AN AGREEMENT
BY AND BETWEEN
THE TEXAS A&M UNIVERSITY SYSTEM OFFICES
AND JON TUCKER CONSTRUCTION LTD

This Services Agreement ("Agreement") is entered into and effective upon final execution (the "Effective Date"), by and between The Texas A&M University System (hereafter referred to as "A&M System"), an agency of the state of Texas, and Jon Tucker Construction LTD (hereafter referred to as "PROVIDER"). A&M System and PROVIDER are sometimes hereafter referred to as "Party" individually or "Parties" collectively).

A&M System and PROVIDER hereby agree as follows:

1. SCOPE OF WORK

PROVIDER will work with A&M System and RELLIS Campus administration to provide road maintenance services as needed throughout the term of this Agreement on the RELLIS Campus. The services included (but not limited to) in the scope of this Agreement are listed in Exhibit A, attached hereto.

This Agreement is an Indefinite Delivery, Indefinite Quantity (IDIQ), per Invitation to Bid # TAMUS-ITB 2424. There is no guarantee of any quantity of work as a result of this Agreement. Individual orders will be placed on an as needed basis.

2. TERM OF THE AGREEMENT

The initial term of this Agreement shall begin upon the Effective Date and will extend for three (3) years. This Agreement can be extended for two (2) additional one-year terms upon written agreement of both parties. Any extensions shall be at the same terms and conditions plus any approved changes to be determined by A&M System and negotiated in writing with the PROVIDER.

3. PAYMENT TERMS

A. A&M System shall not pay any costs or fees as a direct result of this Agreement. For services rendered as a result of this Agreement, the A&M System shall pay Provider based on prices listed for each item in Exhibit A.

B. PROVIDER shall invoice A&M System for amounts due consistent with the purchase order issued for each specific project. Invoices shall be sent to the Bill To email address noted on each purchase order. Payment will be made to PROVIDER upon approval of such invoice by A&M System. It is the policy of the state of Texas to make payment on a properly prepared and submitted invoice within thirty (30) days of the latter of any final acceptance of performance or the receipt of a properly submitted invoice, in conformance with the Texas Prompt Payment law. Generally, payment will be made on the 30th day unless a discount has been arranged for more immediate payment.

C. All payments shall be made by electronic direct deposit. PROVIDER is required to complete and submit to A&M System a Vendor Direct Deposit Authorization form prior to the first payment request. The form can be accessed at: https://www.tamus.edu/business/budgets-and-accounting/accounting/general/ .

D. All invoices must reference the purchase order number issued for a specific project and include the description of services provided as well as time, deliverables, and activities. Invoices will be processed for payment upon approval by the appropriate A&M System personnel.

4. DEFAULT AND TERMINATION

A. For Cause: In the event of substantial failure by Provider to perform in accordance with the terms hereof, A&M System may terminate this Agreement upon fifteen (15) days written notice of termination setting forth the nature of the failure (the termination shall not be effective if the failure is fully cured prior by the end of the fifteen-day period), provided that said failure is through no fault of A&M System.

B. For Convenience: A&M System may terminate this Agreement at any time upon thirty (30) days prior notice to Provider.

C. Termination of this Agreement for either of the reasons stated above shall not terminate any specific project already assigned by purchase order. Refer to Section 8.M for survivability of terms beyond termination of this Agreement.

5. PUBLIC INFORMATION

A. PROVIDER acknowledges that A&M System is obligated to strictly comply with the Public Information Act, Chapter 552, Texas Government Code, in responding to any request for public information pertaining to this Agreement, as well as any other disclosure of information required by applicable Texas law.

B. Upon A&M System's written request, PROVIDER will promptly provide specified contracting information exchanged or created under this Agreement for or on behalf of A&M System.

C. PROVIDER acknowledges that A&M System may be required to post a copy of the fully executed Agreement on its Internet website in compliance with Section 2261.253(a)(1), Texas Government Code.

D. The requirements of Subchapter J, Chapter 552, Texas Government Code, may apply to this Agreement and the PROVIDER agrees that the Agreement can be terminated if the PROVIDER knowingly or intentionally fails to comply with a requirement of that subchapter.

6. DISPUTE RESOLUTION

The dispute resolution process provided in Chapter 2260, *Texas Government Code*, and the related rules adopted by the Texas Attorney General pursuant to Chapter 2260, shall be used by A&M System and PROVIDER to attempt to resolve any claim for breach of contract made by PROVIDER that cannot be resolved in the ordinary course of business. PROVIDER shall submit written notice of a claim of breach of contract under this Chapter to Billy Hamilton, Deputy Chancellor and Chief Financial Officer for A&M System, who shall examine PROVIDER's claim and any counterclaim and negotiate with PROVIDER in an effort to resolve the claim.

7. INSURANCE

Insurance requirements as stated within Exhibit C, attached hereto.

8. MISCELLANEOUS

A. **Indemnification.** PROVIDER agrees to indemnify and hold harmless A&M System from any claim, damage, liability, expense or loss to the extent arising out of PROVIDER's negligent or willful errors or omissions under this Agreement.

B. **Independent Contractor.** PROVIDER is an independent contractor, and neither PROVIDER nor any employee of PROVIDER shall be deemed to be an agent or employee of A&M System. A&M System will have no responsibility to provide transportation, insurance or other fringe benefits normally

associated with employee status. PROVIDER shall observe and abide by all applicable laws and regulations, policies and procedures, including but not limited to those of A&M System relative to conduct on its premises.

C. **Delinquent Child Support Obligations.** A child support obligor who is more than 30 days delinquent in paying child support and a business entity in which the obligor is a sole proprietor, partner, shareholder, or owner with an ownership interest of at least 25 percent is not eligible to receive payments from state funds under an agreement to provide property, materials, or services until all arrearages have been paid or the obligor is in compliance with a written repayment agreement or court order as to any existing delinquency. The *Texas Family Code* requires the following statement: "Under Section 231.006, *Texas Family Code*, the vendor or applicant certifies that the individual or business entity named in this contract, bid, or application is not ineligible to receive the specified grant, loan, or payment and acknowledges that this contract may be terminated and payment may be withheld if this certification is inaccurate."

D. **Payment of Debt or Delinquency to the State.** Pursuant to Section 2252.903, *Texas Government Code*, PROVIDER agrees that any payments owing to PROVIDER under this Agreement may be applied directly toward certain debts or delinquencies that PROVIDER owes the State of Texas or any agency of the State of Texas regardless of when they arise, until such debts or delinquencies are paid in full.

E. **Previous Employment.** PROVIDER acknowledges and understands that Section 2252.901, *Texas Government Code*, prohibits A&M System from using state appropriated funds to enter into any employment contract, consulting contract, or professional services contract with any individual who has been previously employed, as an employee, by the agency within the past twelve (12) months. If PROVIDER is an individual, by signing this Agreement, PROVIDER certifies that Section 2252.901, *Texas Government Code,* does not prohibit the use of state appropriated funds for satisfying the payment obligations herein.

F. **Not Eligible for Rehire.** PROVIDER is responsible to ensure that employees participating in work for any A&M System member have not been designated by the A&M System as Not Eligible for Rehire as defined in System policy 32.02, Section 4. Non-conformance to this requirement may be grounds for termination of this Agreement.

G. **Franchise Tax Certification.** If PROVIDER is a taxable entity subject to the Texas Franchise Tax (Chapter 171, *Texas Tax Code*), then PROVIDER certifies that it is not currently delinquent in the payment of any franchise (margin) taxes or that PROVIDER is exempt from the payment of franchise (margin) taxes.

H. **State Auditor's Office.** PROVIDER understands that acceptance of funds under this Agreement constitutes acceptance of the authority of the Texas State Auditor's Office, or any successor agency (collectively, "Auditor"), to conduct an audit or investigation in connection with those funds pursuant to Section 51.9335(c), *Texas Education Code*. PROVIDER agrees to cooperate with the Auditor in the conduct of the audit or investigation, including without limitation, providing all records requested. PROVIDER will include this provision in all contracts with permitted subcontractors.

I. **Entire Agreement.** This Agreement constitutes the sole agreement of the parties and supersedes any other oral or written understanding or agreement pertaining to the subject matter of this Agreement. This Agreement may not be amended or otherwise altered except upon the written agreement of both parties.

J. **Severability.** If any provisions of this Agreement are rendered or declared illegal for any reason, or shall be invalid or unenforceable, such provision shall be modified or deleted in such manner so as to afford the Party for whose benefit it was intended the fullest benefit commensurate with

making this Agreement, as modified, enforceable, and the remainder of this Agreement and the application of such provision to other persons or circumstances shall not be affected thereby, but shall be enforced to the greatest extent permitted by applicable law.

K. **Headings.** Headings appear solely for convenience of reference. Such headings are not part of this Agreement and shall not be used to construe it.

L. **Non-Assignment.** PROVIDER shall neither assign its rights nor delegate its duties under this Agreement without the prior written consent of A&M System.

M. **Survivability.** The Provider's duties under this Agreement and any specific project purchase order, which impose an obligation after expiration or termination of this Agreement, will survive unless otherwise stated within the project specific purchase order.

N. **HUB Subcontracting Plan.** If an individual project assigned as a result of this Agreement, the PROVIDER will be required to complete a HUB Subcontracting Plan ("HSP") in full if the cost of that specific project exceeds $50,000 per the instructions below prior to issuance of the purchase order for that specific project.

a. Complete Section 1

b. Complete Section 2a through d.

c. Complete Section 4

d. Complete Method A or B as applicable depending on your response to questions in Section 2c-d. Below are the instructions for each Method;

Method A: Provide Method A (Attachment A) for each opportunity identified in Section 2b of the HSP and complete all sections. Section A-2 shall include all subconsultants selected for that opportunity, both HUBs and non-HUBs.

Method B: Provide Method B (Attachment B) for each opportunity identified in Section 2b. Reminder that all supporting documentation listed in Section B-3 shall be provided as part of this attachment. The following are additional items of note as part of the good faith effort required:

- The respondent shall provide potential HUB subcontractors reasonable time to respond to the respondent's notice. "Reasonable time to respond" in this context is no less than seven (7) working days from receipt of notice, unless circumstances require a different time period and it is approved by A&M System in writing.
- The respondent shall use the State of Texas Centralized Master Bidders List (CMBL), HUB Directory, internet resources, and/or other directories as identified by the State of Texas or the A&M System HUB Program Office when searching for HUB subcontractors. **A complete list of all State of Texas certified HUBs may be electronically accessed at;** https://mycpa.cpa.state.tx.us/tpasscmblsearch/index.jsp
- The respondent shall provide the notice described in this section to **three (3) or more** HUBs for **each** subcontracting opportunity as stated in Section B3a. The A&M System encourages respondents to seek and find a "Diverse Group" of Historically Underutilized Businesses in each category in which a subcontract of services is solicited.
- The respondent shall provide notice to minority and women business trade organizations or development centers that assist in identifying HUBs by disseminating opportunities to their membership/participants. A list of possible organizations/centers can be found at the following site; https://comptroller.texas.gov/purchasing/vendor/hub/resources.php.

- The respondent shall negotiate in good faith with qualified HUBs, not rejecting qualified HUBs who were also the best value responsive bidder.
- Provide written justification of the selection process if a non-HUB subcontractor is selected in Section B-4c.

e. Submit the completed HSP to the A&M System Procurement and HUB Program office for review and approval by email to soprocurement@tamus.edu.

O. **Force Majeure.** Neither party will be in breach of its obligations under this Agreement or incur any liability to the other party for any losses or damages of any nature whatsoever incurred or suffered by that other party if and to the extent that it is prevented from carrying out those obligations by, or such losses or damages are caused by, a Force Majeure event (as defined below), except to the extent that the relevant breach of its obligations would have occurred, or the relevant losses or damages would have arisen, even if the Force Majeure event had not occurred. "Force Majeure event" is defined as: 1) acts of God; 2) war; 3) act(s) of terrorism; 4) fires; 5) explosions; 6) natural disasters, to include without limitation, hurricanes, floods, and tornadoes; 7) failure of transportation; 8) strike(s); 9) loss or shortage of transportation facilities; 10) lockout, or commandeering of materials, products, plants or facilities by the government or other order (both federal and state); 11) interruptions by government or court orders (both federal and state); 12) present and future orders of any regulatory body having proper jurisdiction; 13) civil disturbances, to include without limitation, riots, rebellions, and insurrections; 14) epidemic(s), pandemic(s), or other national, state, or regional emergency(ies); and 15) any other cause not enumerated in this provision, but which is beyond the reasonable control of the party whose performance is affected and which by the exercise of all reasonable due diligence, such party is unable to overcome. Such excuse from performance will be effective only to the extent and duration of the Force Majeure event(s) causing the failure or delay in performance and provided that the affected party has not caused such Force Majeure event(s) to occur and continues to use diligent, good faith efforts to avoid the effects of such Force Majeure event(s) and to perform its obligation(s). Written notice of a party's failure or delay in performance due to Force Majeure must be given within a reasonable time after its occurrence and must describe the Force Majeure event(s) and the actions taken to minimize the impact of such Force Majeure event(s). For the avoidance of doubt, the COVID-19 pandemic and any governmental changes or closures related thereto shall be deemed Force Majeure events, even to the extent reasonably foreseeable by either party as of the effective date of this Agreement.

P. **Loss of Funding.** Performance by A&M System under this Agreement may be dependent upon the appropriation and allotment of funds by the Texas State Legislature (the "Legislature"). If the Legislature fails to appropriate or allot the necessary funds, A&M System will issue written notice to PROVIDER and A&M System may terminate this Agreement without further duty or obligation hereunder. PROVIDER acknowledges that appropriation of funds is beyond the control of A&M System.

Q. **Governing Law.** The validity of this Agreement and all matters pertaining to this Agreement, including but not limited to, matters of performance, non-performance**,** breach, remedies, procedures, rights, duties, and interpretation or construction, shall be governed and determined by the Constitution and the laws of the State of Texas.

R. **Venue.** Pursuant to Section 85.18, *Texas Education Code*, venue for any suit filed against A&M System shall be in the county in which the primary office of the chief executive officer of A&M System is located, which is Brazos County, Texas.

S. **Non-Waiver.** PROVIDER expressly acknowledges that A&M System is an agency of the State of Texas and nothing in this Agreement will be construed as a waiver or relinquishment by A&M System of its right to claim such exemptions, privileges, and immunities as may be provided by law.

T. **Conflict of Interest.** By executing this Agreement, PROVIDER and each person signing on behalf of PROVIDER certifies, and in the case of a sole proprietorship, partnership or corporation, each party thereto certifies as to its own organization, that to the best of their knowledge and belief, no member of The A&M System or The A&M System Board of Regents, nor any employee, or person, whose salary is payable in whole or in part by The A&M System, has direct or indirect financial interest in the award of this Agreement, or in the services to which this Agreement relates, or in any of the profits, real or potential, thereof.

U. **Prohibition on Contracts with Companies Boycotting Israel.** To the extent that Texas Government Code, Chapter 2271 applies to this Agreement, PROVIDER certifies that (a) it does not currently boycott Israel; and (b) it will not boycott Israel during the term of this Agreement. PROVIDER acknowledges this Agreement may be terminated and payment withheld if this certification is inaccurate.

V. **Certification Regarding Business with Certain Countries and Organizations.** Pursuant to Subchapter F, Chapter 2252, Texas Government Code, PROVIDER certifies it is not engaged in business with Iran, Sudan, or a foreign terrorist organization. PROVIDER acknowledges this Purchase Order may be terminated if this certification is or becomes inaccurate.

W. **Prohibition on Contracts Related to Persons Involved in Human Trafficking**. Under Section 2155.0061, Government Code, the vendor certifies that the individual or business entity named in this contract is not ineligible to receive the specified contract and acknowledges that this contract may be terminated and payment withheld if this certification is inaccurate.

X. **Records Retention.** PROVIDER will preserve all contracting information, as defined under Texas Government Code, Section 552.003 (7), related to the Agreement for the duration of the Agreement and for seven years after the conclusion of the Agreement.

Y. **Notices.** Any notice required or permitted under this Agreement must be in writing, and shall be deemed to be delivered (whether actually received or not) when deposited with the United States Postal Service, postage prepaid, certified mail, return receipt requested, and addressed to the intended recipient at the address set out below. Notice may also be given by regular mail, personal delivery, courier delivery, facsimile transmission, email or other commercially reasonably means and will be effective when actually received. A&M System and PROVIDER can change their respective notice address by sending to the other party a notice of the new address. Notices should be addressed as follows:

A&M System:
The Texas A&M University System
301 Tarrow St., Suite 273
College Station, Texas 77840
Attention: Jeff Zimmermann
Phone: (979) 458-6410
E-mail: jzimmermann@tamus.edu

PROVIDER:
Jon Tucker Construction LTD
7425 Mize Road
Bryan, TX 77808
Attention: Jeremy Baker
Phone: (979) 589-3471
Email: jeremy@jontuckerconstruction.com

IN WITNESS WHEREOF, intending to be bound, the Parties have entered into this Agreement as of the Effective Date.

DS

The Texas A&M University System

By DocuSigned by: BEDCDB89EA78479... 12/7/2020 | 14:29:10 CST

Billy Hamilton — Date

Deputy Chancellor & Chief Financial Officer

Jon Tucker Construction LTD

By DocuSigned by: Jeremy Baker ADA25C3EACA04A9... 12/7/2020 | 13:57:37 CST

Jeremy Baker — Date

Project Manager

EXHIBIT A – SCOPE

Scope of services:

Furnish materials and equipment for the road maintenance supplies/services listed. All services are for the A&M System RELLIS Campus and shall be quoted upon request as specific maintenance projects arise. All services performed shall be per specifications (Exhibit B) and pricing as noted.

Contacts:

Jon Tucker Construction
Jon Tucker
Email: jon@jontuckerconstruction.com
Phone: 979-412-0223

RELLIS Campus
Tim Krivdo
Email: TKrivdo@tamus.edu
Phone: 979-317-1036

Supplies/Services:

1. Seal Coating Roadways
    a. Assumptions:
        i. Provide and use power broom
        ii. Provide and place asphalt rubber blend with calibrated asphalt rig
        iii. Provide and place and roll aggregate surface course
    b. Subcontracting: Yes - Larry Young Paving
    c. Pricing: $3.03/Sq Yard
    d. Reference Exhibit B: Seal Coating Roadways Spec Item 316

2. Seal Coating Mobilization
    a. Assumptions:
        i. Mobilize all equipment necessary to perform seal coat operation
        ii. Broom
        iii. Chip spreader
        iv. Pneumatic roller
    b. Subcontracting: Yes - Larry Young Paving
    c. Pricing: $2,100.00

3. Restripe Roadways / Pavement Markings
    a. Assumptions:
        i. Clean existing surface to accept striping
        ii. Use paint meeting specification 32-17-32
    b. Subcontracting: Yes - Precision Pavement Maintenance
    c. Pricing: $3.75/Sq Ft
    d. Reference Exhibit B : Restripe Roadways Pavement Markings Spec PAVEMENT MARKINGS – 32 17 23

4. Cleaning and Sealing Joints and Cracks, Asphalt
    a. Assumptions:
        i. Rout cracks as needed
        ii. Clean cracks with high pressure air

iii. Fill and bridge cracks with
b. Subcontracting: Yes - Larry Young Paving
c. Pricing: $3.90/Linear Ft
d. Reference Exhibit B: Cleaning and Crack Sealing Joints-Asphalt Spec Item 712

5. Cleaning and Sealing Joints and Cracks, Concrete
    a. Assumptions:
        i. Use mechanical means of cleaning existing crack and removing material from sealant reservoir
        ii. Remove all existing sealant and scar sides of joint (use saw)
        iii. Blow out joint with compressed high pressure are
        iv. Apply new backer and sealant in reservoir
    b. Subcontracting: No
    c. Pricing: $11.38/Linear Ft
    d. Reference Exhibit B: Cleaning and Crack Sealing Joints-Concrete Spec Item 713

6. Full Depth Repair, Includes Removal
    a. Assumptions:
        i. Sawcut square edges full depth
        ii. Remove existing patch area through subgrade
        iii. Furnish and place new cement stabilized subgrade
        iv. Furnish and place prime/tack
        v. Furnish and place and compact black base (HMAC type B)
        vi. Furnish and place and compact HMAC type D surface
    b. Subcontracting: No
    c. Pricing: $240.00/Sq Yard
    d. Reference Exhibit B: Full Depth Repair Detail

7. Full Depth Repair Equipment Mobilization
    a. Assumptions:
        i. Mobilize all equipment necessary to perform patch
        ii. Walk behind saw
        iii. Mini excavator
        iv. Skid steer loader
        v. Small Compactor
    b. Subcontracting: No
    c. Pricing: $2,280.00

8. Curb and Gutter Remove and Replace
    a. Assumptions:
        i. Sawcut, remove, and haul off existing curb and gutter
        ii. Form, reinforce, place and finish new curb section
        iii. Repair asphalt surface course damage as needed (sawcut straight lines for repair)
    b. Subcontracting: No
    c. Pricing: $48.50/Linear Ft
    d. Reference Exhibit B: Curb and Gutter Remove and Replace Spec Item 529

9. Pothole Repair
    a. Assumptions:
        i. Sawcut square edges full depth

ii. Remove existing material and debris to stable material
iii. Replace material in lifts compacting each lift
iv. Match original adjacent material
v. Use cement stabilized material for subgrade repair

b. Subcontracting: No
c. Pricing: $660.00/Ton
d. Reference Exhibit B: Pothole Repair Spec Item 700

10. Repair of Spalling in Concrete Pavement
    a. Assumptions:
        i. Sawcut square edges around spall area to a depth of 1-1/2”
        ii. Chip out spall area and remove debris
        iii. Repair spall area with a high strength cementitious polymeric patching compound
    b. Subcontracting: No
    c. Pricing: $313.80/Cu Ft
    d. Reference Exhibit B: Repair of Spalling in Concrete Pavement Spec Item 720

11. Concrete Crack Repair
    a. Assumptions:
        i. Chase (Rout) crack 1/2” wide with a “v” bottom
        ii. Blow out routed crack with high pressure compressed air
        iii. Place sealant in newly routed reservoir
    b. Subcontracting: No
    c. Pricing: $14.86/Linear Ft
    d. Reference Exhibit B: Concrete Crack Repair Spec Item 780

12. Cleaning and Reshaping Ditches
    a. Assumptions:
        i. Strip off existing grass from ditch
        ii. Reshape existing ditch by cleaning silt from flow line
        iii. Re-establish drainage
        iv. Spread silt on backslap of ditch
        v. Replace grass on disturbed areas
    b. Subcontracting: No
    c. Pricing: $7.24/Linear Ft
    d. Reference Exhibit B: Cleaning and Reshaping Ditches Spec Item 760

13. Mill and stockpile on site 2” asphalt, tack coat, replace with 2” TY D
    a. Assumptions:
        i. Mill and stockpile existing paving
        ii. Sweep and clean debris from milled surface
        iii. Apply tack coat
        iv. Place 2” HMAC Type D surface
    b. Subcontracting: Yes - Larry Young Paving
    c. Pricing: $15.18/Sq Yd
    d. Reference Exhibit B: Asphalt Spec Item 340

14. Replace Damaged Street Sign - Pole and Sign Only
    a. Assumptions:
        i. Unbolt post from base and remove from site

   ii. Replace post
   iii. Replace sign to match original
b. Subcontracting: No
c. Pricing: $960.50 EA
d. Reference Exhibit B: Street sign and foundation Drawing C1112

15. Replace Damaged Street Sign - Pole, Sign, and Foundation
   a. Assumptions:
      i. Dig and remove pole foundation
      ii. Remove and haul off sign, foundation, and pole
      iii. Place new post base
      iv. Provide and install new pole
      v. Provide and install new sign
   b. Subcontracting: No
   c. Pricing: $1,800.00 EA
   d. Reference Exhibit B: Street sign and foundation Drawing C1112

Item 316
Seal Coat

1. DESCRIPTION

Construct a surface treatment consisting of one or more applications of a single layer of asphalt material covered with a single layer of aggregate.

2. MATERIALS

Furnish materials of the type and grade shown on the plans in accordance with the following:

2.1. **Asphalt**. Furnish asphalt materials meeting the requirements of Item 300, "Asphalts, Oils, and Emulsions."

Furnish Type II or Type III A-R binder in accordance with Section 300.2.9., "Asphalt-Rubber Binders," as shown on the plans. Furnish a blend design for approval. Include in the design, at a minimum, the following:

- manufacturer and grade of asphalt cement;
- manufacturer and grade of crumb rubber;
- manufacturer, type, and percentage of extender oil, if used;
- test report on crumb rubber gradation in accordance with Tex-200-F, Part I;
- design percentage of crumb rubber versus asphalt content;
- blending temperature; and
- test results on the properties at reaction times of 60, 90, 240, 360, and 1,440 min. in accordance with Section 300.2.9., "Asphalt-Rubber Binders."

Furnish a new asphalt-rubber blend design if the grade or source for any of the components changes.

If a tack coat is specified when using asphalt-rubber, unless otherwise shown on the plans or approved, furnish CSS-1H, SS-1H, or a performance grade (PG) binder with a minimum high temperature grade of PG 58 for tack coat binder. Do not dilute emulsified asphalts at the terminal, in the field, or at any other location before use. If required, verify that emulsified asphalt proposed for use meets the minimum residual asphalt percentage specified in Item 300, "Asphalts, Oils, and Emulsions."

2.2. **Aggregate**. Furnish aggregate meeting Item 302, "Aggregates for Surface Treatments," of the type and grade shown on the plans. Unless otherwise shown on the plans, furnish aggregate with a minimum B Surface Aggregate Classification.

2.3. **Materials Selections**. Furnish asphalt and aggregate shown on the plans.

3. EQUIPMENT

3.1. **Distributor**. Furnish a distributor that will apply the asphalt material uniformly at the specified rate or as directed.

3.1.1. **Transverse Variable Rate**. When a transverse variable rate is shown on the plans, ensure that the nozzles outside the wheel paths will output a predetermined percentage more asphalt material by volume than the nozzles over the wheel paths. Use a dual spray bar distributor as desired to provide for a transverse variable rate.

3.1.2. **Agitation for Asphalt-Rubber**. If using asphalt-rubber, furnish a distributor capable of keeping the rubber in uniform suspension and adequately mixing the asphalt, rubber, and any additional additives.

3.1.3. **Calibration**.

3.1.3.1. **Transverse Distribution**. Furnish a distributor test report, less than 1 yr. old, when tested in accordance with Tex-922-K, Part III. The Department reserves the right to witness the calibration testing. Notify the Engineer 3 days before calibration testing.

Include the following documentation on the test report:

- the serial number of the distributor,
- a method that identifies the actual nozzle set used in the test, and
- the fan width of the nozzle set at a 12-in. bar height.

When a transverse variable rate is required, and a single spray bar is to be used, perform the test using the type and grade of asphalt material to be used on the project. The Engineer may verify the transverse rate and distribution at any time. If verification does not meet the requirements, correct deficiencies and furnish a new test report.

3.1.3.2. **Tank Volume**. Furnish a volumetric calibration and strap stick for the distributor tank in accordance with Tex-922-K, Part I.

Provide documentation of distributor calibration performed not more than 5 yr. before the date first used on the project. The Engineer may verify calibration accuracy in accordance with Tex-922-K, Part II.

3.1.4. **Computerized Distributor**. When paying for asphalt material by weight, the Engineer may allow use of the computerized distributor display to verify application rates. Verify application rate accuracy at a frequency acceptable to the Engineer.

3.2. **Aggregate Spreader**. Use a continuous-feed, self-propelled spreader to apply aggregate uniformly at the specified rate or as directed. If racked in aggregate is specified on the plans, furnish a second aggregate spreader for the racked in aggregate to apply aggregate uniformly at the specified rate.

3.3. **Rollers**. Unless otherwise shown on the plans, furnish light pneumatic-tire rollers in accordance with Item 210, “Rolling.”

3.4. **Broom**. Furnish rotary, self-propelled brooms.

3.5. **Asphalt Storage and Handling Equipment**. When the plans or the Engineer allows storage tanks, furnish a thermometer in each tank to indicate the asphalt temperature continuously. Keep equipment clean and free of leaks. Keep asphalt material free of contamination.

3.6. **Aggregate Haul Trucks**. Unless otherwise approved, use trucks of uniform capacity to deliver the aggregate. Provide documentation showing measurements and calculation in cubic yards. Clearly mark the calibrated level. Truck size may be limited when shown on the plans.

3.7. **Digital Distance Measuring Instrument**. Furnish a vehicle with a calibrated digital distance measuring instrument accurate to ±6 ft. per mile.

4. CONSTRUCTION

4.1. **General**. Comply with the seal coat season as shown on the plans. Asphalt and aggregate rates shown on the plans are for estimating purposes only. Adjust the rates for existing conditions as directed.

4.2. **Temporary Aggregate Stockpiles**. The Engineer will approve the location of temporary aggregate stockpiles on the right of way before delivery. Place stockpiles in a manner that will not:

- obstruct traffic or sight distance,
- interfere with the access from abutting property, or
- interfere with roadway drainage.

Locate stockpiles a minimum of 30 ft. from roadway when possible. Sign and barricade as shown on the plans.

4.3. **Aggregate Furnished by the Department**. When shown on the plans, the Department will furnish aggregate to the Contractor without cost. Stockpile locations are shown on the plans.

4.4. **Adverse Weather Conditions**. Do not place surface treatments when, in the Engineer's opinion, general weather conditions are unsuitable. Meet the requirements for air and surface temperature shown below.

4.4.1. **Standard Temperature Limitations**. Apply seal coat when air temperature is above 50°F and rising. Do not apply seal coat when air temperature is 60°F and falling. In all cases, do not apply seal coat when surface temperature is below 60°F.

4.4.2. **Polymer-Modified Asphalt Cement Temperature Limitations**. When using materials described in Section 300.2.2., "Polymer Modified Asphalt Cement," apply seal coat when air temperature is above 70°F and rising. Do not apply seal coat when air temperature is 80°F and falling. In all cases, do not apply seal coat when surface temperature is below 70°F.

4.4.3. **Asphalt-Rubber Temperature Limitations**. Do not place hot asphalt-rubber seal coat when, in the Engineer's opinion, general weather conditions are unsuitable. Apply seal coat when the air temperature is 80°F and above, or above 70°F and rising. In all cases, do not apply seal coat when surface temperature is below 70°F.

4.4.4. **Cool Weather Night Air Temperature**. The Engineer reserves the right to review the **National Oceanic and Atmospheric Administration** (**NOAA**) weather forecast and determine if the nightly air temperature is suitable for asphalt placement to prevent aggregate loss.

4.4.5. **Cold Weather Application**. When asphalt application is allowed outside of the above temperature restrictions, the Engineer will approve the binder grade and the air and surface temperatures for asphalt material application. Apply seal coat at air and surface temperatures as directed.

4.5. **Mixing Hot A-R Binder**. If using asphalt-rubber, mix in accordance with the approved blend design required in Section 316.2.1., "Asphalt."

At the end of each shift, provide the Engineer with production documentation, which includes the following:

- amount and temperature of asphalt cement before addition of rubber,
- amount of rubber and any extender added,
- viscosity of each hot A-R batch just before roadway placement, and
- time of the rubber additions and viscosity tests.

4.6. **Surface Preparation**. Remove existing raised pavement markers. Repair any damage incurred by removal as directed. Remove dirt, dust, or other harmful material before sealing. When shown on the plans, remove vegetation and blade pavement edges. When directed, apply a tack coat before applying the hot asphalt-rubber treatment on an existing wearing surface in accordance with Section 340.2.5., "Tack Coat."

4.7. **Rock Land and Shot**.

4.7.1. **Definitions**.

- A "rock land" is the area covered at the aggregate rate directed with 1 truckload of aggregate.

- A “shot” is the area covered by 1 distributor load of asphalt material.

4.7.2. **Setting Lengths**. Calculate the lengths of both rock land and shot. Adjust shot length to be an even multiple of the rock land. Verify that the distributor has enough asphalt material to complete the entire shot length. Mark shot length before applying asphalt. When directed, mark length of each rock land to verify the aggregate rate.

4.8. **Asphalt Placement**.

4.8.1. **General**. The maximum shot width is the width of the current transverse distribution test required under Section 316.3.1.3.1., “Transverse Distribution,” or the width of the aggregate spreader box, whichever is less. Adjust the shot width so operations do not encroach on traffic or interfere with the traffic control plan, as directed. Use paper or other approved material at the beginning and end of each shot to construct a straight transverse joint and to prevent overlapping of the asphalt. Unless otherwise approved, match longitudinal joints with the lane lines. The Engineer may require a string line if necessary to keep joints straight with no overlapping. Use sufficient pressure to flare the nozzles fully.

Select an application temperature, as approved, in accordance with Item 300, “Asphalts, Oils, and Emulsions.” Uniformly apply the asphalt material at the rate directed, within 15°F of the approved temperature, and not above the maximum allowable temperature.

4.8.2. **Limitations**. Do not apply asphalt to the roadway until:

- traffic control methods and devices are in place as shown on the plans or as directed,
- the loaded aggregate spreader is in position and ready to begin,
- haul trucks are loaded with enough aggregate to cover the shot area and are in place behind the spreader box, and
- rollers are in place behind the haul trucks.

4.8.3. **Nonuniform Application**. Stop application if it is not uniform due to streaking, ridging, puddling, or flowing off the roadway surface. Verify equipment condition, operating procedures, application temperature, and material properties. Determine and correct the cause of nonuniform application. If the cause is high or low emulsion viscosity, replace emulsion with material that corrects the problem.

4.8.4. **Test Strips**. The Engineer may stop asphalt application and require construction of test strips at the Contractor’s expense if any of the following occurs:

- nonuniformity of application continues after corrective action;
- on 3 consecutive shots, application rate differs by more than 0.03 gal. per square yard from the rate directed; or
- any shot differs by more than 0.05 gal. per square yard from the rate directed.

The Engineer will approve the test strip location. The Engineer may require additional test strips until surface treatment application meets specification requirements.

4.9. **Aggregate Placement**. As soon as possible, apply aggregate uniformly at the rate directed without causing the rock to roll over.

4.9.1. **Nonuniform Application**. Stop application if it is not uniform in the transverse direction. Verify equipment condition, operating procedures, and transverse application rate. The transverse application rate should be within 1 lb. Determine and correct the cause of nonuniform application.

4.10. **Rolling**. Start rolling operation on each shot as soon as aggregate is applied. Use sufficient rollers to cover the entire mat width in 1 pass, i.e., 1 direction. Roll in a staggered pattern. Unless otherwise shown on the plans, make a minimum of:

- 5 passes or

- 3 passes when the asphalt material is an emulsion.

If rollers are unable to keep up with the spreader box, stop application until rollers have caught up, or furnish additional rollers. Keep roller tires asphalt-free.

4.11. **Patching**. Before rolling, repair spots where coverage is incomplete. Repair can be made by hand spotting or other approved method. When necessary, apply additional asphalt material to embed aggregate.

4.12. **Racked-in Aggregate**. If specified on the plans, apply racked-in aggregate after patching, uniformly at the rate directed. The racked-in aggregate must be applied before opening the roadway or intersection to traffic.

4.13. **Brooming**. After rolling, sweep as soon as aggregate has sufficiently bonded to remove excess. In areas of racked-in aggregate, sweep as directed.

4.14. **Final Acceptance**. Maintain seal coat until the Engineer accepts the work. Repair any surface failures. Before final project acceptance, remove all temporary stockpiles and restore the area to the original contour and grade.

Contractor to submit seal coat mix design (aggregate and oil design) as part of base bid. Submit representative projects where the mix was used in the local area.

SECTION 32 17 23 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes painted markings applied to asphalt and concrete pavement.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to marking pavement including, but not limited to, the following:

    a. Pavement aging period before application of pavement markings.
    b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.

B. Shop Drawings: For pavement markings.

1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Texas MUTCD for pavement-marking work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials and 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Conco Paints.
2. Dow Chemical Company (The).
3. PPG Architectural Coatings.
4. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.

2.2 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type S; colors complying with FS TT-P-1952.

1. Color: White, Yellow, and As indicated.

B. Pavement-Marking Paint: MPI #32, alkyd traffic-marking paint.

1. Color: White, Yellow, and As indicated.

C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.

1. Color: White, Yellow, and As indicated.

D. Pavement-Marking Paint: MPI #97, latex traffic-marking paint.

1. Color: White, Yellow, and As indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age for a minimum of 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.

3.3 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 32 17 23

Item 712

Cleaning and Sealing Joints and Cracks (Asphalt Concrete)

1. DESCRIPTION

Clean and seal joints and cracks in asphalt concrete roadway surfaces.

2. MATERIALS

Furnish materials unless otherwise shown on the plans. Furnish sealant materials as shown on the plans in accordance with Item 300, “Asphalts, Oils, and Emulsions.” Furnish fine aggregate in accordance with Section 340.2.1.3., “Fine Aggregate.”

3. EQUIPMENT

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

3.1. **Hot-Applied Sealants**. Heat in a double-jacketed heater using a heat transfer oil so no direct flame comes in contact with the shell of the vessel containing the sealing compound. Provide a heater capable of circulating and agitating the sealant during the heating process to achieve a uniform temperature rise and maintain the desired temperature. Provide gauges to monitor the temperature of the vessel contents and avoid overheating the material. Provide a heater equipped with a gear-driven asphalt pump with adequate pressure to dispense the sealant.

[redacted]

4. WORK METHODS

Apply material when the air or pavement temperature is within the manufacturer’s recommendations or as approved. Clean and seal joints and cracks that are 1/16 in. or greater in width. Fill cracks with dry sand for cracks greater than 1/2 in. or as shown on the plans. Rout joints and cracks to the configuration shown on the plans when required. Clean joints and cracks with air blast cleaning or other acceptable methods to a depth at least twice the joint or crack width. Joints and cracks must be free of moisture before sealing. Dispose of materials removed as directed or approved. Apply sealing material with a pressure nozzle. Completely fill cracks and joints. Squeegee material to no more than 3 in. wide and 1/8 in. above the pavement surface. Prevent tracking with an application of fine aggregate as directed.

5. MEASUREMENT

This Item will be measured by the foot, gallon, pound, or lane mile. Shoulders wider than 6 ft. are considered additional lanes.

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 “Joint and Crack Sealing” of the sealant material specified and “Joint and Crack Routing and Sealing” of the sealant material specified. This price is full

compensation for routing, cleaning, and sealing joints and cracks; furnishing and placing materials; and equipment, labor, tools, and incidentals.

If measurement is by the lane mile, shoulders 6 ft. or narrower will not be paid for directly but will be subsidiary to work on the adjacent travel lane.

Item 713

Cleaning and Sealing Joints and Cracks (Concrete Pavement)

1. DESCRIPTION

Clean and seal joints and cracks in concrete pavement.

2. MATERIALS

Furnish sealant, boards, and backer rods in accordance with DMS-6310, "Joint Sealants and Fillers." The sealant must be type 4, 5, 7, or 8 unless otherwise shown on the plans and specifications. Furnish primer when required by the sealant manufacturer.

3. EQUIPMENT

Use equipment that meets the sealant manufacturer's recommendations. Furnish equipment capable of placing the sealant, backer rods, and boards as detailed on the plans. Furnish equipment capable of removing all foreign material from the concrete joint or the grooved crack. The following equipment is recommended to meet cleaning and sealing requirements:

- Power Concrete Saw
- Sandblasting Equipment
- Power Router
- High Pressure Air
- Sealant Dispenser

4. WORK METHODS

Use dimensions shown for joint details in standard drawing *Concrete Paving Details, Joint Seals,* unless other dimensions are shown on the plans. Make a groove, follow the cracks to be sealed, and rout the groove approximately 1/2 in. deep × 5/8 in. wide, unless otherwise directed or shown on the plans. The Engineer will select joints and cracks to be cleaned and sealed.

Remove all foreign material from the joint or groove reservoir. Clean the joint by sandblasting or other approved methods. If directed, saw joint sides to remove embedded foreign material in the concrete that sandblasting will not remove. Do not place sealant when the concrete pavement is below 55°F or above 90°F. Do not place sealant in a wet or damp joint or groove. Use approved drying method if joints or grooves are sealed within 24 hours of rain. Apply primer when required by the sealant manufacturer. Blow out joint or groove with high pressure air or other approved methods before placing sealant. Remove and replace sealant when placed flush with or above the pavement surface. The different types of joints and cracks are described in Table 1.

Table 1
Types of Joints and Cracks Requirements

Joint or Crack Type	Requirement
Transverse Contraction Joints	Backer rods and sealants
Longitudinal Contraction Joint	Sealant
Longitudinal Construction Joint	Sealant
Expansion Joints	Boards, backer rods, and sealant
Cracks in Jointed Concrete Pavement	Sealant

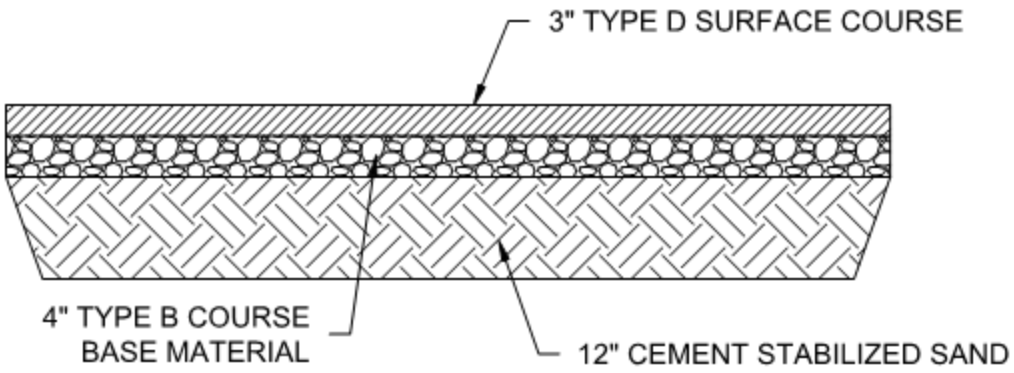
5. MEASUREMENT

Joint cleaning and sealing will be measured by the foot of joint cleaned and sealed. Crack cleaning and sealing will be measured by the foot of crack cleaned and sealed.

6. PAYMENT

The work performed and materials furnished in accordance with this Item and measured in accordance with "Measurement" will be paid for at the unit price bid for "Joint Sealing and Cleaning" of the type specified, or "Crack Cleaning and Sealing."

EXHIBIT B - SPECIFICATIONS



3" HMAC PAVEMENT
NTS

Item 529

Concrete Curb, Gutter, and Combined Curb and Gutter

1. DESCRIPTION

Construct hydraulic cement concrete curb, gutter, and combined curb and gutter.

2. MATERIALS

Furnish materials conforming to:

- Item 360, “Concrete Pavement”
- Item 420, “Concrete Substructures”
- Item 421, “Hydraulic Cement Concrete”
- Item 440, “Reinforcement for Concrete”

Use Class A concrete or material specified on the plans. Use Grade 8 coarse aggregate for extruded Class A concrete. Use other grades if approved.

When approved, use fibers meeting the requirements of DMS-4550, “Fibers for Concrete,” to replace reinforcing steel in Class A concrete. Dose fibers in accordance with the Department’s MPL of pre-qualified fibers for concrete.

3. CONSTRUCTION

Provide finished work with a well-compacted mass and a surface free from voids and honeycomb, in the required shape, line, and grade. Round exposed edges with an edging tool of the radius shown on the plans. Mix, place, and cure concrete in accordance with Item 420, “Concrete Substructures.” Construct joints at locations shown on the plans. Cure for at least 72 hr.

Furnish and place reinforcing steel in accordance with Item 440, “Reinforcement for Concrete.”

Set and maintain a guideline that conforms to alignment data shown on the plans, with an outline that conforms to the details shown on the plans. Ensure that changes in curb grade and alignment do not exceed 1/4 in. between any 2 contacts on a 10-ft. straightedge.

3.1. **Conventionally Formed Concrete**. Shape and compact subgrade, foundation, or pavement surface to the line, grade, and cross-section shown on the plans. Lightly sprinkle subgrade or foundation material immediately before concrete placement.

Pour concrete into forms, and strike off with a template 1/4 to 3/8 in. less than the dimensions of the finished curb unless otherwise approved. After initial set, plaster surface with mortar consisting of 1 part hydraulic cement and 2 parts fine aggregate. Brush exposed surfaces to a uniform texture.

Place curbs, gutters, and combined curb and gutters in 50-ft. maximum sections unless otherwise approved.

3.2. **Extruded or Slipformed Concrete**. Hand-tamp and sprinkle subgrade or foundation material before concrete placement. Provide clean surfaces for concrete placement. Coat cleaned surfaces, if required, with approved adhesive or coating at the rate of application shown on the plans or as directed. Place concrete with approved self-propelled equipment.

The forming tube of the extrusion machine or the form of the slipform machine must be easily adjustable vertically during the forward motion of the machine to provide variable heights necessary to conform to the established gradeline.

Attach a pointer or gauge to the machine so that a continual comparison can be made between the extruded or slipform work and the grade guideline. Other methods may be used when approved.

Finish surfaces immediately after extrusion or slipforming.

4. MEASUREMENT

This Item will be measured by the foot.

Item 700
Pothole Repair

1. DESCRIPTION

Repair potholes, spalled areas, depressions, and raveled or damaged pavement edges in roadway surfaces.

2. MATERIALS

Furnish materials, unless otherwise shown on the plans. Use materials that meet the requirements of the following Items, as shown on the plans.

- Item 300, “Asphalt, Oils, and Emulsions”
- Item 330, “Limestone Rock Asphalt Pavement”
- Item 334, “Hot-Mix Cold-Laid Asphalt Concrete Pavement”
- Item 340, “Dense-Graded Hot-Mix Asphalt (Small Quantity)”
- DMS-9202, “Asphaltic Concrete Patching Material (Stockpile Storage or Bagged)”
- DMS-9203, “Rapid-Curing Asphaltic Concrete Patching Material (Containerized)”
- DMS-9204, “Fiber Additives for Bituminous Mixtures”

3. WORK METHODS

Work requests are made on a callout basis. Begin physical repair within 24 hr. of notification, 3 hr. if emergency mobilization is required, unless otherwise shown on the plans.

3.1. **Standard Repair**. Remove loose and foreign materials from the repair area. Remove water, dry, and apply tack coat to surfaces of the repair area unless otherwise directed.

Place repair material in horizontal lifts as directed. Finish to grade and compact to conform to roadway surface. Compact with hand tamp, mechanical tampers, or rollers as directed or approved. Compact to achieve full consolidation.

Repair pavement edges to the line and grade of original pavement. Clean roadway surface after repair operations. Dispose of materials removed as directed or approved.

3.2. **Saw-Cut Repair**. Square the sides of the repair area by saw-cutting or other approved methods. Remove loose and foreign material. Clean and dry the repair area. Apply tack coat to surfaces of the repair area unless otherwise directed.

Place repair material in horizontal lifts no more than 3 in. deep. Finish to grade and compact to conform to roadway surface. Compact with hand tamp, mechanical tampers, or rollers as directed or approved. Compact to achieve full consolidation.

Repair pavement edges to the line and grade of original pavement. Clean roadway surface after repair operations. Dispose of materials removed as directed or approved.

Item 720
Repair of Spalling in Concrete Pavement

1. DESCRIPTION

Repair spalling and partial-depth failures in concrete pavement.

2. MATERIALS

Furnish either rapid-set concrete or polymeric patching material unless otherwise shown on the plans.

2.1. **Rapid-Set Concrete**. Provide concrete that meets DMS-4655, "Concrete Repair Materials," Type "B."

Use a packaged blend of hydraulic cement, sand, and gravel (maximum size 3/8 in.) which requires the addition of water and has a maximum shrinkage of 0.15% in accordance with ASTM C928.

Do not use chlorides, magnesium or gypsum to accelerate setting time.

Demonstrate that mixture achieves flexural strength of at least 425 psi in 5 hr., a minimum compressive strength of 5,100 psi in 7 days, and 6,300 psi in 28 days before spall repair operations. Test in accordance with Tex-418-A and Tex-448-A.

2.2. **Polymeric Patching Material**. Provide polymeric patching material that meets DMS-6170, "Polymeric Materials for Patching Spalls in Concrete Pavement," and matches the color of the pavement.

3. EQUIPMENT

Furnish equipment in accordance with Item 429, "Concrete Structure Repair," or as approved.

4. WORK METHODS

Repair areas as shown on the plans or as directed. Dispose of debris off the right of way in accordance with federal, state, and local regulations.

4.1. **Hydraulic Cement Concrete Material**. Saw at least 1-1/2 in. deep around repair area before concrete removal, unless otherwise directed, providing a vertical face around the perimeter of the repair area. Protect and reuse existing reinforcing if encountered, unless otherwise directed. Provide a uniform rough surface free of loose particles and suitable for bonding. Remove concrete to a depth of 1-1/2 in. or the depth of deteriorated concrete, whichever is greater. Use chipping hammers not heavier than the nominal 15-lb. class or hydrodemolition equipment for the removal of concrete below 1-1/2 in. depth. Mix, place, and cure in accordance with manufacturer's recommendations. Place concrete if the air temperature is 40°F or above. Screed concrete to conform to roadway surface. Provide a rough broom finish.

4.2. **Polymeric Patching Material**. Submit for approval a statement from the manufacturer identifying the recommended equipment and installation procedures. Remove the deteriorated concrete to the dimensions shown on the plans or as directed. Dry and abrasive blast the repair area to ensure it is free from moisture, dirt, grease, oil, or other foreign material that may reduce the bond. Remove dust from the abrasive blasting operation. Apply primer to the repair area in accordance with manufacturer's recommendations. Reapply primer if conditions change before placing patching material. Mix, place, and cure in accordance with manufacturer's recommendations. Begin placement of material at the lower end of sloped areas. Screed

polymeric patching material to conform to the roadway surface. Provide a non-skid finish with a notched trowel.

5. MEASUREMENT

This Item will be measured as follows:

5.1. **Hydraulic Cement Concrete Material**. By the cubic foot of concrete repair material placed.

5.2. **Polymeric Patching Material**. By the gallon of polymeric patching material placed.

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 "Spalling Repair" of the type (Hydraulic Cement; Polymeric, Flexible; or Polymeric, Semirigid) specified. This price is full compensation for sawing, chipping, milling, cleaning, abrasive blasting, repairing spalled concrete pavement, disposal of materials, materials, equipment, labor, tools, and incidentals.

Item 780
Concrete Crack Repair

1. DESCRIPTION

Repair cracks in concrete members by epoxy injection, gravity filling, routing and sealing, or surface sealing.

2. MATERIALS

Provide materials in accordance with the TxDOT *Concrete Repair Manual*. Select a pre-approved material meeting the requirements of the applicable DMS when available.

3. WORK METHODS

Follow the procedures outlined in the Department's *Concrete Repair Manual*. Submit alternate procedures to the Engineer for approval before proceeding with repair work.

The manual includes the following categories of concrete crack repair:

- Pressure-Injected Epoxy
- Gravity-Fed Epoxy
- Routing and Sealing
- Surface Sealing

Routing and sealing method to be used for pricing.

4. MEASUREMENT

This Item will be measured by the foot of exterior crack length, injected gallon, square footage for flood coats, or lump sum.

5. PAYMENT

The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Concrete Crack Repair" of the type specified. This price is full compensation for furnishing and installing all repair materials, equipment, labor, and incidentals.

Item 760
Cleaning and Reshaping Ditches

1. DESCRIPTION

Clean and reshape ditches.

2. WORK METHODS

Excavate and remove excess material from ditches and from around fixtures within the limits of the excavation or reshape by cleaning silt from the ditch and spreading on backslope as approved. Reshape ditches in conformance with the lines, grades, and typical cross-sections shown on the plans, or as directed. Dispose of excess material in accordance with applicable federal, state, and local regulations, or place on right of way, as directed. Maintain ditch drainage during cleaning and reshaping work.

3. MEASUREMENT

Measurement will be as follows:

3.1. **Foot**. By the foot, measured along the centerline of the ditch.

3.2. **Cubic Yard in Place**. By the cubic yard in its original position computed by the method of average end areas.

3.3. **Cubic Yard in Vehicle**. By the cubic yard in vehicles measured at the point of excavation.

4. PAYMENT

The work performed in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Ditch Reshaping (Foot),” “Ditch Cleaning and Reshaping (Cubic Yard in Place),” or “Ditch Cleaning and Reshaping (Cubic Yard in Vehicle).” This price is full compensation for excavation, disposal of removed materials, reshaping, equipment, labor, tools, and incidentals.

As a part of this scope, the top 1.5" is to be stripped with grass in place and replaced when cleaning and regrading is complete. As an alternate, new cut sod may be used at stripped areas.

Item 340
Dense-Graded Hot-Mix Asphalt (Small Quantity)

1. DESCRIPTION

Construct a hot-mix asphalt (HMA) pavement layer composed of a compacted, dense-graded mixture of aggregate and asphalt binder mixed hot in a mixing plant. This specification is intended for small quantity (SQ) HMA projects, typically under 5,000 tons total 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 when the Contractor makes a source or formulation change, and may require a new laboratory mixture design, trial batch, or both. The Engineer may sample and test project materials at any time 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 as specified in 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 listed in Table 1. Document all test results on 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 given in 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 hot-mix listed in the BRSQC. Rated values for surface treatment (ST) do not apply to coarse aggregate sources used in hot-mix asphalt.

For sources not listed on the Department's BRSQC:

- build an individual stockpile for each material;
- request the Department test the stockpile for specification compliance; and
- once approved, do not add material to the stockpile unless otherwise approved.

Provide aggregate from non-listed sources only when tested by the Engineer and approved before use. Allow 30 calendar days for the Engineer to sample, test, and report results for non-listed sources.

Provide coarse aggregate with at least the minimum SAC shown on the plans. SAC requirements only apply to aggregates used on the surface of travel lanes. SAC requirements apply to aggregates used on surfaces other than travel lanes when shown on the plans. The SAC for sources on 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 in Table 1 may be blended with a Class A aggregate to meet requirements for Class A materials. 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 when blending Class A and B aggregates to meet a Class A requirement. Blend by volume if the bulk specific gravities of the Class A and 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 at any time during production, when the Contractor blends Class A and B aggregates to meet a Class A requirement, to 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. The Engineer will use the Department's mix design Excel 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 using the gradations supplied by the Contractor on the mixture design report as an input for the Excel template; however, a failing spot check will require confirmation with a stockpile gradation determined by the Engineer.

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 from organic impurities.

The Engineer may test the intermediate aggregate in accordance with Tex-408-A to verify the material is free from 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 gradation requirements in Table 2. Supply fine aggregates that are free from organic impurities. The Engineer may test the fine aggregate in accordance with Tex-408-A to verify the material is free from organic impurities. No more than 15% of the total aggregate may be field sand or other uncrushed fine aggregate. Use fine aggregate, with the exception of 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
Combined Aggregate[3]		
Sand equivalent, %, Min	Tex-203-F	45

1. Not used for acceptance purposes. Optional test used by the Engineer as an indicator of the need for further investigation.
2. Only applies to crushed gravel.
3. Aggregates, without mineral filler, RAP, RAS, or additives, combined as used in the job-mix formula (JMF).

Table 2
Gradation Requirements for Fine Aggregate

Sieve Size	% Passing by Weight 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 sufficiently dry, free-flowing, and free from 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 in Table 3.

Table 3
Gradation Requirements for Mineral Filler

Sieve Size	% Passing by Weight 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 specified on the plans.

2.5. **Tack Coat**. Furnish CSS-1H, SS-1H, or a PG binder with a minimum high-temperature grade of PG 58 for tack coat binder in accordance with Item 300, “Asphalts, Oils, and Emulsions.” Specialized or preferred tack coat materials may 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.

The Engineer will obtain at least one sample of the tack coat binder per project in accordance with Tex-500-C, Part III, and test it to verify compliance with Item 300, “Asphalts, Oils, and Emulsions.” The Engineer will obtain the sample from the asphalt distributor immediately before use.

2.6. **Additives**. Use the type and rate of additive specified when shown on the plans. Additives that facilitate mixing, 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**. 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)**. Warm Mix Asphalt (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 Department's 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 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.

2.7. **Recycled Materials**. Use of RAP and RAS is permitted unless otherwise shown on the plans. Do not exceed the maximum allowable percentages of RAP and RAS shown in Table 4. The allowable percentages shown in Table 4 may be decreased or increased when shown on the plans. Determine asphalt binder content and gradation of the RAP and RAS stockpiles for mixture design purposes in accordance with Tex-236-F. The Engineer may verify the asphalt binder content of the stockpiles at any time 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 shown in 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 Tables 4 and 5 are defined as follows:

- **Surface**. The final HMA lift placed at or near the top of the pavement structure;
- **Intermediate**. Mixtures placed below an HMA surface mix and less than or equal to 8.0 in. from the riding surface; and
- **Base**. Mixtures placed greater than 8.0 in. from the riding surface.

2.7.1. **RAP**. RAP is salvaged, milled, pulverized, broken, or crushed asphalt pavement. Crush or break RAP so that 100% of the particles pass the 2 in. sieve. Fractionated RAP is defined as 2 or more RAP stockpiles, divided into coarse and fine fractions.

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. This allowance does not apply to a Contractor using unfractionated RAP. Department-owned RAP generated through 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.

The coarse RAP stockpile will contain only material retained by processing over a 3/8-in. or 1/2-in. screen unless otherwise approved. The fine RAP stockpile will contain only material passing the 3/8-in. or 1/2-in. screen unless otherwise approved. The Engineer may allow the Contractor to use an alternate to the 3/8-in. or 1/2-in. screen to fractionate the RAP. The maximum percentages of fractionated RAP may be comprised of coarse or fine fractionated RAP or the combination of both coarse and fine fractionated RAP.

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 RAP[1]

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**. Use of post-manufactured RAS or post-consumer RAS (tear-offs) is permitted unless otherwise shown on the plans. Up to 5% RAS may be used separately or as a replacement for fractionated RAP in accordance with Table 4 and Table 5. 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 by-product. Post-consumer RAS is processed shingle scrap removed from residential structures. Comply with all regulatory requirements stipulated for RAS by the TCEQ. RAS may be used separately or in conjunction with RAP.

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 5.0% 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 Department's MPL. Remove substantially all materials before use that are not part of the shingle, such as wood, paper, metal, plastic, and felt paper. 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**. Unless otherwise shown on the plans, the Contractor may use a substitute PG binder listed in Table 5 instead of the PG binder originally specified, 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 300.2.10., "Performance-Graded Binders"; and
- 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 only be allowed 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
WMA[3]				
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 340.2.6.2., "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 by the specification, Contractors may perform other QC tests as deemed necessary. At any time during the project, the Engineer may perform production and placement tests as deemed necessary in accordance with Item 5, "Control of the Work." Schedule and participate in a pre-paving meeting with the Engineer on or before the first day of paving unless otherwise directed.

4.1. **Certification**. Personnel certified by the Department-approved hot-mix asphalt 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.

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				
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
Moisture content	Tex-212-F		✓	1A
Hamburg Wheel test	Tex-242-F		✓	2
Boil test	Tex-530-C		✓	1A
5. Placement Testing				
Trimming roadway cores	Tex-207-F	✓	✓	1A/1B
In-place air voids	Tex-207-F		✓	1A/1B
Establish rolling pattern	Tex-207-F	✓		1B
Ride quality measurement	Tex-1001-S	✓	✓	Note[4]

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 340.4.8.3., "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, Testing, and Responsibilities**. Use Department-provided Excel templates to record and calculate all test data pertaining to the mixture design. The Engineer will use Department Excel templates for any production and placement testing. Obtain the latest version of the Excel templates at http://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/forms/site-manager.html or from the Engineer.

The maximum allowable time for the Engineer to exchange test data with the Contractor is as given in Table 7 unless otherwise approved. The Engineer will immediately report to the Contractor any test result that requires suspension of production or placement or that fails to meet the specification requirements.

Subsequent mix 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 Testing			
Gradation	Engineer	Contractor	1 working day of completion of the test
Asphalt binder content			
Laboratory-molded density			
VMA (calculation)			
Hamburg Wheel test			
Moisture content			
Boil test			
Binder tests			
Placement Testing			
In-place air voids	Engineer	Contractor	1 working day of completion of the test[1]

1. 2 days are allowed if cores cannot be dried to constant weight within 1 day.

4.3. **Mixture Design**.

4.3.1. **Design Requirements**. The Contractor may design the mixture using a Texas Gyratory Compactor (TGC) or a Superpave Gyratory Compactor (SGC) unless otherwise shown on the plans. Use the typical weight design example given in Tex-204-F, Part I, when using a TGC. Use the Superpave mixture design procedure given in Tex-204-F, Part IV, when using a SGC. Design the mixture to meet the requirements listed in Tables 1, 2, 3, 4, 5, 8, 9, and 10.

4.3.1.1. **Target Laboratory-Molded Density When The TGC Is Used**. Design the mixture at a 96.5% target laboratory-molded density. Increase the target laboratory-molded density to 97.0% or 97.5% at the Contractor's discretion or when shown on the plans or specification.

4.3.1.2. **Design Number of Gyrations (Ndesign) When The SGC Is Used**. Design the mixture at 50 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 noted in Table 9. The Ndesign level may be reduced to no less than 35 gyrations at the Contractor's discretion.

Use an approved laboratory from the Department's MPL to perform the Hamburg Wheel test in accordance with Tex-242-F, and provide results with the mixture design, or provide the laboratory mixture and request that the Department perform the Hamburg Wheel test. 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 at any time 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 Excel template. Include the following items in the report:

- the combined aggregate gradation, source, specific gravity, and percent of each material used;
- asphalt binder content and aggregate gradation of RAP and RAS stockpiles;
- the target laboratory-molded density (or Ndesign level when using the SGC);

- results of all applicable tests;
- the mixing and molding temperatures;
- the signature of the Level 2 person or persons that 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 (Ndesign 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[1] @ 12.5 mm[2] Rut Depth, Tested @ 50°C
PG 64 or lower	Tex-242-F	10,000
PG 70		15,000
PG 76 or higher		20,000

1. May be decreased or waived when shown on the plans.
2. 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 Ndesign level (SGC) to no less than 35 gyrations.

4.3.2. **Job-Mix Formula Approval**. The job-mix formula (JMF) is the combined aggregate gradation, target laboratory-molded density (or Ndesign 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. When WMA is used, document the additive or process used and recommended rate on the JMF1 submittal. Furnish a mix design report (JMF1) with representative samples of all component materials and request approval to produce the trial batch. Provide approximately 10,000 g of the design mixture and request that the Department perform the Hamburg Wheel test if opting to have the Department perform the test. The Engineer will verify JMF1 based on plant-produced mixture from the trial batch unless otherwise determined. The Engineer may accept an existing mixture design previously used on a Department project and may waive the trial batch to verify JMF1. Provide split samples of the mixtures and blank samples used to determine the ignition oven correction factors. The Engineer will determine the aggregate and asphalt correction factors from the ignition oven used for production testing in accordance with Tex-236-F.

The Engineer will use a TGC calibrated in accordance with Tex-914-K in molding production samples. Provide an SGC at the Engineer's field laboratory for use in molding production samples if the SGC is used to design the mix.

The Engineer may perform Tex-530-C and retain the tested sample for comparison purposes during production. The Engineer may waive the requirement for the boil test.

4.3.3. **JMF Adjustments**. If JMF adjustments are necessary to achieve the specified requirements, 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 Table 4 and Table 5;
- meet the master gradation limits shown in Table 8; and
- be within the operational tolerances of the current JMF listed in Table 11.

The Engineer may adjust the asphalt binder content to maintain desirable laboratory density near the optimum value while achieving other mix requirements.

Table 11
Operational Tolerances

Description	Test Method	Allowable Difference Between Trial Batch and JMF1 Target	Allowable Difference from Current JMF Target
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[1,2]
Individual % retained for sieves smaller than #8 and larger than #200			±3.0[1,2]
% passing the #200 sieve			±2.0[1,2]
Asphalt binder content, %	Tex-236-F	±0.5	±0.3[2]
Laboratory-molded density, %	Tex-207-F	±1.0	±1.0
VMA, %, min	Tex-204-F	Note[3]	Note[3]

1. 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.
2. Only applies to mixture produced for Lot 1 and higher.
3. Mixture is required to meet Table 8 requirements.

4.4. **Production Operations**. Perform a new trial batch when the plant or plant location is changed. Take corrective action and receive approval to proceed after any production suspension for noncompliance to 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 on the mixture design report; or
- RAS stockpile used in the mix is more than 2.0% higher than the value shown on the mixture design report.

4.4.1. **Storage and Heating of Materials**. Do not heat the asphalt binder above the temperatures specified in Item 300, "Asphalts, Oils, and Emulsions," or outside the manufacturer's recommended values. Provide the Engineer with daily records of asphalt binder and hot-mix asphalt discharge temperatures (in legible and

discernible increments) in accordance with Item 320, “Equipment for Asphalt Concrete Pavement,” 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.

4.4.2. **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 350°F (or 275°F for WMA) and is not lower than 215°F. The Department will not pay for or allow placement of any mixture produced above 350°F.

Produce WMA within the target discharge temperature range of 215°F and 275°F when WMA is required. Take corrective action any time 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. The Engineer may determine the moisture content by oven-drying in accordance with Tex-212-F, Part II, and verify that the mixture contains no more than 0.2% of moisture by weight. The Engineer will obtain the sample immediately after discharging the mixture into the truck, and will perform the test promptly.

4.5. **Hauling Operations**. Clean all truck beds before use to ensure that mixture is not contaminated. Use a release agent shown on the Department’s MPL to coat the inside bed of the truck when necessary.

Use equipment for hauling as defined in Section 340.4.6.3.2., “Hauling Equipment.” Use other hauling equipment only when allowed.

4.6. **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 hand-held thermal camera or infrared thermometer 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 and an approximate station number or GPS coordinates on each ticket unless otherwise directed. 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 with lane lines, 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 in Table 12 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./sq. yd. for each inch of pavement unless otherwise shown on the plans.

Table 12
Compacted Lift Thickness and Required Core Height

Mixture Type	Compacted Lift Thickness Guidelines		Minimum Untrimmed Core Height (in.) Eligible for Testing
	Minimum (in.)	Maximum (in.)	
A	3.00	6.00	2.00
B	2.50	5.00	1.75
C	2.00	4.00	1.50
D	1.50	3.00	1.25
F	1.25	2.50	1.25

4.6.1. **Weather Conditions**. Place mixture when the roadway surface temperature is at or above 60°F unless otherwise approved. Measure the roadway surface temperature with a hand-held 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. The Engineer may restrict the Contractor from paving if the ambient temperature is likely to drop below 32°F within 12 hr. of paving.

4.6.2. **Tack Coat**. 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 a thin, uniform tack coat to all contact surfaces of curbs, structures, and all joints. 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. Roll the tack coat with a pneumatic-tire roller to remove streaks and other irregular patterns when directed.

4.6.3. **Lay-Down Operations**.

4.6.3.1. **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.

4.6.3.2. **Hauling Equipment**. Use belly dumps, live bottom, or end dump trucks to haul and transfer mixture; however, with exception of paving miscellaneous areas, end dump trucks are only allowed when used in conjunction with an MTD with remixing capability unless otherwise allowed.

4.6.3.3. **Screed Heaters**. Turn off screed heaters, to prevent overheating of the mat, if the paver stops for more than 5 min.

4.7. **Compaction**. Compact the pavement uniformly to contain between 3.8% and 8.5% in-place air voids.

Furnish the type, size, and number of rollers required for compaction as approved. Use a pneumatic-tire roller to seal the surface unless excessive pickup of fines occurs. 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 with rollers. The Engineer may require rolling with a trench roller on widened areas, in trenches, and in other limited areas.

Complete all compaction operations before the pavement temperature drops below 160°F unless otherwise allowed. The Engineer may allow compaction with a light finish roller operated in static mode for pavement temperatures below 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.

4.8. **Production Acceptance**.

4.8.1. **Production Lot**. Each day of production is defined as a production lot. Lots will be sequentially numbered and correspond to each new day of production. Note that lots are not subdivided into sublots for this specification.

4.8.2. **Production Sampling**.

4.8.2.1. **Mixture Sampling**. The Engineer may obtain mixture samples in accordance with Tex-222-F at any time during production.

4.8.2.2. **Asphalt Binder Sampling**. The Engineer may obtain or require the Contractor to obtain 1 qt. samples of the asphalt binder at any time during production from a port located immediately upstream from the mixing drum or pug mill in accordance with Tex-500-C, Part II. The Engineer may test any of the asphalt binder samples to verify compliance with Item 300, “Asphalts, Oils, and Emulsions.”

4.8.3. **Production Testing**. The Engineer will test at the frequency listed in the Department’s *Guide Schedule of Sampling and Testing* and this specification. The Engineer may suspend production if production tests do not meet specifications or are not within operational tolerances listed in Table 11. Take immediate corrective action if the Engineer’s laboratory-molded density on any sample is less than 95.0% or greater than 98.0%, 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 use alternate methods for determining the asphalt binder content and aggregate gradation if the aggregate mineralogy is such that Tex-236-F does not yield reliable results. Use the applicable test procedure if an alternate test method is selected.

Table 13
Production and Placement Testing

Description	Test Method
Individual % retained for #8 sieve and larger	Tex-200-F or Tex-236-F
Individual % retained for sieves smaller than #8 and larger than #200	
% passing the #200 sieve	
Laboratory-molded density	Tex-207-F
Laboratory-molded bulk specific gravity	
In-Place air voids	
VMA	Tex-204-F
Moisture content	Tex-212-F, Part II
Theoretical maximum specific (Rice) gravity	Tex-227-F
Asphalt binder content	Tex-236-F
Hamburg Wheel test	Tex-242-F
Recycled Asphalt Shingles (RAS)[1]	Tex-217-F, Part III
Asphalt binder sampling and testing	Tex-500-C
Tack coat sampling and testing	Tex-500-C, Part III
Boil test	Tex-530-C

1. Testing performed by the Construction Division or designated laboratory.

4.8.3.1. **Voids in Mineral Aggregates (VMA)**. The Engineer may determine the VMA for any production lot. Take immediate corrective action if the VMA value for any lot is less than the minimum VMA requirement for production listed in Table 8. 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 listed in Table 8. In addition to suspending production, the Engineer may require removal and replacement or may allow the lot to be left in place without payment.

4.8.3.2. **Hamburg Wheel Test**. The Engineer may perform a Hamburg Wheel test at any time during production, including when the boil test indicates a change in quality from the materials submitted for JMF1. In addition to testing production samples, the Engineer may obtain cores and perform Hamburg Wheel tests on any areas of the roadway where rutting is observed. Suspend production until further Hamburg Wheel tests meet the specified values when the production or core samples fail the Hamburg Wheel test criteria in Table 10. Core samples, if taken, will be obtained from the center of the finished mat or other areas excluding the vehicle wheel paths. The Engineer may require up to the entire lot of any mixture failing the Hamburg Wheel test to be removed and replaced at the Contractor's expense.

If the Department's or Department-approved laboratory's Hamburg Wheel test results in a "remove and replace" condition, the Contractor may request that the Department confirm the results by re-testing the failing material. The Construction Division will perform the Hamburg Wheel tests and determine the final disposition of the material in question based on the Department's test results.

4.8.4. **Individual Loads of Hot-Mix**. The Engineer can 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. **Placement Acceptance**.

4.9.1. **Placement Lot**. A placement lot is defined as the area placed during a production lot (one day's production). Placement lot numbers will correspond with production lot numbers.

4.9.2. **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, and other similar areas. Miscellaneous areas also include level-ups and thin overlays when the layer thickness specified on the plans is less than the minimum untrimmed core height eligible for testing shown in Table 12. The specified layer thickness is based on the rate of 110 lb./sq. yd. for each inch of pavement unless another rate is shown on the plans. Compact miscellaneous areas in accordance with Section 340.4.7., "Compaction." Miscellaneous areas are not subject to in-place air void determination except for temporary detours when shown on the plans.

4.9.3. **Placement Sampling**. Provide the equipment and means to obtain and trim roadway cores on site. On site is defined as in close proximity to where the cores are taken. Obtain the cores within one working day of the time the placement lot is completed unless otherwise approved. Obtain two 6-in. diameter cores side-by-side at each location selected by the Engineer for in-place air void determination unless otherwise shown on the plans. For Type D and Type F mixtures, 4-in. diameter cores are allowed. 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 the cores from the roadway in accordance with Tex-207-F if the core heights meet the minimum untrimmed value listed in Table 12. Trim the cores on site in the presence of the Engineer. Use a permanent marker or paint pen to record the date and lot number on each core as well as the designation as Core A or 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 they are trimmed 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 Roadway Core Custody protocol located at http://www.txdot.gov/business/specifications.htm to provide a secure means and process that protects the integrity of the cores during transport.

Instead of the Contractor trimming the cores on site 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 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 with other methods when approved.

4.9.4. **Placement Testing**. The Engineer may measure in-place air voids at any time during the project to verify specification compliance.

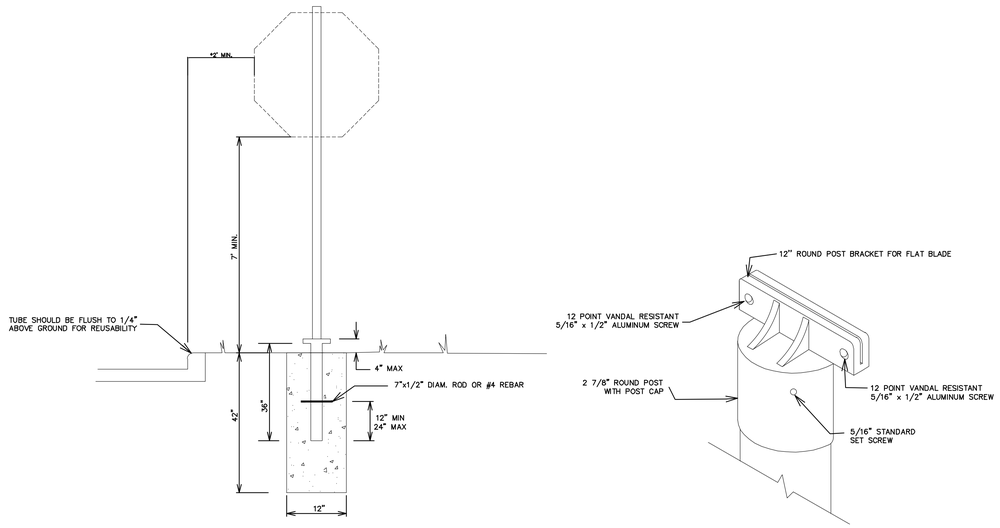
4.9.4.1. **In-Place Air Voids**. The Engineer will measure in-place air voids in accordance with Tex-207-F and Tex-227-F. Cores not meeting the height requirements in Table 12 will not be tested. Before drying to a constant weight, cores may be pre-dried using a Corelok or similar vacuum device to remove excess moisture. The Engineer will use the corresponding theoretical maximum specific gravity to determine the air void content of each core. The Engineer will use the average air void content of the 2 cores to determine the in-place air voids at the selected location.

The Engineer will use the vacuum method to seal the core if required by Tex-207-F. The Engineer will use the test results from the unsealed core 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.

Take immediate corrective action when the in-place air voids exceed the range of 3.8% and 8.5% to bring the operation within these tolerances. The Engineer may suspend operations or require removal and replacement if the in-place air voids are less than 2.7% or greater than 9.9%. 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. Areas defined in Section 340.9.2., "Miscellaneous Areas," are not subject to in-place air void determination.

4.9.5. **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 and 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 one day while the Contractor is taking appropriate corrective action.

4.9.6. **Ride Quality**. Use Surface Test Type A to evaluate ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces," unless otherwise shown on the plans.

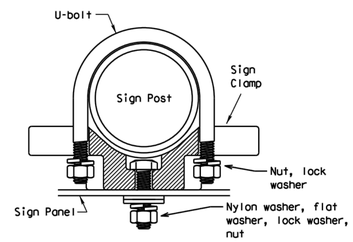


SIGN ELEVATION AND STREET NAME SIGN DETAIL

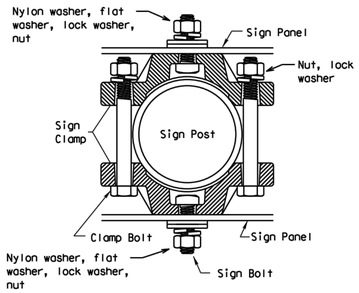
NOTE:
SIGN POST COLOR SHALL BE DARK BRONZE POWDER COATED, OR APPROVED EQUAL BY ARCHITECT. PROVIDE SAMPLE TO OWNER FOR APPROVAL.

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS

SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. https://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   0.134" nominal wall thickness
   Seamless or electric-resistance welded steel tubing or pipe
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   20% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
   Schedule 80 Pipe (2.875" outside diameter)
   0.276" nominal wall thickness
   Steel tubing per ASTM A500 Gr C
   Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
   46,000 PSI minimum yield strength
   62,000 PSI minimum tensile strength
   21% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is:
   http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

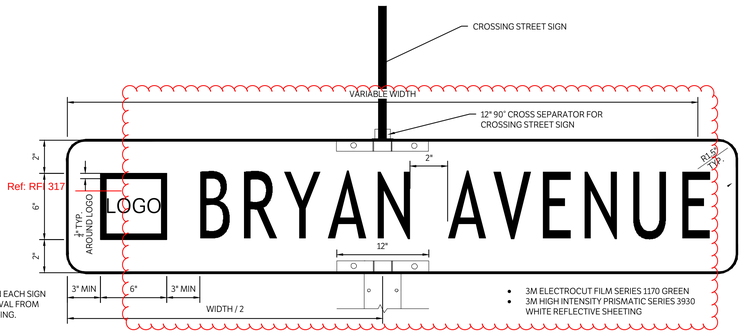
Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the traveiway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the traveiway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMDSLIP-21 for clearances based on sign types.

CONCRETE ANCHOR

SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.



CONTRACTOR SHALL SUBMIT ON EACH SIGN AND LOGO AND RECEIVE APPROVAL FROM OWNER PRIOR TO MANUFACTURING.

- 3M ELECTROCUT FILM SERIES 1170 GREEN
- 3M HIGH INTENSITY PRISMATIC SERIES 3930 WHITE REFLECTIVE SHEETING

LOGOS
1" = 0.5'

- TAMUS SEAL
- TEXAS A&M UNIVERSITY - TEXARKANA
- WEST TEXAS A&M UNIVERSITY
- PRAIRIE VIEW A&M UNIVERSITY
- TEXAS A&M UNIVERSITY COMMERCE
- TEXAS A&M UNIVERSITY - SAN ANTONIO
- TEXAS A&M UNIVERSITY - CORPUS CHRISTI
- TEXAS A&M UNIVERSITY - CENTRAL TEXAS
- TEXAS A&M INTERNATIONAL UNIVERSITY
- TARLETON STATE UNIVERSITY
- TEXAS A&M UNIVERSITY - KINGSVILLE

GENERAL NOTES

1. STREET NAME SIGNS FOR PUBLIC STREETS SHALL BE MANUFACTURED WITH A THICKNESS OF 0.125-INCHES ALUMINUM SIGN BLADE, MEASURING 10-INCHES IN HEIGHT.
2. BACKGROUND SHEETING AND LEGEND SHALL BE MATCHED COMPONENTS SYSTEM (MCS), MEETING ASTM D4956 SPECIFICATIONS FOR TYPE III OR IV SHEETING STANDARDS.
3. LETTERING FOR STREET NAME AND CARDINAL DIRECTION SHALL BE 6-INCHES ON A 10-INCH SIGN.
4. LETTERING FOR STREET NAME, SHALL BE FHWA SERIES D WITH 100% SPACING ACCORDING TO THE MOST RECENT EDITION OF STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS. MODIFICATIONS CAN BE MADE WITH APPROVAL FROM THE ENGINEER.
5. STREET NAME SIGNS SHALL BE AT LEAST 24-INCHES IN WIDTH, BUT NO MORE THAN 60-INCHES.
6. STREET NAME SIGN SHALL BE MOUNTED ON A 2 3/8-INCHES (O.D) ROUND POST USING POST CAP AND SIGN TEE. USE OF A LARGER POLE SHALL BE APPROVED BY ENGINEER.
7. LOCATION OF POLE SHALL BE APPROVED BY ENGINEER.
8. SIGN MOUNTING BRACKETS SHALL BE 12-INCHES LONG BRACKET FOR FLAT STREET NAME SIGNS.
9. STREET NAME SIGN PLATE SHALL BE PERFORATED USING DRILL BIT FOR METAL TO FIT A 12 POINT VANDAL RESISTANT 5/16 X 1/2 ALUMINUM SCREW THROUGH BRACKET AND PLATE.

ALL ROADSIDE SIGN INSTALLATIONS MUST CONFORM TO THE FEDERAL STANDARDS OUTLINED IN THE MOST RECENT EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES WITH RESPECT TO HEIGHT AND LATERAL LOCATION.

ROAD	SCHOOL SYSTEM LOGO
RELLIS PARKWAY	TAMUS SEAL
~~HWY 21 ENTRANCE~~	TAMUS SEAL
4TH STREET	TEXAS A&M UNIVERSITY-TEXARKANA
AIRFIELD DRIVE	TAMUS SEAL
6TH STREET	WEST TEXAS A&M UNIVERSITY
7TH STREET	TEXAS A&M UNIVERSITY-CENTRAL TEXAS
8TH STREET	TEXAS A&M UNIVERSITY INTERNATIONAL UNIVERSITY
9TH STREET	TEXAS A&M UNIVERSITY- COMMERCE
FLIGHT LINE ROAD	TEXAS A&M UNIVERSITY - SAN ANTONIO
AVENUE A	TEXAS A&M UNIVERSITY -CORPUS CHRISTI
AVENUE B	TEXAS A&M UNIVERSITY-KINGSVILLE
AVENUE D	PRAIRIE VIEW A&M UNIVERSITY
BRYAN ROAD	TARLETON STATE UNIVERSITY

ENERGYARCHITECTURE
2777 Allen Parkway, Suite 460
Houston, TX 77019
713.487.3400
www.energyarch.com

GESSNER ENGINEERING
GESSNER ENGINEERING
Corporate Office
2501 Ashford Drive
Suite 102
College Station, Texas 77840
www.gessnerengineering.com

FIRM REGISTRATION NUMBER: TBPE F-7451, TBPLSF-10193910

COLLEGE STATION 979.680.8840
BRENHAM 979.836.6855
FORT WORTH 817.887.8732
SAN ANTONIO 210.556.4124

RELLIS CENTRAL UTILITY PLANT AND SITE INFRASTRUCTURE

RELLIS CAMPUS
BRYAN, TX 77807

TAMUS PROJECT #: 01-3228
BUILDING INVENTORY #:

REV	DATE	DESCRIPTION
04	05/16/2018	ASI #042
03	04/19/2018	RFI-341
02	03/09/2018	RFI 317
01	12/07/2017	ASI #025
00	09/15/2017	RFI-122

Ref RFI 341

EA PROJECT #: 16063
GESSNER PROJECT #: 16-0787
DRAWN BY: PR
CHECKED BY: SHR

STATE OF TEXAS
SEAN RAY
116239
LICENSED
PROFESSIONAL ENGINEER
5/16/18

DETAILS

C1112

EXHIBIT C – INSURANCE

PROVIDER shall obtain and maintain, for the duration of this Agreement or longer, the minimum insurance coverage set forth below. With the exception of Professional Liability (E&O), all coverage shall be written on an occurrence basis. All coverage shall be underwritten by companies authorized to do business in the State of Texas or eligible surplus lines insurers operating in accordance with the Texas Insurance Code and have a financial strength rating of A- or better and a financial strength rating of VII or better as measured by A.M. Best Company or otherwise acceptable to A&M System. By requiring such minimum insurance, the Owner shall not be deemed or construed to have assessed the risk that may be applicable to PROVIDER under this Agreement. PROVIDER shall assess its own risks and if it deems appropriate and/or prudent, maintain higher limits and/or broader coverage. PROVIDER is not relieved of any liability or other obligations assumed pursuant to this Agreement by reason of its failure to obtain or maintain insurance in sufficient amounts, duration, or types. No policy will be canceled without unconditional written notice to A&M System at least ten days before the effective date of the cancellation.

Insurance:

Coverage	**Limit**
A. **Worker's Compensation**	
Statutory Benefits (Coverage A)	Statutory
Employers Liability (Coverage B)	$1,000,000 Each Accident
	$1,000,000 Disease/Employee
	$1,000,000 Disease/Policy Limit

Workers' Compensation policy must include under Item 3.A. on the information page of the workers' compensation policy the state in which work is to be performed for A&M System. Workers' compensation insurance is required, and no "alternative" forms of insurance will be permitted

B. **Automobile Liability**

Business Auto Liability Insurance covering all owned, non-owned or hired automobiles, with limits of not less than $1,000,000 Single Limit of liability per accident for Bodily Injury and Property Damage;

If a separate Business Auto Liability policy is not available, coverage for hired and non-owned auto liability may be endorsed on the Commercial General Liability policy.

C. **Commercial General Liability**

Each Occurrence Limit	$1,000,000
General Aggregate Limit	$2,000,000
Products / Completed Operations	$1,000,000
Personal / Advertising Injury	$1,000,000
Damage to rented Premises	$300,000
Medical Payments	$5,000

The required commercial general liability policy will be issued on a form that insures PROVIDER's or its subcontractors' liability for bodily injury (including death), property damage, personal and advertising injury assumed under the terms of this Agreement

D. **Additional Endorsements**

The Auto and Commercial General Liability Policies shall name the Texas A&M University System Board of Regents for and on behalf of The Texas A&M University System as additional insured's.

E. **Professional Liability (Errors & Omissions)** Insurance with limits of not less than $1,000,000 each occurrence, $2,000,000 aggregate. Such insurance will cover all professional services rendered by or on behalf of PROVIDER and its subcontractors under this Agreement. Renewal policies written on a claims-made basis will maintain the same retroactive date as in effect at the inception of this Agreement. If coverage is written on a claims-made basis, PROVIDER agrees to purchase an Extended Reporting Period Endorsement, effective for two (2) full years after the expiration or cancellation of the policy. No professional liability policy written on an occurrence form will include a sunset or similar clause that limits coverage unless such clause provides coverage for at least three (3) years after the expiration of cancellation of this Agreement.

F. PROVIDER will deliver to A&M System:

Evidence of insurance on a Texas Department of Insurance approved certificate form verifying the existence and actual limits of all insurance after the execution and delivery of this Agreement and prior to the performance of any services by PROVIDER under this Agreement. Additional evidence of insurance will be provided on a Texas Department of Insurance approved certificate form verifying the continued existence of all required insurance no later than thirty (30) days after each annual insurance policy renewal.

All insurance policies, with the exception of worker's compensation, employer's liability and professional liability will be endorsed and name The Board of Regents for and on behalf of The Texas A&M University System and The Texas A&M University System as Additional Insureds up to the actual liability limits of the policies maintained by PROVIDER. Commercial General Liability and Business Auto Liability will be endorsed to provide primary and non-contributory coverage. The Commercial General Liability Additional Insured endorsement will include on-going and completed operations and will be submitted with the Certificates of Insurance.

All insurance policies will be endorsed to provide a waiver of subrogation in favor of The Board of Regents of The Texas A&M University System and The Texas A&M University System. No policy will be canceled without unconditional written notice to A&M System at least ten days before the effective date of the cancellation. ***All insurance policies*** will be endorsed to require the insurance carrier providing coverage to send notice to A&M System ten (10) days prior to the effective date of cancellation, material change, or non-renewal relating to any insurance policy required in this Exhibit C.

Any deductible or self-insured retention must be declared to and approved by A&M System prior to the performance of any services by PROVIDER under this Agreement. PROVIDER is responsible to pay any deductible or self-insured retention for any loss. All deductibles and self-insured retentions will be shown on the Certificates of Insurance.

Certificates of Insurance and Additional Insured Endorsements as required by this Agreement will be emailed to the following A&M System contact in SOProcurement@tamus.edu.

The insurance coverage required by this Agreement will be kept in force until all services have been fully performed and accepted by A&M System in writing, except as may be noted.