA production. Surface, intermediate, and base mixes referenced in Table 4 and Table 5 are defined as follows, unless otherwise shown on the plans.

- **Surface.** The final HMA lift placed at the top of the pavement structure.
- **Intermediate.** Mixtures placed below an HMA surface mix and less than or equal to 8.0 in. below the riding surface.
- **Base.** Mixtures placed greater than 8.0 in. below the riding surface. Unless otherwise shown on the plans, mixtures used for bond breaker are defined as base mixtures.

2.7.1.

RAP. RAP is salvaged, milled, pulverized, broken, or crushed asphalt pavement. Fractionated RAP is defined as a stockpile that contains RAP material with at least 95.0% passing the 1/2-in. sieve, before burning in the ignition oven, unless otherwise approved. The Engineer may allow the Contractor to use an alternate to the 1/2-in. screen to fractionate the RAP.

Use of Contractor-owned RAP, including HMA plant waste, is permitted unless otherwise shown on the plans. Department-owned RAP stockpiles are available for the Contractor's use when the stockpile locations are shown on the plans. If Department-owned RAP is available for the Contractor's use, the Contractor may use Contractor-owned fractionated RAP and replace it with an equal quantity of Department-owned RAP. Department-owned RAP generated by required work on the Contract is available for the Contractor's use when shown on the plans. Perform any necessary tests to ensure Contractor- or Department-owned RAP is appropriate for use. The Department will not perform any tests or assume any liability for the quality of the Department-owned RAP unless otherwise shown on the plans. The Contractor will retain ownership of RAP generated on the project when shown on the plans.

Do not use Department- or Contractor-owned RAP contaminated with dirt or other objectionable materials. Do not use Department- or Contractor-owned RAP if the decantation value exceeds 5% and the plasticity index is greater than 8. Test the stockpiled RAP for decantation in accordance with [Tex-406-A](#), Part I. Determine the plasticity index in accordance with [Tex-106-E](#) if the decantation value exceeds 5%. The decantation and plasticity index requirements do not apply to RAP samples with asphalt removed by extraction or ignition.

Do not intermingle Contractor-owned RAP stockpiles with Department-owned RAP stockpiles. Remove unused Contractor-owned RAP material from the project site upon completion of the project. Return unused Department-owned RAP to the designated stockpile location.

Table 4
Maximum Allowable Amounts of RAP¹

Maximum Allowable Fractionated RAP ² (%)			Maximum Allowable Unfractionated RAP ³ (%)		
Surface	Intermediate	Base	Surface	Intermediate	Base
20.0	30.0	40.0	10.0	10.0	10.0

1. Must also meet the recycled binder to total binder ratio shown in Table 5.
2. Up to 5% RAS may be used separately or as a replacement for fractionated RAP.
3. Unfractionated RAP may not be combined with fractionated RAP or RAS.

2.7.2.

RAS. RAS is defined as processed asphalt shingle material from manufacturing of asphalt roofing shingles or from re-roofing residential structures. Post-manufactured RAS is processed manufacturer's shingle scrap byproduct. Post-consumer RAS is processed shingle scrap removed from residential structures. Use of post-manufactured RAS or post-consumer RAS (tear-offs) is not permitted in surface mixtures unless otherwise shown on the plans. RAS may be used in intermediate and base mixtures unless otherwise shown on the

plans. Up to 3% RAS may be used separately or as a replacement for fractionated RAP in accordance with Table 4 and Table 5. RAS may be used separately or in conjunction with RAP. Comply with all regulatory requirements stipulated for RAS by TCEQ.

Process the RAS by ambient grinding or granulating such that 100% of the particles pass the 3/8-in. sieve when tested in accordance with [Tex-200-F](#), Part I. Perform a sieve analysis on processed RAS material before extraction (or ignition) of the asphalt binder.

Add sand meeting the requirements of Table 1 and Table 2, or fine RAP, to RAS stockpiles if needed to keep the processed material workable. Any stockpile that contains RAS will be considered a RAS stockpile and be limited to no more than 3.0% of the HMA mixture in accordance with Table 4.

Certify compliance of the RAS with [DMS-11000](#), "Evaluating and Using Nonhazardous Recyclable Materials Guidelines." Treat RAS as an established nonhazardous recyclable material if it has not come into contact with any hazardous materials. Use RAS from shingle sources on the MPL. Remove all materials that are not part of the shingle, such as wood, paper, metal, plastic, and felt paper, before use. Determine the deleterious content of RAS material for mixture design purposes in accordance with [Tex-217-F](#), Part III. Do not use RAS if deleterious materials are more than 0.5% of the stockpiled RAS, unless otherwise approved. Submit a sample for approval before submitting the mixture design. The Department will perform the testing for deleterious material of RAS to determine specification compliance.

2.8.

Substitute Binders. No binder substitution will be allowed when shown on the plans. The Contractor may use a substitute PG binder shown in Table 5 instead of the PG binder originally specified, if using recycled materials, and if the substitute PG binder and mixture made with the substitute PG binder meet the following.

- The substitute binder meets the specification requirements for the substitute binder grade in accordance with Section 300.2.11., "Performance-Graded Binders."
- The mixture has less than 10.0 mm of rutting on the Hamburg wheel test ([Tex-242-F](#)) after the number of passes required for the originally specified binder. Use of substitute PG binders may be allowed only at the discretion of the Engineer if the Hamburg wheel test results are between 10.0 mm and 12.5 mm.

Table 5
Allowable Substitute PG Binders and Maximum Recycled Binder Ratios

Originally Specified PG Binder	Allowable Substitute PG Binder	Maximum Ratio of Recycled Binder ¹ to Total Binder (%)		
		Surface	Intermediate	Base
HMA				
76-22 ²	70-22 or 64-22	20.0	20.0	20.0
	70-28 or 64-28	30.0	35.0	40.0
70-22 ²	64-22	20.0	20.0	20.0
	64-28 or 58-28	30.0	35.0	40.0
64-22 ²	58-28	30.0	35.0	40.0
76-28 ²	70-28 or 64-28	20.0	20.0	20.0
	64-34	30.0	35.0	40.0
70-28 ²	64-28 or 58-28	20.0	20.0	20.0
	64-34 or 58-34	30.0	35.0	40.0
64-28 ²	58-28	20.0	20.0	20.0
	58-34	30.0	35.0	40.0
WMA³				
76-22 ²	70-22 or 64-22	30.0	35.0	40.0
70-22 ²	64-22 or 58-28	30.0	35.0	40.0
64-22 ⁴	58-28	30.0	35.0	40.0
76-28 ²	70-28 or 64-28	30.0	35.0	40.0
70-28 ²	64-28 or 58-28	30.0	35.0	40.0
64-28 ⁴	58-28	30.0	35.0	40.0

1. Combined recycled binder from RAP and RAS.
2. Use no more than 20.0% recycled binder when using this originally specified PG binder.
3. WMA as defined in Section 341.2.6.2., "Warm Mix Asphalt (WMA)."
4. When used with WMA, this originally specified PG binder is allowed for use at the maximum recycled binder ratios shown in this table.

3. EQUIPMENT

Provide required or necessary equipment in accordance with Item 320, "Equipment for Asphalt Concrete Pavement."

4. CONSTRUCTION

Produce, haul, place, and compact the specified paving mixture. In addition to tests required in accordance with the Specification, the Contractor may perform other QC tests as necessary. Anytime during the project, the Engineer may perform production and placement tests as necessary in accordance with Item 5, "Control of the Work." Schedule and participate in a mandatory pre-paving meeting with the Engineer on or before the first day of paving unless otherwise shown on the plans.

- 4.1. **Certification.** Personnel certified by the Department-approved HMA certification program must conduct all mixture designs, sampling, and testing in accordance with Table 6. Supply the Engineer with a list of certified personnel and copies of their current certificates before beginning production and when personnel changes are made. Provide a mixture design developed and signed by a Level 2-certified specialist. Provide Level 1A-certified specialists at the plant during production operations. Provide Level 1B-certified specialists to conduct placement tests. Provide Level AGG101-certified specialists for aggregate testing.

Table 6
Test Methods, Test Responsibility, and Minimum Certification Levels

Test Description	Test Method	Contractor	Engineer	Level ¹
1. Aggregate and Recycled Material Testing				
Sampling	Tex-221-F	✓	✓	1A
Dry sieve	Tex-200-F, Part I	✓	✓	1A
Washed sieve	Tex-200-F, Part II	✓	✓	1A
Deleterious material	Tex-217-F, Parts I & III	✓	✓	1A
Decantation	Tex-217-F, Part II	✓	✓	1A
Los Angeles abrasion	Tex-410-A		✓	TxDOT
Magnesium sulfate soundness	Tex-411-A		✓	TxDOT
Micro-Deval abrasion	Tex-461-A		✓	2
Crushed face count	Tex-460-A	✓	✓	2
Flat and elongated particles	Tex-280-F	✓	✓	2
Linear shrinkage	Tex-107-E	✓	✓	2
Sand equivalent	Tex-203-F	✓	✓	2
Organic impurities	Tex-408-A	✓	✓	2
2. Asphalt Binder & Tack Coat Sampling				
Asphalt binder sampling	Tex-500-C, Part II	✓	✓	1A/1B
Tack coat sampling	Tex-500-C, Part III	✓	✓	1A/1B
3. Mix Design & Verification				
Design and JMF changes	Tex-204-F	✓	✓	2
Mixing	Tex-205-F	✓	✓	2
Molding (TGC)	Tex-206-F	✓	✓	1A
Molding (SGC)	Tex-241-F	✓	✓	1A
Laboratory-molded density	Tex-207-F	✓	✓	1A
VMA ² (calculation only)	Tex-204-F	✓	✓	2
Rice gravity	Tex-227-F	✓	✓	1A
Ignition oven correction factors ³	Tex-236-F	✓	✓	2
Indirect tensile strength	Tex-226-F	✓	✓	2
Hamburg Wheel test	Tex-242-F	✓	✓	2
Boil test	Tex-530-C	✓	✓	1A
4. Production Testing				
Selecting production random numbers	Tex-225-F, Part I		✓	1A
Mixture sampling	Tex-222-F	✓	✓	1A
Molding (TGC)	Tex-206-F	✓	✓	1A
Molding (SGC)	Tex-241-F	✓	✓	1A
Laboratory-molded density	Tex-207-F	✓	✓	1A
VMA ² (calculation only)	Tex-204-F	✓	✓	1A
Rice gravity	Tex-227-F	✓	✓	1A
Gradation & asphalt binder content ³	Tex-236-F	✓	✓	1A
Control charts	Tex-233-F	✓	✓	1A
Moisture content	Tex-212-F	✓	✓	1A
Hamburg Wheel test	Tex-242-F	✓	✓	2
Micro-Deval abrasion	Tex-461-A		✓	2
Boil test	Tex-530-C	✓	✓	1A
Abson recovery	Tex-211-F		✓	TxDOT
Overlay test	Tex-248-F		✓	TxDOT
Cantabro loss	Tex-245-F		✓	2
5. Placement Testing				
Selecting placement random numbers	Tex-225-F, Part II		✓	1A/1B
Trimming roadway cores	Tex-207-F	✓	✓	1A/1B
In-place air voids	Tex-207-F	✓	✓	1A/1B
Establish rolling pattern	Tex-207-F	✓		1B
Control charts	Tex-233-F	✓	✓	1A
Ride quality measurement	Tex-1001-S	✓	✓	Note 4
Segregation (density profile)	Tex-207-F, Part V	✓	✓	1B
Longitudinal joint density	Tex-207-F, Part VII	✓	✓	1B
Thermal profile	Tex-244-F	✓	✓	1B

1. Level 1A, 1B, and 2 are certification levels provided by the Hot Mix Asphalt Center certification program.
2. Voids in mineral aggregates.
3. Refer to Section 341.4.9.2.3, "Production Testing," for exceptions to using an ignition oven.
4. Profiler and operator are required to be certified at the Texas A&M Transportation Institute facility when Surface Test Type B is specified.

4.2. **Reporting and Responsibilities.** Use Department-provided templates to record and calculate all test data, including mixture design, production and placement QC and QA, control charts, thermal profiles, segregation density profiles, and longitudinal joint density. Obtain the current version of the templates from the Department’s website or from the Engineer. The Engineer and the Contractor will provide any available test results to the other party when requested. The maximum allowable time for the Contractor and Engineer to exchange test data is as shown in Table 7, unless otherwise approved. The Engineer and the Contractor will immediately report to the other party any test result that requires suspension of production or placement, or a payment adjustment less than 1.000, or that fails to meet the specification requirements. Record and electronically submit all test results and pertinent information on Department-provided templates.

Subsequent sublots placed after test results are available to the Contractor, which require suspension of operations, may be considered unauthorized work. Unauthorized work will be accepted or rejected at the discretion of the Engineer in accordance with Article 5.3., “Conformity with Plans, Specifications, and Special Provisions.”

Table 7
Reporting Schedule

Description	Reported By	Reported To	To Be Reported Within
Production Quality Control			
Gradation ¹	Contractor	Engineer	1 working day of completion of the sublot
Asphalt binder content ¹			
Laboratory-molded density ²			
Moisture content ³			
Boil test ³			
Production Quality Assurance			
Gradation ³	Engineer	Contractor	1 working day of completion of the sublot
Asphalt binder content ³			
Laboratory-molded density ¹			
Hamburg Wheel test ²			
Boil test ³			
Binder tests ²			
Placement Quality Control			
In-place air voids ²	Contractor	Engineer	1 working day of completion of the lot
Segregation ¹			
Longitudinal joint density ¹			
Thermal profile ¹			
Placement Quality Assurance			
In-place air voids ¹	Engineer	Contractor	1 working day of receipt of the trimmed cores for in-place air voids ⁴
Segregation ²			
Longitudinal joint density ²			
Thermal profile ²			
Aging ratio ²			
Payment adjustment summary	Engineer	Contractor	2 working days of performing all required tests and receiving Contractor test data

1. These tests are required on every sublot.
2. Optional test. To be reported as soon as results become available.
3. To be performed at the frequency specified on the plans.
4. 2 days are allowed if cores cannot be dried to constant weight within 1 day.

The Engineer will use the Department-provided template to calculate all payment adjustment factors for the lot. Sublot samples may be discarded after the Engineer and Contractor sign off on the payment adjustment summary documentation for the lot.

Use the procedures described in [Tex-233-F](#) to plot the results of all QC and QA testing. Update the control charts as soon as test results for each sublot become available. Make the control charts readily accessible at the field laboratory. The Engineer may suspend production for failure to update control charts.

- 4.3. **Quality Control Plan (QCP).** Develop and follow the QCP in detail. Obtain approval for changes to the QCP made during the project. The Engineer may suspend operations if the Contractor fails to comply with the QCP.

Submit a written QCP before the mandatory pre-paving meeting. Receive approval of the QCP before beginning production. Include the following items in the QCP.

- 4.3.1. **Project Personnel.** For project personnel, include:

- a list of individuals responsible for QC with authority to take corrective action,
- current contact information for each individual listed, and
- current copies of certification documents for individuals performing specified QC functions.

- 4.3.2. **Material Delivery and Storage.** For material delivery and storage, include:

- the sequence of material processing, delivery, and minimum quantities to assure continuous plant operations;
- aggregate stockpiling procedures to avoid contamination and segregation;
- frequency, type, and timing of aggregate stockpile testing to assure conformance with material requirements before mixture production; and
- procedure for monitoring the quality and variability of asphalt binder.

- 4.3.3. **Production.** For production, include:

- loader operation procedures to avoid contamination in cold bins;
- procedures for calibrating and controlling cold feeds;
- procedures to eliminate debris or oversized material;
- procedures for adding and verifying rates of each applicable mixture component (e.g., aggregate, asphalt binder, RAP, RAS, lime, liquid antistripping, compaction aid, foaming process, and WMA);
- procedures for reporting job control test results; and
- procedures to avoid segregation and drain-down in the silo.

- 4.3.4. **Loading and Transporting.** For loading and transporting, include:

- type and application method for release agents, and
- truck-loading procedures to avoid segregation.

- 4.3.5. **Placement and Compaction.** For placement and compaction, include:

- proposed agenda for mandatory pre-paving meeting, including date and location;
- proposed paving plan (e.g., production rate, paving widths, joint offsets, and lift thicknesses);
- type and application method for release agents in the paver and on rollers, shovels, lutes, and other utensils;
- procedures for the transfer of mixture into the paver while avoiding physical and thermal segregation and preventing material spillage;
- process to balance production, delivery, paving, and compaction to achieve continuous placement operations and good ride quality;
- paver operations (e.g., speed, operation of wings, and height of mixture in auger chamber) to avoid physical and thermal segregation and other surface irregularities; and
- procedures to construct quality longitudinal and transverse joints.

- 4.4. **Mixture Design.**

- 4.4.1. **Design Requirements.** Use the dense-graded design procedure provided in [Tex-204-F](#), unless otherwise shown on the plans. Design the mixture to meet the requirements shown in Tables 1, 2, 3, 4, 5, 8, 9, and 10.

Design the mixture using an SGC, and 50 gyrations as the design number of gyrations (Ndesign). Use a target laboratory-molded density of 96.0% to design the mixture; however, adjustments can be made to the Ndesign value as shown in Table 9. The Ndesign level may be reduced to at least 35 gyrations at the Contractor's discretion.

Use a Department-approved laboratory on the MPL to perform the Hamburg wheel test and provide results with the mixture design, or provide the laboratory mixture and request that the Department perform the Hamburg wheel test. Upon receiving the sample from the Contractor, the Engineer will be allowed 10 working days to provide the Contractor with Hamburg wheel test results on the laboratory mixture design.

The Engineer will provide the mixture design when shown on the plans. The Contractor may submit a new mixture design anytime during the project. The Engineer will verify and approve all mixture designs (JMF1) before the Contractor can begin production.

Provide the Engineer with a mixture design report using the Department-provided template. Include the following items in the report:

- the combined aggregate gradation, source, specific gravity, and percent of each material used;
- the binder source and optimum design asphalt content;
- asphalt binder content and aggregate gradation of RAP and RAS stockpiles;
- the Ndesign level used on the SGC;
- results of all applicable tests;
- the mixing and molding temperatures;
- the signature of the Level 2 person or persons who performed the design;
- the date the mixture design was performed; and
- a unique identification number for the mixture design.

Table 8
Master Gradation Limits (% Passing by Weight or Volume) and VMA Requirements

Sieve Size	A Coarse Base	B Fine Base	C Coarse Surface	D Fine Surface	F Fine Mixture
2"	100.0 ¹	–	–	–	–
1-1/2"	98.0–100.0	100.0 ¹	–	–	–
1"	78.0–94.0	98.0–100.0	100.0 ¹	–	–
3/4"	64.0–85.0	84.0–98.0	95.0–100.0	100.0 ¹	–
1/2"	50.0–70.0	–	–	98.0–100.0	100.0 ¹
3/8"	–	60.0–80.0	70.0–85.0	85.0–100.0	98.0–100.0
#4	30.0–50.0	40.0–60.0	43.0–63.0	50.0–70.0	70.0–90.0
#8	22.0–36.0	29.0–43.0	32.0–44.0	35.0–46.0	38.0–48.0
#30	8.0–23.0	13.0–28.0	14.0–28.0	15.0–29.0	12.0–27.0
#50	3.0–19.0	6.0–20.0	7.0–21.0	7.0–20.0	6.0–19.0
#200	2.0–7.0	2.0–7.0	2.0–7.0	2.0–7.0	2.0–7.0
Design VMA, % Minimum					
–	12.0	13.0	14.0	15.0	16.0
Production (Plant-Produced) VMA, % Minimum					
–	11.5	12.5	13.5	14.5	15.5

1. Defined as maximum sieve size. No tolerance allowed.

**Table 9
Laboratory Mixture Design Properties**

Mixture Property	Test Method	Requirement
Target laboratory-molded density, % (TGC)	Tex-207-F	96.5 ¹
Design gyrations (N _{design} for SGC)	Tex-241-F	50 ²
Indirect tensile strength (dry), psi	Tex-226-F	85–200 ³
Boil test ⁴	Tex-530-C	–

1. Increase to 97.0% or 97.5% at the Contractor's discretion or when shown on the plans or specification.
2. Adjust within a range of 35–100 gyrations when shown on the plans or specification or when mutually agreed between the Engineer and Contractor.
3. The Engineer 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.
4. Used to establish baseline for comparison to production results. May be waived when approved.

**Table 10
Hamburg Wheel Test Requirements**

High-Temperature Binder Grade	Test Method	Minimum # of Passes @ 12.5 mm ¹ Rut Depth, Tested @ 50°C
PG 64 or lower	Tex-242-F	10,000 ²
PG 70		15,000 ³
PG 76 or higher		20,000

1. When the rut depth at the required minimum number of passes is less than 3 mm, the Engineer may require the Contractor to increase the target laboratory-molded density (TGC) by 0.5% to no more than 97.5% or lower the N_{design} level (SGC) to no less than 35 gyrations.
2. May be decreased to no less than 5,000 passes when shown on the plans.
3. May be decreased to no less than 10,000 passes when shown on the plans.

4.4.2. **Job-Mix Formula Approval.** The JMF is the combined aggregate gradation, design level, and target asphalt percentage used to establish target values for hot-mix production. JMF1 is the original laboratory mixture design used to produce the trial batch. When WMA is used, JMF1 may be designed and submitted to the Engineer without including the WMA additive, foaming process, or compaction aid. When WMA or a compaction aid is used, document the additive or process used and recommended rate in the JMF1 submittal. The Engineer and the Contractor will verify JMF1 based on plant-produced mixture from the trial batch, unless otherwise approved. The Engineer may accept an existing mixture design previously used on a Department project and may waive the trial batch to verify JMF1. The Department may require the Contractor to reimburse the Department for verification tests if more than two trial batches per design are required.

4.4.2.1. **Contractor's Responsibilities.**

4.4.2.1.1. **Providing Superpave Gyrotory Compactor.** Provide an SGC in accordance with Item 504, "Field Office and Laboratory," and make the SGC available to the Engineer for use in molding production samples.

4.4.2.1.2. **Gyrotory Compactor Correlation Factors.** Use [Tex-206-F](#), Part II, to perform a gyrotory compactor correlation when the Engineer uses a different SGC. Apply the correlation factor to all subsequent production test results.

4.4.2.1.3. **Submitting JMF1.** Furnish a mix design report (JMF1) with representative samples of all component materials and request approval to produce the trial batch. Provide approximately 25 lb. of the design mixture if opting to have the Department perform the Hamburg wheel test on the laboratory mixture, and request that the Department perform the test.

4.4.2.1.4. **Supplying Aggregates.** Provide approximately 40 lb. of each aggregate stockpile unless otherwise directed.

4.4.2.1.5. **Supplying Asphalt.** Provide at least 1 gal. of the asphalt material and enough quantities of any additives proposed for use.

- 4.4.2.1.6. **Ignition Oven Correction Factors.** Notify the Engineer before performing [Tex-236-E](#), Part II. Allow the Engineer to witness the mixing of ignition oven correction factor sample. Determine the aggregate and asphalt correction factors from the ignition oven in accordance with [Tex-236-F](#), Part II.
- If the Engineer witnesses the mixing of the ignition oven correction factor samples, provide the Engineer with identically prepared samples of the mixtures before the trial batch production, including all additives (except water), and blank samples used to determine the correction factors for the ignition oven used for QA testing during production.
- Correction factors established from a previously approved mixture design may be used for the current mixture design if the mixture design and ignition oven are the same as previously used, unless otherwise directed. Correction factors must be performed every 12 mo.
- 4.4.2.1.7. **Boil Test.** When shown on the plans, perform the test and retain the tested sample from [Tex-530-C](#) until completion of the project or as directed. Use this sample for comparison purposes during production.
- 4.4.2.1.8. **Trial Batch Production.** Provide a plant-produced trial batch upon receiving conditional approval of JMF1 and authorization to produce a trial batch. If applicable, include the WMA additive, foaming process, or compaction aid for verification testing of JMF1 and development of JMF2. Produce a trial batch mixture that meets the requirements shown in Tables 4, 5, and 11. The Engineer may accept test results from recent production of the same mixture instead of a new trial batch.
- 4.4.2.1.9. **Trial Batch Production Equipment.** Use only equipment and materials proposed for use on the project to produce the trial batch.
- 4.4.2.1.10. **Trial Batch Quantity.** Produce enough quantity of the trial batch to ensure that the mixture meets the specification requirements.
- 4.4.2.1.11. **Number of Trial Batches.** Produce trial batches as necessary to obtain a mixture that meets the specification requirements.
- 4.4.2.1.12. **Trial Batch Sampling.** Obtain a representative sample of the trial batch and split it into three equal portions in accordance with [Tex-222-F](#). Label these portions as "Contractor," "Engineer," and "Referee." Deliver samples to the appropriate laboratory as directed.
- 4.4.2.1.13. **Trial Batch Testing.** Test the trial batch to ensure the mixture produced using the proposed JMF1 meets the mixture requirements shown in Table 11. Ensure the trial batch mixture is also in compliance with the Hamburg wheel requirement shown in Table 10. Use a Department-approved laboratory listed on the MPL to perform the Hamburg wheel test on the trial batch mixture, or request that the Department perform the Hamburg wheel test. Provide approximately 25 lb. of the trial batch mixture if opting to have the Department perform the Hamburg wheel test, and request that the Department perform the test. Upon receiving the sample from the Contractor, the Engineer will be allowed 10 working days to provide the Contractor with Hamburg wheel test results on the trial batch. Provide the Engineer with a copy of the trial batch test results.
- 4.4.2.1.14. **Development of JMF2.** After the Engineer grants full approval of JMF1, evaluate the trial batch test results, determine the optimum mixture proportions, and submit as JMF2. Adjust the asphalt binder content or gradation to achieve the specified target laboratory-molded density. The asphalt binder content established for JMF2 is not required to be within any tolerance of the optimum asphalt binder content established for JMF1; however, mixture produced using JMF2 must meet the VMA requirements for production shown in Table 8. If the optimum asphalt binder content for JMF2 is more than 0.5% lower than the optimum asphalt binder content for JMF1, the Engineer may perform or require the Contractor to perform [Tex-226-F](#) on Lot 1 production to confirm the indirect tensile strength does not exceed 200 psi. Verify that JMF2 meets the mixture requirements shown in Table 4 and Table 5.

- 4.4.2.1.15. **Mixture Production.** Use JMF2 to produce Lot 1 in accordance with Section 341.4.9.3.1.1., “Lot 1 Placement,” after receiving approval for JMF2 and a passing Hamburg wheel result on the trial batch from a laboratory listed on the MPL. Once JMF2 is approved, and without receiving the results from the Department’s Hamburg wheel test on the trial batch, the Contractor may proceed to Lot 1 production at their own risk.
- Notify the Engineer if electing to proceed without Hamburg wheel test results from the trial batch. Note that the Engineer may require up to the entire subplot of any mixture failing the Hamburg wheel test to be removed and replaced at the Contractor’s expense.
- 4.4.2.1.16. **Development of JMF3.** Evaluate the test results from Lot 1, determine the optimum mixture proportions, and submit as JMF3 for use in Lot 2.
- 4.4.2.1.17. **JMF Adjustments.** If JMF adjustments are necessary to achieve the specified requirements, make the adjustments before beginning a new lot. The adjusted JMF must:
- be provided to the Engineer in writing before the start of a new lot,
 - be numbered in sequence to the previous JMF,
 - meet the mixture requirements in accordance with Table 4 and Table 5,
 - meet the master gradation limits in accordance with Table 8, and
 - be within the operational tolerances of JMF2 in accordance with Table 11.
- 4.4.2.1.18. **Requesting Referee Testing.** Use referee testing, if needed, in accordance with Section 341.4.9.1., “Referee Testing,” to resolve testing differences with the Engineer.

**Table 11
Operational Tolerances**

Description	Test Method	Allowable Difference Between Trial Batch and JMF1 Target	Allowable Difference from Current JMF Target	Allowable Difference between Contractor and Engineer ¹
Individual % retained for #8 sieve and larger	Tex-200-F or Tex-236-F	Must be Within Master Grading Limits in Table 8	±5.0 ^{2,3}	±5.0
Individual % retained for sieves smaller than #8 and larger than #200			±3.0 ^{2,3}	±3.0
% passing the #200 sieve			±2.0 ^{2,3}	±1.6
Asphalt binder content, %	Tex-236-F	±0.5	±0.3 ³	±0.3
Laboratory-molded density, %	Tex-207-F	±1.0	±1.0	±1.0
In-place air voids, %		N/A	N/A	±1.0
Laboratory-molded bulk specific gravity		N/A	N/A	±0.020
VMA, %, min	Tex-204-F	Note 4	Note 4	N/A
Theoretical maximum specific (Rice) gravity	Tex-227-F	N/A	N/A	±0.020

1. Contractor may request referee testing only when values exceed these tolerances.
2. When within these tolerances, mixture production gradations may fall outside the master grading limits; however, the % passing the #200 will be considered out of tolerance when outside the master grading limits.
3. Only applies to mixture produced for Lot 1 and higher.
4. Test and verify that Table 8 requirements are met.

- 4.4.2.2. **Engineer’s Responsibilities.**
- 4.4.2.2.1. **Superpave Gyrotory Compactor.** The Engineer will use a Department SGC, calibrated in accordance with [Tex-241-F](#), to mold samples for laboratory mixture design verification. For molding trial batch and production specimens, the Engineer will use the Contractor-provided SGC at the field laboratory or provide and use a Department SGC at an alternate location.
- 4.4.2.2.2. **Conditional Approval of JMF1 and Authorizing Trial Batch.** The Engineer will review and verify conformance with the following information within 2 working days of receipt:
- the Contractor’s mix design report (JMF1);

- the Contractor-provided Hamburg wheel test results;
- all required materials including aggregates, asphalt, additives, and recycled materials; and
- the mixture specifications.

The Engineer will grant the Contractor conditional approval of JMF1 if the information provided on the paper copy of JMF1 indicates that the Contractor's mixture design meets the specifications. When the Contractor does not provide Hamburg wheel test results with laboratory mixture design, 10 working days are allowed for conditional approval of JMF1. The Engineer will base full approval of JMF1 on the test results on mixture from the trial batch.

Unless waived, the Engineer will determine the Micro-Deval abrasion loss in accordance with Section 341.2.1.1.2., "Micro-Deval Abrasion." If the Engineer's test results are pending after 2 working days, conditional approval of JMF1 will still be granted within 2 working days of receiving JMF1. When the Engineer's test results become available, they will be used for specification compliance.

The Contractor is authorized to produce a trial batch after the Engineer grants conditional approval of JMF1.

4.4.2.2.3. **Hamburg Wheel Testing of JMF1.** If the Contractor requests the option to have the Department perform the Hamburg wheel test on the laboratory mixture, the Engineer will mold samples in accordance with [Tex-242-F](#) to verify compliance with the Hamburg wheel test requirement shown in Table 10. Upon receiving the sample from the Contractor, the Engineer will be allowed 10 working days to provide the Contractor with Hamburg wheel test results on the laboratory mixture design.

4.4.2.2.4. **Ignition Oven Correction Factors.** The Engineer will determine ignition oven correction factors by one of the following options.

- Witness the mixing of ignition oven correction factor samples by the Contractor in accordance with [Tex-236-F](#), Part III. The Engineer will use the identically prepared samples provided by the Contractor to determine the aggregate and asphalt correction factors for the ignition oven in accordance with [Tex-236-F](#), Part II.
- If the Engineer does not witness the mixing of ignition oven correction factor samples, the Engineer will prepare the samples to determine the aggregate and asphalt correction factors for the ignition oven in accordance with [Tex-236-F](#), Part II. Notify the Contractor before performing [Tex-236-F](#), Part II. Allow the Contractor to witness the Engineer performing [Tex-236-F](#), Part II.

Correction factors must be performed every 12 mo. to be used for QA testing during production.

4.4.2.2.5. **Testing the Trial Batch.** Within 1 full working day, the Engineer will sample and test the trial batch to ensure that the mixture meets the requirements shown in Table 11. If the Contractor requests the option to have the Department perform the Hamburg wheel test on the trial batch mixture, the Engineer will mold samples in accordance with [Tex-242-F](#) to verify compliance with the Hamburg wheel test requirement shown in Table 10.

The Engineer will have the option to perform the following tests on the trial batch.

- [Tex-226-F](#), to verify that the indirect tensile strength meets the requirement shown in Table 9.
- [Tex-530-C](#), to retain and use for comparison purposes during production.

4.4.2.2.6. **Full Approval of JMF1.** The Engineer will grant full approval of JMF1 and authorize the Contractor to proceed with developing JMF2 if the Engineer's results for the trial batch meet the requirements shown in Tables 8, 9, and 10. The Engineer will notify the Contractor that an additional trial batch is required if the trial batch does not meet these requirements.

4.4.2.2.7. **Approval of JMF2.** The Engineer will approve JMF2 within 1 working day if the mixture meets the requirements shown in Table 5 and Table 8. The asphalt binder content established for JMF2 is not required

to be within any tolerance of the optimum asphalt binder content established for JMF1; however, mixture produced using JMF2 must meet the VMA requirements shown in Table 8. If the optimum asphalt binder content for JMF2 is more than 0.5% lower than the optimum asphalt binder content for JMF1, the Engineer may perform or require the Contractor to perform [Tex-226-F](#) on Lot 1 production to confirm the indirect tensile strength does not exceed 200 psi.

- 4.4.2.2.8. **Approval of Lot 1 Production.** The Engineer will authorize the Contractor to proceed with JMF2 for Lot 1 production after a passing Hamburg wheel test result on the trial batch is achieved from a laboratory listed on the MPL. The Contractor may proceed at their own risk with Lot 1 production without the results from the Hamburg wheel test on the trial batch.

If the Department-approved laboratory's sample from the trial batch fails the Hamburg wheel test, the Engineer will suspend production until further Hamburg wheel tests meet the specified values. The Engineer may require up to the entire subplot of any mixture failing the Hamburg wheel test be removed and replaced at the Contractor's expense.

- 4.4.2.2.9. **Approval of JMF3 and Subsequent JMF Changes.** JMF3 and subsequent JMF changes are approved if they meet the mixture requirements shown in Table 4 and Table 5, and the master gradation limits shown in Table 8, and they are within the operational tolerances of JMF2 shown in Table 11. The addition of a WMA additive to facilitate mixing or as a compaction aid does not require a new laboratory mixture design or trial batch. Current JMF changes that exceed the operational tolerances of JMF2 in accordance with Table 11 may require a new laboratory mixture design, trial batch, or both.

- 4.5. **Production Operations.** Perform a new trial batch when the plant or plant location is changed. All source changes for asphalt will require a passing Hamburg wheel test result from a laboratory listed on the MPL. The Contractor may proceed at their own risk with Lot 1 production without the results from the Hamburg wheel test on the trial batch. All aggregate source changes will require a new laboratory mixture design and trial batch. Take corrective action and receive approval to proceed after any production suspension for noncompliance with the specification. Submit a new mix design and perform a new trial batch when the asphalt binder content of:

- any RAP stockpile used in the mix is more than 0.5% higher than the value shown in the mixture design report, or
- RAS stockpile used in the mix is more than 2.0% higher than the value shown in the mixture design report.

- 4.5.1. **Storage and Heating of Materials.** Do not heat the asphalt binder above the temperatures specified in Item 300, or outside the manufacturer's recommended values. Provide the Engineer with daily records of asphalt binder and HMA discharge temperatures (in legible and discernible increments) in accordance with Item 320, unless otherwise directed. Do not store mixture for a period long enough to affect the quality of the mixture, nor in any case longer than 12 hr. unless otherwise approved.

- 4.5.2. **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 the maximum production temperatures shown in Table 12. The Department will not pay for or allow placement of any mixture produced above the maximum production temperatures shown in Table 12.

Table 12
Max Production Temperature

High-Temperature Binder Grade ¹	Max Production Temperature (°F)
PG 64	325 ²
PG 70	335 ²
PG 76	345 ²

1. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
2. The Max production temperature of WMA is 275°F.

Produce WMA within the target discharge temperature range of 215–275°F when WMA is required. Take corrective action anytime the discharge temperature of the WMA exceeds the target discharge range. The Engineer may suspend production operations if the Contractor's corrective action is not successful at controlling the production temperature within the target discharge range. Note that when WMA is produced, it may be necessary to adjust burners to ensure complete combustion such that no burner fuel residue remains in the mixture.

Control the mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant. Determine the moisture content, if requested, 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.

- 4.6. **Hauling Operations.** Clean all truck beds before use to ensure that mixture is not contaminated. Use a release agent listed on the MPL to coat the inside bed of the truck when necessary. Do not use diesel or any release agent not listed on the MPL.

Use equipment for hauling as defined in Section 341.4.7.3.3., "Hauling Equipment." Use other hauling equipment only when allowed.

- 4.7. **Placement Operations.** Collect haul tickets from each load of mixture delivered to the project and provide the Department's copy to the Engineer approximately every hour, or as directed. Use a handheld thermal camera or infrared thermometer, when a thermal imaging system is not used, to measure and record the internal temperature of the mixture as discharged from the truck or material transfer device (MTD) before or as the mix enters the paver. Measure the mixture temperature at a minimum frequency of one per ten trucks, or as approved. Include an approximate station number or Global Positioning System coordinates of the location where the temperature was taken on each ticket. Ensure the mixture meets the temperature requirements shown in Table 12. Calculate the daily yield and cumulative yield for the specified lift and provide to the Engineer at the end of paving operations for each day unless otherwise directed. The Engineer may suspend production if the Contractor fails to produce and provide haul tickets and yield calculations by the end of paving operations for each day.

Prepare the surface by removing raised pavement markers and objectionable material such as moisture, dirt, sand, leaves, and other loose impediments from the surface before placing mixture. Remove vegetation from pavement edges. Place the mixture to meet the typical section requirements and produce a smooth, finished surface with a uniform appearance and texture. Offset longitudinal joints of successive courses of hot mix by at least 6 in. Place mixture so that longitudinal joints on the surface course coincide within 6 in. of lane lines, are not placed in the wheel path, or will not be covered with pavement markings, or as directed. Ensure that all finished surfaces will drain properly. Place the mixture at the rate or thickness shown on the plans. The Engineer will use the guidelines shown in Table 13 to determine the compacted lift thickness of each layer when multiple lifts are required. The thickness determined is based on the rate of 110 lb. per square yard for each inch of pavement, unless otherwise shown on the plans.

Table 13
Compacted Lift Thickness and Required Core Height

Mixture Type	Compacted Lift Thickness Guidelines		Min Untrimmed Core Height Eligible for Testing (in.)
	Min (in.)	Max (in.)	
DG-B	2.50	5.00	1.75
DG-C	2.00	4.00	1.50
DG-D	1.50	3.00	1.25
DG-F	1.25	2.50	1.25

4.7.1. **Weather Conditions.**

4.7.1.1. **When Using a Thermal Imaging System.** Place mixture when the roadway surface is dry and the roadway surface temperature is at or above the temperatures shown in Table 14A, unless otherwise approved or as shown on the plans. Place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable as determined by the Engineer. Provide output data from the thermal imaging system to demonstrate to the Engineer that no recurring severe thermal segregation exists in accordance with Section 341.4.7.3.1.2., "Thermal Imaging System."

Table 14A
Min Pavement Surface Temperatures

High-Temperature Binder Grade ¹	Min Pavement Surface Temperatures (°F)	
	Subsurface Layers	Surface Layers
PG 64	35	40
PG 70	45 ²	50 ²
PG 76	45 ²	50 ²

1. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
2. The Contractor may pave at temperatures 10°F lower than these values when a chemical WMA additive is used as a compaction aid in the mixture or when using WMA.

4.7.1.2. **When Not Using a Thermal Imaging System.** When using a thermal camera instead of the thermal imaging system, place mixture when the roadway surface temperature is at or above the temperatures shown in Table 14B, unless otherwise approved or as shown on the plans. Measure the roadway surface temperature using a handheld thermal camera or infrared thermometer. The Engineer may allow mixture placement to begin before the roadway surface reaches the required temperature if conditions are such that the roadway surface will reach the required temperature within 2 hr. of beginning placement operations. Place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable as determined by the Engineer.

Table 14B
Min Pavement Surface Temperatures

High-Temperature Binder Grade ¹	Min Pavement Surface Temperatures (°F)	
	Subsurface Layers	Surface Layers
PG 64	45	50
PG 70	55 ²	60 ²
PG 76	60 ²	60 ²

1. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
2. The Contractor may pave at temperatures 10°F lower than these values when a chemical WMA additive is used as a compaction aid in the mixture, when using WMA, or when using a paving process with equipment that eliminates thermal segregation. In such cases, for each subplot and in the presence of the Engineer, use a handheld thermal camera operated in accordance with [Tex-244-F](#) to demonstrate to the satisfaction of the Engineer that the uncompacted mat has no more than 10°F of thermal segregation.

4.7.2. **Tack Coat.**

4.7.2.1. **Application.** Clean the surface before placing the tack coat. The Engineer will set the rate between 0.04 and 0.10 gal. of residual asphalt per square yard of surface area. Apply a uniform tack coat at the specified rate unless otherwise directed. Apply the tack coat in a uniform manner to avoid streaks and other irregular patterns. Apply the tack coat to all surfaces that will come in contact with the subsequent HMA placement, unless otherwise directed. Apply adequate overlap of the tack coat in the longitudinal direction during placement of the mat to ensure bond of adjacent mats, unless otherwise directed. Allow adequate time for emulsion to break completely before placing any material. Prevent splattering of tack coat when placed adjacent to curb, gutter, and structures. Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use, unless required in conformance with the manufacturer’s recommendation for approved TRAIL product use, or when shown on the plans.

4.7.2.2. **Sampling.** The Engineer will obtain at least one sample of the tack coat binder per project per source in accordance with [Tex-500-C](#), Part III, and test it to verify compliance with Item 300. The Engineer will notify the Contractor when the sampling will occur and will witness the collection of the sample from the asphalt distributor immediately before use. Label the can with the corresponding lot and subplot numbers, producer, producer facility location, grade, district, date sampled, all applicable bills of lading (if available), and project information, including highway and control-section-job (CSJ) number. For emulsions, the Engineer may test as often as necessary to ensure the residual of the emulsion is greater than or equal to the specification requirement in Item 300.

4.7.3. **Lay-Down Operations.** Use the placement temperatures shown in Table 15 to establish the minimum placement temperature of the mixture delivered to the paving operation.

Table 15
Min Mixture Placement Temperature

High-Temperature Binder Grade ¹	Min Placement Temperature ^{2,3,4} (°F)
PG 64	260
PG 70	270
PG 76	280

1. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
2. The mixture temperature must be measured using a handheld thermal camera or infrared thermometer immediately before entering MTD or paver.
3. Min placement temperatures may be reduced 20°F if using a chemical WMA additive as a compaction aid, MTD with remixing capabilities, or paver hopper insert with remixing capabilities.
4. When using WMA, the minimum placement temperature is 215°F.

4.7.3.1. **Thermal Profile.** Use a handheld thermal camera or a thermal imaging system to obtain a continuous thermal profile in accordance with [Tex-244-F](#). Thermal profiles are not applicable in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas."

4.7.3.1.1. **Thermal Segregation.**

4.7.3.1.1.1. **Moderate.** Any areas that have a temperature differential greater than 25°F, but not exceeding 50°F.

4.7.3.1.1.2. **Severe.** Any areas that have a temperature differential greater than 50°F.

4.7.3.1.2. **Thermal Imaging System.** Review the output results when a thermal imaging system is used, and provide the automated report described in [Tex-244-F](#) to the Engineer daily, unless otherwise directed. Modify the paving process as necessary to eliminate any recurring (moderate or severe) thermal segregation identified by the thermal imaging system.

The Engineer may suspend paving operations if the Contractor cannot successfully modify the paving process to eliminate recurring severe thermal segregation. Density profiles are not required and not applicable when using a thermal imaging system.

Provide the Engineer with electronic copies of all daily data files that can be used with the thermal imaging system software to generate temperature profile plots daily or as requested.

4.7.3.1.3. **Thermal Camera.** Provide the Engineer with the thermal profile of every subplot within 1 working day of the completion of each lot. When requested by the Engineer, provide the thermal images generated using the thermal camera. Report the results of each thermal profile in accordance with Section 341.4.2., "Reporting and Responsibilities." The Engineer will use a handheld thermal camera to obtain a thermal profile at least once per project.

Take immediate corrective action to eliminate recurring moderate thermal segregation when a handheld thermal camera is used.

Suspend operations and take immediate corrective action to eliminate severe thermal segregation unless otherwise directed. Resume operations when the Engineer determines that subsequent production will meet the requirements of this Section. No production or placement payment adjustments greater than 1.000 will be paid for any subplot that contains severe thermal segregation. Evaluate areas with severe thermal segregation by performing density profiles in accordance with Section 341.4.9.3.3.3., "Segregation (Density Profile)." Remove and replace the material in any areas that have severe thermal segregation and a failing result for segregation (density profile), unless otherwise directed. The subplot in question may receive a production and placement payment adjustment greater than 1.000, if applicable, when the defective material is successfully removed and replaced.

- 4.7.3.2. **Windrow Operations.** Operate windrow pickup equipment so that when hot mix is placed in windrows, substantially all the mixture deposited on the roadbed is picked up and loaded into the paver.
- 4.7.3.3. **Hauling Equipment.** Use belly dump, live-bottom, or end dump trucks to haul and transfer mixture. Except for paving miscellaneous areas, end dump trucks are allowed only when used in conjunction with an MTD with remixing capability or when a thermal imaging system is used, unless otherwise approved.
- 4.7.3.4. **Screed Heaters.** Turn off screed heaters to prevent overheating of the mat if the paver stops for more than 5 min. The Engineer may evaluate the suspect area in accordance with Section 341.4.9.3.3.5., "Recovered Asphalt Dynamic Shear Rheometer (DSR)," if the screed heater remains on for more than 5 min. while the paver is stopped.
- 4.8. **Compaction.** Compact the pavement uniformly to contain between 3.8% and 8.5% in-place air voids. Take immediate corrective action to bring the operation within 3.8% and 8.5% when the in-place air voids exceed the range of these tolerances. The Engineer will allow paving to resume when the proposed corrective action is likely to yield between 3.8% and 8.5% in-place air voids.
- Obtain cores in areas placed under exempt production, as directed, at locations determined by the Engineer. The Engineer may test these cores and suspend operations or require removal and replacement if the in-place air voids are less than 2.7% or more than 9.9%. Areas defined in Section 341.4.9.3.1.4., "Miscellaneous Areas," are not subject to in-place air void determination.
- Furnish the type, size, and number of rollers necessary to ensure desired compaction. Use additional rollers as required to remove any roller marks. Use only water or an approved release agent on rollers, tamps, and other compaction equipment unless otherwise directed.
- Use the control strip method shown in [Tex-207-F](#), Part IV, on the first day of production to establish the rolling pattern that will produce the desired in-place air voids, unless otherwise directed.
- Use tamps to thoroughly compact the edges of the pavement along curbs, headers, and similar structures and in locations that will not allow thorough compaction using rollers. The Engineer may require rolling using a trench roller on widened areas, in trenches, and in other limited areas.
- Complete all compaction operations using breakdown rollers before the pavement temperature drops below 180°F, unless otherwise allowed. Compaction using a pneumatic or light finish roller operated in static mode is allowed for pavement temperatures above 160°F.
- Allow the compacted pavement to cool to 160°F or lower before opening to traffic, unless otherwise directed. Sprinkle the finished mat with water or limewater, when directed, to expedite opening the roadway to traffic.
- 4.9. **Acceptance Plan.** Payment adjustments for the material will be in accordance with Article 341.6., "Payment."
- Sample and test the hot mix on a lot and subplot basis. Suspend production if the production payment factor shown in Section 341.6.1., "Production Payment Adjustment Factors," or the placement payment factor shown in Section 341.6.2., "Placement Payment Adjustment Factors," for two consecutive lots is below 1.000. Resume production once test results or other information indicates to the satisfaction of the Engineer that the next material produced or placed will result in payment factors of at least 1.000.
- 4.9.1. **Referee Testing.** The Materials and Tests Division is the referee laboratory. The Contractor may request referee testing if a "remove and replace" condition is determined based on the Engineer's test results, or if the differences between Contractor and Engineer test results exceed the maximum allowable difference in accordance with Table 11 and the differences cannot be resolved. The Contractor may also request referee testing if the Engineer's test results require suspension of production and the Contractor's test results are within specification limits. Make the request within 5 working days after receiving test results and cores from

the Engineer. Referee tests will be performed only on the subplot in question and only for the tests in question. Allow 10 working days from the time the referee laboratory receives the samples for test results to be reported. The Department may require the Contractor to reimburse the Department for referee tests if more than three referee tests per project are required and the Engineer's test results are closer to the referee test results than the Contractor's test results.

The Materials and Tests Division will determine the laboratory-molded density based on the molded specific gravity and the maximum theoretical specific gravity of the referee sample. The in-place air voids will be determined based on the bulk specific gravity of the cores, as determined by the referee laboratory, and the Engineer's average maximum theoretical specific gravity for the lot. Except for "remove and replace" conditions, referee test results are final and will establish payment adjustment factors for the subplot in question. The Contractor may decline referee testing and accept the Engineer's test results when the placement payment adjustment factor for any subplot results in a "remove and replace" condition. Placement sublots subject to be removed and replaced will be further evaluated in accordance with Section 341.6.2.2., "Placement Sublots Subject to Removal and Replacement."

4.9.2. **Production Acceptance.**

4.9.2.1. **Production Lot.** A production lot consists of four equal sublots. The default quantity for Lot 1 is 1,000 ton; however, when requested by the Contractor, the Engineer may increase the quantity for Lot 1 to no more than 4,000 ton. The Engineer will select subsequent lot sizes based on the anticipated daily production such that approximately three-four sublots are produced each day. The lot size will be between 1,000 ton and 4,000 ton. The Engineer may change the lot size before the Contractor begins any lot.

If the optimum asphalt binder content for JMF2 is more than 0.5% lower than the optimum asphalt binder content for JMF1, the Engineer may perform or require the Contractor to perform [Tex-226-F](#) on Lot 1 to confirm the indirect tensile strength does not exceed 200 psi. Take corrective action to bring the mixture within specification compliance if the indirect tensile strength exceeds 200 psi, unless otherwise directed.

4.9.2.1.1. **Incomplete Production Lots.** If a lot is begun but cannot be completed, such as on the last day of production or in other circumstances deemed appropriate, the Engineer may close the lot. Adjust the payment for the incomplete lot in accordance with Section 341.6.1., "Production Payment Adjustment Factors." Close all lots within 5 working days unless otherwise allowed.

4.9.2.2. **Production Sampling.**

4.9.2.2.1. **Mixture Sampling.** The Engineer will perform or witness the sampling of production sublots from trucks at the plant in accordance with [Tex-222-F](#). The sampler will split each sample into three equal portions in accordance with [Tex-200-F](#) and label these portions as "Contractor," "Engineer," and "Referee." The Engineer will perform or witness the sample splitting and take immediate possession of the samples labeled "Engineer" and "Referee." The Engineer will maintain the custody of the samples labeled "Engineer" and "Referee" until the Department's testing is completed.

4.9.2.2.1.1. **Random Sample.** At the beginning of the project, the Engineer will select random numbers for all production sublots. Determine sample locations in accordance with [Tex-225-F](#). Take one sample for each subplot at the randomly selected location. The Engineer will perform or witness the sampling of production sublots.

4.9.2.2.1.2. **Blind Sample.** For one subplot per lot, the Engineer will sample, split, and test a "blind" production sample instead of the random sample collected by the Contractor. The location of the Engineer's "blind" sample will not be disclosed to the Contractor before sampling. The Engineer's "blind" sample may be randomly selected in accordance with [Tex-225-F](#) for any subplot or selected at the discretion of the Engineer. The Engineer may sample and test an additional blind sample when the random sampling process does not result in obtaining a sample.

For one subplot per lot, the Contractor must obtain from the Engineer a “blind” production sample collected by the Engineer. If desired, the Contractor may witness the collection of blind samples. Test either the “blind” or the random sample; however, referee testing for the subplot (if applicable) will be based on a comparison of results from the “blind” sample.

- 4.9.2.2.2. **Asphalt Binder Sampling.** The Engineer will witness the Contractor obtain a 1-qt. sample of the asphalt binder for each lot of mixture produced. The Contractor will notify the Engineer when the sampling will occur. Obtain the sample at approximately the same time the mixture random sample is obtained. Sample from a port located immediately upstream from the mixing drum or pug mill and upstream from the introduction of any additives in accordance with [Tex-500-C](#), Part II. Label the can with the corresponding lot and subplot numbers, producer name, producer facility, grade, District, date sampled, all applicable bills of lading (if available), and project information, including highway and CSJ number. The Engineer will retain these samples for 1 yr. The Engineer may also obtain independent samples. If obtaining an independent asphalt binder sample and upon request of the Contractor, the Engineer will split a sample of the asphalt binder with the Contractor.

At least once per project, the Engineer will collect split samples of each binder grade and source used. The Engineer will submit one split sample to the Materials and Tests Division to verify compliance with Item 300, and will retain the other split sample for 1 yr.

- 4.9.2.3. **Production Testing.** The Contractor and Engineer must perform production tests shown in Table 16. The Contractor has the option to verify the Engineer’s test results on split samples provided by the Engineer. Determine compliance with operational tolerances shown in Table 11 for all sublots.

Take immediate corrective action if the Engineer’s laboratory-molded density on any subplot is less than 95.0% or greater than 97.0% to bring the mixture within these tolerances. The Engineer may suspend operations if the Contractor’s corrective actions do not produce acceptable results. The Engineer will allow production to resume when the proposed corrective action is likely to yield acceptable results.

The Engineer may allow alternate methods for determining the asphalt binder content and aggregate gradation if the aggregate mineralogy is such that [Tex-236-F](#), Part I does not yield reliable results. Provide evidence that results from [Tex-236-F](#), Part I are not reliable before requesting permission to use an alternate method unless otherwise directed. Use the applicable test procedure as directed if an alternate test method is allowed.

**Table 16
Production and Placement Testing Frequency**

Description	Test Method	Min Contractor Testing Frequency	Min Engineer Testing Frequency
Individual % retained on #8 sieve and larger	Tex-200-F or Tex-236-F	1 per subplot	1 per 12 sublots ¹
Individual % retained on sieves smaller than #8 and larger than #200			
% passing #200 sieve			
Laboratory-molded density	Tex-207-F	-	1 per subplot ¹
Laboratory-molded bulk specific gravity			
In-place air voids			
VMA			
Segregation (density profile)	Tex-207-F , Part V	1 per subplot ²	1 per project
Longitudinal joint density	Tex-207-F , Part VII	1 per subplot ³	1 per project
Moisture content	Tex-212-F , Part II	When directed	1 per project
Theoretical maximum specific (Rice) gravity	Tex-227-F	-	1 per subplot ¹
Asphalt binder content	Tex-236-F	1 per subplot	1 per lot ¹
Thermal profile	Tex-244-F	1 per subplot ²	1 per project
Hamburg wheel test	Tex-242-F	-	
Deleterious in RAS ⁴	Tex-217-F , Part III	-	
Asphalt binder sampling and testing ^{4,5}	Tex-500-C , Part II	-	
Tack coat sampling and testing	Tex-500-C , Part III	-	
Boil test ⁶	Tex-530-C	1 per lot	
Shear bond strength test ⁷	Tex-249-F	-	

1. For production defined in Section 341.4.9.4., "Exempt Production," the Engineer will perform one test per day if 100 ton or more is produced. For exempt production, no testing is required when < 100 ton is produced.
2. To be performed in the presence of the Engineer when not using the thermal imaging system, unless otherwise approved.
3. To be performed in the presence of the Engineer.
4. Testing performed by the Materials and Tests Division or designated laboratory.
5. Sampling performed by the Contractor. The Engineer will witness sampling and retain the samples for 1 yr.
6. When shown on the plans.
7. Testing performed by the Materials and Tests Division or District for informational purposes on a sample obtained by the Contractor within the first four lots of the project.

4.9.2.4. **Operational Tolerances.** Control the production process within the operational tolerances shown in Table 11. When production is suspended, the Engineer will allow production to resume when test results or other information indicates the next mixture produced will be within the operational tolerances.

4.9.2.4.1. **Gradation.** Suspend operation and take corrective action if any aggregate is retained on the maximum sieve size shown in Table 8. A subplot is defined as out of tolerance if either the Engineer's or the Contractor's test results are out of operational tolerance. Suspend production when test results for gradation exceed the operational tolerances shown in Table 11 for three consecutive sublots on the same sieve or four consecutive sublots on any sieve, unless otherwise directed. The consecutive sublots may be from more than one lot.

4.9.2.4.2. **Asphalt Binder Content.** A subplot is defined as out of operational tolerance if either the Engineer's or the Contractor's test results exceed the values shown in Table 11. No production or placement payment adjustments greater than 1.000 will be paid for any subplot that is out of operational tolerance for asphalt binder content. Suspend production and shipment of the mixture if the Engineer's or the Contractor's asphalt binder content deviates from the current JMF by more than 0.5% for any subplot.

4.9.2.4.3. **VMAs.** The Engineer will determine the VMA for every subplot. For sublots when the Engineer does not determine asphalt binder content, the Engineer will use the asphalt binder content results from QC testing performed by the Contractor to determine VMA.

Take immediate corrective action if the VMA value for any subplot is less than the minimum VMA requirement for production shown in Table 8. Suspend production and shipment of the mixture if the Engineer's VMA results on two consecutive sublots are below the minimum VMA requirement for production shown in Table 8. No production or placement payment adjustments greater than 1.000 will be paid for any subplot that does not meet the minimum VMA requirement for production shown in Table 8 based on the Engineer's VMA determination.

Suspend production and shipment of the mixture if the Engineer's VMA result is more than 0.5% below the minimum VMA requirement for production shown in Table 8. In addition to suspending production, the Engineer may require removal and replacement or may allow the subplot to be left in place without payment.

- 4.9.2.4.4. **Hamburg Wheel Test.** The Engineer may perform a Hamburg wheel test on plant-produced mixture anytime during production. Suspend production until further Hamburg wheel tests meet the specified values when the production samples fail the Hamburg wheel test criteria shown in Table 10. The Engineer may require up to the entire subplot of any mixture failing the Hamburg wheel test to be removed and replaced at the Contractor's expense.

If the Department-approved laboratory's Hamburg wheel test on plant-produced mixture results in a "remove and replace" condition, the Contractor may request that the Materials and Tests Division determine the final disposition of the material in question by re-testing the failing material.

- 4.9.2.5. **Individual Loads of Hot Mix.** The Engineer may reject individual truckloads of hot mix. When a load of hot mix is rejected for reasons other than temperature, contamination, or excessive uncoated particles, the Contractor may request that the rejected load be tested. Make this request within 4 hr. of rejection. The Engineer will sample and test the mixture. If test results are within the operational tolerances shown in Table 11, payment will be made for the load. If test results are not within operational tolerances, no payment will be made for the load.

- 4.9.3. **Placement Acceptance.**

- 4.9.3.1. **Placement Lot.** A placement lot consists of four placement sublots. A placement subplot consists of the area placed during a production subplot.

- 4.9.3.1.1. **Lot 1 Placement.** Placement payment adjustments greater than 1.000 for Lot 1 will be in accordance with Section 341.6.2., "Placement Payment Adjustment Factors"; however, no placement adjustment less than 1.000 will be assessed for any subplot placed in Lot 1 when the in-place air voids are greater than or equal to 2.7% and less than or equal to 9.9%. Remove and replace any subplot with in-place air voids less than 2.7% or greater than 9.9%.

- 4.9.3.1.2. **Incomplete Placement Lots.** An incomplete placement lot consists of the area placed as described in Section 341.4.9.2.1.1., "Incomplete Production Lots," excluding areas defined in Section 341.4.9.3.1.4., "Miscellaneous Areas." Placement sampling is required if the random sample plan for production resulted in a sample being obtained from an incomplete production subplot.

- 4.9.3.1.3. **Shoulders, Ramps, Etc.** Shoulders, ramps, intersections, acceleration lanes, deceleration lanes, and turn lanes are subject to in-place air void determination and payment adjustments unless shown on the plans as not eligible for in-place air void determination. Intersections may be considered miscellaneous areas when determined by the Engineer.

- 4.9.3.1.4. **Miscellaneous Areas.** Miscellaneous areas include areas that typically involve significant handwork or discontinuous paving operations, such as temporary detours, driveways, mailbox turnouts, crossovers, gores, spot level-up areas, pavement repair sections less than 300 ft., and other similar areas. Temporary detours are subject to in-place air void determination when shown on the plans. Miscellaneous areas also include level-ups and thin overlays when the layer thickness shown on the plans is less than the minimum untrimmed core height eligible for testing in accordance with Table 13. The specified layer thickness is based

on the rate of 110 lb. per square yard for each inch of pavement unless another rate is shown on the plans. When "Level Up" is listed as part of the bid item description, a payment adjustment factor of 1.000 will be assigned for all placement sublots as described in Article 341.6., "Payment." Miscellaneous areas are not eligible for random placement sampling locations. Compact miscellaneous areas in accordance with Section 341.4.8., "Compaction." Miscellaneous areas are not subject to in-place air void determination, thermal profiles testing, segregation (density profiles), or longitudinal joint density evaluations.

- 4.9.3.2. **Placement Sampling.** The Engineer will select random numbers for all placement sublots at the beginning of the project. The Engineer will provide the Contractor with the placement random numbers only immediately after the subplot is completed. Mark the roadway location at the completion of each subplot and record the station number. Determine one random sample location for each placement subplot in accordance with [Tex-225-F](#). Adjust the random sample location by no more than necessary to achieve a 2-ft. clearance if the location is within 2 ft. of a joint or pavement edge.

Shoulders, ramps, intersections, acceleration lanes, deceleration lanes, and turn lanes are always eligible for selection as a random sample location; however, if a random sample location falls on one of these areas and the area is shown on the plans as not subject to in-place air void determination, cores will not be taken for the subplot and a 1.000 pay factor will be assigned to that subplot.

Provide the equipment and means to obtain and trim roadway cores onsite. Onsite is defined as in close proximity to where the cores are taken. Obtain the cores within 1 working day of the time the placement subplot is completed, unless otherwise approved. Obtain two 6-in. diameter cores side-by-side from within 1 ft. of the random location provided for the placement subplot. Mark the cores for identification, measure and record the untrimmed core height, and provide the information to the Engineer. The Engineer will witness the coring operation and measurement of the core thickness. Visually inspect each core and verify that the current paving layer is bonded to the underlying layer. Take corrective action if an adequate bond does not exist between the current and underlying layer to ensure that an adequate bond will be achieved during subsequent placement operations.

Trim the cores immediately after obtaining them from the roadway in accordance with [Tex-251-F](#) if the core heights meet the minimum untrimmed value in accordance with Table 13. Trim the cores onsite in the presence of the Engineer. Use a permanent marker or paint pen to record the lot and subplot numbers on each core, as well as the designation as Core A or Core B. The Engineer may require additional information to be marked on the core and may choose to sign or initial the core. The Engineer will take custody of the cores immediately after witnessing the trimming of the cores and will retain custody of the cores until the Department's testing is completed. Before turning the trimmed cores over to the Engineer, the Contractor may wrap the trimmed cores or secure them in a manner that will reduce the risk of possible damage occurring during transport by the Engineer. After testing, the Engineer will return the cores to the Contractor.

The Engineer may have the cores transported back to the Department's laboratory at the HMA plant via the Contractor's haul truck or other designated vehicle. In such cases where the cores will be out of the Engineer's possession during transport, the Engineer will use Department-provided security bags and the Protocol for Roadway Core Custody located on the Department's website to provide a secure means and process that protect the integrity of the cores during transport.

Decide whether to include the pair of cores in the air void determination for that subplot if the core height before trimming is less than the minimum untrimmed value shown in Table 13. Trim the cores in accordance with [Tex-251-F](#) before delivering to the Engineer if electing to have the cores included in the air void determination. If electing to not have the cores included in air void determination, inform the Engineer of the decision, and deliver untrimmed cores to the Engineer. The placement pay factor for the subplot will be 1.000 if cores will not be included in air void determination.

Instead of the Contractor trimming the cores onsite immediately after coring, the Engineer and the Contractor may mutually agree to have the trimming operations performed at an alternate location, such as a field laboratory or other similar location. In such cases, the Engineer will take possession of the cores immediately after they are obtained from the roadway and will retain custody of the cores until testing is completed. Either

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the Department or Contractor representative may perform trimming of the cores. The Engineer will witness all trimming operations in cases where the Contractor representative performs the trimming operation.

Dry the core holes and tack the sides and bottom immediately after obtaining the cores. Fill the hole with the same type of mixture and properly compact the mixture. Repair core holes using other methods when approved.

4.9.3.3. **Placement Testing.** Perform placement tests in accordance with Table 16. After the Engineer returns the cores, the Contractor may test the cores to verify the Engineer's test results for in-place air voids. The allowable differences between the Contractor's and Engineer's test results are shown in Table 11.

4.9.3.3.1. **In-Place Air Voids.** The Engineer will measure in-place air voids in accordance with [Tex-207-F](#) and [Tex-227-F](#). Before drying to a constant weight, cores may be pre-dried using a CoreDry or similar vacuum device to remove excess moisture. The Engineer will average the values obtained for all sublots in the production lot to determine the theoretical maximum specific gravity. The Engineer will use the average air void content for in-place air voids.

The Engineer will use the vacuum method to seal the core if required in accordance with [Tex-207-F](#). The Engineer will use the test results from the unsealed core to determine the placement payment adjustment factor if the sealed core yields a higher specific gravity than the unsealed core. After determining the in-place air void content, the Engineer will return the cores and provide test results to the Contractor.

4.9.3.3.2. **Informational Shear Bond Strength Testing.** The Engineer will select one random subplot within the first four lots of the project for shear bond strength testing. Obtain full-depth cores in accordance with [Tex-249-F](#) unless the HMA is being placed directly on concrete pavement. Label the cores with lot and subplot numbers and provide to the Engineer. Inspector must use pertinent Department form to document the CSJ number, producer of the tack coat, mix type, and shot rate. The Engineer will ship the cores to the Materials and Tests Division or District laboratory for shear bond strength testing. Results from these tests will not be used for specification compliance.

4.9.3.3.3. **Segregation (Density Profile).** Test for segregation using density profiles in accordance with [Tex-207-F](#), Part V. Density profiles are not required and are not applicable when using a thermal imaging system. Density profiles are not applicable in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas."

Perform at least one density profile per subplot. Perform additional density profiles when any of the following conditions occur, unless otherwise approved:

- areas that are identified by either the Contractor or the Engineer with severe thermal segregation,
- any visibly segregated areas that exist,
- the paver stops due to lack of material being delivered to the paving operations and the temperature of the uncompacted mat before the initial breakdown rolling is less than the temperatures shown in Table 17.

Table 17
Min Uncompacted Mat Temperature Requiring Segregation Profile¹

High-Temperature Binder Grade ²	Min Temperature of Uncompacted Mat Allowed Before Initial Breakdown Rolling ^{3,4,5} (°F)
PG 64	<250
PG 70	<260
PG 76	<270

1. Applicable only to paver stops that occur due to lack of material being delivered to the paving operations and when not using a thermal imaging system.
2. The high-temperature binder grade refers to the high-temperature grade of the virgin asphalt binder used to produce the mixture.
3. The surface of the uncompacted mat must be measured using a handheld thermal camera or infrared thermometer.
4. Min uncompacted mat temperature requiring a segregation profile may be reduced 20°F if using a chemical WMA additive as a compaction aid, MTD with remixing capabilities, or paver hopper insert with remixing capabilities.
5. When using WMA, the Min uncompacted mat temperature requiring a segregation profile is 215°F.

Provide the Engineer with the density profile of every subplot in the lot within 1 working day of the completion of each lot. Report the results of each density profile in accordance with Section 341.4.2., "Reporting and Responsibilities."

The density profile is considered failing if it exceeds the tolerances shown in Table 18. When a thermal imaging system is not used, the Engineer will measure the density profile at least once per project. The Engineer's density profile results will be used when available. The Engineer may require the Contractor to remove and replace the area in question if the area fails the density profile and has surface irregularities as defined in Section 341.4.9.3.3.6., "Irregularities." The subplot in question may receive a production and placement payment adjustment greater than 1.000, if applicable, when the defective material is successfully removed and replaced.

Investigate density profile failures and take corrective actions during production and placement to eliminate the segregation. Suspend production if two consecutive density profiles fail unless otherwise approved. Resume production after the Engineer approves changes to production or placement methods.

Table 18
Segregation (Density Profile) Acceptance Criteria

Mixture Type	Max Allowable Density Range (highest to lowest, pcf)	Max Allowable Density Range (average to lowest, pcf)
DG-B	8.0	5.0
DG-C, DG-D, and DG-F	6.0	3.0

4.9.3.3.4. **Longitudinal Joint Density.**

4.9.3.3.4.1. **Informational Tests.** Perform joint density evaluations while establishing the rolling pattern and verify that the joint density is no more than 3.0 pcf below the density taken at or near the center of the mat. Adjust the rolling pattern, if needed, to achieve the desired joint density. Perform additional joint density evaluations, at least once per subplot, unless otherwise directed.

4.9.3.3.4.2. **Record Tests.** Perform a joint density evaluation for each subplot at each pavement edge that is or will become a longitudinal joint. Joint density evaluations are not applicable in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas." Determine the joint density in accordance with [Tex-207-F](#), Part VII. Record the joint density information and submit results on Department forms to the Engineer. The evaluation is considered failing if the joint density is more than 3.0 pcf below the density taken at the core

random sample location and the correlated joint density is less than 90.0%. The Engineer will make independent joint density verification at least once per project and may make independent joint density verifications at the random sample locations. The Engineer's joint density test results will be used when available.

Provide the Engineer with the joint density of every subplot in the lot within 1 working day of the completion of each lot. Report the results of each joint density in accordance with Section 341.4.2., "Reporting and Responsibilities."

Investigate joint density failures and take corrective actions during production and placement to improve the joint density. Suspend production if the evaluations on two consecutive sublots fail, unless otherwise approved. Resume production after the Engineer approves changes to production or placement methods.

4.9.3.3.5. **Recovered Asphalt Dynamic Shear Rheometer (DSR).** The Engineer may take production samples or cores from suspect areas of the project to determine recovered asphalt properties. Asphalt binders with an aging ratio greater than 3.5 do not meet the requirements for recovered asphalt properties and may be deemed defective when tested and evaluated by the Materials and Tests Division. The aging ratio is the DSR value of the extracted binder divided by the DSR value of the original unaged binder. Obtain DSR values in accordance with AASHTO T 315 at the specified high-temperature PG of the asphalt. The Engineer may require removal and replacement of the defective material at the Contractor's expense. The asphalt binder will be recovered for testing from production samples or cores in accordance with [Tex-211-F](#).

4.9.3.3.6. **Irregularities.** Identify and correct irregularities, including segregation, rutting, raveling, flushing, fat spots, mat slippage, irregular color, irregular texture, roller marks, tears, gouges, streaks, uncoated aggregate particles, or broken aggregate particles. The Engineer may also identify irregularities, and in such cases, the Engineer will promptly notify the Contractor. If the Engineer determines that the irregularity will adversely affect pavement performance, the Engineer may require the Contractor to remove and replace (at the Contractor's expense) areas of the pavement that contain irregularities. The Engineer may also require the Contractor to remove and replace (at the Contractor's expense) areas where the mixture does not bond to the existing pavement.

If irregularities are detected, the Engineer may require the Contractor to immediately suspend operations or may allow the Contractor to continue operations for no more than 1 day while the Contractor is taking appropriate corrective action.

4.9.4. **Exempt Production.** The mixture may be deemed as exempt production when mutually agreed upon between the Engineer and the Contractor, or when shown on the plans. Exempt production may be used for the following conditions.

- Anticipated daily production is less than 500 ton.
- Total production for the project is less than 5,000 ton.
- Pavement repair sections are equal to or greater than 300 ft. For pavement repair sections less than 300 ft., refer to Section 341.4.9.3.1.4., "Miscellaneous Areas."

Exempt production is not eligible for referee testing. For exempt production, the Contractor is relieved of all production and placement QC and QA sampling and testing requirements, except for coring operations when required by the Engineer. When mutually agreed upon between the Engineer and the Contractor, production sampling will be allowed at the point of delivery. When 100 ton or more per day is produced, the Engineer must perform acceptance tests for production and placement in accordance with Table 16. If the specification requirements listed below are met, the production and placement pay factors are 1.000:

- produce, haul, place, and compact the mixture in compliance with the specification and as directed;
- control mixture production to yield a laboratory-molded density that is within $\pm 1.0\%$ of the target laboratory-molded density as tested by the Engineer;
- compact the mixture in accordance with Section 341.4.8., "Compaction;"

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- when a thermal imaging system is not used, the Engineer may perform segregation (density profiles) and thermal profiles in accordance with the specification; and
- all other specification requirements.

4.9.5. **Ride Quality.** Measure ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces," unless otherwise shown on the plans.

5. MEASUREMENT

5.1. **Dense-Graded HMA.** Hot mix will be measured by the ton of composite hot mix, which includes asphalt, aggregate, and additives. Measure the weight on scales in accordance with Item 520, "Weighing and Measuring Equipment."

5.2. **Tack Coat.** Tack coat will be measured at the applied temperature by strapping the tank before and after road application and determining the net volume in gallons from the calibrated distributor. The Engineer will witness all strapping operations for volume determination. All tack, including emulsions, will be measured by the gallon applied.

The Engineer may allow the use of a metering device to determine asphalt volume used and application rate if the device is accurate within 1.5% of the strapped volume.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under Section 341.5.1., "Measurement", will be paid for at the unit price bid for "Dense-Graded Hot-Mix Asphalt" of the mixture type, SAC, and binder specified. These prices are full compensation for surface preparation, materials, placement, equipment, labor, tools, and incidentals.

The work performed and materials furnished in accordance with this Item and measured as provided under Section 341.5.2., "Tack Coat," will be paid for at the unit price bid for "Tack Coat" of the tack coat provided. These prices are full compensation for materials, placement, equipment, labor, tools, and incidentals.

Payment adjustments will be applied as determined in accordance with this Item; however, a payment adjustment factor of 1.000 will be assigned for all placement sublots for level-ups only when "Level Up" is listed as part of the bid item description. A payment adjustment factor of 1.000 will be assigned to all production and placement sublots when "Exempt" is listed as part of the bid item description, and all testing requirements are met.

Payment for each subplot, including applicable payment adjustments greater than 1.000, will be paid only for sublots when the Contractor supplies the Engineer with the required documentation for production and placement QC and QA, thermal profiles, segregation density profiles, and longitudinal joint densities in accordance with Section 341.4.2., "Reporting and Responsibilities." When a thermal imaging system is used, documentation is not required for segregation density profiles on individual sublots; however, the thermal imaging system automated reports described in [Tex-244-F](#) are required.

Trial batches will not be paid for unless they are included in pavement work approved by the Department.

Payment adjustment for ride quality will be determined in accordance with Item 585.

6.1. **Production Payment Adjustment Factors.** The production payment adjustment factor is based on the laboratory-molded density using the Engineer's test results. The bulk specific gravities of the samples from each subplot will be divided by the Engineer's maximum theoretical specific gravity for the subplot. The individual sample densities for the subplot will be averaged to determine the production payment adjustment factor in accordance with Table 19 for each subplot, using the deviation from the target laboratory-molded

density in accordance with Table 9. The production payment adjustment factor for completed lots will be the average of the payment adjustment factors for the four sublots sampled within that lot.

Table 19
Production Payment Adjustment Factors for Laboratory-Molded Density¹

Absolute Deviation from Target Laboratory-Molded Density	Production Payment Adjustment Factor (Target Laboratory-Molded Density)
0.0	1.050
0.1	1.050
0.2	1.050
0.3	1.044
0.4	1.038
0.5	1.031
0.6	1.025
0.7	1.019
0.8	1.013
0.9	1.006
1.0	1.000
1.1	0.965
1.2	0.930
1.3	0.895
1.4	0.860
1.5	0.825
1.6	0.790
1.7	0.755
1.8	0.720
>1.8	Remove and replace

1. If the Engineer's laboratory-molded density on any subplot is <95.0% or >97.0%, take immediate corrective action to bring the mixture within these tolerances. The Engineer may suspend operations if the Contractor's corrective actions do not produce acceptable results. The Engineer will allow production to resume when the proposed corrective action is likely to yield acceptable results.

6.1.1. **Payment for Incomplete Production Lots.** Production payment adjustments for incomplete lots, described under Section 341.4.9.2.1.1., "Incomplete Production Lots," will be calculated using the average production payment factors from all sublots sampled.

A production payment factor of 1.000 will be assigned to any lot when the random sampling plan did not result in collection of any samples within the first subplot.

6.1.2. **Production Sublots Subject to Removal and Replacement.** If after referee testing the laboratory-molded density for any subplot results in a "remove and replace" condition as shown in Table 19, the Engineer may require removal and replacement or may allow the subplot to be left in place without payment. The Engineer may also accept the subplot in accordance with Section 5.3.1., "Acceptance of Defective or Unauthorized Work." Replacement material meeting the requirements of this Item will be paid for in accordance with this Section.

6.2. **Placement Payment Adjustment Factors.** The placement payment adjustment factor is based on in-place air voids using the Engineer's test results. The bulk specific gravities of the cores from each subplot will be divided by the Engineer's average maximum theoretical specific gravity for the lot. The individual core densities for the subplot will be averaged to determine the placement payment adjustment factor in accordance with Table 20 for each subplot that requires in-place air void measurement. A placement payment adjustment factor of 1.000 will be assigned to the entire subplot when the random sample location falls in an area shown on the plans as not subject to in-place air void determination. A placement payment adjustment factor of 1.000 will be assigned to quantities placed in areas described in Section 341.4.9.3.1.4., "Miscellaneous Areas." The placement payment adjustment factor for completed lots will be the average of the placement payment adjustment factors for up to four sublots within that lot.

Table 20
Placement Payment Adjustment Factors for In-Place Air Voids

In-Place Air Voids	Placement Pay Adjustment Factor	In-Place Air Voids	Placement Payment Adjustment Factor
<2.7	Remove and replace	6.4	1.042
2.7	0.710	6.5	1.040
2.8	0.740	6.6	1.038
2.9	0.770	6.7	1.036
3.0	0.800	6.8	1.034
3.1	0.830	6.9	1.032
3.2	0.860	7.0	1.030
3.3	0.890	7.1	1.028
3.4	0.920	7.2	1.026
3.5	0.950	7.3	1.024
3.6	0.980	7.4	1.022
3.7	0.998	7.5	1.020
3.8	1.002	7.6	1.018
3.9	1.006	7.7	1.016
4.0	1.010	7.8	1.014
4.1	1.014	7.9	1.012
4.2	1.018	8.0	1.010
4.3	1.022	8.1	1.008
4.4	1.026	8.2	1.006
4.5	1.030	8.3	1.004
4.6	1.034	8.4	1.002
4.7	1.038	8.5	1.000
4.8	1.042	8.6	0.998
4.9	1.046	8.7	0.996
5.0	1.050	8.8	0.994
5.1	1.050	8.9	0.992
5.2	1.050	9.0	0.990
5.3	1.050	9.1	0.960
5.4	1.050	9.2	0.930
5.5	1.050	9.3	0.900
5.6	1.050	9.4	0.870
5.7	1.050	9.5	0.840
5.8	1.050	9.6	0.810
5.9	1.050	9.7	0.780
6.0	1.050	9.8	0.750
6.1	1.048	9.9	0.720
6.2	1.046	>9.9	Remove and replace
6.3	1.044	-	-

6.2.1. **Payment for Incomplete Placement Lots.** Payment adjustments for incomplete placement lots described under Section 341.4.9.3.1.2., “Incomplete Placement Lots,” will be calculated using the average of the placement payment factors from all sublots sampled and sublots where the random location falls in an area shown on the plans as not eligible for in-place air void determination.

If the random sampling plan results in production samples, but not in placement samples, the random core location and placement adjustment factor for the subplot will be determined by applying the placement random number to the length of the subplot placed.

If the random sampling plan results in placement samples, but not in production samples, no placement adjustment factor will apply for that subplot placed.

A placement payment adjustment factor of 1.000 will be assigned to any lot when the random sampling plan did not result in collection of any production samples.

- 6.2.2. **Placement Sublots Subject to Removal and Replacement.** If after referee testing the placement payment adjustment factor for any subplot results in a “remove and replace” condition as shown in Table 20, the Engineer will choose the location of two cores to be taken within 3 ft. of the original failing core location. The Contractor must obtain the cores in the presence of the Engineer. The Engineer will take immediate possession of the untrimmed cores and submit the untrimmed cores to the Materials and Tests Division, where they will be trimmed, if necessary, and tested for bulk specific gravity within 10 working days of receipt.

The bulk specific gravity of each core from each subplot will be divided by the Engineer’s average maximum theoretical specific gravity for the lot. The individual core densities for the subplot will be averaged to determine the new payment adjustment factor of the subplot in question. If the new payment adjustment factor is 0.720 or greater, the new payment adjustment factor will apply to that subplot. If the new payment adjustment factor is less than 0.720, no payment will be made for the subplot. Remove and replace the failing subplot, or the Engineer may allow the subplot to be left in place without payment. The Engineer may also accept the subplot in accordance with Section 5.3.1., “Acceptance of Defective or Unauthorized Work.” Replacement material meeting the requirements of this Item will be paid for in accordance with this Section.

- 6.3. **Total Adjusted Pay (TAP) Calculation.** TAP will be based on the applicable payment adjustment factors for production and placement for each lot. $TAP = (A+B)/2$

where:

$A = \text{Bid price} \times \text{production lot quantity} \times \text{average payment adjustment factor for the production lot}$

$B = \text{Bid price} \times \text{placement lot quantity} \times \text{average payment adjustment factor for the placement lot} + (\text{bid price} \times \text{quantity placed in miscellaneous areas} \times 1.000)$

$\text{Production lot quantity} = \text{Quantity actually placed} - \text{quantity left in place without payment}$

$\text{Placement lot quantity} = \text{Quantity actually placed} - \text{quantity left in place without payment} - \text{quantity placed in miscellaneous areas}$

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Item 460

Corrugated Metal Pipe



1. DESCRIPTION

Furnish and install corrugated metal pipes, materials for constructing corrugated metal pipe culverts, or corrugated metal storm drain mains, laterals, stubs, and inlet leads.

2. MATERIALS

2.1. **Fabrication.** Furnish corrugated metal pipe in accordance with Table 1.

Table 1
Specifications for Corrugated Metal Pipe

Pipe Type	AASHTO Specification
Galvanized steel and aluminized steel	M 36
Aluminized Type 2	M 36
Polymer Coated	M 36 & M 245
Asphalt Coated	M 36
Aluminum	M 196

The pipe type and corresponding AASHTO designations are shown in Table 2.

Table 2
Corrugated Metal Pipe Types

Pipe Type	AASHTO Classification
Circular	Type I
Circular, smooth-lined	Type IA
Circular, spiral rib	Type IR
Arch	Type II
Arch, smooth-lined	Type IIA
Arch, spiral rib	Type IIR

Provide corrugated metal pipe of all types with annular corrugations, helical corrugations, or spiral ribs (corrugations) projecting outward. Provide pipe with helical end corrugations only when necessary to join new pipe to existing pipe with helical end corrugations.

Provide a minimum polymer coating thickness of 10 mils on each side for pre-coated galvanized steel pipe. Galvanized metal sheets and coils used for galvanized corrugated metal pipe may be sampled and tested in accordance with [Tex-708-I](#).

Repair damaged galvanized coating in accordance with Section 445.3.5., "Repairs." Repair damaged aluminized or polymer coating in accordance with AASHTO M 36 and M 245 respectively.

2.2. **Protective Coating.** Furnish bituminous coating, when required, that meets AASHTO M 190 and that tightly adheres to the metal, does not chip off in handling, and protects the pipe from deterioration as evidenced by samples prepared from the coating material successfully meeting the Shock Test and Flow Test in accordance with Tex-522-C.

Coat the pipe uniformly inside and out to a minimum thickness of 0.05 in. measured on the crests of the corrugations. Coat the pipe with additional material applied to the full inner circumference to form a smooth inside lining with a minimum thickness of 1/8 in. above the crest of the corrugations when smooth lining is specified.

2.3.

Design. The diameter, permissible corrugations, and required gauges for full-circle pipe will be shown. The design size and permissible corrugations for pipe arch will be shown. The required gauges of the shell and the liner for smooth lined pipe will also be shown. Furnish the shape and minimum gauge for steel pipe arch in accordance with Tables 3, 4, 5, or 6 for the specified design size and corrugation. Use Table 7 or 8 for aluminum pipe arch. Refer to U.S. Standard Gauge for uncoated sheets where reference is made to gauge of metal.

Measure dimensions from the inside crests of the corrugations. A tolerance of ± 1 in. or 2% of the equivalent circular diameter, whichever is greater, is allowed for span and rise.

Table 3
Steel Pipe Arch
2-2/3 x 1/2-in. Corrugations

Design Size	Span (in.)	Rise (in.)	Min Cover (in.)	Min Gauge Required	Coated Thickness (in.)	Equivalent Diameter Full-Circle Pipe (in.)
1	17	13	12	16	0.064	15
2	21	15	12	16	0.064	18
2A	23	19	12	16	0.064	21
3	28	20	12	16	0.064	24
4	35	24	12	16	0.064	30
5	42	29	12	14	0.079	36
6	49	33	12	14	0.079	42
7	57	38	12	12	0.109	48
8	64	43	12	12	0.109	54
9	71	47	12	10	0.138	60

Table 4
Steel Pipe Arch
3 x 1-in. Corrugations

Design Size	Span (in.)	Rise (in.)	Min Cover (in.)	Min Gauge Required	Coated Thickness (in.)	Equivalent Diameter Full-Circle Pipe (in.)
7	53	41	12	14	0.079	48
8	60	46	12	14	0.079	54
9	66	51	12	14	0.079	60
10	73	55	12	14	0.079	66
11	81	59	12	14	0.079	72
12	87	63	12	14	0.079	78
13	95	67	12	12	0.109	84
14	103	71	18	12	0.109	90
15	112	75	18	12	0.109	96
16	117	79	18	12	0.109	102
17	128	83	24	10	0.138	108
18	137	87	24	10	0.138	114
19	142	91	24	10	0.138	120

Table 5
Steel Pipe Arch
5 x 1-in. Corrugations

Design Size	Span (in.)	Rise (in.)	Min Cover (in.)	Min Gauge Required	Coated Thickness (in.)	Equivalent Diameter Full-Circle Pipe (in.)
11	81	59	12	12	0.109	72
12	87	63	12	12	0.109	78
13	95	67	12	12	0.109	84
14	103	71	18	12	0.109	90

15	112	75	18	12	0.109	96
16	117	79	18	12	0.109	102
17	128	83	24	10	0.138	108
18	137	87	24	10	0.138	114
19	142	91	24	10	0.138	120

Table 6
Steel Pipe Arch, Spiral Rib
7-1/2 × 3/4 × 3/4-in. Corrugations

Design Size	Span (in.)	Rise (in.)	Min Cover (in.)	Min Gauge Required	Coated Thickness (in.)	Equivalent Diameter Full-Circle Pipe (in.)
2	20	16	12	16	0.064	18
2A	23	19	12	16	0.064	21
3	27	21	12	16	0.064	24
4	33	26	12	16	0.064	30
5	40	31	12	14	0.064	36
6	46	36	12	12	0.064	42
7	53	41	12	12	0.079	48
8	60	46	12	12	0.079	54
9	66	51	15	12	0.079	60

Table 7
Aluminum Pipe Arch
2-2/3 × 1/2-in. Corrugations

Design Size	Span (in.)	Rise (in.)	Min Cover (in.)	Min Gauge Required	Coated Thickness (in.)	Equivalent Diameter Full-Circle Pipe (in.)
1	17	13	12	16	0.060	15
2	21	15	12	16	0.060	18
2A	23	19	12	16	0.060	21
3	28	20	12	14	0.075	24
4	35	24	12	14	0.075	30
5	42	29	18	12	0.105	36
6	49	33	18	12	0.105	42
7	57	38	18	10	0.135	48
8	64	43	18	10	0.135	54
9	71	47	18	8	0.164	60

Table 8
Aluminum Pipe Arch, Spiral Rib
7-1/2 × 3/4 × 3/4-in. Corrugations

Design Size	Span (in.)	Rise (in.)	Min Cover (in.)	Min Gauge Required	Coated Thickness (in.)	Equivalent Diameter Full-Circle Pipe (in.)
2	20	16	12	16	0.064	18
2A	23	19	12	16	0.064	21
3	27	21	15	16	0.064	24
4	33	26	18	16	0.064	30
5	40	31	18	14	0.075	36
6	46	36	18	12	0.105	42
7	53	41	21	12	0.105	48
8	60	46	18	10	0.135	54
9	66	51	21	10	0.135	60

2.4. **Coupling Bands.** Furnish coupling bands and other hardware for galvanized or aluminized steel pipe in

accordance with AASHTO M 36 for steel pipe and AASHTO M 196 for aluminum pipe. Use coupling bands that are no more than 3 nominal sheet thicknesses lighter than the thickness of the pipe to be connected or no lighter than 0.052 in. for steel or 0.048 in. for aluminum. Provide coupling bands made of the same base metal and coating as the pipe.

3. CONSTRUCTION

3.1. **Designation of Type.** The types of pipes will be indicated on the plans by the following descriptions:

- Pipe type: Corrugated metal pipe (CMP), corrugated metal pipe arch (CMP ARCH), spiral rib corrugated metal pipe (SRCMP), or spiral rib corrugated metal pipe arch (SRCMP ARCH);
- Type of material: Galvanized steel, aluminum-coated (Type 2), or aluminum;
- Pipe coating: Bituminous coated or polymer coated;
- Special requirements: Paved invert or smooth lining; and
- Pipe size: Diameter or design number.

Furnish any of the material types specified above when pipe is designated as “Corrugated Metal Pipe” without a type of material or pipe coating designation.

3.2. **Excavation, Shaping, Bedding, and Backfill.** Excavate, shape, bed, and backfill in accordance with Item 400, “Excavation and Backfill for Structures,” except where jacking, boring, or tunneling methods are shown on the plans or permitted. Jack, bore, or tunnel in accordance with Item 476, “Jacking, Boring, or Tunneling Pipe or Box.”

Provide uniform backfill material and uniformly compacted density throughout the length of the structure so equal pressure is provided. Allow no heavy earth-moving equipment over the structure until a minimum of 4 ft. of compacted fill (permanent or temporary) has been placed over the top of the structure unless otherwise shown on the plans or permitted in writing. Inspect the inside periphery of the structure for local or unequal deformation caused by improper construction methods before adding each new layer of loose backfill material. Continue inspections until a minimum of 24 in. of cover is obtained. Evidence of such deformation will be reason for corrective measures as directed. Remove and replace pipe damaged by the Contractor at no additional cost to the Department.

3.3. **Laying Pipe.** Lay pipes on the bedding from the outlet end and join the separate sections firmly together with outside laps of annular joints pointing upstream and longitudinal laps on the sides unless otherwise authorized. Coat any metal in joints not protected by galvanizing or aluminizing with a suitable asphalt paint. Lower sections of pipe into the trench without damaging the pipe or disturbing the bedding and the sides of the trench. Remove and re-lay, without extra compensation, pipe that is not in alignment or shows excessive settlement after laying.

Lay multiple installations of corrugated metal pipe and pipe arches with the centerlines of individual barrels parallel. Maintain the clear distances between outer surfaces of adjacent pipes given in Table 9 unless otherwise indicated on the plans.

**Table 9
 Required Pipe Clear Distances**

Diameter Full-Circle Pipe (in.)	Pipe Arch Design Size	Clear Distance Between Pipes (Full-Circle Pipe and Pipe Arch)
18	2	1 ft. 2 in.
21	2A	1 ft. 3 in.
24	3	1 ft. 5 in.
30	4	1 ft. 8 in.
36	5	1 ft. 11 in.
42	6	2 ft. 2 in.
48	7	2 ft. 5 in.
54	8	2 ft. 10 in.

60 to 84	9	3 ft. 2 in.
90 to 120	10 and over	3 ft. 5 in.

3.4. **Jointing.** Provide field joints that maintain pipe alignment during construction and prevent infiltration of side material during the life of the installation. Provide one of the following jointing systems unless otherwise shown on the plans.

3.4.1. **Coupling Bands.** Use coupling bands with annular corrugations only with pipe with annular corrugations or with helical pipe or spiral rib pipe in which the ends have been rerolled to form annular corrugations. Provide bands with corrugations that have the same dimensions as the corrugations in the pipe end or are designed to engage the first or second corrugation from the end of each pipe. The band may also include a U-shaped channel to accommodate upturned flanges on the pipe.

Field-join pipe with helically corrugated bands or bands with projections (dimples) when helical end corrugations are allowed.

Coupling bands with projections may be used with pipe that has annular or helical end corrugations or spiral ribs. Provide bands formed with the projections in annular rows with 1 projection for each corrugation of helical pipe or spiral rib pipe. Provide 2 annular rows for bands 10-1/2 in. or 12 in. wide and 4 annular rows of projections for bands 16-1/2 in. or 22 in. wide.

Use a coupling band width that conforms to Table 10. Connect the bands using suitable galvanized devices in accordance with AASHTO M 36. Lap coupling bands equally on each of the pipes to form a tightly closed joint after installation. Provide at least the minimum coupling band width recommended by the manufacturer for corrugations not shown in Table 10.

Table 10
Coupling Band Width Requirements

Nominal Corrugation Size ¹ (in.)	Nominal Pipe Inside Diameter ² (in.)	Minimum Coupling Band Width (in.)		
		Annular Corrugated Bands	Helically Corrugated Bands	Bands with Projections
2-2/3 by 1/2	12 to 36	7	12	10-1/2
	42 to 72	10-1/2	12	10-1/2
	78 to 84 ³	10-1/2	12	16-1/4
3 by 1	36 to 72	12	14	10-1/2
	78 to 120	12	14	16-1/4
5 by 1	36 to 72	20	22	12
	78 to 120	20	22	22
7-1/2 by 3/4 by 3/4	18 to 60	10-1/2	12	10-1/2
	66 to 102	10-1/2	12	16-1/4

1. For helically corrugated pipe or spiral rib pipe with rerolled ends, the nominal size refers to the dimensions of the end corrugations in the pipe.
2. Equivalent circular diameter for Type II pipe.
3. Diameter through 120 in. for annular corrugated bands used on rerolled ends of helically corrugated pipe or spiral rib pipe.

The minimum diameter of bolts for coupling bands is 3/8 in. for pipe diameters 18 in. and less and 1/2 in. for pipe diameters 21 in. and greater. Provide at least 2 bolts for bands 12 in. wide or less. Provide at least 3 bolts for bands wider than 12 in.

Provide galvanized hardware in accordance with Item 445, "Galvanizing."

3.4.2. **Bell and Spigot.** Attach the bell to one end of the corrugated metal pipe at the manufacturing plant before shipment. Provide a bell with a minimum 6-in. stab depth. Install the gasket on the spigot end and apply lubricant in accordance with the manufacturer's recommendations. Provide gaskets that meet ASTM F477

with Type A Shore durometer hardness of 45 ± 5 . Do not use thermoplastic elastomer as the basic polymer. Push the spigot end of the pipe into the bell end of the previously laid pipe during laying of the pipe.

- 3.4.3. **Pipe Connections and Stub Ends.** Make connections of pipe to existing pipe or appurtenances as shown on the plans or as directed. Mortar or concrete the bottom of the existing structure, if necessary, to eliminate any drainage pockets created by the new connection.

Insulate portions of aluminum pipe that are to be in contact with metal other than aluminum by a coating of bituminous material meeting the requirements of Section 460.2.2., "Protective Coating." Extend the coating a minimum of 1 ft. beyond the area of contact.

Restore any damage that results from making the connection when connecting pipe into existing structures that will remain in service. Seal stub ends for connections to future work not shown on the plans by installing watertight plugs into the free end of the pipe.

4. MEASUREMENT

This Item will be measured by the foot. Pipe will be measured between the ends of the barrel along the flow line, not including safety end treatments. Safety end treatments will be measured in accordance with Item 467, "Safety End Treatment." Pipe that is required to be jacked, bored, or tunneled will be measured in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." Where spurs, branches, or connections to existing pipe lines are involved, measurement of the spur or new connecting pipe will be made from the intersection of the flow line with the outside surface of the pipe into which it connects. Where inlets, headwalls, catch basins, manholes, junction chambers, or other structures are included in lines of pipe, the length of pipe tying into the structure wall will be included for measurement but no other portion of the structure length or width will be included.

For multiple pipes, the measured length will be the sum of the lengths of the barrels.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

5. PAYMENT

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 for "Corrugated Metal Pipe," "Corrugated Metal Pipe Arch," "Spiral Rib Corrugated Metal Pipe," or "Spiral Rib Corrugated Metal Pipe Arch" of the type, size, and coating specified. This price is full compensation for furnishing, hauling, placing, and joining of pipes; jointing materials; all connections to new or existing structures; breaking back, removing, and disposing of portions of the existing structure; replacing portions of the existing structure; cutting pipe ends on skew or slope; and equipment, labor, tools, and incidentals.

Protection methods for excavations greater than 5 ft. deep will be measured and paid for as required under Item 402, "Trench Excavation Protection," or Item 403, "Temporary Special Shoring." Excavation, shaping, bedding, and backfill will be paid for in accordance with Item 400, "Excavation and Backfill for Structures." When jacking, boring, or tunneling is used at the Contractor's option, payment will be made under this Item. When jacking, boring, or tunneling is required, payment will be made under Item 476, "Jacking, Boring, or Tunneling Pipe or Box."

Item 467

Safety End Treatment



1. DESCRIPTION

Furnish, construct, and install safety end treatments for drainage structures, or install or replace pipe runners or pipe runner assemblies on existing drainage structures.

2. MATERIALS

2.1. **General.** Furnish materials in accordance with the following.

- Item 420, "Concrete Substructures,"
- Item 421, "Hydraulic Cement Concrete,"
- Item 432, "Riprap,"
- Item 440, "Reinforcement for Concrete,"
- Item 442, "Metal for Structures,"
- Item 445, "Galvanizing,"
- Item 460, "Corrugated Metal Pipe," and
- Item 464, "Reinforced Concrete Pipe."

Use Class C concrete for cast-in-place and precast concrete units unless otherwise shown on the plans. Furnish cast-in-place or precast safety end treatments unless otherwise shown on the plans. Furnish Class B concrete for concrete riprap unless otherwise shown on the plans. Provide galvanized steel for prefabricated metal end sections in accordance with Item 460, "Corrugated Metal Pipe."

Furnish pipe runners in accordance with the following:

- ASTM A1085;
- ASTM A53, Type E or S, Grade B;
- ASTM A500, Grade B; or
- API 5L, Grade X42.

Furnish plates and angles in accordance with ASTM A36. Furnish nuts and bolts in accordance with ASTM A307. Galvanize pipes, plates, angles, nuts, and bolts in accordance with Item 445, "Galvanizing."

2.2. **Fabrication.** Fabricate cast-in-place concrete units and precast units in accordance with Item 420, "Concrete Substructures." Provide either prefabricated metal end sections or mitered CMP when specified for the pipe structure unless otherwise shown on the plans.

Provide one of the following when reinforced concrete pipe (RCP) is specified for the pipe structure, unless otherwise shown on the plans:

- mitered RCP or
- precast safety end treatment (SET) units. Provide riprap only if the plans specifically require it for this alternative.

2.2.1. **SET Types.**

2.2.1.1. **Type I.** Provide Type I SET consisting of reinforced concrete headwalls or wingwalls and pipe runners in accordance with the details shown on the plans when required.

- 2.2.1.2. **Type II.** Provide Type II SET in accordance with the details shown on the plans consisting of the following:
- CMP or RCP mitered to the proper slope, concrete riprap and pipe runners, when required;
 - prefabricated metal end sections, concrete riprap and pipe runners, when required; or
 - precast SET units, concrete riprap, when required, and pipe runners, when required.
- 2.2.2. **Lifting Holes.** Provide no more than 4 lifting holes in each section for precast units. Lifting holes may be cast, cut into fresh concrete after form removal, or drilled. Provide lifting holes large enough for adequate lifting devices based on the size and weight of the section. The maximum hole diameter is 3 in. at the inside surface of the wall and 4 in. at the outside surface. Cut no more than 1 longitudinal wire or 2 circumferential wires per layer of reinforcing steel when locating lift holes. Repair spalled areas around lifting holes.
- 2.2.3. **Marking.** Clearly mark the following on each precast unit, mitered CMP, mitered RCP, or metal end section before shipment from the casting or fabrication yard:
- the date of manufacture,
 - the name or trademark of the manufacturer, and
 - the type and size designation.
- 2.2.4. **Storage and Shipment.** Store precast units on a level surface. Do not place any loads on precast units until the design strength is reached. Do not ship units until design strength requirements have been met.
- 2.2.5. **Causes for Rejection.** Precast units may be rejected for not meeting any one of the specification requirements. Individual units may also be rejected for fractures or cracks passing through the wall or surface defects indicating honeycombed or open texture surfaces. Remove rejected units from the project and replace with acceptable units meeting the requirements of this Item.
- 2.2.6. **Defects and Repairs.** Occasional imperfections in manufacture or accidental damage sustained during handling may be repaired. The repaired units will be acceptable if they conform to the requirements of this Item and the repairs are sound and properly finished and cured in conformance with pertinent specifications. Repair damaged galvanizing in accordance with Section 445.3.5., "Repairs."

3. CONSTRUCTION

- 3.1. **General.** Remove portions of existing structures in accordance with Section 420.4.8., "Extending Existing Substructures." Drill, dowel, and grout in accordance with Item 420, "Concrete Substructures." Furnish concrete riprap in accordance with Item 432, "Riprap."
- Provide riprap on all prefabricated metal end sections.
- 3.2. **Excavation, Shaping, Bedding, and Backfill.** Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures." Take special precautions in placing and compacting the backfill to avoid any movement or damage to the units. Bed precast units on foundations of firm and stable material accurately shaped to conform to the bases of the units.
- 3.3. **Placement of Precast Units.** Provide adequate means to lift and place the precast units. Fill lifting holes with mortar or concrete and cure. Precast concrete or mortar plugs may be used.
- 3.4. **Connections.** Make connections to new or existing structures in accordance with the details shown on the plans. Furnish jointing material in accordance with Item 464, "Reinforced Concrete Pipe."
- Also remove a length of the existing pipe from the headwall to the joint when removing existing headwalls as shown on the plans or as approved. Re-lay the removed pipe if approved, or furnish and lay a length of new pipe.

- 3.5. **Install or Replace Pipe Runners or Assemblies.** Install or replace individual pipe runners or pipe runner assemblies on existing drainage structures as indicated on the plans.

4. MEASUREMENT

SETs of all types will be measured by each barrel of each structure end.

Pipe runners or pipe runner assemblies installed or replaced on existing structure will be measured by each installed or replaced on each structure end.

5. PAYMENT

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 for the various designations of "Safety End Treatment" specified as follows:

- SET (Type I) (Barrel Span) (Wall Height) (Slope, Horizontal:Vertical) (Orientation, Cross or Parallel)
- SET (Type I) (Pipe Diameter or Design) (Slope, Horizontal:Vertical) (Orientation, Cross or Parallel)
- SET (Type II) (Pipe Diameter or Design) (Pipe Material) (Slope, Horizontal:Vertical) (Orientation, Cross or Parallel)
- SET (Pipe Runner)
- SET (Pipe Runner Assembly)

For payment purposes, the wingwall heights of Type I SETs for box culverts will be rounded to the nearest foot.

This price is full compensation for constructing, furnishing, transporting, and installing the end treatments; pipe runners, or pipe runner assemblies, connecting to existing structure; breaking back, removing and disposing of portions of the existing structure, removing and disposing of existing pipe runner or pipe runner assemblies, and replacing portions of the existing structure as required to make connections; excavation and backfill; furnishing concrete, reinforcing steel, corrugated metal pipe or reinforced concrete pipe, and pipe runners; and concrete riprap, nuts, bolts, plates, angles, equipment, labor, tools, and incidentals.

The removal and re-laying of existing pipe or the furnishing of new pipe to replace existing pipe will not be paid for directly but will be considered subsidiary to this Item.

The mitered length of CMP or RCP that is a part of the SET (Type II) will not be paid for directly but will be considered subsidiary to this Item. The limits for payment for pipe will be as shown on the plans and paid for in accordance with the pertinent bid item.

The limits of riprap to be included in the price bid for each SET will be shown on the plans. Any riprap placed beyond the limits shown will be paid in accordance with Item 432, "Riprap." Riprap between multiple precast SET units will be required as shown on the plans and is included in the price bid for SET.

When precast SETs are provided as an option to mitered RCP, riprap aprons will not be required unless the plans specifically require riprap aprons for precast SET units. The plans will show the limits of the riprap to be included with the precast SET for payment.

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Last plotted by: Dockery, Olivia R. Plot Style: AECmono.ctb Plot Scale: 1:1 Plot Date: 2/26/2026 10:35 AM Plotter used: DWG To PDF.pc3

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DEMOLITION PLAN OVERVIEW		
29	CD-100	DEMOLITION PLAN OVERVIEW
30	CD-101	DEMOLITION PLAN 1
31	CD-102	DEMOLITION PLAN 2
32	CD-103	DEMOLITION PLAN 3
DEMOLITION DETAILS		
33	CD-501	DEMOLITION DETAILS
TYPICAL SECTIONS 1		
34	CP-001	TYPICAL SECTIONS 1
TYPICAL SECTIONS 2		
35	CP-002	TYPICAL SECTIONS 2
PLAN AND PROFILE - OVERVIEW		
36	CP-100	PLAN AND PROFILE - OVERVIEW
PLAN AND PROFILE 1 - TW A CONNECTOR		
37	CP-101	PLAN AND PROFILE 1 - TW A CONNECTOR
PLAN AND PROFILE 2		
38	CP-102	PLAN AND PROFILE 2
PLAN AND PROFILE 3		
39	CP-103	PLAN AND PROFILE 3
PLAN AND PROFILE 4		
40	CP-104	PLAN AND PROFILE 4
PLAN AND PROFILE 5		
41	CP-105	PLAN AND PROFILE 5
PLAN AND PROFILE 6		
42	CP-106	PLAN AND PROFILE 6
PLAN AND PROFILE 7		
43	CP-107	PLAN AND PROFILE 7
PLAN AND PROFILE 8 - TW B		
44	CP-108	PLAN AND PROFILE 8 - TW B
PLAN AND PROFILE 9 - TW C		
45	CP-109	PLAN AND PROFILE 9 - TW C
PLAN AND PROFILE 10 - TW D		
46	CP-110	PLAN AND PROFILE 10 - TW D
TERMINAL APRON ELEVATION PLAN (BASE BID & ADD ALT 3)		
47	CP-111	TERMINAL APRON ELEVATION PLAN (BASE BID & ADD ALT 3)
TERMINAL APRON (ADD ALT 4) ELEVATION PLAN		
48	CP-112	TERMINAL APRON (ADD ALT 4) ELEVATION PLAN
PAVEMENT REHABILITATION PLAN 1		
49	CP-113	PAVEMENT REHABILITATION PLAN 1
PAVEMENT REHABILITATION PLAN 2		
50	CP-114	PAVEMENT REHABILITATION PLAN 2
PAVEMENT REHABILITATION PLAN 3		
51	CP-115	PAVEMENT REHABILITATION PLAN 3
PAVING DETAILS		
52	CP-501	PAVING DETAILS
PAVEMENT MARKING PLAN OVERVIEW		
53	CM-100	PAVEMENT MARKING PLAN OVERVIEW
PAVEMENT MARKING REMOVAL PLAN		
54	CM-101	PAVEMENT MARKING REMOVAL PLAN
PAVEMENT MARKING PLAN 1		
55	CM-102	PAVEMENT MARKING PLAN 1
PAVEMENT MARKING PLAN 2		
56	CM-103	PAVEMENT MARKING PLAN 2
PAVEMENT MARKING PLAN 3		
57	CM-104	PAVEMENT MARKING PLAN 3
PAVEMENT MARKING PLAN 4		
58	CM-105	PAVEMENT MARKING PLAN 4
PAVEMENT MARKING PLAN 5		
59	CM-106	PAVEMENT MARKING PLAN 5
PAVEMENT MARKING PLAN 6		
60	CM-107	PAVEMENT MARKING PLAN 6
PAVEMENT MARKING PLAN 7		
61	CM-108	PAVEMENT MARKING PLAN 7
PAVEMENT MARKING DETAILS 1		
62	CM-501	PAVEMENT MARKING DETAILS 1
PAVEMENT MARKING DETAILS 2		
63	CM-502	PAVEMENT MARKING DETAILS 2

NO.	SPEC. NO.	DESCRIPTION
64	CM-503	PAVEMENT MARKING DETAILS 3
ELECTRICAL		
65	EN001	ELECTRICAL NOTES
66	ED101	ELECTRICAL REMOVAL PLAN
67	ED501	ELECTRICAL REMOVAL DETAILS
68	EL101	ELECTRICAL INSTALLATION PLAN
69	EL501	ELECTRICAL INSTALLATION DETAILS 1
70	EL502	ELECTRICAL INSTALLATION DETAILS 2
71	EL503	ELECTRICAL INSTALLATION DETAILS 3
CROSS SECTIONS		
72	XS-101	TAXIWAY A CROSS SECTIONS 1
73	XS-102	TAXIWAY A CROSS SECTIONS 2
74	XS-103	TAXIWAY A CROSS SECTIONS 3
75	XS-104	TAXIWAY A CROSS SECTIONS 4
76	XS-105	TAXIWAY A CROSS SECTIONS 5
77	XS-106	TAXIWAY A CROSS SECTIONS 6
78	XS-107	TAXIWAY A CROSS SECTIONS 7
79	XS-108	TAXIWAY A CROSS SECTIONS 8
80	XS-109	TAXIWAY A CROSS SECTIONS 9
81	XS-110	TAXIWAY A CROSS SECTIONS 10
82	XS-111	TAXIWAY A CROSS SECTIONS 11
83	XS-112	TAXIWAY A CROSS SECTIONS 12
84	XS-113	TAXIWAY A CROSS SECTIONS 13
85	XS-114	TAXIWAY A CROSS SECTIONS 14
86	XS-115	TAXIWAY A CROSS SECTIONS 15
87	XS-116	TAXIWAY A CROSS SECTIONS 16
88	XS-117	TAXIWAY A CROSS SECTIONS 17

BASE BID - SCHEDULE 1

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	SS-120-3.1	Construction Safety and Security	LS	1
2	SS-220-5.1	Pavement Edge Grading	LF	8,600
3	SS-262-5.1	Tiedown Anchors	EA	6
4	TX-SS-2001-5.1	Tied Concrete Block Mat (Complete In Place)	SY	600
5	TX-247-6.1	Flexible Base (Complete In Place)	SY	5,000
6	TX-250-5.1	Geogrid Base Reinforcement	SY	5,000
7	TX-341.6.1	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	6,300
8	TX-341.6.2	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift) - Transition Area	TON	1,600
9	TX-341.6.3	Dense-Graded Hot-Mix Asphalt, Type B, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	220
10	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1
11	C-102-5.1	Temporary Erosion Control	LS	1
12	C-105-6.1	Mobilization - Base Bid (Maximum 10% of Base Bid)	LS	1
13	P-101-5.1	Asphalt Transition Milling	SY	7,000
14	P-101-5.2	Crack Repair (Less than 1.5')	LF	41,700
15	P-101-5.3	Crack Repair (Greater than 1.5')	LF	12,600
16	P-101-5.4	Pavement Section Removal	SY	5,000
17	P-152-4.1	Unclassified Excavation	CY	3,100
18	P-207-5.1	8' In Place Full Depth Recycled (FDR) Asphalt Aggregate Base Course	SY	24,400
19	P-207-5.2	Cement	TON	450
20	P-620-5.1	Pavement Marking with Reflective Media	SF	10,800
21	P-620-5.2	Pavement Markings without Reflective Media	SF	15,900
22	P-620-5.3	Pavement Markings Removal	SF	4,400
23	P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat	SY	52,000
24	T-901-5.1	Seeding	AC	2
25	T-905-5.1	Topsoil	SY	9,440

**ADD ALT 1:
RUNWAY 14-32 REHABILITATION**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	P-101-5.2	Crack Repair (Less than 1.5')	LF	31,100
2	P-101-5.3	Crack Repair (Greater than 1.5')	LF	12,500
3	P-620-5.1	Pavement Marking with Reflective Media	SF	49,100
4	P-620-5.2	Pavement Markings without Reflective Media	SF	13,100
5	P-620-5.3	Pavement Markings Removal	SF	30,000
6	P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat	SY	47,700

BASE BID - SCHEDULE 2

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	SS-120-3.1	Construction Safety and Security	LS	1
2	SS-220-5.1	Pavement Edge Grading	LF	8,600
3	SS-262-5.1	Tiedown Anchors	EA	6
4	TX-SS-2001-5.1	Tied Concrete Block Mat (Complete In Place)	SY	600
5	TX-250-5.1	Geogrid Base Reinforcement	SY	5,000
6	TX-251-6.1	Place and Compact FDR Trimmings	CY	1,250
7	TX-341.6.1	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	6,300
8	TX-341.6.2	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift) - Transition Area	TON	1,600
9	TX-341.6.3	Dense-Graded Hot-Mix Asphalt, Type B, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	220
10	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1
11	C-102-5.1	Temporary Erosion Control	LS	1
12	C-105-6.1	Mobilization - Base Bid (Maximum 10% of Base Bid)	LS	1
13	P-101-5.1	Asphalt Transition Milling	SY	7,000
14	P-101-5.2	Crack Repair (Less than 1.5')	LF	41,700
15	P-101-5.3	Crack Repair (Greater than 1.5')	LF	12,600
16	P-101-5.4	Pavement Section Removal	SY	5,000
17	P-152-4.1	Unclassified Excavation	CY	1,400
18	P-207-5.1	8' In Place Full Depth Recycled (FDR) Asphalt Aggregate Base Course	SY	24,400
19	P-207-5.2	Cement	TON	450
20	P-620-5.1	Pavement Marking with Reflective Media	SF	10,800
21	P-620-5.2	Pavement Markings without Reflective Media	SF	15,900
22	P-620-5.3	Pavement Markings Removal	SF	4,400
23	P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat	SY	52,000
24	T-901-5.1	Seeding	AC	2
25	T-905-5.1	Topsoil	SY	9,440

**ADD ALT 2 - SCHEDULE 1:
TDG 2B PAVEMENT FILLETS AT
TAXIWAY A AND D RUNWAY APPROACH**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	SS-140-5.1	Demolition and Disposal of Existing Safety End Treatments	EA	2
2	SS-220-5.1	Pavement Edge Grading	LF	500
3	TX-247-6.1	Flexible Base (Complete In Place)	SY	1,400
4	TX-250-5.1	Geogrid Base Reinforcement	SY	1,400
5	TX-341.6.1	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	1,100
6	TX-341.6.2	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift) - Transition Area	TON	400
7	TX-460-5.1	Corrugated Metal Pipe (18-inch) (Complete in Place)	LF	40
8	TX-467-5.1	Safety End Treatment (Type II) (18") (4.1) (Cross)	EA	2
9	P-101-5.4	Pavement Section Removal	SY	350
10	P-152-4.1	Unclassified Excavation	CY	800
11	T-901-5.1	Seeding	AC	1
12	T-905-5.1	Topsoil	SY	2,420
13	SS-300-5.1	Lockout/Tagout and Constant Current Regulator Calibration Procedures	LS	1
14	SS-301-5.1	Existing Base Mounted Guidance Sign, Removed	EA	1
15	L-108-5.1	No. 6 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit	LF	350
16	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above the Duct Bank or Conduit, Including Connections/Terminations	LF	150
17	L-110-5.1	Non-Encased Electrical Conduit, 1-Way, 2-inch, Installed	LF	150
18	L-125-5.1	L-958(L) Base Mounted, 3-Module Guidance Sign, Installed	EA	1

**ADD ALT 2 - SCHEDULE 2:
TDG 2B PAVEMENT FILLETS AT
TAXIWAY A AND D RUNWAY APPROACH**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	SS-140-5.1	Demolition and Disposal of Existing Safety End Treatments	EA	2
2	SS-220-5.1	Pavement Edge Grading	LF	500
3	TX-250-5.1	Geogrid Base Reinforcement	SY	1,400
4	TX-251-6.1	Place and Compact FDR Trimmings	CY	350
5	TX-341.6.1	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	1,100
6	TX-341.6.2	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift) - Transition Area	TON	400
7	TX-460-5.1	Corrugated Metal Pipe (18-inch) (Complete in Place)	LF	40
8	TX-467-5.1	Safety End Treatment (Type II) (18") (4.1) (Cross)	EA	2
9	P-101-5.4	Pavement Section Removal	SY	350
10	P-152-4.1	Unclassified Excavation	CY	350
11	T-901-5.1	Seeding	AC	1
12	T-905-5.1	Topsoil	SY	2,420
13	SS-300-5.1	Lockout/Tagout and Constant Current Regulator Calibration Procedures	LS	1
14	SS-301-5.1	Existing Base Mounted Guidance Sign, Removed	EA	1
15	L-108-5.1	No. 6 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit	LF	350
16	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above the Duct Bank or Conduit, Including Connections/Terminations	LF	150
17	L-110-5.1	Non-Encased Electrical Conduit, 1-Way, 2-inch, Installed	LF	150
18	L-125-5.1	L-958(L) Base Mounted, 3-Module Guidance Sign, Installed	EA	1

**ADD ALT 3 - SCHEDULE 1:
TERMINAL APRON PAVEMENT REHABILITATION
(NORTH PORTION) (RECONSTRUCTION)**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	SS-262-5.1	Tiedown Anchors	EA	21
2	TX-247-6.1	Flexible Base (Complete In Place)	SY	2,500
3	TX-250-5.1	Geogrid Base Reinforcement	SY	2,500
4	TX-341.6.1	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	615
5	P-101-5.4	Pavement Section Removal	SY	2,500
6	P-152-4.1	Unclassified Excavation	CY	1,400
7	P-620-5.3	Pavement Marking Removal	SF	(500)
8	P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat	S.Y.	(2,500)

**ADD ALT 3 - SCHEDULE 2:
TERMINAL APRON PAVEMENT REHABILITATION
(NORTH PORTION) (RECONSTRUCTION)**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	SS-262-5.1	Tiedown Anchors	EA	21
2	TX-250-5.1	Geogrid Base Reinforcement	SY	2,500
3	TX-251-6.1	Place and Compact FDR Trimmings	CY	625
4	TX-341.6.1	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	615
5	P-101-5.4	Pavement Section Removal	SY	2,500
6	P-152-4.1	Unclassified Excavation	CY	625
7	P-620-5.3	Pavement Marking Removal	SF	(500)
8	P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat	S.Y.	(2,500)

**ADD ALT 4 - SCHEDULE 1:
TERMINAL APRON PAVEMENT
RECONSTRUCTION (WEST TAXILANE)**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	TX-247-6.1	Flexible Base (Complete In Place)	SY	4,900
2	TX-341.6.1	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	1,280
3	TX-250-5.1	Geogrid Base Reinforcement	SY	4,900
4	P-101-5.4	Pavement Section Removal	SY	4,900
5	P-152-4.1	Unclassified Excavation	CY	400
6	P-620-5.3	Pavement Marking Removal	S.F.	(690)
7	P-631-7.1	Refined Coal Tar Emulsion with Additives for Slurry Coat	S.Y.	(4,900)

**ADD ALT 4 - SCHEDULE 2:
TERMINAL APRON PAVEMENT
RECONSTRUCTION (WEST TAXILANE)**

ITEM NO.	SPEC. NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY
1	TX-250-5.1	Geogrid Base Reinforcement	SY	4,900
2	TX-251-6.1	Place and Compact FDR Trimmings	CY	1,225
3	TX-341.6.1	Dense-Graded Hot-Mix Asphalt, Type D, SAC B, PG 64-22 (4-inch Thickness, 2 Lift)	TON	1,280
4	P-101-5.4	Pavement Section Removal	SY	4,900
5	P-152-4.1	Unclassified Excavation	CY	1,225
6	P-620-5.3	Pavement Marking Removal	S.F.	(690)
7	P-631-7.1	Refined Coal Tar Emulsion with		

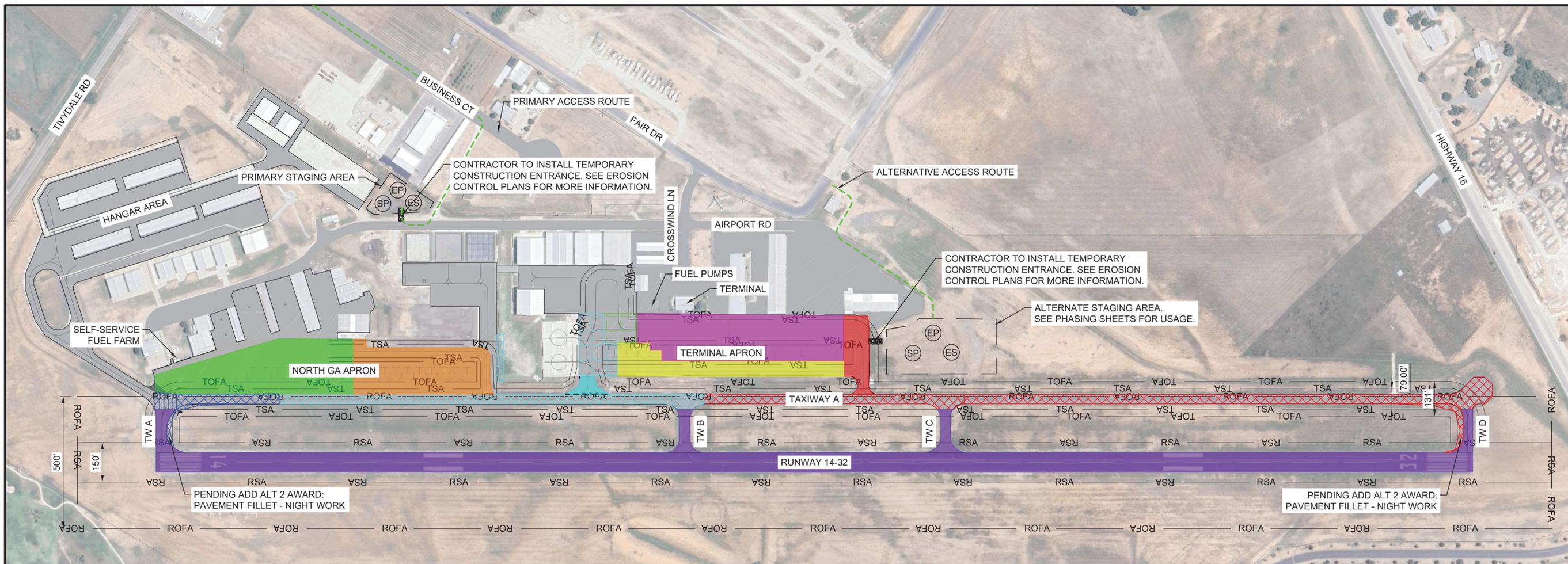


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REGISTRATION NO. F-5713



Digitally Signed 02/26/2026



BY	PJH
DESCRIPTION	ADDENDUM 1
DATE	2/26/26
REV.	1



GILLESPIE COUNTY
 AIRPORT
 FREDERICKSBURG, TX
 AIRFIELD PAVEMENT REHABILITATION

CONSTRUCTION SAFETY AND PHASING PLAN - OVERVIEW

JOB NO.: 23A06150
 DATE: JULY 2025
 DESIGNED BY: PJH
 DRAWN BY: MCC

BAR IS ONE INCH ON ORIGINAL DRAWING
 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DRAWING NUMBER
GC-100

SHEET NUMBER
7

ITEMS OF WORK

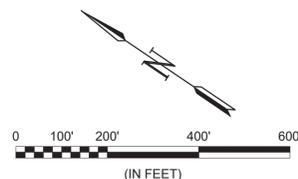
- PERFORM FULL-DEPTH RECLAMATION AND INSTALL PAVEMENT MARKINGS. **PENDING ADD. ALT. 2 AWARD: CONSTRUCT ASPHALT PAVEMENT AND GRADING
- PERFORM CRACK SEALING, APPLY SEAL COAT, AND INSTALL PAVEMENT MARKINGS.
- PERFORM FULL-DEPTH RECLAMATION AND INSTALL PAVEMENT MARKINGS. INSTALL DETENTION POND SLOPE STABILIZATION.
- PERFORM FULL DEPTH RECONSTRUCTION AND INSTALL PAVEMENT MARKINGS.
- PERFORM FULL-DEPTH RECLAMATION AND INSTALL PAVEMENT MARKINGS. **PENDING ADD. ALT. 2 AWARD: CONSTRUCT ASPHALT PAVEMENT AND GRADING
- FULL DEPTH RECONSTRUCTION AND INSTALL PAVEMENT MARKINGS.
- PERFORM CRACK SEALING, APPLY SEAL COAT, AND INSTALL PAVEMENT MARKINGS.
- PERFORM CRACK SEALING, APPLY SEAL COAT, AND INSTALL PAVEMENT MARKINGS. PENDING ADD. ALT. 3 AND/OR 4 AWARD: PERFORM FULL DEPTH RECONSTRUCTION AND AIRCRAFT TIE-DOWNS.
- PERFORM FULL DEPTH RECONSTRUCTION AND INSTALL PAVEMENT MARKINGS.
- PERFORM CRACK SEALING, APPLY SEAL COAT, AND INSTALL PAVEMENT MARKINGS.
- PERFORM CRACK SEALING, APPLY SEAL COAT, AND INSTALL PAVEMENT MARKINGS.
- **PENDING ADD. ALT. 1 AWARD: PERFORM CRACK SEALING, APPLY SEAL COAT, AND INSTALL PAVEMENT MARKINGS.

NOTES:

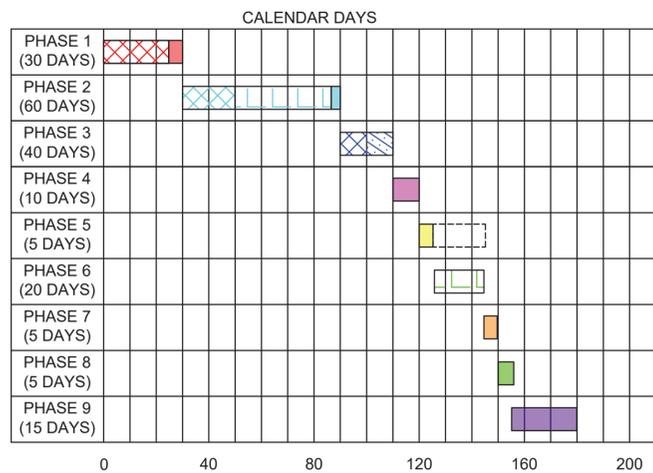
1. PRINT NOTE: SHEET SHALL BE PRINTED IN COLOR.
2. SEE CONSTRUCTION SAFETY AND PHASING NOTES FOR ADDITIONAL INFORMATION.
3. LIGHTED BARRICADES SHOWN ARE FOR GRAPHIC PURPOSES ONLY. THE CONTRACTOR SHALL DETERMINE THE QUANTITY OF LIGHTED BARRICADES REQUIRED TO COMPLETE THE WORK AS SHOWN AND MUST BE IN ACCORDANCE WITH CURRENT FAA ADVISORY CIRCULARS.
4. CONTRACTOR SHALL HAVE AN APPROVED PAVEMENT BROOM OR VACUUM TRUCK AVAILABLE ON SITE AT ALL TIMES. HYDRANTS TO FILL VACUUM TRUCK WILL BE AVAILABLE ON AIRPORT PROPERTY.
5. IN NO EVENT SHALL CONSTRUCTION VEHICLES, EQUIPMENT, OR MATERIALS BE PARKED/STORED WITHIN 50' OF BARRICADES OR ACTIVE AIRFIELD PAVEMENT.
6. ON NORTH APRON, CONTRACTOR TO MAINTAIN TENANT ACCESS TO AIRCRAFT HANGARS.
7. ON THE TERMINAL APRON, CONTRACTOR SHALL MAINTAIN ACCESS TO SELF-SERVICE FUEL PUMPS. CONTRACTOR TO COORDINATE WITH AIRPORT MANAGER AND FBO MANAGER TO MAINTAIN ACCESS TO FBO HANGARS DURING CONSTRUCTION.
8. VEHICULAR TRAFFIC SHALL ALWAYS YIELD TO AIRCRAFT TRAFFIC.
9. FOR RUNWAY CLOSURES, COORDINATE IN ADVANCE WITH AIRPORT AND AVOID PEAK TRAFFIC TIMES. AIRPORT TRAFFIC PEAK TIMES ARE THURSDAY THROUGH SUNDAY.
10. SHOULD ADDITIVE ALTERNATE 1 & 2 BE AWARDED CONTRACTOR HAS OPTION TO INCORPORATE TAXIWAY CONNECTOR FILLET CONSTRUCTION INTO PHASE 9 RUNWAY CLOSURES.

LEGEND

- RSA — RUNWAY SAFETY AREA
- ROFA — RUNWAY OBJECT FREE AREA
- TSA — TAXIWAY SAFETY AREA
- TOFA — TAXIWAY OBJECT FREE AREA
- (SP) STOCKPILE LOCATION
- (ES) EQUIPMENT STORAGE
- (EP) EMPLOYEE PARKING
- STAGING AREA
- PHASE 1 WORK AREA
- PHASE 2 WORK AREA
- PHASE 3A & 3B WORK AREA
- PHASE 4 WORK AREA
- PHASE 5 WORK AREA
- PHASE 6 WORK AREA
- PHASE 7 WORK AREA
- PHASE 8 WORK AREA
- PHASE 9 WORK AREA (ADD. ALT. 1)



CONTRACT TIME

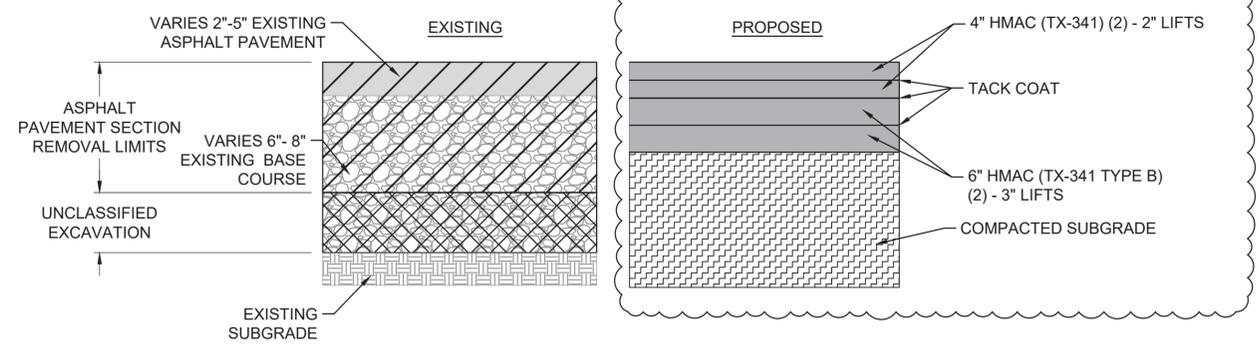


NOTES:

1. PRIOR TO PERMANENT MARKING APPLICATION, CONTRACTOR SHALL ALLOW 30 DAYS FOR CURING OF ASPHALT PAVEMENT. TEMPORARY MARKINGS SHALL BE APPLIED PRIOR TO OPENING WORK AREAS TO TRAFFIC.
2. SHOULD ADDITIVE ALTERNATE 3 OR 4 BE AWARDED, CONTRACTOR SHALL BE ALLOTTED 30 CALENDAR DAYS TO COMPLETE PHASE 5 OF CONSTRUCTION. PHASE 5 SHALL BE COMPLETED SIMULTANEOUSLY WITH PHASE 2. NO ADDITIONAL CONSTRUCTION TIME WILL BE PROVIDED.

**NOTE: ALL WORK TO BE COMPLETED PAST EXISTING HOLD SHORT MARKING LOCATIONS OR WITHIN RSA LIMITS SHALL BE COMPLETED DURING NIGHT TIME WORK, OR AS COORDINATED WITH AIRPORT MANAGEMENT THROUGH DAILY DAYTIME HOUR CLOSURES, WITH RUNWAY CLOSURES. PHASE 9 ONLY REQUIRES RUNWAY CLOSURES.

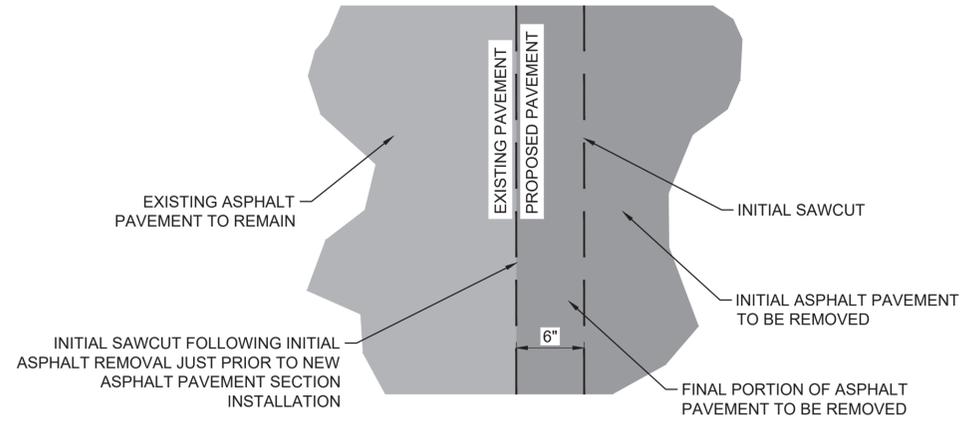
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PAVEMENT DEMOLITION NOTES:

- PAVEMENT SECTION REMOVAL IS THE REMOVAL OF ALL MATERIAL TO THE SPECIFIED DEPTH (E.G. 22" PAVEMENT SECTION REMOVAL) REGARDLESS OF WHAT TYPE OF MATERIAL (CONCRETE, ASPHALT, BASE, SUBGRADE, ETC.) IS ENCOUNTERED. SEE BL-101 AND GEOTECHNICAL REPORT PLANS FOR BORING LOGS.
- EXCAVATION NEEDED BETWEEN THE REMOVED PAVEMENT SECTION MATERIAL AND THE TOP OF THE PROPOSED LIME TREATMENT LAYER SHALL BE PAID FOR UNDER P-152 UNCLASSIFIED EXCAVATION AS SHOWN IN THE PAVEMENT DEMOLITION DETAILS. CONTRACTOR WILL BE PAID FOR THE SQUARE YARDS OF PAVEMENT SECTION REMOVED MEASURED FROM THE EXISTING SURFACE PLUS THE PLAN QUANTITY FOR P-152 "UNCLASSIFIED EXCAVATION" REGARDLESS OF MATERIAL OR DEPTH ENCOUNTERED.
- ANY PAVING FABRIC ENCOUNTERED WITHIN THE EXISTING SECTION WILL NOT BE PAID FOR SEPARATELY, BUT CONSIDERED SUBSIDIARY TO SS-140.
- CONTRACTOR TO SAWCUT FULL DEPTH PAVEMENT AT LIMITS OF DEMOLITION. CONTRACTOR TO PROTECT EDGE FROM SPALLS PRIOR TO INSTALLATION OF PROPOSED PAVEMENT. THERE WILL BE NO SEPARATE PAYMENT FOR REPAIR.
- IN AREAS UNDER PROPOSED PAVEMENT, IF BASE IS ENCOUNTERED BELOW THE PAVEMENT SECTION REMOVAL, THE BASE SHALL BE REMOVED TO THE BOTTOM OF THE EXISTING PAVEMENT SECTION. REMOVAL OF THIS MATERIAL WILL BE PAID FOR UNDER P-152 UNCLASSIFIED EXCAVATION.

1 FULL DEPTH PAVEMENT SECTION REMOVAL DETAIL
 CD-501 SCALE: NONE



2 ASPHALT REMOVAL DETAIL
 CD-501 SCALE: NONE

PAVEMENT DEMOLITION NOTES:

- CONTRACTOR WILL BE PAID FOR THE SQUARE YARD OF ASPHALT PAVEMENT REMOVED UNDER SS-140 TO THE TOP OF PROPOSED SUBGRADE.
- ALL DRAINAGE STRUCTURES AND MATERIAL DEMOLISHED SHALL BE REMOVED FROM THE SITE WITH PAYMENT CONSIDERED SUBSIDIARY TO SS-140.
- THE CONTRACTOR SHALL ENSURE A CLEAN AND STRUCTURALLY SOUND JOINT FACE AT THE EDGE OF ALL REMOVED PAVEMENT. ALL WORK, MATERIAL AND EQUIPMENT (SAW CUT, JOINT SPALL REPAIR, ETC.) SHALL NOT BE A BASIS FOR ADDITIONAL PAYMENT. SEE SHEET BL-101 AND BORING INFORMATION IN THE GEOTECHNICAL REPORT FOR MORE INFORMATION.
- THICKNESSES AND TYPES OF MATERIALS FOR ASPHALT SECTIONS ARE APPROXIMATE. VARIATIONS OF EXISTING PAVEMENT SECTIONS ON-SITE SHALL NOT BE A BASIS FOR ADDITIONAL PAYMENT. SEE SHEET BL-101 AND BORING INFORMATION IN THE GEOTECHNICAL REPORT FOR MORE INFORMATION.
- ALL PAVEMENT REMOVED SHALL BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED AND DISPOSED OF OFF AIRPORT PROPERTY AT THE CONTRACTOR'S OWN EXPENSE.
- CONTRACTOR SHALL PROTECT ALL UTILITIES, DRAINAGE FACILITIES, AND AIRPORT FACILITIES THAT ARE TO REMAIN DURING CONSTRUCTION. CONTRACTOR SHALL PERFORM THE WORK IN SUCH A MANNER AS NOT TO DAMAGE THE EXISTING UTILITIES. ANY DAMAGE TO THESE UTILITIES ARISING FROM THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED IMMEDIATELY AND AT NO COST TO THE OWNER.
- DAMAGE TO EXISTING PAVEMENT TO REMAIN SHALL REQUIRE THE CONTRACTOR TO CUT A CLEAN VERTICAL EDGE BEYOND THE DAMAGE AND REMOVE AND REPLACE THE ADDITIONAL PAVEMENT AT NO COST TO THE OWNER. REMOVAL LIMITS SHALL BE APPROVED BY THE ENGINEER.
- MISCELLANEOUS STRUCTURES EXISTING WITHIN PAVEMENT DEMOLITION EXTENTS, INCLUDING, BUT NOT LIMITED TO BOLLARDS AND AIRCRAFT TIE-DOWNS, ARE SUBSIDIARY TO PAVEMENT REMOVAL.

UNDERGROUND UTILITIES NOTE:

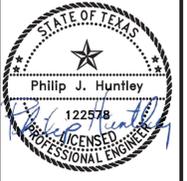
- UNDERGROUND UTILITIES EXIST WITHIN AND ADJACENT TO THE LIMITS OF CONSTRUCTION. AN ATTEMPT HAS BEEN MADE TO LOCATE THESE UTILITIES ON THE PLANS. HOWEVER, ALL EXISTING UTILITIES MAY NOT BE SHOWN AND THE ACTUAL LOCATIONS OF THE UTILITIES MAY VARY FROM THE LOCATIONS SHOWN. PRIOR TO BEGINNING ANY TYPE OF EXCAVATION, THE CONTRACTOR SHALL CONTACT THE UTILITIES INVOLVED AND MAKE ARRANGEMENTS FOR THE LOCATION OF THE UTILITIES ON THE GROUND. THE CONTRACTOR SHALL MAINTAIN THE UTILITY LOCATION MARKINGS UNTIL THEY ARE NO LONGER NECESSARY.

TEXAS STATE LAW, THE UNDERGROUND FACILITIES DAMAGE PREVENTION ACT, REQUIRES TWO WORKING DAYS ADVANCE NOTIFICATION THROUGH THE ONE-CALL SYSTEM CENTER BEFORE EXCAVATING USING MECHANIZED EQUIPMENT OR EXPLOSIVES (EXCEPT IN THE CASE OF AN EMERGENCY). THE ONE-CALL SYSTEM PHONE NUMBER IS 1-800-344-8377. THE CONTRACTOR IS ADVISED THAT THERE IS A SEVERE PENALTY FOR NOT MAKING THIS CALL. NOT ALL UTILITY COMPANIES ARE MEMBERS OF THE TEXAS ONE-CALL SYSTEM; THEREFORE, THE CONTRACTOR IS ADVISED TO CONTACT ALL NON-MEMBER UTILITIES AS WELL AS THE ONE-CALL SYSTEM.



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REGISTRATION NO. F-5713



Digitally Signed 02/26/2026

REV.	DATE	DESCRIPTION	BY
1	2/26/26	ADDENDUM 1	PGH



GILLESPIE COUNTY AIRPORT
 FREDERICKSBURG, TX
 AIRFIELD PAVEMENT REHABILITATION

DEMOLITION DETAILS

JOB NO.: 23A06150
 DATE: JULY 2025
 DESIGNED BY: PJH
 DRAWN BY: MCC

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 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DRAWING NUMBER
CD-501

SHEET NUMBER
33

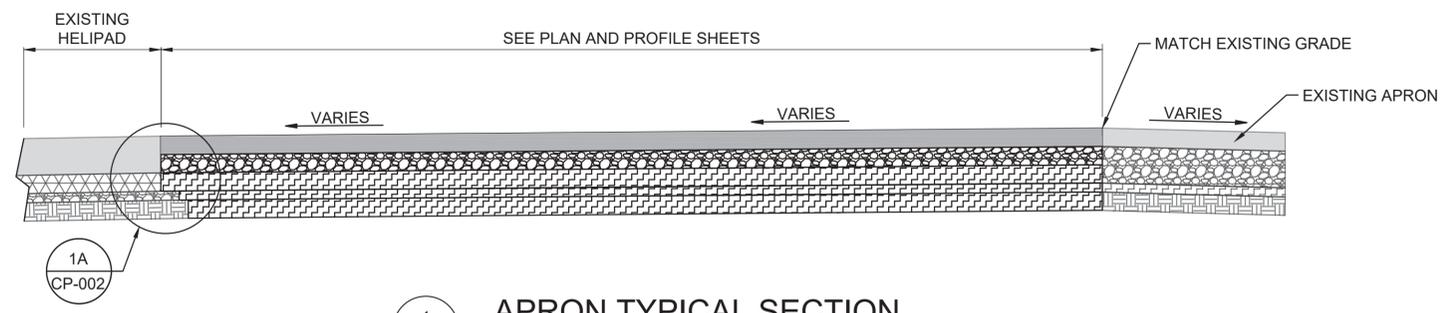


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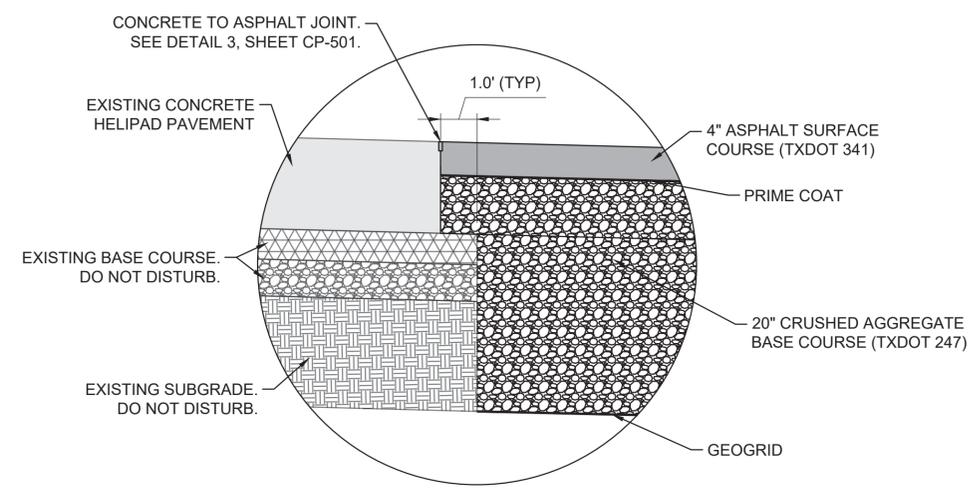
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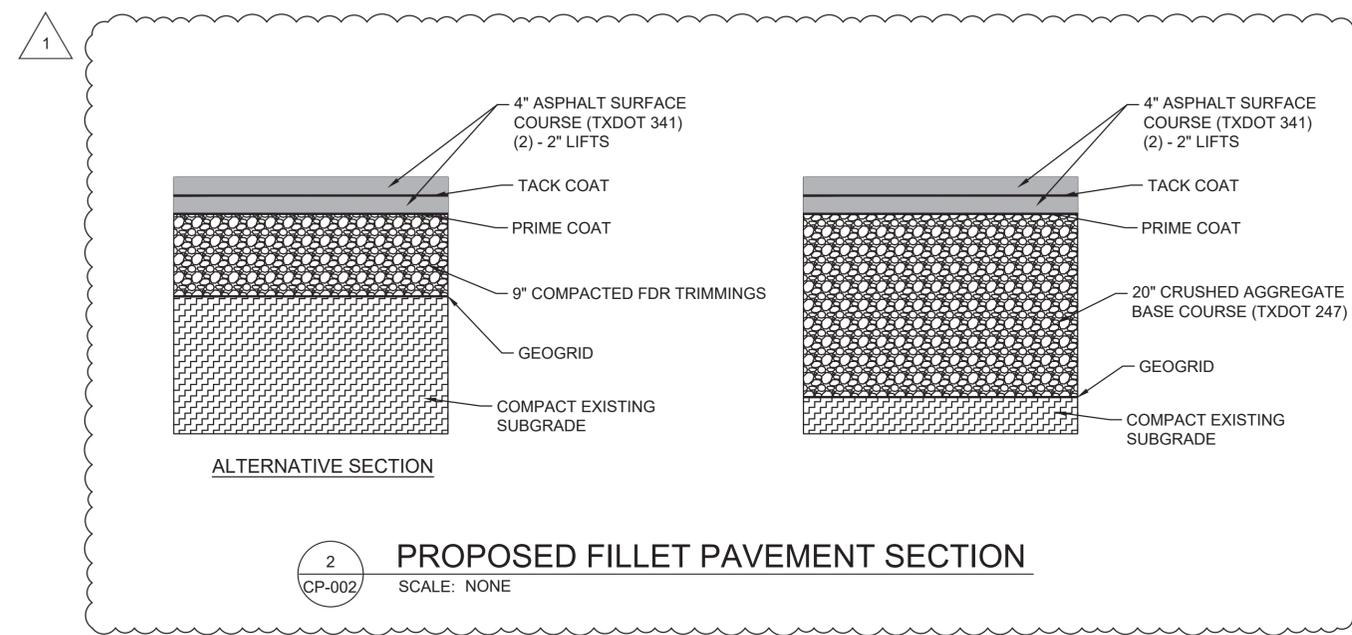
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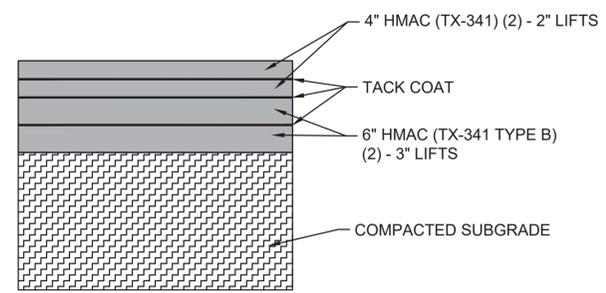
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 CP-002 **APRON TYPICAL SECTION**
 SCALE: NONE



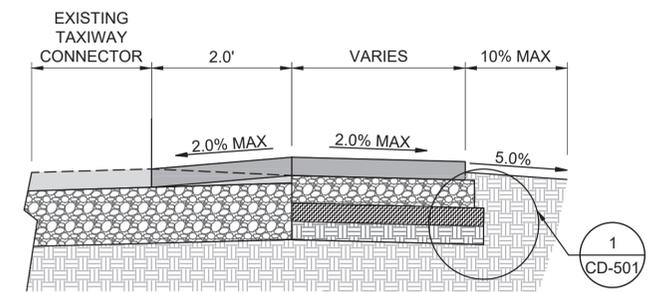
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 CP-002 **APRON SECTION DETAIL**
 SCALE: NONE



2
 CP-002 **PROPOSED FILLET PAVEMENT SECTION**
 SCALE: NONE



3
 CP-002 **PHASE 3B FULL DEPTH PAVEMENT SECTION DETAIL**
 SCALE: NONE



4
 CP-002 **ADD ALT 2 FILLET TYPICAL SECTION**
 SCALE: NONE

REV.	DATE	DESCRIPTION	BY	PGH
1	2/26/26	ADDENDUM 1		



GILLESPIE COUNTY
 AIRPORT
 FREDERICKSBURG, TX
 AIRFIELD PAVEMENT
 REHABILITATION

TYPICAL SECTIONS 2

JOB NO.: 23A06150
 DATE: JULY 2025
 DESIGNED BY: PJH
 DRAWN BY: MCC

BAR IS ONE INCH ON ORIGINAL DRAWING
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DRAWING NUMBER
CP-002

SHEET NUMBER
35

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