



# FORT HAYS STATE UNIVERSITY

*Forward thinking. World ready.*

## REQUEST FOR QUOTE #: 24026

Date Emailed: March 5, 2024

Questions to [purchasing@fhsu.edu](mailto:purchasing@fhsu.edu) by:

Monday, March 11, 2024 at 12 p.m.

Closing Date: Tuesday, March 19, 2024 at 4:30 p.m.

Fort Hays State University (FHSU)

Purchasing Office bid solicitation site:

<https://fhsu.edu/purchasing/bids/index.html>

It shall be the bidder's responsibility to monitor this website on a regular basis for any changes/addenda,

<http://www.fhsu.edu/purchasing/bids>.

Purchasing Office Contact Information:

Telephone: 785-628-4251

Fax: 785-628-4046

Email: [purchasing@fhsu.edu](mailto:purchasing@fhsu.edu)

## INSTRUCTIONS TO BIDDERS:

1. The FHSU Purchasing Office is the only point of contact for this RFQ. When communicating, always refer to the quotation number.
2. To be considered, one copy of this quotation, with your bid properly filled in, must be signed and returned to the FHSU Purchasing Office by the specified closing date. Late bids cannot be considered.
3. **Submit bid response through FHSU's bid solicitation site, Vendor Registry:** <https://fhsu.edu/purchasing/bids/index.html>. **Bidder must be registered.**
4. Bid must be in U.S. Dollars (\$US) excluding Federal Excise/State Sales Taxes.
5. All prices and conditions must be shown. Additions or conditions not shown on this bid will not be allowed.
6. Bid for comparable merchandise will be considered, unless the specifications indicate "no substitution".
7. Bidder must specify exceptions to any requirement or specification in the bid.
8. Bid must include complete specifications and/or descriptive literature to facilitate consideration.
9. Please browse our web-site for similar pending requests.
10. **THIS IS NOT AN ORDER.**

Item No.	Qty.	Unit	Description of Item(s)	Unit Price	Total Amount
<b>Gross Coliseum/Cunningham Hall Parking Lot Improvements. Bidding to include patching all previous and new cracks as required according to the construction notes as depicted. This project must be completed from May 13, 2024, to July 31, 2024.</b>					
<b>Base Bid:</b>					
1	1	Lot	Polypatch all cracks greater than 1 1/2" within specified parking lots.		\$ _____
2	1	Lot	Crack seal all cracks 1/4" to 1 1/2" within specified parking lots.		\$ _____
3	1	Lot	Re-stripe all parking stalls and markings within specified parking lots.		\$ _____
4			<b>TOTAL DELIVERED PRICE (FOB Destination Prepaid &amp; Allowed)</b>		\$ _____
<b>Unit Prices:</b>					
Unit price bid to include pricing as requested below for those areas of specified parking lot where asphalt cutting & patching is required.					
5	1	Lot	Pavement patching, 1-500 square feet.	\$ _____	
6	1	Lot	Pavement patching, 500-1,000 square feet.	\$ _____	
7	1	Lot	Pavement patching, 1,000-2,000 square feet.	\$ _____	

**Drawings are attached after the Specifications. If you have questions regarding this project, please contact:**

**Troy J. Steiner**  
**Architect**  
**Office of Facilities Planning**  
**785.628.4437**  
[tjsteiner@fhsu.edu](mailto:tjsteiner@fhsu.edu)

**Proof of Insurance, Bid Guaranty, Public Works Bond, and Performance Bond are required:**

**Proof of Insurance:** Upon request, the vendor shall present Certificates of Insurance to the FHSU Purchasing Office evidencing the following coverage during the performance of the Services:

- (a) Worker's Compensation with statutory limits;
- (b) Employers Liability, with a minimum \$1,000,000 limit of liability per occurrence.
- (c) Commercial General Liability, including Contractual Liability coverage, with the following minimum limits of liability: \$1,000,000 per occurrence for Bodily Injury and Property Damage, and \$3,000,000 General Aggregate; and
- (d) Professional Liability in the minimum amount of \$1,000,000 per claim.

**Bid Guaranty:** The FHSU Purchasing Office requires that a bid guaranty in the amount of five percent (5%) of the total bid be submitted by all bidders to ensure faithful performance with the conditions of this RFP. A bid guaranty must be one of the following: 1) certified check, cashier check, or certificate of deposit payable to Fort Hays State University; or 2) a properly executed bid bond payable to Fort Hays State University.

All checks or certificates of deposit submitted as a bid guaranty shall be returned after contract award unless the guaranty shall serve as a performance guaranty for the successful bidder. Bonds will not be returned. If the successful bidder fails to enter into a written contract, FHSU shall retain the bid guaranty as liquidated damages.

**Public Works Bond:** The Successful Contractor shall file with the FHSU Purchasing Office a Public Works Bond as required by K.S.A. 60-1111, as amended, in an amount equal to one hundred percent (100%) of contract price and shall be filed with the Clerk of the District Court in the County where the project is being constructed.

The bond funding will be released upon the completion of this contract subject to total or partial forfeiture for failure to perform adequately the terms of this contract. If damages exceed the amount of the guaranty, FHSU may seek additional damages. A Public Works Bond is not required for projects with a contract price below \$100,000.00.

**Performance Bond:** The Successful Bidder shall file with the FHSU Director of Purchases a Performance Bond in an amount equal to one hundred percent (100%) of the price bid as security for the faithful performance of this contract and as security for the payment of all persons performing labor and furnishing materials in connection with this solicitation.

The guaranty shall be returned to the Contractor upon the completion of this contract subject to total or partial forfeiture for failure to perform adequately the terms of this contract. If damages exceed the amount of the guaranty, Fort Hays State University may seek additional damages.

Necessary bond forms will be furnished by the FHSU Purchasing Office. The forms can be completed by any General Insurance Agent. Bonds shall be issued by a Surety Company licensed to do business in the State of Kansas.

**NOTE: Vendors must register through Vendor Registry to access this bid document on FHSU Purchasing website, <https://fhsu.edu/purchasing/bids/index.html>. Submit your bid response through Vendor Registry.**

**TO BE CONSIDERED, THE FOLLOWING INFORMATION MUST BE PROVIDED BY THE BIDDER:**

DATE \_\_\_\_\_  
 TERMS \_\_\_\_\_  
 DELIVERY WILL BE MADE \_\_\_\_\_ DAYS A.R.O.  
 Fort Hays State University, Hays, KS  
 F.O.B. DEST. 67601  
 F.E.I.N. OR S.S.N. \_\_\_\_\_  
 NAME \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ ST \_\_\_\_\_ ZIP \_\_\_\_\_

**SIGNED BY** \_\_\_\_\_  
 PRINT OR TYPE NAME \_\_\_\_\_  
 TITLE \_\_\_\_\_  
 TELEPHONE # \_\_\_\_\_  
 FAX # \_\_\_\_\_  
 E-MAIL ADDRESS \_\_\_\_\_  
 CHECK IF APPLICABLE  
 Small Business \_\_\_\_\_ Woman-Owned \_\_\_\_\_ Minority-Owned \_\_\_\_\_

**State Credit Card:** Presently, FHSU uses a State of Kansas Procurement Card (Visa) in lieu of a state warrant to pay for some of its purchases. State of Kansas Law does not allow retailers to charge a credit fee for using their cards. (Refusal will not be a determining factor in award of this contract.) Will the credit card be allowed for purchases? Yes \_\_\_\_\_ No \_\_\_\_\_

# **GROSS COLISEUM/CUNNINGHAM HALL PARKING LOT REPAIRS**

## **SPECIFICATIONS**

FORT HAYS STATE UNIVERSITY

600 PARK STREET

HAYS, KANSAS 67601

February 2024

A-N/A

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## SECTION 011000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Access to site.
  - 4. Coordination with occupants.
  - 5. Work restrictions.
  - 6. Specification and drawing conventions.

#### 1.3 PROJECT INFORMATION

- A. Project Identification: Gross Coliseum/Cunningham Hall Parking Lot Repairs.
  - 1. Project Location: Fort Hays State University, Hays, Kansas.
- B. Owner/Architect: Fort Hays State University Office of Facilities Planning.
  - 1. Owner's Representative: Troy J. Steiner; Architect; Office of Facilities Planning; Ph. 785.628.4437; email: [tjsteiner@fhsu.edu](mailto:tjsteiner@fhsu.edu).

#### 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of the Project is defined by the Contract Documents and consists of the following:
  - 1. Repair of Gross Coliseum/Cunningham Hall parking lot using crack sealing, PolyPatch, and full depth patching as required.
- B. Type of Contract
  - 1. Project will be constructed under a single prime contract.

#### 1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

#### 1.6 COORDINATION WITH OCCUPANTS

- A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawings included in the Plans are as follows:
  - 1. T1.1 – Title Sheet.
  - 2. A1.1 – Construction Plan.

END OF SECTION 011000

## SECTION 012200 - UNIT PRICES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.

#### 1.3 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

#### 1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price 1: Pavement Patching, 1-500 square feet.
  - 1. Description: Remove and patch existing asphalt pavement as per typical patch section detail on the construction plan.
  - 2. Unit of Measurement: Square Feet with an average patching width of 3'-0".
- B. Unit Price No. 2: Pavement Patching, 500-1000 square feet.
  - 1. Description: Remove and patch existing asphalt pavement as per typical patch section detail on the construction plan.



2. Unit of Measurement: Square Feet with an average patching width of 3'-0".
- C. Unit Price No. 3: Pavement Patching, 1000-2000 square feet.
1. Description: Remove and patch existing asphalt pavement as per typical patch section detail on the construction plan.
  2. Unit of Measurement: Square Feet with an average patching width of 3'-0".

END OF SECTION 012200

## SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Final completion procedures.
  - 2. Warranties.
  - 3. Final cleaning.
- B. Related Sections:
  - 1. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

#### 1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
  - 1. Submit a final Application for Payment as per contract instructions.
  - 2. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  - 1. Organize list of spaces in sequential order.
  - 2. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Page number.

## 1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within [15] <Insert number> days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Leave Project clean and ready for occupancy.

END OF SECTION 017700

## SECTION 321216 - ASPHALT PAVING

### 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:
  - 1. Crack Sealing.
  - 2. Hot-mix asphalt patching.
  - 3. Pavement-marking paint.

#### 1.3 UNIT PRICES

- A. Work of this Section is affected by Pavement Patching unit prices.

#### 1.4 REFERENCES

- A. Kansas Department of Transportation Standard Specifications, 2015 Edition (see sections and applicable referenced sections in Appendix A of this section):
  - 1. Section 835 – Resealing Joints and Sealing Cracks in Exist. PCCP and HMA Pavements. (Crack Sealing).
  - 2. Section 204 – Excavation of Backfill for Structures (Pavement Patching).
  - 3. Section 205 – Excavation of Embankment for Highways (Pavement Patching).
  - 4. Section 612 – Milling (Pavement Patching).
  - 5. Section 833 – Pavement Patching (Pavement Patching).
- B. Crafc0, Inc. (see applicable sections in Appendix B of this section):
  - 1. Installation Instructions, PolyPatch Products, 2014.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
  - 1. Job-Mix Designs: For each job mix proposed for the Work.
  - 2. Maintain a minimum one copy of Plans and Specification documents on site at all times.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Material Certificates: For each paving material, from manufacturer.

#### 1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Kansas Department of Transportation standards for asphalt paving work.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 55 deg F for water-based materials, and not exceeding 95 deg F.

## PART 2 - PRODUCTS

### 2.1 ASPHALT MATERIALS

- A. Crack Sealing and Pavement Patching materials shall be in accordance with Kansas Department of Transportation Standard Specifications, 2015 Edition, and as specified in the Contract Documents.
- B. PolyPatch materials shall be in accordance with the manufacturer Crafcoc, Inc. and as specified in the Contract Documents.
  - 1. Products equal to Crafcoc, inc. specifications shall be allowed with prior approval of the Owner.

### 2.2 AUXILIARY MATERIALS

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952.
  - 1. Color: White and Blue as required.
- B. Glass Beads: AASHTO M 247, Type 1.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

### 3.2 PATCHING

- A. Crack Sealing and Pavement Patching.
  - 1. Preparation, mixing, placing, and other required work and appurtenances shall all be in accordance with Kansas Department of Transportation Standard Specifications, 2015 Edition.

3.3 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 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 (0.4 mm).
  - 1. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

3.4 PROTECTION OF FINISHED WORK

- A. Shall be in accordance with Kansas Department of Transportation Standard Specifications, 2015 Edition.

END OF SECTION 321216

February 2024

A-N/A  
Fort Hays State University  
Gross Coliseum/Cunningham Hall Parking Lot Repairs

**APPENDIX A**

KDOT Standard Specifications, 2015 Edition  
Applicable Sections

## 155 – ASPHALT SURFACING AND ASPHALT RECYCLING EQUIPMENT

### SECTION 155

#### ASPHALT SURFACING AND ASPHALT RECYCLING EQUIPMENT

##### 155.1 EQUIPMENT FOR HEATING ASPHALT MATERIALS

a. Use equipment for heating asphalt materials at project asphalt plant sites by one of the following methods:

- Circulate steam, hot gases or hot oil through coils of a tank.
- Circulate the asphalt material around a system of heated coils or pipes.
- Circulate the asphalt material through a system of coils or pipes enclosed in a heated jacket.
- Other approved means subject to the requirements of this specification.

Construct the heating device to prevent direct flame from striking the surface of the coils, pipes or jacket through which the asphalt material is circulated. Operate the heating device in a manner that shall not damage or change the characteristics of the asphalt material.

b. Railroad tank cars or truck tankers that have defective coils, or from which the coils have been removed, shall be rejected by the Engineer, unless the Contractor can provide satisfactory auxiliary means for heating the asphalt material without contamination and introducing moisture. Do not use a tanker connection or any other equipment by means of which free steam can be introduced directly into the asphalt material as a means of agitation or auxiliary heating.

##### 155.2 ASPHALT DISTRIBUTOR

a. Use equipment for the distribution of asphalt materials equipped with the following:

- Tachometers;
- Pressure gauge;
- Adjustable length spray bars;
- Separate power unit and pump on the distributing system or hydrostatic drive system;
- Heating coils and burner;
- Thermometer well and accurate thermometer;
- Measuring sticks; and
- Quick opening gate in the dome.

Mount all distributors and supply tanks on trucks or trailers equipped with pneumatic tires. Design the units so that no rutting or other injury to the road surface shall result. Provide sufficient power to maintain the desired speed of the equipment during operation.

The tachometer designating the speed of the truck shall be a separate operating unit attached to the truck. Equip the tachometer with a large gauge approximately 5.5 inches in diameter and graduated in units so the speed of the truck can be determined within limits of approximately 10 feet per minute. Locate the gauge so that it can be easily read at all times by both the driver and the Engineer.

Equip the distributor with either a tachometer attached to the pump shaft and calibrated to indicate revolution per minute, or a pressure gauge placed in the distributing system and calibrated to indicate pounds per square inch or gallons per minute by which the flow of asphalt materials can be regulated.

The spray bars and nozzles shall be constructed to accomplish the following:

- Permit adjustment for length in increments of 1 foot for any length up to 16 feet;
- Permit vertical adjustment of all nozzles to the desired height above the road surface and conforming to the roadway crown;
- Permit lateral shifting of the entire spray bar during operation;
- Prevent clogging of the nozzles; and
- Provide positive and immediate cut-off when distribution of asphalt material ceases.

The power unit and pump distribution system requirements are as follows:

- Capacity of a minimum of 250 gallons per minute;



## 155 – ASPHALT SURFACING AND ASPHALT RECYCLING EQUIPMENT

- Equipped with a bypass into the supply tank;
- Capable of distributing a uniform and constant flow of asphalt material through all nozzles at a pressure between 30 to 50 pounds per square inch; and
- Capable of being calibrated and adjusted to accurately distribute asphalt material within 0.01 gallon per square yard for any quantity from 0.1 to 1 gallon per square yard.

b. Calibrate and check all distributors before using on a KDOT project. The calibration of the tank and preparation of the certificate shall be performed by the DME in the District in which the distributor is first used. Provide all equipment, materials and assistance necessary for the calibration.

The DME will give a certificate of approval to the distributor operator indicating the record of the calibration and check. Keep this certificate in the distributor at all times and make it available to the Engineer in charge on each project on which the distributor is used. Failure to present the certificate shall require a re-check, and if deemed necessary, a re-calibration of the distributor before it may be used on a project. The certificate may be revoked at any time due to unsatisfactory performance of the distributor. It shall be returned only when satisfactory repairs or adjustments have been made.

Each subsequent year, the operation of the distributor must be checked by the Engineer the first time it is used. When the operation is found to be satisfactory, the distributor may be used. The Engineer making the check will sign and date the certificate.

### 155.3 STORAGE OR SURGE BINS

a. When a storage or surge bin is used with any type of plant, the following items are required as a minimum.

- (1) Design, equip and use the bin to prevent segregation.
- (2) Protect the belt leading from the drum discharge to the bin to prevent heat loss due to wind blowing on the material.
- (3) Use a “Gob-Hopper” or other type of device approved by the Engineer to help prevent segregation of the mix as it falls into the bin or silo.
- (4) Use a Tel-Tale device located at the top of the tapered portion of the bottom of the bin to indicate when the level of the asphalt mixture in the bin has been lowered to that point. In the case of special designed bins (such as full length tapered bins), locate the device at the point designated by the Engineer. Do not lower the mixture below this point except to clean out the bin, when plant operations are being terminated at the end of the day and such other times as deemed necessary by the Engineer.

Interconnect the Tel-Tale device with the controls of the gate in the bottom of the bin to close the gate automatically when the mixture in the bin has been lowered to the level of the Tel-Tale device. Provide a means of over-riding these controls solely for the purpose of cleaning out the bin at the termination of plant operation. The material in the bottom of the bin below the device may be used when the bin is cleaned out, provided the Engineer approves the material.

(5) Do not keep hot asphalt mixtures in storage or surge bins longer than 3 hours without prior approval by the Engineer.

b. See **subsection 155.6a.(6)** for use of surge or storage bins.

c. If the Engineer determines that segregation is occurring, use of storage or surge bins may be prohibited.

### 155.4 ASPHALT PAVER

Acceptable asphalt pavers are self-contained, power-propelled units, equipped with an automatically controlled activated screed or strike-off assembly, and heated if necessary. They are capable of spreading and finishing courses of asphalt material in lane widths applicable to the specified section and thickness shown in the Contract Documents. Pavers used for shoulders and similar construction shall be capable of spreading finishing courses of asphalt material to the width shown in the Contract Documents.

Equip the paver with an approved automatic screed control system capable of grade reference and transverse slope control. The automatic controls shall include a system of sensor operated devices that sense and follow a reference line or surfaces on one or both sides of the paver as required. Maintain the screed at the proper

## 155 – ASPHALT SURFACING AND ASPHALT RECYCLING EQUIPMENT

elevation at each end by controlling the elevation of one end while automatically controlling the transverse slope, or by controlling the elevation of each end independently.

With the screed or strike-off assembly, produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

Equip the paver with a receiving hopper having sufficient capacity for a uniform and continuous spreading operation. Equip the hopper with a distribution system to place the mixture uniformly in front of the screed. Pickup attachments used to feed the hopper may not exert any vertical load on the paver and shall be capable of picking up and loading substantially all of the material on the surface.

When laying mixtures, the paver shall be capable of being operated at variable forward speeds consistent with satisfactory laying of the mixture.

### 155.5 MATERIAL TRANSFER DEVICE

Mobile conveyors, shuttle buggies, material transfer vehicles, materials transfer paver and pick-up devices are considered material transfer devices. Provide a self-propelled material transfer device, capable of moving independent of the paver or attached to the paver. Equip the materials transfer device to perform additional mixing of the material, and then deposit the mixture into the paver at a uniform temperature and consistency.

Paver hopper inserts shall be required when spillage of the HMA occurs during transfer of the material.

### 155.6 HOT MIX ASPHALT (HMA) PLANTS

Plants used for the manufacture of HMA shall consist of a drum mix plant, batch plant or continuous mix plant. Provide equipment complying with the requirements specified below, having capacity to adequately handle the proposed asphalt construction, and meeting the approval of the Engineer.

Continued use of any hot mix plant is on the condition that the Contractor is fully responsible for producing material that complies with contract requirements.

#### **a. Requirements for All HMA Plants.**

- (1) Uniformity. Design, coordinate and operate the plants to produce a uniform mixture.
- (2) Proportioning Equipment. The Engineer may require locking or sealing of any automated proportioning equipment that can be manually manipulated.
- (3) Heating and Storage Tanks for Asphalt Material. Use storage tanks for asphalt material that have sufficient capacity to provide for continuous operation. They shall be capable of uniformly heating and holding the asphalt material at the required temperature range without damaging or changing its characteristics. Direct flame against the tanks is prohibited. Design the circulating system to obtain proper and continuous circulation during the operating period. Provide an accurate procedure for determining the amount of asphalt material in the tanks at any time. Document and substantiate the calibration data. Situate and construct the tanks so the level of material can be safely and accurately measured at any time. Set the tanks as nearly level as possible. Include a means of obtaining samples of asphalt material from the delivery line to the plant in the system.
- (4) Cold Feed Aggregate Bins. Provide separate cold feed bins for each aggregate size used, unless blending is permitted by methods approved by the Engineer. Use cold feed bins with sufficient capacity to maintain a continuous flow of material. Construct the bins to prevent any spilling or leakage from one bin to another. Each bin shall have a belt feeder equipped with an adjustable gate or an adjustable drive, or both, that can be calibrated and controlled. Provide a uniform distribution of aggregate on the conveyor belt. Equip each bin with a device that shall detect any reduction or interruption of aggregate flow and actuate a visual or audible signal at locations approved by the Engineer.
- (5) Thermometric Equipment. Equip the plant with a sufficient number of thermometric instruments to control the temperature of the aggregate and the asphalt material. Use instruments capable of recording temperature on a chart over each 24-hour period with a maximum chart gradation of 15 minutes and 10°F. Use a 24-hour clock or designate AM and PM on the chart. The Engineer shall retain all temperature records as part of the contract records. Install the units separate from the plant in a readily accessible location.

Locate the actuating unit for recording temperature either in the storage tank or in the feed line between the pump and the discharge valve.

Locate the actuating unit for recording aggregate temperature and HMA as specified for each type of plant.

## 155 – ASPHALT SURFACING AND ASPHALT RECYCLING EQUIPMENT

(6) Use of Storage Bins and Batchers. When used with a storage bin, design and operate these plants so the transfer of HMA from the drum to the storage bin shall not cause segregation of the mix, and the batcher can be operated according to **subsection 602.4a.(3)(d)**.

Equip all storage bins with controls capable of maintaining a specified minimum level or amount of HMA in the bin at all times during production.

If the amount of HMA in the bin can be determined by reading the output of load cells or other approved sensors, the Engineer shall specify the minimum amount of material in tons. Otherwise, the minimum level of HMA is the top of the tapered portion of the bin or at the point designated by the Engineer on special designed bins.

Set the controls to close and lock the bin gate when the specified minimum amount or level is reached. Override of the lock is permitted only to clean out the bin at the end of a production run.

Equip every storage bin with a batcher at the top, located so the HMA is discharged vertically from the batcher into the center of the bin. The Engineer may approve other equipment such as a rotating chute. Do not load the storage bin directly from a belt or other conveyor. Cover the belts carrying HMA to prevent excess heat loss.

Establish control of the batcher gates so the batcher shall operate as specified in **subsection 602.4a.(3)(d)** throughout the output range of the plant.

(7) Dust Collectors. Equip the plant with an approved dust collector, bag house or other type of collector that complies with limit particulate emissions standards.

Dispose of all waste material in a suitable manner.

Equip the plant to prevent particulate leakage.

(8) Air Emission Permit. Provide a copy of an Air Emission Permit issued by the Kansas Department of Health and Environment (KDHE) to the Engineer before installing a hot mix plant. It is the Contractor's responsibility and expense to satisfy the KDHE requirements.

(9) Safety Requirements. Provide adequate and safe access to sampling points and other locations where checking of plant operations is necessary. Thoroughly guard and protect all gears, pulleys, chains, sprockets and other dangerous moving parts. When required by the Engineer, provide access to the top of truck bodies by a platform or other suitable device to enable the Engineer to obtain samples and temperature data.

### **b. Requirements for Drum Mix Plants.**

(1) General. Specifically design the plant for drum mixing and to be capable of satisfactorily heating, drying and mixing the HMA.

(2) Cold Aggregate Feed System. Use belt scales for positive weight measurement of the combined cold aggregates. Continuously record the amount of cold aggregate using a non-set-back recorder. The belt scale shall be accurate within 2% by weight of the material being measured over any given period of time. Calibrate the belt scales at intervals as directed by the Engineer. Provide a weight system automatically coupled with the asphalt flow to maintain the required proportions.

(a) Sampling. Provide safe, adequate and convenient facilities for obtaining representative samples of the combined cold aggregate. Provide a sampling device capable of producing a sample of proper size (large enough to be representative, but small enough to be carried safely by 2 people) from the full width of the combined aggregate flow, while the plant is operating at regular production rate.

(b) Recycled Material Conveyor. If the plant is used for recycling, a weighing system is required to control delivery of virgin aggregate and recycled material components to the drum. Equip the system with interlocking mechanisms that shall accurately deliver virgin aggregates, Reclaimed Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS) in proper proportions. Belt scales for the RAP and RAS shall comply with **subsection 155.6b.(2)**.

(c) Moisture Compensation. Include a moisture compensation device in the cold feed system to correct for the moisture in the aggregate passing over the belt scales.

(d) Weather Protection. Protect belt scales from the effect of wind and weather.

(3) Asphalt Material Feed System. Supply asphalt material to the mixing drum through a continuously registering cumulative indicating meter by a pump specifically designed for drum mix plants. Locate the meter in the asphalt material so it shall register the discharge to the drum. Provide a means to divert the flow into a container for calibration. Supply the meter with a non-set-back register accurate within 2% by weight of the material measured in any given period of time. The register shall record only material delivered to the drum.

(4) Mineral Filler Feed System. Introduce and uniformly disperse fly ash and similar mineral fillers into the drum mixer at the point of introduction of the asphalt without loss to the dust collector system. Use a non-set-back register to record the quantity of mineral filler discharged into the mixer. Equip the delivery system with

## 155 – ASPHALT SURFACING AND ASPHALT RECYCLING EQUIPMENT

variable speed to interlock with the aggregate weigh belt so the total aggregate weight including the mineral filler is indicated to the asphalt proportioning system. Provide a device to indicate that mineral filler is being delivered uniformly to the drum that shall activate a visible or audible signal to the plant operator if the flow is reduced or interrupted.

(5) Calibration of Feed Systems. Enable easy calibration of the aggregate weighing system and the asphalt material meter system. The calibration methods are subject to approval by the Engineer, who may require a schematic diagram of the system.

(6) Mixing Drum. Equip the drum with automatic burner controls to prevent damage to the aggregate or asphalt material. Keep the discharge temperature of the mixture within the range specified in **DIVISION 600** for the type of asphalt material being used. Install the activating unit for recording the asphalt mixture temperature in the discharge chute of the drum mixer.

Use a rate of flow through the drum such that the aggregate and asphalt material form a homogeneous mixture with all particles uniformly coated. Do not exceed the manufacturer's rated capacity.

### c. Requirements for Hot Mix Batch Plants.

(1) Dryer. Include one or more dryers in the plant that continuously agitate the aggregate during the heating and drying process. Use dryers that dry and heat all aggregate to specified requirements.

(2) Aggregate Temperature. Install the actuating unit for recording the aggregate temperature where the hot materials flow over it during the proportioning operation.

(3) Hot Aggregate Storage Unit. Configure the unit so the aggregate shall not be segregated and can be discharged into the weigh hopper in a manner that shall not affect the accuracy of weighing.

(4) Weigh Box or Hopper. Include a means for accurately weighing the aggregate in a weigh box or hopper suspended on scales, and of ample size to hold a full batch without running over. The gate shall close tightly so no material is allowed to leak into the mixer while a batch is being weighed.

(5) Asphalt Control. The weigh bucket shall be non-tilting with a loose sheet metal cover. Make the length of the discharge opening or spray bar greater than  $\frac{3}{4}$  the length of the mixer, and make it discharge directly into the mixer. Heat the asphalt material bucket, its discharge valve or valves and spray bar. Provide an asphalt material bucket with a capacity a minimum of 15% in excess of the weight of asphalt material required in any batch. Have a heated quick-acting, non-drip, charging valve located directly over the asphalt material bucket.

Locate a scale dial with a capacity of a minimum of 15% in excess of the quantity of asphalt material used in a batch in full view of the mixer operator. Automatically control the flow of asphalt material to begin when the dry mixing period is over, and all of the asphalt material required for one batch shall be discharged in less than 15 seconds after the flow has started. If an approved metering device is used to control the amount of asphalt material, provide a valve and outlet for checking the meter in the section of line between the charging valve and the spray bar.

(6) Scales. Scales may be of the beam, springless dial or electronic type that complies with **subsection 152.2**. Equip beam scales with a Tel-Tale dial that shall start to function when the load being applied is within 100 pounds of that required. The dials shall be compounding, with full complements of index pointers. Do not place dials to give excessive parallax errors. Locate all dials to be plainly visible to the operator at all times.

(7) Control of Mixing Time. Equip the mixer:

- with an accurate time lock to control the operations of a complete mixing cycle;
- to lock the weigh box gate after charging the mixer until the mixer gate closes at completion of the cycle; and
- to lock the asphalt material bucket throughout the dry mixing period and lock the mixer gate throughout the dry and wet mixing periods.

The dry mixing period is defined as the interval of time between the opening of the weigh box gate and the start of introduction of asphalt material. The wet mixing period is the interval of time between the start of introduction of asphalt material and the opening of the mixer gate.

Perform the setting of time intervals in the presence of the Engineer. The Engineer will then lock the case covering the timing device until such time as a change is to be made in the timing device.

(8) Mixer. Use an approved type of batch mixer capable of producing a uniform mixture.

If not enclosed, equip the mixer box with a dust hood to prevent loss of dust.

The clearance of blades from all fixed or moving parts may not exceed 1 inch, if the maximum size of the aggregate is less or equal to 1 inch. The clearance may not exceed  $1\frac{1}{4}$  inches, if the maximum size of the aggregate in the mix exceeds 1 inch.

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### 155.7 SELF-PROPELLED AGGREGATE SPREADER

Use a spreader that is supported by a minimum of 4 wheels with pneumatic tires on 2 axles. Equip the spreader with a means of applying the larger cover coat materials to the surface ahead of the smaller cover coat material so that the required amount of material is deposited uniformly over the full width of the asphalt material.

### 155.8 SURFACE RECYCLE EQUIPMENT

**a. Pre-Heating Unit.** Use a self-propelled heating unit, adjustable in width, with ports permitting fuel and forced air injection for proper combustion without excessive smoke. The unit shall be under a closed or shielded hood, capable of heating asphalt pavement to a temperature that allows milling or scarifying to the specified depths. Equip each unit with a water spray system used to wet the adjacent vegetation.

**b. Heating Milling Unit.** Use a self-propelled unit capable of milling, heating and windrowing the asphalt pavement that is being processed, and meeting **subsection 155.8a**. In addition, equip this unit with automatic grade controls to mill the desired depth of material to be processed.

**c. Heating Scarifying Unit.** Use a self-propelled unit capable of heating and scarifying the asphalt pavement that is being processed, and meeting **subsection 155.8a**.

**d. Tunnel Heater.** Use a self-propelled unit capable of heating the underlying pavement while shielding the previously milled material from direct flame, preventing the material from catching on fire and meeting **subsection 155.8a**. The tunnel heater may be equipped with a milling unit. In this case, the tunnel heater shall also meet **subsection 155.8b**.

**e. Distributor-Paving Unit.** Use a single unit that uniformly distributes the rejuvenator at the stipulated rate onto the scarified or milled material and mixes them together using a minimum of 2 telescopic milling heads. This equipment also screeds and finishes the scarified or milled material similar to an asphalt paver specified in **subsection 155.4**.

**f. Milling-Mixing-Paving Unit.** Use a unit complying with **subsection 155.8b**. The rejuvenator shall be added uniformly at the stipulated rate onto the scarified or milled material and mixed with a minimum of 2 telescopic milling heads. Alternatively, the rejuvenator may be added directly to the milling heads provided the applied rate is uniform across the width of the HIR material. This equipment shall also screed and finish the scarified or milled material similar to an asphalt paver specified in **subsection 155.4**. Alternatively, a self-propelled independent paver complying with the asphalt paver specification in **subsection 155.4** may be used after the mixing operation.

### 155.9 COLD RECYCLED ASPHALT PAVEMENT EQUIPMENT (LIME SLURRY/FLY ASH)

**a. General.** Provide a self-propelled machine capable of cutting and removing the asphalt pavement (to the dimensions specified in the Contract Documents) in one pass. Equip the cutting machine with automatic controls capable of maintaining a uniform grade and cross slope.

Equip to pulverize the reclaimed asphalt pavement (RAP) material to specified requirements without contamination from the subgrade material. The RAP material processing unit shall consist of a closed loop system with a crusher and a scalper screen, or other approved devices capable of reducing the RAP material to the specified gradation.

Provide the mixing unit with a continuous weighing system for the processed RAP material, and be coupled with meters to maintain the proper proportion of RAP material, liquid binder, set retarder (used only with fly ash) and water. Meter all water (including water added by the milling machine) introduced into the mix. If delivery of RAP material is stopped, automatically shut off the liquid binder, set retarder (used only with fly ash) and water pumps. Provide positive means for calibrating the weight measurement device and the additive metering devices.

Apply the additives in a mixing chamber that is capable of mixing the pulverized pavement material and additive to a homogeneous mixture. Equip the additive system to maintain the binder amount within plus or minus 0.2% of the specified application rate and to shut off automatically if delivery of RAP material is stopped. Place the mixture in a windrow or load it into trucks so segregation does not occur.

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Place the recycled mixture without segregation using a self-propelled asphalt paver complying with **subsection 155.4**. If a pick-up machine is used to feed the windrow into the paver hopper, provide one capable of picking up the entire windrow down to the underlying materials.

Provide self-propelled vibratory steel and pneumatic rollers to establish the rolling procedure. The vibratory steel roller may also be used as a static steel roller.

**b. Lime Slurry.** Equip the milling chamber with spray bars to incorporate hydrated lime slurry and water into the RAP. The metering device for the spray bars is calibrated to, and controlled by the continuous weighing system for the RAP.

Provide slaking equipment specifically manufactured for this purpose. Equip transport, tank trucks or trailers with mechanical agitators.

**c. Fly Ash.** Provide equipment to introduce set retarder and water into the mix independent of one another.

### 155.10 HOT POUR CRACK SEALANT EQUIPMENT

Provide a machine used for pouring cracks, capable of mixing the asphalt and rubber or other specified material in the specified proportions into a homogeneous mixture at the specified temperatures. Use a double boiler melter with a permanently attached temperature gauge to continuously verify sealant temperature in the material tank. Do not use units with a solvent flush system for clean out, due to the risk of solvent contamination to the sealant. Use a melter with a heat chamber for hose storage and valve heating, or an air flush system to eliminate the need for a solvent flush clean-up system. Provide material tank mixing with a reversible paddle agitator in a vertical tank configuration. Use units similar to those purchased by KDOT Maintenance under Spec: MS 168, latest version.

### 155.11 MODIFIED SLURRY SEAL EQUIPMENT

**a. Mixing Equipment.** Use a self-propelled mixing machine capable of delivering and proportioning the aggregate, mineral filler, water, additives and emulsified asphalt to a revolving multi-blade dual mixer, and discharging the thoroughly mixed product. Provide storage capacity for all components to maintain a supply in the proportioning controls. Operate the machine continuously while loading, to eliminate unnecessary construction joints.

Provide individual volume or weight controls for proportioning each material to be added to the mix. Calibrate and properly mark each material control device. Provide controls accessible for ready calibration and placed so the Engineer may determine the amount of each material used at any time.

Equip the mixing machine with a water pressure system and nozzle spray bar to provide a water spray immediately ahead of and outside the spreader box as required.

Equip the machine with opposite side driving stations to optimize longitudinal alignment. Equip the machine to allow the mix operator to have full control of the forward and reverse speed during application of the material.

**b. Spreading Equipment.** Equip the machine with opposite side driving stations to optimize longitudinal alignment. Configure the machine to allow the mix operator to have full control of the forward and reverse speed during application of the material.

Spread the paving mixture uniformly by means of a mechanical laydown box attached to the mixer and equipped with paddles to agitate and spread the materials through the box. Design and operate the paddles so all the fresh mix shall be agitated to prevent the mixture from setting up in the box or causing side buildup and lumps. Flexible seals in the front and rear shall be in contact with the road to prevent loss of mixture from the box.

Equip the box with lateral movement controls. The rear flexible strike-off shall be adjustable. Rut filling equipment requires adjustable steel strike-off plates. Design and operate the spreader box and rear strike-off so a uniform consistency is achieved to produce a free flow of material to the rear strike-off without causing skips, lumps or tears in the finished surface. When directed by the Engineer, provide a secondary strike-off to improve surface texture. Use a secondary strike-off with the same adjustments as the rear flexible strike-off. Spread the mixture to fill cracks and minor surface irregularities and leave a uniform application of slurry on the surface. When directed by the Engineer, provide a secondary strike-off to improve surface texture. The secondary strike-off shall have the same adjustments as the rear flexible strike-off.

Operate the spreader to prevent the loss of the paving mixture when surfacing super-elevated curves. Keep the box clean and free of build up of asphalt and aggregate.

## 201 – CLEARING AND GRUBBING

### SECTION 201

#### CLEARING AND GRUBBING

##### 201.1 DESCRIPTION

Clear and grub the vegetation and debris as specified in the Contract Documents.

**DO NOT** clear and grub areas unless work will actively be performed in the exposed area (or portions of the exposed area) within 7 calendar days on exposed steep slope areas (40% or greater) or within 14 calendar days for all other exposed areas.

##### BID ITEM

Clearing and Grubbing

##### UNITS

Lump Sum

##### 201.2 MATERIALS

Backfill stump holes using granular material or loose friable soil from the project. Use material that is free of excess moisture, frozen lumps, roots, sod, rocks greater than 4 inches in diameter or other deleterious material.

The Engineer will accept the backfill material based on visual inspection.

##### 201.3 CONSTRUCTION REQUIREMENTS

Do not damage any vegetation designated to remain. The Engineer will identify any trees, shrubs and other vegetation designated to remain. Remove low hanging, unsound or unsightly branches on trees and shrubs designated to remain as specified in the Contract Documents. Trim the branches according to recognized industry practices.

Within the construction limits, clear and grub all vegetation not designated to remain. Undisturbed stumps and roots no more than 6 inches above the original ground line or low water level may remain, provided they are a minimum of 3 feet below the finished subgrade or embankment slope and approved by the Engineer.

Strip and stockpile the existing topsoil from within the construction limits. To the extent practical, use this material to cap the finished embankment and cut slopes. This work is subsidiary to grading items in the contract.

Where practical, do not store equipment or materials (including soil stockpiles) within 50 feet of rivers, streams or other surface waters. Where such storage is necessary, obtain the Engineer's written approval and include in the project SWPPP appropriate best management practices for the storage area.

Unless requested in writing from the Contractor, and approved in writing by the Engineer, or specified otherwise in the Contract Documents, do not exceed 750,000 square feet of surface area of erodible earth material per equipment spread at one time. The Engineer will limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow (within right-of-way) and embankment operations. Limit the exposed erodible earth material according to the capability and progress, and in keeping with the approved schedule.

Areas will not count toward the 750,000 square feet limit, when the following conditions are met:

For areas that will not be disturbed again due to project phasing:

- Finish grade the completed area;
- Stabilize and maintain stabilization according to **SECTION 902**; and
- Do not disturb the area again without a written request from the Contractor and written approval from the Engineer;

For areas that will be disturbed again due to project phasing:

- Rough grade; and
- Stabilize and maintain stabilization according to **SECTION 902**.

**DO NOT** clear and grub areas unless work will actively be performed in the exposed area (or portions of the exposed area) within 7 calendar days on exposed steep slope areas (40% or greater) or within 14 calendar days for all other exposed areas. If areas are cleared and grubbed and not finish graded, not part of project phasing and no meaningful work toward the completion of the bid item is performed within the exposed area (or portions of the exposed area) for 7 calendar days on exposed steep slope areas (40% or greater) or 14 calendar days for all other

## 201 – CLEARING AND GRUBBING

exposed areas, stabilize and maintain stabilization at these exposed areas according to **SECTION 902** at no cost to KDOT.

Remove and dispose of the cleared vegetation and debris. If authorized by the Engineer, dispose of the cleared vegetation and debris on the right-of-way.

Backfill and compact all stump holes, except in areas of excavation. Backfill the stump holes to the level of the surrounding ground. If the backfill area is within the limits of the new construction, compact the backfill to the type of compaction and within the moisture range designated in the Contract Documents.

Provide temporary erosion and pollution control according **DIVISION 900**.

### 201.4 MEASUREMENT AND PAYMENT

The Engineer will measure the clearing and grubbing as a lump sum.

Stabilization of finished areas will be measured and paid for under **DIVISION 900** bid items. Exempt areas specified in **subsection 201.3** will not be measured for payment.

Payment for "Clearing and Grubbing" at the contract unit price is full compensation for the specified work.



**204 - EXCAVATION AND BACKFILL FOR STRUCTURES**

**SECTION 204**

**EXCAVATION AND BACKFILL FOR STRUCTURES**

**204.1 DESCRIPTION**

Excavate for the structures as shown in the Contract Documents. Unless specified otherwise, backfill the completed structures to the original ground line.

**BID ITEMS**

**UNITS**

Class * Excavation	Cubic Yard
Concrete for Seal Course (Set Price)	Cubic Yard
Foundation Stabilization	Cubic Yard
Foundation Stabilization (Set Price)	Cubic Yard
Granular Backfill	Cubic Yard
Granular Backfill (Wingwalls) (Set Price)	Cubic Yard
Granular Backfill (Wingwalls) (Set Price)	Cubic Yard
Water (Grading) (Set Price)	M Gallon
*Class of Excavation	

**204.2 MATERIALS**

Provide materials that comply with the applicable requirements.

Concrete .....	<b>SECTIONS 401 &amp; 402</b>
Aggregates for Concrete Not On Grade .....	<b>DIVISION 1102</b>
Aggregates for Backfill .....	<b>DIVISION 1100</b>
Water .....	<b>DIVISION 2400</b>

Provide sand, or other aggregate that contains sufficient binder to allow compaction and limit the flow of water through the material, as granular material for culvert bedding. Provide material with enough moisture to allow compaction. The Engineer will accept the granular bedding material based on visual inspection of the material placed on the project.

**204.3 CONSTRUCTION REQUIREMENTS**

**a. Classification of Excavation.**

(1) Class I Excavation and Class II Excavation. Excavation for bridges is normally classified as Class I and Class II Excavation. Class I and Class II Excavation is referenced to the Excavation Boundary Plane (a horizontal plane at a given elevation) shown in the Contract Documents.

(a) Class I Excavation is the entire volume of whatever nature, except water, found above the Excavation Boundary Plane, within the limits specified.

(b) Class II Excavation is the entire volume of whatever nature, including water, found below the Excavation Boundary Plane, within the limits specified.

(2) Class III Excavation. Bridge excavation not classified as Class I or Class II, is classified as Class III Excavation. Excavation for structures other than bridges is also classified as Class III Excavation.

Class III Excavation is the entire volume of whatever nature encountered, including water, within the limits specified. The water level for determining quantities is the water level during construction at which pumping or bailing is necessary to continue excavation.

**b. Excavation Requirements.**

(1) General. Allow the Engineer to define the limits of the excavation and cross-section the original ground before beginning the excavation for the structure.

## 204 - EXCAVATION AND BACKFILL FOR STRUCTURES

Excavate all foundations to the elevations and dimensions shown in the Contract Documents. If rock of the quality that will not erode is encountered in the toe wall excavation, the Engineer may allow the toe wall to be keyed into the rock.

Follow OSHA safety regulations for sloping the sides of excavations, using shoring and bracing as required.

If material encountered below the foundation elevation will not support the structure, remove such material and replace with stable backfill material approved by the Engineer.

Save excavated material for structure backfill. Dispose of surplus excavated material and excavated material unsuitable as backfill material.

Provide temporary erosion and pollution control according to **DIVISION 900**.

When a bridge is constructed in conjunction with a new roadway alignment or elevation, construct the roadway embankment (a minimum of 300 feet) at the bridge to approximate grade first, then excavate for the abutments.

(2) Cofferdams. Use watertight cofferdams if excavating in water, or if the excavation is affected by groundwater. Construct and shore the cofferdams according to OSHA safety regulations. The minimum size of the cofferdams shall be greater than the limits for pay excavation. Extend the cofferdams below the bottom of the footing, or at least to an elevation as near the bottom of the excavation as foundation conditions will allow. If necessary, dewater the cofferdams.

(3) Foundations with Piling. Complete the foundation excavation before driving any piling. After driving all piling, remove the loose and displaced material in the foundation pit. If necessary, reshape and recompact the bottom of the excavation according to the Contract Documents.

(4) Spread Footing Bridge Foundations. From the elevation that rock or shale is encountered or from the top elevation of the footing, whichever is lower, excavate the footing as shown in the Contract Documents. No side forming is allowed below the top elevation of rock or shale, or below the top of the footing, whichever is lower. Cut spread footing bridge foundations in rock to within 6 inches of the bottom of footing elevation. Complete the excavation to the required elevation, using hand equipment. Do not use blasting excavation below the top of footing elevation.

If the bottom elevation of the spread footing excavation is in shale, minimize the time the shale is exposed to the elements before placing the concrete footing. Place the concrete footing within the time limits designated in the Contract Documents. Contact the Regional Geologist if the shale exposure exceeds the maximum time specified.

Mitigate the effects of the shale exposure by excavating a minimum of 4 inches below the over-exposed shale to expose sound material. The Contractor has the option (at own expense) to negate the time limits imposed for exposure of the shale by placing a 4-inch (minimum) concrete seal of Grade 4.0 concrete over the exposed shale before the specified time limits expire. If the Contractor chooses this option, excavate to 4 inches below the plan bottom of footing elevation so the bottom of footing elevation remains at the elevation designated by the Contract Documents.

After the excavation is completed, and all loose material is removed from the footing, drill exploratory borings 1½ to 2 inches in diameter and 5 feet deep to verify the quality and soundness of the material below the bottom of the footing. Notify the Engineer before starting the exploratory borings.

- For footings with an area of less than 12 square yards, drill the boring in the center of the footing.
- For footings with an area of 12 square yards or greater, drill a boring within 3 feet of each corner of the footing.

If an exploratory boring encounters unsound material, or if the material at the bottom of the footing does not match the material shown on the geology sheet in the Contract Documents, do not proceed with the construction of the spread footing until the site is reviewed by the Regional Geologist and a recommended course of action made.

**c. Foundation Stabilization.** When designated in the Contract Documents, the Contractor has the option to construct the foundation stabilization 6 inches thick, according to the details shown, or underrun the item when deemed unnecessary. When conditions require, the Engineer may approve a depth greater than 6 inches.

**d. Foundation Stabilization (Set Price).** If the Contract Documents do not designate foundation stabilization and a firm foundation is not encountered at the established grade for boxes or pipe culverts, the Engineer may approve the removal of unsound material and installation of suitable foundation stabilization material.

## 204 - EXCAVATION AND BACKFILL FOR STRUCTURES

Before this work is done, the Engineer will determine the limits of excavation for the material removal.

**e. Concrete Seal Course (Set Price).** When designated in the Contract Documents, construct the concrete seal course according to the details shown.

When the Contract Documents do not show a concrete seal course, but the bottom of the excavation can not be pumped free of water, the Engineer may approve the placement of a concrete seal course. When approved by the Engineer, construct a 3-inch seal course of commercial grade concrete below the bottom of footing elevation. If the Contract Documents call for foundation stabilization, and the Engineer determines the conditions require a concrete seal course as specified above, underrun the foundation stabilization. The Engineer will consider alternate methods of sealing out the water. The burden of proof regarding an alternate method of sealing out the water will be on the Contractor.

If a concrete seal course is not shown in the Contract Documents, or the Engineer does not approve one, the Contractor may still place one at own expense.

When the Contract Documents show constructing foundation stabilization, the Contractor has the option to construct a concrete seal course in its place. However, the concrete seal course will be paid for as foundation stabilization at the contract quantity and unit price.

If a concrete seal course is constructed, uniformly consolidate the concrete without voids.

### **f. Backfill for Structures.**

(1) General. Do not place backfill against any structure without the Engineer's approval.

Remove all shoring, bracing and cofferdams before backfilling a structure.

Use material from the structure excavation or material from the roadway excavation for the backfill of structures. If necessary, adjust the moisture content of the soil by adding water to or aerating the material.

Place granular backfill as detailed in the Contract Documents. If the area for granular backfill is excavated beyond the theoretical limits of the granular backfill, fill the over-excavation with granular backfill material suitable for the conditions, and that meets the Engineer's approval. Do not use hydraulic methods of backfill.

After the designated cure period for a concrete structure expires, wait at least 3 days before subjecting the structure to the pressures of backfilling or to live loads. If adverse curing conditions exist, the Engineer may extend this period.

Provide for drainage at all weep holes in concrete structures. Unless drainage is provided for otherwise in the Contract Documents, place approximately 2 cubic feet of crushed stone or sand gravel at each weep hole.

Place the backfill in horizontal layers evenly on all sides of the structure, a maximum of 8 inches thick (loose measurement). If the backfill is placed on only one side of a structure (such as abutments, piers, wingwalls), do not put excessive pressure against the structure. Prevent wedging action against the structure during the backfill. Bench the slopes bounding the excavation.

Extend each layer of the backfill to the limits of the excavation or to the original ground line. Continuously level and manipulate the material during the placing and compacting of each layer of the backfill. Use a motorgrader where possible. Compact each layer as specified before placing the next layer.

Drain all water from areas before backfilling. If backfill compaction is not required for piers, it is not necessary to drain the water from the pier excavations before backfilling.

If it is impossible to drain the water, deposit thin layers of backfill material into the water. When placing backfill material into water, the compaction requirements do not apply until the backfill progresses to the point that all water is absorbed by the backfill material.

Unless otherwise shown in the Contract Documents, backfill compaction is not required around piers, except piers adjacent to railroad tracks, roadways or in the toe slopes of embankments.

If the Contract Documents provide for "Compaction of Earthwork", compact the backfill according to **SECTION 205**. If the Contract Documents do not provide for compaction, compact the backfill according to Type B compaction in **SECTION 205**.

If the Contract Documents designate a moisture range for the embankment adjacent to the structure, use backfill material with uniform moisture content within the specified range according to **SECTION 205**. If the Contract Documents do not designate a moisture range, use backfill material with uniform moisture content adequate to produce the specified density.

(2) Backfill of Reinforced Concrete Box. If the top of a reinforced concrete box extends above the original ground line, continue the compacted backfill to the top of the reinforced concrete box. Place the backfill 10 feet wide on each side of the culvert for the full width of the roadway embankment.

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(3) Granular Backfill (Wingwalls) (Set Price). When designated in the Contract Documents, construct the granular backfill for wingwalls according to the details shown.

(4) Granular Backfill (Wingwalls). When designated in the Contract Documents, construct the granular backfill for wingwalls according to the details shown.

### 204.4 MEASUREMENT AND PAYMENT

**a. Contract Quantities.** Provided the project is constructed essentially to the lines and grades shown in the Contract Documents, the quantities shown in the Contract Documents for the various balances will be the quantities for which payment is made.

If the Contract Documents have been altered, or if the Engineer or Contractor questions the accuracy of the contract quantities at any location, either party may request the quantities involved be measured.

**b. Measured Quantities.** The Engineer will measure quantities for the various classes of excavation by cross-sectioning the area. The Engineer will compute the quantities (volume) by the average end area method. Where it is impractical to measure material by the cross-section method, the Engineer will use 3-dimensional measurements. Measurement will not include additional excavation required to mitigate the effects of over-exposed shale in foundations.

(1) Bridge Excavation. The Engineer will measure the various classes of excavation by the cubic yard. If the Contract Documents show excavation dimensions, the measured quantity is limited to the volume bounded by vertical planes at the contract dimensions. When excavation dimensions are not shown in the Contract Documents, the quantity measured for payment is the quantity removed, limited to the volume bounded by vertical planes 2 feet outside the footings and tie beams.

(2) Excavation for Structures Other Than Bridges. If shown as a bid item in the Contract Documents, the Engineer will measure Class III excavation by the cubic yard. If not shown as a bid item in the Contract Documents, Class III excavation for structures other than bridges is subsidiary to other items of work.

If the Contract Documents show excavation dimensions, the measured quantity is limited to the volume bounded by vertical planes at the contract dimensions. When excavation dimensions are not shown in the Contract Documents, the quantity measured for payment is the quantity removed, limited to the volume bounded by vertical planes 2 feet outside the footings.

Excavation for reinforced concrete box culverts, pipe culverts or headwalls for culverts is not measured for payment. Excavation over the culvert necessitated by the imperfect trench method of backfill is not measured for payment. If rock is not shown in the Contract Documents and is encountered during the excavation for reinforced concrete box culverts, pipe culverts or headwalls for culverts, the rock excavation is paid for as Extra Work,

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(3) Concrete for Seal Course (Set Price). The Engineer will measure concrete placed for a seal course (either shown in the Contract Documents or approved by the Engineer) by the cubic yard. The quantity measured for payment is the quantity placed, limited to the volume bounded by vertical planes at the limits of the pay excavation for the structure. If the excavation for the structure is subsidiary, the quantity of concrete measured for payment is the quantity placed, limited to the volume bounded by vertical planes 2 feet outside the footings.

If the Contractor elects to use a concrete seal course in place of the foundation stabilization shown in the Contract Documents, the Engineer will measure and pay for the concrete seal course as the foundation stabilization at the contract quantity and at the contract unit price.

The excavation necessary to place the concrete seal course is not measured for payment.

(4) Foundation Stabilization. When designated in the Contract Documents and the Contractor opts to construct it, the Engineer will measure the foundation stabilization for box and pipe culverts by the cubic yard to the volume bounded by vertical planes at the contract dimensions to a depth of 6 inches, or greater depth approved by the Engineer.

If the Contractor deems the foundation stabilization unnecessary, the Engineer will underrun the item.

The Engineer will not measure excavation necessary to place the foundation stabilization.

(5) Foundation Stabilization (Set Price). The Engineer will measure the foundation stabilization (set price) by the cubic yard. The quantity measured for payment is the quantity placed, limited to the volume bounded by vertical planes at the limits of the pay excavation for the structure. If the excavation for the structure is subsidiary, the quantity of foundation stabilization measured for payment is the quantity placed, limited to the volume bounded by vertical planes 2 feet outside the footings.

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The excavation necessary to place the foundation stabilization (Set Price) is not measured for payment.

(6) Granular Backfill, Granular Backfill (Wingwalls) and Granular Backfill (Wingwalls) (Set Price). The Engineer will measure granular backfill by the cubic yard. The Engineer will measure to the neat lines shown in the Contract Documents. The Engineer will not measure for payment the excavation required to place the granular backfill or any granular backfill material placed beyond the limits shown in the Contract Documents (over-excavated areas).

(7) Water (Grading) (Set Price). The Engineer will measure water used for earthwork compaction by the M gallon, by means of calibrated tanks or water meters. Water used for dust control, water wasted through the Contractor's negligence, water in excess of the quantity required to obtain the proper moisture content or water used for compaction of earthwork (backfill) around structures classified as bridges is not measured for payment.

**c. Payment.** Payment for the various classes of "Excavation", the various grades of "Concrete", "Foundation Stabilization", "Granular Backfill" and "Granular Backfill (Wingwalls)" at the contract unit prices is full compensation for the specified work.

Payment for "Concrete for Seal Course (Set Price)", "Foundation Stabilization (Set Price)", "Granular Backfill (Wingwalls) (Set Price)" and "Water (Grading) (Set Price)" at the contract set unit prices is full compensation for the specified work.

If the Engineer determines it is necessary to lower a footing below the elevation shown in the Contract Documents, the additional excavation is paid as follows:

- Additional excavation up to and including 2 feet below the contract elevation is paid at the contract unit price.
- Additional excavation from more than 2 feet up to and including 6 feet below the contract elevation is paid at 1½ times the contract unit price.
- Additional excavation more than 6 feet below the contract elevation is paid as Extra Work, **SECTION 104.**

## 205 - EXCAVATION AND EMBANKMENT FOR HIGHWAYS

### SECTION 205

#### EXCAVATION AND EMBANKMENT FOR HIGHWAYS

##### 205.1 DESCRIPTION

Excavate, haul, place, remove and dispose of the specified materials. Construct the embankments as specified in the Contract Documents. Compact the earthwork according to the requirements for the type of compaction and moisture range specified in the Contract Documents.

##### BID ITEMS

Common Excavation  
Common Excavation (Contractor-Furnished)  
Rock Excavation  
Rock Excavation (Non-Durable Shale)  
Unclassified Excavation  
Common Excavation (Unstable)  
Common Excavation (Unsuitable)  
Compaction of Earthwork (Type \*) (MR-\*\*)  
Embankment  
Embankment (Contractor-Furnished)  
Eradication of Traveled Way  
Water (Grading) (Set Price)  
\*Type of Compaction  
\*\*Moisture Range

##### UNITS

Cubic Yard  
Cubic Yard  
Cubic Yard  
Cubic Yard  
Cubic Yard  
Cubic Yard  
Cubic Yard  
Cubic Yard  
Cubic Yard  
Cubic Yard  
Station  
M Gallon

##### 205.2 MATERIALS

Provide water for earthwork compaction that complies with **DIVISION 2400**.

If "Common Excavation (Contractor-Furnished)" is specified, provide soil or a mixture of soil and gravel, stone or other acceptable material. Provide material that is similar to the material shown in the Contract Documents or found in the Report of Soil Survey. Provide material with a quality satisfactory for the purpose intended. Do not use material that has sod, roots, stumps and other perishable and deleterious matter. Provide soil that complies with the requirements shown in the Contract Documents for the material used in the top 18 inches of the embankment.

The Engineer will accept the material based on compliance with these requirements and visual inspection of the material placed on the project.

Provide crushed stone for backfill that complies with **DIVISION 1100**.

##### 205.3 CLASSIFICATION OF EXCAVATION

The geological information shown in the Contract Documents is based on studies made in the field, and represents the best information available to KDOT. The classification of embankment and drainage excavation as "Common Excavation", "Rock Excavation" or "Rock Excavation (Non-Durable Shale)", which classifications shall include all materials of whatever nature encountered, is shown in the Contract Documents. As the work is performed, the Engineer in conjunction with the Regional Geologist will determine if the classification of embankment and drainage excavation requires adjustment. The Engineer has the authority to identify and define the physical characteristics that determine the classification. The classification of materials for excavation is based on the materials in an unfrozen condition.

**a. Common Excavation.** Common excavation is all excavation not included as rock excavation or excavation otherwise classified. The following are included in common excavation: hot mix asphalt or concrete sidewalk, concrete ditch lining, concrete or stone wash checks and hot mix asphalt pavement 6 inches or less in thickness.

Depending on the makeup and characteristics of the common excavation, some material may or may not be used for embankment. The Engineer will identify which materials may not be used for embankment.

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**b. Common Excavation (Contractor-Furnished).** Common excavation (Contractor-Furnished) is material provided by the Contractor that complies with the material requirements of this specification.

Non-durable shale provided as common excavation (Contractor-Furnished) shall be manipulated (sized) with equipment and water as required for non-durable shale excavation.

**c. Rock Excavation.** Rock excavation includes firm, rigid and unweathered sedimentary, igneous and metamorphic rock that is naturally in-place. Boulders or detached stones with a volume of 2 cubic yards or more are classified as rock excavation.

Portland cement concrete pavement, portland cement concrete base, cement treated base, hot mix asphalt pavement greater than 6 inches in thickness, concrete curb and gutter and any hot mix asphalt placed upon these structures is classified as rock excavation.

When common excavation is interlayered with the rock excavation, and the common excavation makes up 25% or less of the volume, the entire volume is classified as rock excavation.

**d. Rock Excavation (Non-Durable Shale).** Rock excavation (Non-Durable Shale) is non-durable rock shale that if used in embankments is required to be manipulated with construction equipment and water added until it is broken down to particle sizes shown in **subsection 205.4c**.

**e. Unclassified Excavation.** Unclassified excavation includes all excavation, regardless of type, nature or condition of materials encountered. When excavation is unclassified, the Contractor assumes full responsibility to estimate the kind and extent of the various materials to be encountered in order to accomplish the work. Unclassified excavation includes materials which, if classified, would be included in **subsections 205.3a., b., c. and d.**

**f. Common Excavation (Unstable).** Common excavation (Unstable) is considered to be material in the subgrade or embankment with any of the following characteristics:

- When the material encountered has a moisture content above the plastic limit of the soil.
- When the plastic limit of the soil is at or less than the optimum moisture content, the soil is not capable of being compacted at the optimum moisture content.

Suitable material with excess moisture caused by the Contractor's negligent operations is not classified as unstable excavation.

**g. Common Excavation (Unsuitable).** Common excavation (Unsuitable) is material encountered in the subgrade or embankment that contains a high organic content (such as peat or A-horizon soils).

### 205.4 CONSTRUCTION REQUIREMENTS

**a. General Excavation Requirements.** Before beginning the excavation, clear and grub all vegetation according to the Contract Documents. Remove existing structures as shown in the Contract Documents.

Strip and stockpile the existing topsoil from within the construction limits. To the extent practical use this material to cap the finished embankment and cut slopes. This work is subsidiary to grading items in the contract.

Where practical, do not store equipment or materials (including soil stockpiles) within 50 feet of rivers, streams or other surface waters. Where such storage is necessary, obtain the Engineer's written approval and include in the project SWPPP appropriate best management practices for the storage area.

Unless requested in writing from the Contractor, and approved in writing by the Engineer, or specified otherwise in the Contract Documents, do not exceed 750,000 square feet of surface area of erodible earth material per equipment spread at one time. The Engineer will limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow (within right-of-way) and embankment operations. Limit the exposed erodible earth material according to the capability and progress, and in keeping with the approved schedule.

Areas will not count toward the 750,000 square feet limit, when the following conditions are met:

For areas that will not be disturbed again due to project phasing:

- Finish grade the completed area;
- Stabilize and maintain stabilization according to **SECTION 902**; and

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- Do not disturb the area again without a written request from the Contractor and written approval from the Engineer;

For areas that will be disturbed again due to project phasing:

- Rough grade; and
- Stabilize and maintain stabilization according to **SECTION 902**.

**DO NOT** clear and grub areas unless work will actively be performed in the exposed area (or portions of the exposed area) within 7 calendar days on exposed steep slope areas (40% or greater) or within 14 calendar days for all other exposed areas. If areas are cleared and grubbed and not finish graded, not part of project phasing and no meaningful work toward the completion of the bid item is performed within the exposed area (or portions of the exposed area) for 7 calendar days on exposed steep slope areas (40% or greater) or 14 calendar days for all other exposed areas, stabilize and maintain stabilization at these exposed areas according to **SECTION 902** at no cost to KDOT.

Before beginning excavation or depositing waste at the Contractor-Furnished site, obtain all permits and clearances required for compliance as shown in **SECTION 107**, (which most commonly includes wildlife and archaeological clearances). See **SECTION 106** for requirements for use of private property.

Before incorporating any material from these areas into the project, the Engineer shall require a copy of the KDWP clearance and the KSHS clearance. Before depositing any project waste onto these waste sites, the Engineer shall require a copy of the KDWP clearance, the KSHS clearance, and when required, the KDHE waste disposal permit.

If the Contractor's excavation operations expose potentially historical or archaeological significant sites, discontinue the excavation of such sites until the Engineer determines the disposition of the discovery. The Engineer will contact the ESS to determine the proper course of action, according to **SECTION 107**.

Obtain the Engineer's approval before wasting surplus excavation material. Use approved surplus excavated material to widen embankments, flatten slopes, or as directed by the Engineer. If surplus excavation material is wasted on the project, place the material to provide a neat appearance. Do not place waste materials in a manner that is detrimental to the abutting property.

If the Contract Documents designate certain materials to be excavated and stockpiled for future use, do not contaminate these materials in the process. Stockpile the materials neatly and compactly at locations approved by the Engineer.

Before beginning excavation, allow the Engineer to define the limits and cross-section the borrow areas shown in the Contract Documents. The Contractor shall define the limits and cross-section Contractor-Furnished sites before beginning excavation. Do not remove any material beyond the dimensions and elevations established. When borrow excavation is complete, grade the site uniformly to drain. Comply with any permit requirements.

The Engineer may allow the use of borrow pits or waste areas other than those shown in the Contract Documents, provided the change does not increase the cost for KDOT.

If rock, shale or unsuitable material is encountered in cuts, excavate this material to the cross-section or limits shown in the Contract Documents.

Do not overbreak rock excavation below the cross-section shown in the Contract Documents. If overbreakage occurs, backfill the overbreakage with material designated in the Contract Documents. If the designated backfill is material obtained through normal excavation, compact the backfill to the density requirements shown in the Contract Documents. If the designated backfill is crushed aggregate or other special aggregate, make sure that there are no layers of earth or shale between the backfill material and the surface of the rock. Before backfilling overbreakage areas with crushed stone for backfill or other specified material, shape the rock overbreakage area to drain.

Trim all slopes to the lines shown on the cross-sections. When warranted, the Engineer may approve a modified slope in rock or other material. Remove rock so that the resulting rock slope has a uniform face. Do not disturb any materials beyond the limits of the excavation.

Excavate all side ditches as shown in the Contract Documents.

Provide temporary erosion and pollution control according to **DIVISION 900**.

**b. Presplit Rock Excavation.** If designated in the Contract Documents, use a presplitting technique to split the face of the rock along the designated backslope. Presplit along the backslope before blasting the interior portion of the rock cut.



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Devise a plan for the diameter, spacing and loading of the presplit holes. Drill the presplit holes the full depth of the rock ledge. Demonstrate to the Engineer with a 100-foot test section that the presplitting plan will produce an acceptable backslope. If the backslope of the test section is unacceptable, establish additional test sections until satisfactory results are obtained.

**c. Shale Excavation.** Shale will be classified as durable or non-durable in the Contract Documents. Durable and non-durable shale is prohibited in the top 18 inches of the embankment, unless specified in the Contract Documents.

- Durable Shale. Durable shale may be used as any other rock in a fill.
- Non-Durable Shale. Manipulate non-durable shale with equipment and water until 100% of the material is smaller than 6 inches in all dimensions, and until a minimum of 90% of the material is smaller than 3 inches in all dimensions. The Engineer will verify manipulation requirements with a visual inspection (e.g. have the Contractor scarify a known area to a known depth, calculate theoretical volume scarified, calculate an average volume for the stones between 3 and 6 inches and if the volume for the stones exceeds 10%, the test fails). Continue manipulation and retest until the above requirements are met. Compact and adjust the moisture content of this material as specified in the Contract Documents.

The Contractor will determine whether to manipulate and use the non-durable shale on the project, or waste the non-durable shale and replace it with other suitable material.

**d. Common Excavation (Unstable).** Excavate unstable material encountered during construction to the limits designated by the Engineer. Allow the Engineer to measure the area before the backfill is placed. Backfill the area where the unstable material was removed with suitable material from the project.

Aerate the unstable material until the moisture content is acceptable. Use this material in the construction of the project.

Remove and dry unstable material caused by the Contractor's negligence to an acceptable moisture content and use in the project.

**e. Common Excavation (Unsuitable).** If excavation to the finished graded section results in subgrade or slopes of unsuitable material, excavate the unsuitable material to the limits designated by the Engineer. Remove the unsuitable material from the project. Allow the Engineer to measure the area before placing the backfill. Backfill with suitable material from the project.

**f. Eradication of Traveled Way.** Remove the surfacing, if any, excavate the embankment and fill the ditches. Grade the traveled way to approximately the original ground contour, or as shown in the Contract Documents. Stockpile any materials designated for salvage at the locations shown in the Contract Documents. Do not contaminate the salvaged material. Dispose of excess excavation, base materials and surfacing not designated for salvage.

**g. Compaction Requirements.** Requirements for the various types of compaction are shown in **TABLE 205-1**.

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<b>TABLE 205-1: SOIL COMPACTION REQUIREMENTS</b>	
<b>Type</b>	<b>Minimum Compacted Soil Density</b>
Type AAA	100% of Standard Density
Type AA	95% of Standard Density
Type A	90% of Standard Density
Type B	<p>Such that no further consolidation is gained by additional rolling. The Engineer will visually determine acceptable Type B compaction based on the following:</p> <ul style="list-style-type: none"> <li>• Acceptable Type B compaction is demonstrated if the tamping feet of a tamping (sheepsfoot) roller “walks out” of the soil and rides on top of the lift being compacted.</li> <li>• In soil with low plasticity or nonplastic fine-grained materials, the tamping feet may not “walk out” of the material being compacted. With these materials, acceptable Type B compaction is demonstrated if the tamping feet support the weight of the roller (without the drum of the roller contacting the lift being compacted).</li> <li>• In sand and gravel, where the use of a tamping roller produces unacceptable results, use other types of rollers (such as a pneumatic-tired) to compact this type of material. With these materials, acceptable Type B compaction is demonstrated if no further consolidation is evident after additional passes of the roller.</li> <li>• In small irregular areas where the use of conventional compaction equipment is impracticable, use other equipment and methods to obtain compaction. The Engineer will determine by visual inspection if Type B compaction is obtained.</li> <li>• If the Engineer is unable to visually determine that Type B compaction is obtained, the Engineer may conduct density tests on the compacted soil. If tested, the compacted soil density shall be at least 90% of the standard density.</li> </ul>

**h. Moisture Control Requirements.** At the time of compaction, use soil with uniform moisture content within the moisture range designated in the Contract Documents.

Adjust the moisture content of the soil by adding water to or aerating the material to bring soil within the required moisture content.

If the soil is unstable within the designated moisture range, the DME will adjust the moisture range.

Water may be added to the soil in borrow and cut areas (before hauling) or on the embankment (after hauling). Use methods and equipment that will prevent undue loss of moisture. Add only the quantity of water necessary to provide a moisture content within the required moisture range plus a reasonable quantity to compensate for evaporation and other unavoidable losses.

Excavation areas may be pre-watered to provide uniform moisture content. Submit sketches of the areas with details of the proposed methods and equipment for the pre-watering for approval by the Engineer. Provide drilling equipment to obtain samples for moisture determination before, during and after the pre-watering. Using the results of the moisture samples, the Contractor and Engineer will jointly determine the quantities of water necessary to bring the soils to optimum moisture. The Engineer will allow sufficient water to bring the full depth and width of the excavation to optimum moisture plus up to 20% for evaporation.

In areas to be pre-watered, leave the vegetation in place until the watering is completed. If runoff is observed during the pre-watering, rip the area on the contour to a depth of approximately 2 feet at 4-foot intervals. To permit penetration to the full depth of the excavation (for uniform moisture content), allow a curing period after the pre-watering is completed. The Contractor and Engineer will use the moisture samples obtained by the Contractor (at locations and depth agreed to by the Contractor and Engineer) to determine moisture content and uniformity for the pre-watered areas. Strip the vegetation from the areas after the water has penetrated the soils.

Requirements for the various moisture ranges are shown in **TABLE 205-2**.

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<b>TABLE 205-2: SOIL MOISTURE CONTENT REQUIREMENTS</b>	
Moisture Range	Moisture Content
0-5 (MR-0-5)	A maximum of 5 percentage points above optimum, nor less than optimum.
3-3 (MR-3-3)	A maximum of 3 percentage points above optimum, and a maximum of 3 percentage points below optimum.
5-5 (MR-5-5)	A maximum of 5 percentage points above optimum, and a maximum of 5 percentage points below optimum.
90 (MR-90)	Sufficient to allow the type of compaction specified in the Contract Documents. If Type B compaction is specified, the Engineer will determine by visual inspection if satisfactory moisture control and compaction are obtained.

**i. Foundation Treatment.** If an embankment is started less than 4 feet below the finished subgrade, remove all vegetation from the surface where the embankment will be placed. Plow, scarify or break up the cleared surface to a minimum depth of 6 inches (foundation area). Adjust the foundation area to a moisture content within the specified moisture range. Compact the foundation area as specified in the Contract Documents for the embankment.

If an embankment is placed over an existing surface (PCCP, HMA, gravel), plow, scarify or break up the full depth of the existing surface regardless of the height of the embankment.

**j. Embankment Requirements.** Construct the embankment from material classified as Soil, Rock/Soil or Rock, as defined in **TABLE 205-3**.

<b>TABLE 205-3: EMBANKMENT GRADATION CLASSIFICATION</b>	
Classification	Gradation Criteria
Soil	≤ 20% retained on the ¾ inch sieve
Rock/Soil	> 20%, but < 80% retained on the ¾ inch sieve
Rock*	≥80% retained on the ¾ inch sieve

\*Could include concrete pavement.

If frozen soil is encountered in the surface of the original ground or in the surface of a partially constructed embankment, remove the frozen material or allow the frozen material to thaw before continuing construction of the embankment.

Unless shown otherwise in the Contract Documents, if shale (all shale classified as non-durable or common excavation) is used as embankment material, manipulate the shale with equipment and water until it complies with **subsection 205.4c**. Adjust the moisture content and compact the shale as specified in the Contract Documents.

Construct and backfill culverts and other structures below the embankment surface before the embankment is constructed.

When the embankment is placed against a hillside or an existing embankment with slopes steeper than 4:1, bench the existing slope with each lift of the embankment. Cut the benches wide enough to accommodate the hauling and compacting equipment. Begin cutting (horizontally) each new bench at the intersection of the original ground and the vertical side of the previous bench. Use the material excavated from the benches in the embankment.

Exercise care placing and compacting the embankment, when placed on only one side of a structure (such as abutments, piers and wingwalls). Do not put excessive pressure against the structure.

Place soil embankment material in horizontal lifts approximately 8 inches thick (loose measurement). Compact the earthen material as specified in the Contract Documents before placing the next lift. Compact manipulated (sized) non-durable shale to the compaction requirement in the Contract Documents and adjust the moisture content of the manipulated non-durable shale to MR-5-5. Use compaction equipment as specified in **DIVISION 150**. Provide sufficient motorgraders and tamping rollers to adequately blade and compact the material delivered to the embankment. Route the construction equipment uniformly over the entire surface of each lift. Continuously use a motorgrader to level and manipulate the material during the placing and compacting of each lift of the embankment. If the material delivered to the embankment is not properly placed and compacted, suspend delivery of materials to the embankment until the problem is corrected.

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Where it is impracticable to use a roller, use a mechanical tamper. Place the embankment material in horizontal lifts not to exceed 8 inches (loose measurement) capable of being compacted by the mechanical tampers. Compact the earthen material as specified in the Contract Documents before placing the next lift.

If the Contract Documents do not specify a compaction requirement for the earthwork, place the embankment in uniform lifts not to exceed approximately 8 inches thick (loose measurement). Compact the earthen material to the requirements of Type B, MR-90.

Place rock/soil embankment material in horizontal lifts approximately 10 inches thick (loose measurement). Compact the embankment by making consecutive passes of a vibratory roller, with a minimum weight of 16 tons, until no further increase in density is achieved by successive passes. The Engineer shall verify the density by using the nuclear moisture/density gauge.

Place rock embankment material in horizontal lifts approximately the average size of the larger rocks, a maximum of 2 feet thick (loose measurement). Make no more than 10% of the rock embankment material larger than 7 feet in circumference measured in any direction and no more than 10% passing the 1-inch sieve as determined by visual inspection. The maximum size of rock placed will be limited by the thickness of rock to be placed, as shown on the plans.

An embankment made up largely of rock consists of rock in interparticle contact with itself, with no intervening layers of soil. Distribute the large stones uniformly and fill the voids with smaller stones, earth, sand or gravel. Level and manipulate each lift with a motorgrader, bulldozer or similar equipment capable of shifting and shaping the material. Compact each lift by routing construction traffic over the lift until no further consolidation under the traffic is visible. When shown in the Contract Documents to construct the top 12 inches with rock excavation, finish the grade with crushed stone for backfill compacted to Type B, MR-90, **SECTION 204**. No shale is allowed in the top 12 inches.

If the embankment is constructed of rock mixed with enough compactable material to make rolling feasible, and if the Contract Documents specify compaction, compact the embankment to meet Type B compaction requirements (regardless of the type of compaction specified).

If possible, use rock embankment material to form the base (full width) of the embankment. If rock and other embankment material are delivered to the embankment at the same time, place the rock in the outer portions of the embankment and the other material in the center of the embankment. Adjust the hauling and compacting operations (for both materials) as necessary to construct the embankment in level lifts.

Before rock embankment material is placed on compacted embankment constructed of other material, shape the top of the compacted embankment to slope from centerline to the outside. Do not build undrained pockets of rocks into the embankment.

Do not place rocks, broken concrete or other solid materials in embankment areas where piling will be driven or where culverts will be installed. Do not place rocks larger than 3 inches (in any dimension) in the top 12 inches of the embankment.

Where a grass median is constructed, do not place any rock excavation material or shale in the top 18 inches of the median area. Construct the top 18 inches of medians with earthen material suitable for growth of vegetation.

Dispose of all loose rocks within the right-of-way that will interfere with mechanical mowing.  
Apply water as needed to control dust on the project.

**k. Compaction in Cuts.** Plow, scarify or break up the soil 6 inches below the grade line in cut sections. If necessary to obtain compaction, adjust the soil to a moisture content within the specified moisture range. Compact the soil as specified in the Contract Documents.

If the depth of compaction in cut sections is greater than 6 inches, excavate all material to within 6 inches of the lower limit of compaction. Plow, scarify or break up the material left in place. If necessary to obtain compaction, adjust the soil to a moisture content within the specified moisture range. Compact the soil as specified in the Contract Documents. Replace and compact (as embankment) the excavated material until the cut is compacted to the grade line shown in the Contract Documents.

### 205.5 MEASUREMENT AND PAYMENT

**a. Contract Quantities.** Provided the project is constructed essentially to the lines and grades shown in the Contract Documents, the quantities shown in the Contract Documents for the various balances will be the quantities for which payment is made.

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If the Contract Documents are altered, or if the Engineer or Contractor questions the accuracy of the contract quantities in any balance, either party may request the quantities involved be measured by the cross-section method. Unless errors are noted or the original ground was disturbed before the work started, the cross-sections shown in the Contract Documents will be used as the original field cross-sections. Additional original cross-sections may be interpolated, or determined by other approved methods, at points necessary to accurately determine the quantities.

If the Contractor elects to waste the non-durable shale, or fraction thereof, and provide Common Excavation (Contractor-Furnished) in lieu of manipulating the non-durable shale, payment will be made for "Rock Excavation (Non-Durable Shale)," as though it was not wasted, not "Common Excavation (Contractor-Furnished)" actually used.

**b. Measured Quantities.** The Engineer will measure excavation and borrow (including rock, shale, unstable and unsuitable) by the cubic yard. The Engineer will measure quantities for the various types of excavation by cross-sectioning the area. The Engineer will compute the quantities (volume) by the average end area method. Where it is not possible to measure material by the cross-section method, the Engineer may use 3-dimensional measurements. If the depth of compaction through cut areas is greater than 6 inches, the material excavated to gain access to the lower 6-inch layer will be measured for payment. The excavation of unstable and unsuitable material necessary to obtain compaction in cut sections and in foundations for fill sections will be measured for payment. The Engineer will not measure rock overbreakage (below the depth shown in the Contract Documents) for payment. Excavation required for benching into an existing slope will not be measured for payment. The excavation required to remove unstable material caused by the Contractor's negligent operations will not be measured for payment.

If either the Contractor or Engineer questions the accuracy of the plan quantity for non-durable shale excavation, contact the Regional Geologist for guidance.

The Engineer will measure compaction of earthwork (in place after the rolling or tamping is complete) by the cubic yard. The Engineer will measure compaction of earthwork by cross-sectioning the area. The Engineer will compute the quantities (volume) by the average end area method. Where it is impractical to measure material by the cross-section method, the Engineer may use 3-dimensional measurements. The Engineer will not measure for payment the compaction of foundation area under a fill or the bottom 6-inch layer in a cut section.

The Engineer will measure water used for earthwork compaction and non-durable shale manipulation and compaction by the M Gallon by means of calibrated tanks or water meters.

If the Contractor uses non-durable shale for "Common Excavation (Contractor-Furnished)", the Engineer will not measure the manipulation water for payment. However, the Engineer will measure the water required to meet moisture requirements for compaction.

The Engineer will not measure water used for dust control, water wasted through the Contractor's negligence or water in excess of the quantity required to obtain the proper moisture content.

If the Contract Documents include the bid items "Embankment" or "Embankment (Contractor-Furnished)", the Engineer will not measure excavation, compaction and water separately for payment. The Engineer will measure the embankment in place by the cubic yard. The Engineer will measure quantities for the embankment by cross-sectioning the area. The Engineer will compute the quantities (volume) by the average end area method. Where it is impractical to measure material by the cross-section method, the Engineer may use 3-dimensional measurements. No payment will be made for quantities beyond the limits of the Contract Documents.

If the Contract Documents include the bid item "Eradication of Traveled Way", the Engineer will measure this item by the station along the centerline of the traveled way being eradicated. If the Contract Documents do not include the bid item "Eradication of Traveled Way", excavation required for this activity is measured for payment.

### **c. Payment.**

(1) General. Payment for "Common Excavation", "Common Excavation (Contractor-Furnished)", "Rock Excavation", "Rock Excavation (Non-Durable Shale)", "Unclassified Excavation", "Compaction of Earthwork", "Embankment", "Embankment (Contractor-Furnished)" and "Eradication of Traveled Way" at the contract unit prices is full compensation for the specified work. Deduct any measured quantities placed beyond the limits of the Contract Documents, unless the placement was authorized by the Engineer.

Payment for "Water (Grading) (Set Price)" at the contract set unit price is full compensation for the specified work. Payment for water used for pre-watering excavation areas at 75% of the contract set unit price for

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Water (Grading) (Set Price) is full compensation for the specified work. The contract set unit price will govern regardless of the accepted quantity provided.

(2) Common Excavation (Unstable). Payment for "Common Excavation (Unstable)", as provided below, is full compensation for the specified work to remove, manipulate and replace material, including any additional material needed to fill the created void.

Compaction for backfill of areas removed as Common Excavation (Unstable) will be paid for at the appropriate contract unit prices.

- Rural Projects (outside incorporated city limits): 1½ times the contract unit price for "Common Excavation", up to a maximum of \$6.00 per cubic yard. If the contract unit price for "Common Excavation" is greater than \$6.00 per cubic yard, the contract unit price is the maximum paid per cubic yard for this item.

If the Contract Documents have the bid item of "Embankment" instead of "Common Excavation" the Engineer will pay for Common Excavation (Unstable) at 1½ times the contract unit price for "Embankment", up to a maximum of \$6.00 per cubic yard.

- Urban Projects (inside incorporated city limits): 1½ times the contract unit price for "Common Excavation", up to a maximum of \$10.00 per cubic yard. If the contract unit price for "Common Excavation" is greater than \$10.00 per cubic yard, the contract unit price is the maximum paid per cubic yard for this item.

If the Contract Documents have the bid item of "Embankment" instead of "Common Excavation," the Engineer will pay for Common Excavation (Unstable) at 1½ times the contract unit price for "Embankment", up to a maximum of \$10.00 per cubic yard.

(3) Common Excavation (Unsuitable). Payment for the "Common Excavation (Unsuitable)", as provided below, is full compensation for the specified work.

Compaction for backfill of areas removed as Common Excavation (Unsuitable) will be paid for at the appropriate contract unit prices.

Excavation to replace unsuitable material removed from the project will be paid for at the appropriate contract unit price.

- Common Excavation (Unsuitable) not designated in the Contract Documents and encountered during construction is paid for at 3 times the contract unit price for "Common Excavation", up to a maximum of \$12.00 per cubic yard, which price shall include the disposal of materials. If the contract unit price for "Common Excavation" is greater than \$12.00 per cubic yard, the contract unit price will be the maximum paid per cubic yard for this item, which price shall include the disposal of materials.

If the Contract Documents have the bid item of "Embankment" instead of "Common Excavation", the Engineer will pay for Common Excavation (Unsuitable) at \$12.00 per cubic yard.

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**SECTION 602**

**HOT MIX ASPHALT (HMA) CONSTRUCTION**  
**(Quality Control/Quality Assurance (QC/QA))**

**602.1 DESCRIPTION**

Mix and place 1 or more courses of plant produced HMA mixture on a prepared surface as shown in the Contract Documents. Demonstrate quality control by providing the quality control testing.

**BID ITEMS**

HMA Base (\*)(\*\*)(\*\*\*)  
HMA Surface (\*)(\*\*)(\*\*\*)  
HMA Overlay (\*)(\*\*)(\*\*\*)  
HMA Pavement (#) (##)  
HMA Pavement (#) Shoulder  
Emulsified Asphalt (\*\*\*\*)  
Asphalt Core (Set Price)  
Material for HMA Patching (Set Price)  
Quality Control Testing (HMA)  
\*Mix Designation  
\*\*Grade of Asphalt Binder  
\*\*\*Shoulder  
\*\*\*\*Type and Grade of Emulsified Asphalt  
# Thickness  
##Type of surface course HMA mixture

**UNITS**

Ton  
Ton  
Ton  
Square Yard  
Square Yard  
Ton  
Each  
Ton  
Ton

**602.2 CONTRACTOR QUALITY CONTROL REQUIREMENTS**

**a. General.** Provide qualified personnel and sufficient equipment complying with the requirements listed in Part V to conduct quality control testing that complies with Appendix B, Sampling and Testing Frequency Chart for Asphalt Construction Items for Quality Control/Quality Assurance Projects.

Allow the Engineer access to the Contractor's laboratory to observe testing procedures, calculations, test documentation and plotting of test results.

Calibrate and correlate the testing equipment with prescribed procedures, and conduct tests in compliance with specified testing procedures as listed in Part V.

Maintain a Quality Manual in the field laboratory showing the calibrations performed on all test equipment and when the next calibration is due for that equipment. As a minimum, follow the calibration/verification interval established in Table 2: HMA Materials Test Equipment in Section 5.2.7.1-HMA: Contractor's Quality Control Plan, Part V. See also, Section 5.2.7.3-Example of a Laboratory Quality Manual for HMA, Part V.

Store and retain the most recent 2 lots per mix designation of quality control samples for KDOT. KDOT will retain the most recent 2 lots per mix designation gyratory compacted air voids (Va) verification samples and the remaining material not previously used for testing (back half of sample). Do not retain more than the previous 3 lots per mix designation of quality control or verification samples. When the hot mix plant shuts down for the winter, discard the samples after 7 days.

**b. Quality Control Plan (QCP).** At the pre-construction conference, submit to the Engineer for approval, a QCP as outlined in Section 5.2.7-Contractor's Quality Control Plan, Part V. Follow 5.2.7.1-HMA: Contractor's Quality Control Plan in Part V as a general guideline. The Contractor's laboratory and equipment will be inspected and approved as outlined in Section 5.2.7-Contractor's Quality Control Plan, Part V.

Include a listing of the names and phone numbers of individuals and alternates responsible for quality control administration and inspection. On the Contractor's organizational chart, show the specified lines of authority relating both to mix design and quality control operations during production. Post the organizational chart in the Contractor's test facility.

Provide a quality control organization or private testing firm having personnel certified according to the Policy and Procedures Manual for The Certified Inspection and Testing (CIT) Training Program. The testing for this

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type of construction will require personnel certified in Aggregate Field Tester (AGF), Aggregate Lab Technician (AGL), Superpave Field (SF), Profilograph (PO) and Nuclear Moisture Density Gauge Tester (NUC) classifications. Provide a minimum of 1 employee on the project certified in the QC/QA Asphalt Specs (QCA) classification.

Only persons certified in the appropriate classifications covering the specific tests required shall perform such testing. At the beginning of the project, provide the Engineer with the list of certified technicians and alternates, phone numbers and tests/inspection they will be performing. As personnel changes and certifications may expire, continue to provide the Engineer with an accurate list.

Provide an organizational chart showing the specified lines of authority relating to both mix design and quality control operations during production. Identify the company official acting as liaison with KDOT, and the Certified Technician who will direct inspection and testing. Post the chart in the test facility.

**c. Required Duties of Certified Technicians.** Be available on the project site whenever HMA is being produced and being placed on the project site. Perform and utilize quality control tests and other quality control practices to assure that delivered materials and proportioning meet the requirements of the mix designs.

Periodically inspect all equipment utilized in transporting, proportioning, mixing, placing and compacting to assure it is operating properly and that placement and compaction comply with the contract requirements.

**d. Contractor's Testing Facilities.** Describe the testing facility and its accreditation in the QCP.

Locate the testing facility either at the plant site or at the project. Obtain approval of the testing facilities and location from the DME before the commencement of mixture production.

Provide suitable space for the required testing equipment. Also, equip the testing facility with these items for the exclusive use of the testing facility's quality control personnel and the Engineer:

A telephone with a private line for the exclusive use of the testing facility's quality control personnel; and

A copying machine for use by the Contractor's personnel and the Engineer.

Broadband internet connection (for 1 computer). If the Engineer determines that broadband internet service is not available, provide a fax machine, at no additional cost.

An air conditioner capable of maintaining a temperature below 77°F in the main part of the Field Office and Laboratory.

Locate the KDOT field laboratory near the Contractor's testing facility and have it fully functional 2 working days before placement of the pre-production mix.

**e. Documentation.** Include in the QCP procedures, charts and forms to be used to provide the required documentation.

Record all original documentation in a bound field book or other KDOT approved bound record and turn over to KDOT at the end of the project.

At all times, have complete records of all inspections and tests available on site for the Engineer. All records documenting the Contractor's quality control inspections and tests become the property of KDOT upon completion of the work.

Indicate the nature and number of observations made, the number and type of deficiencies found, the quantities approved and rejected, and the corrective action taken in the records. Examples of quality control forms and charts are available in Part V, or Contractors may design their own. Documentation procedures are subject to approval by the Engineer before the start of the work and to compliance checks during the progress of the work.

Maintain control charts on an ongoing basis.

Provide the following test data to the KDOT Project Representative:

- Copies of all test results and control charts on a weekly basis, representing the prior week's production;
- Copies of the quality control summary sheet on a daily basis. Include, as a minimum, mix gradation, binder content, theoretical maximum specific gravity ( $G_{mm}$ ), air voids ( $V_a$ ) at  $N_{des}$ , percent  $G_{mm}$  at  $N_{ini}$  and  $N_{max}$ , voids in mineral aggregate (VMA), voids filled with asphalt (VFA) and dust to effective binder content (D/B) ratio; and
- Copies of all failing test results (based on a moving average of 4 tests, when appropriate). Include all applicable sieves, VMA, VFA, density at  $N_{ini}$  and  $N_{max}$ , and D/B ratio.

**f. Testing Requirements.** In the QCP, identify test methods, procedures and equipment proposed for use. Use standard KDOT test methods and properly calibrated measuring and testing equipment as outlined in Part V.



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Detail any alternative sampling method, procedure or inspection equipment proposed to be used. Such alternatives are subject to review and approval by the DME.

Take all samples for tests and perform in-place tests at random locations, selected according to the Contractor's QCP and at the rates specified in the Sampling and Testing Frequency Chart for Hot Mix Asphalt for Quality Control/Quality Assurance Projects in Appendix B, Part V.

**g. Pre-Production Testing Requirements.**

(1) The Engineer will observe the Contractor obtaining and splitting the pre-production test section sample into 3 representative portions. Each sample set shall consist of enough material for 2 gyratory specimens, theoretical  $G_{mm}$  and ignition burnoff.

(2) Mold 2 gyratory specimens from the 1<sup>st</sup> sample set immediately, while still hot. Additional heating may be required to raise the temperature of the sample to compaction temperature. Determine  $G_{mm}$ , perform ignition burnoff and complete calculations.

(3) Provide the KDOT Field Representative with the 2<sup>nd</sup> sample set. The KDOT Field Representative will mold 2 gyratory specimens, determine  $G_{mm}$ , perform ignition burnoff and complete calculations.

(4) Retain or provide the 3<sup>rd</sup> sample set to the KDOT District Materials Representative.

(5) The results of the testing will be compared. If Contractor and KDOT field laboratory test results do not compare favorably, the District Materials Laboratory will test their  $\frac{1}{3}$  of the sample. This sample will be transported to the District Materials Laboratory, after it has cooled to ambient air temperature. KDOT personnel will reheat the sample to compaction temperature, mold 2 gyratory specimens, determine  $G_{mm}$ , perform ignition burnoff and complete calculations. If the 3<sup>rd</sup> sample set is collected, transported while hot to the District Materials Laboratory and compacted in less than 2 hours, then, at the DME's discretion, the requirement to cool the sample may be waived.

If results are not acceptable to either party, repeat the above steps in **subsections 602.2g.(1) through (5)** for the Contractor's Field Laboratory, KDOT's Field Laboratory, and District Materials Laboratory until the issues may be resolved satisfactorily by all parties.

**h. Lot 1 Testing Requirements.**

(1) Sequence of Sampling. KDOT field personnel will determine the random truckload for the Contractor for sublots A, B, C and D, and the KDOT verification test.

The verification sample will be sampled and tested by KDOT field personnel. The verification sample shall be randomly taken within the lot and shall not be the same truckload as selected for the Contractor's subplot A, B, C or D.

KDOT field personnel will:

- provide the random spots to sample from behind the paving operations before compaction (KT-25);
- not supply the Contractor the identity of the truckload to be sampled ahead of time;
- notify the Contractor's laboratory of which truck to sample after the aggregate has left the cold feeds, and before the truck is finished loading; and
- determine whether the split sample will be taken from subplot A or B and notify the Contractor.

(2) Split Samples. The Contractor shall:

- obtain a sample large enough to split 3 ways for testing;
- retain and test  $\frac{1}{3}$  of the sample;
- supply  $\frac{1}{3}$  of the sample to the KDOT field laboratory for testing; and
- supply  $\frac{1}{3}$  of the sample to the KDOT District Materials Laboratory for testing.

(3) Results. At a minimum, compare  $G_{mm}$  and  $V_a$  results. The acceptable differences are 0.019 and 0.5%, respectively. If the results exceed these differences, take an additional split sample in Lot 1 from subplot C or D, as time permits.

If test results do not compare favorably, KDOT and the Contractor will investigate the differences in test results together and take appropriate action. The Contractor's test results will be used for quality control. KDOT Field Laboratory test results and District Materials Laboratory test results will be reported as "information only" samples.

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**i. Testing Requirements for Lots 2 and Greater.**

(1) Take all samples for tests at random locations as designated in the approved QCP at the rates specified in Appendix B, Part V.

Provide the Engineer with the random locations before going to the roadway to determine density or sample the HMA. The Engineer reserves the right to generate the random locations. If the Engineer generates the random locations, the Contractor will be notified before going to the roadway to sample the HMA or determine density.

(2) Conduct the tests for mixture properties, aggregate gradation and binder content on representative portions of the HMA, quartered from the larger sample of HMA. Take a random sample weighing a minimum of 55 pounds from behind the paver and transport it to the test facility, using a method to retain heat to facilitate sample quartering procedures.

(3) Record and document all test results and calculations on data sheets provided by KDOT. Record specific test results on a daily summary sheet provided by KDOT to facilitate the computation of moving test averages. Base moving averages on 4 consecutive test results. Calculations are to be based on the precision displayed on the data sheets. Use "precision displayed" when calculating within Excel. Appendix B, Part V shows the accuracy to "record to" for the tests listed. Include a description of quality control actions taken (adjustment of cold feed percentages, changes in Job Mix Formulas (JMF), etc.) in the Daily Quality Control Summary Sheet. In addition, post and keep current quality control charts, showing both individual test results and moving average values. As a minimum, plot the single test values and the 4 test moving average values, as applicable, on KDOT approved control charts for the mix characteristics shown in **TABLE 602-12**.

(4) If the Contractor and Engineer agree, the procedures shown for sampling, testing and evaluation of Lot 1 in **subsection 602.2h**, may be used for any other Lot produced on the project.

**g. Corrective Action.** In the QCP, identify procedures for notifying the Engineer when corrective measures must be implemented, and for halting production.

**h. Non-Conforming Materials.** In the QCP, specifically address how non-conforming materials will be controlled and identified. Establish and maintain an effective and positive system for controlling non-complying material, including procedures for its identification, isolation and disposition. Reclaim or rework non-complying materials according to procedures acceptable to the Engineer. This could include removal and replacement of in-place pavement.

Positively identify all non-conforming materials and products to prevent use, shipment and intermingling with complying materials and products. Provide holding areas, mutually agreeable to the Engineer and Contractor.

### **602.3 MATERIALS**

**a. Asphalt Binder.** Provide Asphalt Binder that complies with **DIVISION 1200**. Post a legible copy of the latest bill of lading for the Asphalt Binder on or near the gyratory compactor. Use the mixing and compaction temperatures shown on the bill of lading; however, the maximum mixing or compaction temperature is 340°F, unless otherwise approved by the Field Materials Engineer. Notify the Engineer if the mixing or compaction temperature changes.

Exception: The mixing temperature may be increased no more than 10°F above the maximum mixing temperature shown on the bill of lading provided all the following are met:

- The air temperature is below 70°F.
- The plant has not produced mix earlier in the day.
- Do not exceed a mix temperature of 350°F.
- No truck has returned for its second load of the day.

Once a previously loaded truck returns for its next load, reduce the temperature to not higher than the maximum mix temperature shown on the bill of lading, not to exceed 340°F.

**b. Reclaimed Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS).** Provide RAP and RAS that comply with **SECTION 1103**.

**c. Aggregates.** Provide aggregates that comply with **SECTION 1103**.

**d. Combined Aggregates.** Provide combined aggregates for the mixes required in the Contract Documents as shown in **TABLE 602-1**.

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Mixes may use any combination of aggregate and mineral filler supplements complying with the applicable requirements in **TABLES 1103-1** and **1103-2**.

Provide materials with less than 0.5% moisture in the final mixture.

The maximum quantity of crushed steel slag used in the mix is 50% of the total aggregate weight.

For all mixes used on the traveled way, the maximum quantity of natural sand is 35%.

Natural sand shall be called SSG-1, SSG-2, etc. in the mix design.

Additional requirements for SM-9.5T and SR-9.5T:

- Traveled way mixes shall include a minimum of 40% primary aggregate based on total aggregate weight;
- A minimum of 50% of the plus No. 4 mesh sieve material in the mixture shall be from the primary aggregate;
- A minimum of 45% of the plus No. 8 mesh sieve material in the mixture shall be from the primary aggregate; and
- Primary aggregates are designated as CS-1 (excluding limestone), CS-2 (excluding limestone), CG, CH-1 and CSSL as described in **subsection 1103.2a.(1)**. Primary aggregate requirements do not apply to the mixture used on the shoulder.

**e. Contractor Trial Mix Design.** A minimum of 10 working days before the start of HMA production, submit in writing to the DME for review and approval, a proposed JMF for each combination of aggregates. For each JMF submitted, include test data to demonstrate that mixtures complying with each proposed JMF shall have properties specified in **TABLE 602-1** for the designated mix type at the Recommended Percent Asphalt ( $P_{br}$ ). Submit the proposed JMF on forms provided by KDOT. Submit the worksheets used in the design process to include at a minimum the mix properties listed in **TABLE 602-2**. Contact the DME to determine if additional information should be submitted. Provide sufficient material as identified in **TABLE 602-3**. Contact the DME to determine if additional material is needed for additional design checks such as the modified Lottman test (KT-56).

When more than 25% of the mix is comprised of siliceous virgin aggregates and/or RAP, add anti-strip to the mix. The minimum amount of anti-strip required in the mix is 0.01% for every percent of natural sand and RAP in the mix. Thus, if 25% natural sand and 10% RAP is in a mix, then 0.35% anti-strip by weight of virgin asphalt binder is required in the mix.

If during production, the Tensile Strength Ratio (TSR) values (both KDOT and Contractor) exceed 85%, then the Contractor and the DME, working together, may decide on a lower amount of anti-strip.

Submit for the Engineer's review and approval, the test data listed in **TABLE 602-4** for each blend and the proposed JMF. In addition, for mixes containing RAP or RAS, submit for the Engineer's review and approval, the test data listed in **TABLE 602-5** for each blend and the proposed JMF. Submit a mix design for each blend and the proposed JMF as outlined in **TABLE 602-6**.

For each aggregate used in the mix design, determine the specific gravity using KT-6. This may be accomplished while the project is being constructed or anytime during the 12 months preceding the start of construction on a project. If construction has not yet begun, notify the DME 5 working days prior to obtaining the material for the specific gravity test so that companion samples may be obtained at the same time. If construction has already begun on the project, then determine the specific gravity values of the individual aggregates before 10,000 tons of HMA is produced. Provide the test results to the DME within 14 days of sampling the material. If the producer of the aggregate has been required to submit material to KDOT for a new Official Quality test, since the time the Contractor ran the specific gravity tests, then perform KT-6 on the aggregate currently produced. Do not use the specific gravity values obtained from these tests in the mix design calculations for current projects, unless mutually agreeable to both parties. Use the information, as soon as it becomes available, as part of the process to verify and update the "Monthly Hot Mix Aggregate Specific Gravity Values" posted on KDOT's Internet site.

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<b>TABLE 602-1: COMBINED AGGREGATE REQUIREMENTS</b>											
<b>Nom. Max. Size Mix Designation</b>	<b>Percent Retained – Square Mesh Sieves</b>									<b>Min. VMA (%)</b>	<b>D/B Ratio</b>
	<b>1 1/2"</b>	<b>1"</b>	<b>3/4"</b>	<b>1/2"</b>	<b>3/8"</b>	<b>No. 4</b>	<b>No. 8</b>	<b>No. 16</b>	<b>No. 200</b>		
SM-4.75A SR-4.75A			0	0-2	0-5	0-10		40-70	88.0-94.0	16.0	0.9 – 2.0
SM-9.5A SR-9.5A			0	0-2	0-10	10 min.	33-53		90.0-98.0	15.0	0.6 – 1.2
SM-9.5B SR-9.5B			0	0-2	0-10	10 min.	53-68		90.0-98.0	15.0	0.8 – 1.6
SM-9.5T SR-9.5T			0	0-2	0-10	10 min.	53-68		90.0-98.0	15.0	0.8 – 1.6
SM-12.5A SR-12.5A		0	0	0-10	10 min.		42-61		90.0-98.0	14.0	0.6 – 1.2
SM-12.5B SR-12.5B		0	0	0-10	10 min.		61-72		90.0-98.0	14.0	0.8 – 1.6
SM-19A SR-19A	0	0	0-10	10 min.			51-65		92.0-98.0	13.0	0.6 – 1.2
SM-19B SR-19B	0	0	0-10	10 min.			65-77		92.0-98.0	13.0	0.8 – 1.6

1. The requirements for Coarse Aggregate Angularity (CAA); Fine Aggregate Angularity (FAA); Sand Equivalent (SE); Gyrotory compaction revolutions  $N_{ini}$ ,  $N_{des}$ ,  $N_{max}$ ,  $N_{ini}$  level of compaction and VFA shall be as shown in the Contract Special Provisions for each mix designation.
2. The flat and elongated particles in the combined coarse aggregate shall not exceed 10% for the total sample.
3. The maximum percent moisture in the final mixture shall not exceed 0.5 for any mix designation.
4. The target air voids ( $V_a$ ) for any mix designation shall be 4.0% at  $N_{des}$  gyrations.
5. The minimum tensile strength ratio (%TSR) shall be 80% for any mix designation.
6. The level of compaction of the mix when compacted to  $N_{ini}$  gyrations shall be less than the percent of the  $G_{mm}$  shown in the Contract Special Provision, and when compacted to  $N_{max}$  gyrations shall be a maximum of 98.0% of the  $G_{mm}$ .

<b>TABLE 602-2: MIX PROPERTIES</b>			
<b>Property</b>	<b>Abbreviation</b>	<b>Test Method</b>	<b>Additional Information</b>
Air Voids	$V_a$	KT-15 & KT-58	Calculated from $G_{mm}$ and $G_{mb}$ . Run at the $P_{br}$ .
Recommended Percent Asphalt	$P_{br}$		Produce a mix with a $V_a$ of 3.5% to 4.5%.
Theoretical Maximum Specific Gravity	$G_{mm}$	KT-39	Rice Test.
Percent Tensile Strength Ratio	%TSR	KT-56	Run test at $P_{br}$ or at 0.3% to 0.5% less than $P_{br}$
Sand Equivalent	SE	KT-55	
Bulk Specific Gravity of HMA	$G_{mb}$	KT-15	Compacted Mix Property.
Percent $G_{mm}$ at $N_{ini}$ and $N_{des}$ and $N_{max}$	$\%G_{mm} @ N_{ini}$ $\%G_{mm} @ N_{des}$ $\%G_{mm} @ N_{max}$	KT-15	Use $G_{mm}$ value from KT-39. Calculated from Gyrotory Compaction height data, $G_{mm}$ , and $G_{mb}$ .
Voids in Mineral Aggregate	VMA	KT-15 & KT-6	Calculated from $G_{mb}$ , $G_{sb}$ , $P_b$ .
Voids Filled with Asphalt	VFA		Calculated from VMA and $V_a @ N_{des}$ .
Coarse Aggregate Angularity	CAA	KT-31	
Fine Aggregate Angularity	FAA	KT-50	

Formulas for calculations are in the Superpave Volumetric Mixture Design and Analysis Handbook.

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<b>TABLE 602-3: MATERIAL SUBMITTALS</b>			
<b>Submittal</b>	<b>Quantity</b>	<b>Description</b>	<b>Additional Information</b>
Aggregate for KT-15	3 Samples	Sized for 6 inch Plugs	Comply with Job Mix Gradation.
Aggregate for KT-39	2 Samples	Sized for $G_{mm}$ Testing	Comply with Job Mix Gradation.
Binder for KT-15	As Needed	Sized for 3 Plugs at $P_{br}$	
Binder for KT-39	As Needed	Sized for 2 $G_{mm}$ Tests	
Each Aggregate for KT-6	As Needed	Specific Gravity Test	
Uncompacted HMA Sample	35 lbs	Cool sample to room temperature	If transported hot and compacted within 2 hours, then requirement to cool sample may be waived by the DME.
Gyratory Plugs at $N_{max}$	2 Plugs	Compacted at $P_{br}$	Compacted to $N_{max}$ .

<b>TABLE 602-4: TEST DATA SUBMITTALS</b>	
<b>Submittal</b>	<b>Information</b>
Asphalt Binder	Source, Grade, Specific Gravity, Mixing and Compaction Temperature from the Producer of the asphalt binder.
Each Aggregate	Source and Producer, including Legal Description.
Gradation of Each Aggregate	Percentage Retained to nearest 1% (except nearest 0.1% for No. 200 sieve) Derive RAP gradation after residual binder is removed. Derive RAS gradation after residual binder is removed or from the Shingle Aggregate Gradation table in <b>SECTION 1103</b> .
Material Proportioning	Proportion of each material is shown in percentage of aggregate.
Composite Gradation	Based on Gradation of Each Aggregate and Material Proportioning.
Composite Gradation Plot	Plotted on KDOT Form 712 (0.45 power graph paper).
Asphalt Binder Added	Percentage to nearest 0.01% based on total weight of the mixture.
Aggregate	Percentage of flat and elongated particles in the coarse aggregate, CAA and FAA.
%TSR	Percent Tensile Strength Ratio of the Mixture (Modified Lottman Test).
Sand Equivalent	SE for the combined virgin aggregates.

<b>TABLE 602-5: RAP AND RAS TEST DATA SUBMITTALS</b>	
<b>Submittal</b>	<b>Information</b>
RAP and RAS	Source and location where RAP will be obtained. Source and location where RAS will be obtained.
RAP Aggregate	Bulk Specific Gravity ( $G_{sb}$ ). Use the $G_{sb}$ provided on the Contract Special Provision. If no value is provided, the Effective Specific Gravity ( $G_{se}$ ) shall be calculated as shown in subsection 5.10.4, Part V and used as the $G_{sb}$ .
RAS Aggregate	Bulk Specific Gravity ( $G_{sb}$ ). The Effective Specific Gravity ( $G_{se}$ ) shall be calculated as shown in subsection 5.10.4, Part V and used as the $G_{sb}$ .
Asphalt Binder Content of RAP Asphalt Binder Content of RAS	Determined from ignition oven analysis using KT-57.
RAP $G_{mm}$ RAS $G_{mm}$	Determined by KT-39.
Asphalt Binder Specific Gravity	Specific Gravity of the asphalt binder in the RAP and RAS ( $G_b$ ) shall be set equal to 1.035.
Corrected Asphalt Binder Content of the total recycled mixture	Determined from ignition oven analysis using KT-57.

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<b>TABLE 602-6: MIX DESIGN TEST DATA SUBMITTALS</b>	
<b>Submittal</b>	<b>Information</b>
Minimum of 2 Mix Designs	As a minimum, 1 mix design at the $P_{br}$ and 1 mix design at 0.3% to 0.5% below the $P_{br}$
$G_{mm}$	Determined at each binder content.
Individual and Bulk Specific Gravity Tests	Provide results for a minimum of 2 specimens at each binder content.
Percent Air Voids	Provide % $V_a$ in the mixture for each binder content when compacted to $N_{ini}$ , $N_{des}$ and $N_{max}$ gyratory revolutions along with copies of the Gyratory graphs.
Percent VMA	Provide %VMA at each binder content. (Note: The Contractor is cautioned that plant produced material generally yields a mixture with less VMA than predicted by the design. In such case, the design VMA should be increased above the specified minimum accordingly.)
D/B Ratio	Calculate to the nearest 0.1% at each binder content.

**f. Additives.** Provide Warm Mix Asphalt (WMA) additives or processes that comply with **SECTION 1203**. The Contractor is permitted to use WMA, unless otherwise shown in the Contract Documents.

For mixes containing Warm Mix Asphalt (WMA) additives, submit for the Engineer's review and approval, the additive or process used, the recommended rate of application, and the temperature ranges for mixing and compaction.

Mixing temperature range is provided by the Asphalt Binder Supplier. When using WMA, the mixing temperature may be reduced no more than 30°F for WMA water foaming processes, and no more than 70°F for WMA chemical and organic additives. The minimum mixing temperature for WMA is 220°F.

**602.4 CONSTRUCTION REQUIREMENTS**

**a. Plant Operation.** Adjust all plant operations to operate continuously.

(1) Preparation of the Asphalt Binder. Heat the asphalt binder to within a range as specified in **SECTION 601**. When heating the asphalt binder to the specified temperature, avoid local overheating. At all times, provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. Asphalt binder received from the refinery at temperatures less than 375°F may be used as received, if the requirements regarding the reheating of asphalt binder in **SECTION 601** are met.

(a) Commingling of Asphalt Binders. Do not add or commingle asphalt binders from 2 or more sources into a storage tank. If this occurs, the contents of the storage tank are considered contaminated. Do not use the contents of the storage tank on the project, except as follows: It is permissible, at the Contractor's option, to thoroughly mix the contents of the tank and request sampling of the mixture. Submit the sample to the MRC for testing. Do not use the asphalt binder until approved, and when needed, a new mix design evaluation is completed.

(b) Asphalt Binder Sources. Before changing asphalt binder sources on a project, obtain approval from the DME. A new JMF may be required.

(c) Anti-Strip Additives. If liquid anti-strip additives are added at the Contractor's plant, install a "totalizer" to monitor the quantity of anti-strip additive being added. The Engineer may approve alternative methods for including anti-strip additives in a batch plant. If added at the plant, the anti-strip will be added in line with the asphalt binder as it is being transferred from the transit unit to the asphalt binder storage tank. Provide a method for the Engineer to monitor the percent of additive being added.

If hydrated lime is added, mix it in an approved pug mill to coat the combined aggregates. Moisten the combined virgin aggregate to a minimum of 3% above the saturated surface dry condition prior to, or during the addition of the hydrated lime.

(d) WMA Additives. If WMA additives are added at the Contractor's plant, install a "totalizer" to monitor the quantity of WMA additive being added. The Engineer may approve alternative methods for including chemical and organic WMA additives in a batch plant. If added at the plant, chemical and organic WMA additives will be added in line with the asphalt binder as it is being transferred from the transit unit to the asphalt binder storage tank. Provide a method for the Engineer to monitor the percent of additive being added.

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(2) Preparation of Mineral Aggregate. When the mineral aggregate is composed of 2 or more ingredients, combine as shown in the approved JMF.

(a) Temperature Requirements. Dry the aggregate for the mixture and heat to a temperature to obtain an asphalt-aggregate mixture temperature immediately after mixing within the 75 to 150 second Saybolt viscosity range of the asphalt binder used. Obtain the temperature for this viscosity range from the MRC or the Asphalt Binder Producer. No mixing or compaction temperatures are to exceed 340°F without approval from the Field Materials Engineer. The minimum temperature may be revised by the DME provided it is demonstrated that satisfactory results may be obtained at a lower temperature. In such event, deliver the HMA to the paver at a temperature sufficient to allow the material to be satisfactorily placed and compacted to the specified density and surface tolerance requirements.

(3) Preparation of HMA. Introduce asphalt binder into the prepared aggregate in the proportionate amount determined by the  $P_{br}$  in the JMF.

(a) Basis of Rejection. HMA will be rejected if the aggregate, as it is discharged from the drum or the pugmill, contains sufficient moisture to cause foaming of the mixture, or if the temperature of the aggregate is such that the asphalt-aggregate mixture temperature is outside the range specified in **SECTION 601**.

(b) Mixing Time. Operate drum mixers at a rate to provide uniform aggregate coating in a continuous operation. For batch and continuous type plants, the minimum wet mixing time is 40 seconds. In all cases, mix a sufficient time to produce a uniform mixture in which all the aggregate particles are thoroughly coated. On batch plants, begin the timing at the start of the asphalt binder introduction into the pugmill, and end upon the opening of the discharge gate. For continuous flow plants, mixing time in seconds shall equal:

[pugmill dead capacity in pounds] divided by [pugmill output in pounds per second].

(c) Manufacturer's Specifications. Operate all drying, pumping and mixing equipment within the limits specified by the manufacturer, unless it can be demonstrated to the satisfaction of the Engineer that such limits may be exceeded without detriment to the HMA.

(d) Batcher Operation. Coordinate HMA batchers (Gob Hoppers) with the plant production rate at all times so the hopper is more than  $\frac{3}{4}$  full before the gates open, and the gates close before material can drop through the gob hopper directly into the surge bin, weigh hopper or truck.

(e) Wasted Material. Wasted material is not measured for pay.

If after an interruption of production, the drum-mixer contains cold, uncoated or otherwise unsuitable material, waste material through a diversion chute. In a continuous or batch plant drier, waste unsuitable material through the pugmill.

At the end of a production run, waste any segregated material in the cone of the storage bin.

(4) End of Day Quantities. At the end of each day of production provide the Engineer with a document signed by the Plant Foreman or the Project Manager listing the dry weight of each aggregate, mineral filler, RAP, and WMA chemical or organic additive; the tons of asphalt binder, the tons of anti-strip agent used for the project during the day, and the tons of water used in the WMA foaming process. The dry weight is the tons of the material less the water content.

**b. Road Surface Preparation.**

(1) Preparation of Earth Subgrade. When the HMA is placed on a prepared subgrade, and unless other subgrade preparation is called for in the Contract Documents, perform the following:

At all grade control points, such as existing pavements and bridges, excavate the subgrade according to the specified grades and lines, prior to any subgrade treatment. Prior to the delivery of materials for the base course, prepare the subgrade surface by sprinkling with water, lightly scarifying where necessary, and blading and rolling, until the proper crown is obtained. Disturb the originally compacted crust or top portion of the subgrade as little as possible.

Maintain the subgrade as prepared until it is covered with the base course. Repair any defects which may develop, at the Contractor's expense, to the satisfaction of the Engineer.

(2) Trimming of Subgrade (Untreated, Treated or Modified), Aggregate Base or Granular Sub-base for HMA Pavement. Before placing the subsequent layer of the pavement structure, trim the subgrade (untreated, treated or modified), aggregate base or granular subbase. Use an automated, electronically controlled machine that trims with a rotary cross-shaft trimmer to establish and control the line, grade and typical cross-section as shown in the Contract Documents. The Engineer may waive the use of automatically controlled equipment on areas of narrow width or

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irregular dimensions. Operate all trimming equipment far enough in advance of the paving operation to allow ample opportunity to check the grade and make any needed corrections.

Prior to paving, construct ditches and drains to drain the highway effectively. Maintain the finished subgrade in a smooth and compacted condition to readily drain.

Do not place pavement upon a frozen or muddy subgrade.

(3) Preparation of an Existing Asphalt Pavement. Clean the surface to remove all foreign material and broom to remove dust. Excavate areas shown in the Contract Documents to be patched to a depth directed by the Engineer. Fill with HMA and compact.

(4) Preparation of an Existing Concrete or Brick Pavement. Clean all foreign material and broom to remove dust. Clean and fill cracks and joints, and construct surface leveling as shown in the Contract Documents.

(5) Tack Coat. Prior to placing the HMA, apply a tack coat to the existing surface, as shown in the Contract Documents. When warranted by weather conditions, the Engineer may authorize a change in the asphalt for tack coat. When such changes are made, the price per ton of material being used will be the unit price bid for the material designated in the contract plus or minus the difference in the invoice price per ton of the 2 materials at the refinery as determined at the time of application.

**c. Weighing Operations.** See **SECTION 109** for details regarding weighing operations.

**d. Hauling Operations.** Schedule operations to minimize hauling over a surface course.

Deliver HMA to the paver at a temperature sufficient to allow the material to be placed and compacted to the specified density and surface tolerance.

**e. Paving Operations.** Except when placing SM-4.75A, SM-9.5A or SR-9.5A asphalt mixtures, remix the material transferred from the hauling unit, prior to placement. Use equipment such as a mobile conveyor, material transfer device, shuttle buggy material transfer vehicle, material transfer paver or paver with remixer conveyor system. After starting the project with the equipment listed above, and after producing HMA pavement density within the limits specified in **TABLE 602-7**, the Engineer will consider other types of equipment or modifications to pavers that will produce less segregation. The use of equipment as noted above shall not relieve the Contractor of the responsibility to comply with **TABLE 602-7**. The Engineer will check the pavement for longitudinal streaks and other irregularities. Make every effort to prevent or correct any irregularities in the pavement, such as changing pavers or using different and additional equipment.

Do not raise (dump) the wings of the paver receiving hopper at any time during the paving operation. The Engineer may waive this requirement if it is determined that raising (dumping) the wings will not produce detrimental segregation. If segregation or irregularities in the pavement surface or density are noted, review the plant, hauling and paving operations and take corrective action. The recommendations made in KDOT's "Segregation Check Points" should reduce the segregation and irregularities to an acceptable level. Copies of KDOT's "Segregation Check Points" may be obtained from the KDOT District Office or Field Engineer.

Spread the HMA and finish to the specified crown and grade using an automatically controlled HMA paver. Operate the paver at a speed to provide a uniform rate of placement without undue interruption. At all times, keep the paver hopper sufficiently full to prevent non-uniform flow of the HMA to the augers and screed.

If the automatic grade control devices break down, the Engineer may allow the paver to operate to the close of the working day, provided the surface is satisfactory. Do not operate the paver without working automatic control devices upon another lift that was laid without automatic controls.

(1) Surface Quality. Spread the HMA without tearing the surface. Strike a finish that is smooth, free of segregation, true to cross section, uniform in density and texture and free from surface irregularities. If the pavement does not comply with all of these requirements, plant production and paving will be suspended until the deficiency is corrected.

The Engineer will check segregation and uniformity of density using methods outlined in Section 5.8.3 - Segregation Check Using the Nuclear Density Gauge, Part V. For shoulders with a plan width of less than or equal to 3 feet, and placed at the same time as the traveled way, do not take nuclear density readings on the shoulder nor within 1 foot of the shoulder unless the pavement section is uniform across the entire roadway. The acceptable criteria for density uniformity are in **TABLE 602-7**.



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<b>TABLE 602-7: SEGREGATION AND UNIFORMITY OF DENSITY CHECK</b>		
<b>Mix Designation</b>	<b>Maximum Density Range (highest minus lowest)</b>	<b>Maximum Density Drop (average minus lowest)</b>
All	4.4 lbs./cu. ft.	2.2 lbs./cu. ft.

Whenever the results from 2 consecutive density profiles fail to comply with both of the requirements listed in **TABLE 602-7**, plant production and paving will be suspended. Follow the procedures listed in the Profile Evaluation Subsection of Section 5.8.3-Segregation Check Using the Nuclear Density Gauge, Part V until production may be resumed.

Joint density testing and the associated requirements listed below do not apply for HMA lift thicknesses less than or equal to 1 inch.

Evaluate the longitudinal joint density using methods outlined in Section 5.8.4-Joint Density Evaluation Using the Nuclear Density Gauge, Part V. Although it is the Contractor's responsibility to perform the joint density evaluation, the Engineer may make as many independent joint density verifications as deemed necessary at the random sample locations. The Engineer's results will be used for acceptance for joint density, whenever available. The acceptable criteria for joint density are in **TABLE 602-8**.

<b>TABLE 602-8: JOINT DENSITY REQUIREMENTS</b>	
<b>Nuclear Gauge Readings</b>	<b>Requirement</b>
Interior Density minus Joint Density	≤ 3.0 lbs./cu. ft.
OR	
Joint Density	≥ 90.00% of G <sub>mm</sub>

If the results of 2 consecutive density profiles fail to comply with **TABLE 602-8**, the plant production and paving operations will be suspended. Follow the procedures listed in the Joint Evaluation Subsection of Section 5.8.4-Joint Density Evaluation Using the Nuclear Density Gauge, Part V, until production may be resumed.

(2) Leveling Courses. In general, spread leveling course mixtures by the method to produce the best results under prevailing conditions to secure a smooth base of uniform grade and cross section. The leveling course may be spread with a properly equipped paver or motor grader.

(3) Lift Thickness. Except for leveling courses or when shown otherwise in the Contract Documents, **TABLE 602-9** applies. The Engineer may adjust lift thickness to utilize the most efficient method of acquiring specified density and surface quality. The minimum lift thickness for any HMA mixture is 3 times the nominal maximum aggregate size, unless otherwise designated in the Contract Documents or approved by the Engineer.

<b>TABLE 602-9: NOMINAL COMPACTED THICKNESS</b>	
<b>Lift</b>	<b>Maximum Nominal Compacted Thickness</b>
Surface	2 inches
Base	4 inches

(4) Grade Control. Achieve grade control by use of 1 or more of the following grade reference devices. Approval of any of these devices will be based upon satisfactory performance.

(a) Traveling Stringline. Attach a traveling stringline or ski type attachment, a minimum length of 30 feet, to the paver and operate parallel with its line of travel.

(b) Reference Shoe. Attach a short reference shoe or joint matching device to the paver for control in matching surface grades along longitudinal joints.

(c) Erect Stringline. Use an erected stringline consisting of a tightly stretched wire or string offset from and parallel to the pavement edge on 1 or both sides. Erect the stringline parallel to the established pavement surface grade and support at intervals as necessary to maintain the established grade and alignment.

(d) Stringless Paving. Control line, grade and pavement cross-section as shown in the Contract Documents. Use electronic guidance systems that meet the requirements and tolerances listed in **SECTION 802**. Horizontal control is guided by GPS. Vertical control is guided by Total Stations. GPS will not be allowed for Vertical control.

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When paving on a fresh subgrade that has not been trimmed by an automatically controlled machine, use an erected stringline or stringless paving to establish grade. Use either of these options on the first or second lift. When directed by the Engineer, use an erected stringline or stringless paving to match grade control points such as bridges.

(5) Compaction of Mixtures. Uniformly compact the HMA as soon after spreading and strike-off as possible without shoving or tearing. Use self-propelled rollers operated at speeds slow enough to avoid displacement of the HMA. Equipment and rolling procedures which result in excessive crushing of the aggregate are prohibited. Use a sufficient number and weight of rollers to compact the HMA to the required density, using a minimum of 2 rollers. See **subsections 602.4e.(6)** for exceptions to the minimum number of rollers. Perform final rolling with a steel roller unless otherwise specified. On the final pass, operate finishing, vibratory rollers in the static mode.

Coordinate the frequency, amplitude and forward speed of the vibratory roller to achieve satisfactory compaction without objectionable undulations. For HMA lifts with a compacted thickness less than 1/4 inch, operate vibratory rollers in the static mode.

Keep rollers in operation as necessary so all parts of the pavement receive substantially equal compaction at the proper time. The Engineer will suspend HMA delivery to the project at any time proper compaction is not being performed.

Remove, replace with suitable material and finish according to these specifications any mixture that becomes loose, broken, mixed with foreign material or which does not comply in all respects with the specifications.

(6) Density Requirements.

(a) For mixes with a specified thickness greater than or equal to 1 1/2 inches:

For lots 1 and 2, control density as shown in **subsection 602.4e.(6)(b)**. Before beginning production, the Contractor has the option to accept the pay adjustment for density on both Lots 1 and 2, or only Lot 2. If the Contractor chooses to accept the pay adjustments for density on both Lots 1 and 2, or only Lot 2, control the density as shown in **subsections 602.4e.(6)(a)(i-ii)**. If the Contractor chooses to accept pay adjustment for density on Lot 1, the pay adjustment can not be rejected on Lot 2.

(i) HMA Overlay. For lots 3 and greater, the lot density requirements and appropriate density pay adjustment factors are shown in **subsection 602.9b**, as the percent of the  $G_{mm}$  value based on the average of the density tests. The standard lot size is 10 density tests. Smaller lot sizes may result as outlined in **TABLE 602-10**. Normally, the  $G_{mm}$  value used to calculate the density percentage is the average value of all  $G_{mm}$  tests conducted the same day the lot was placed and compacted. If less than 3  $G_{mm}$  values were obtained that day, use the moving average value (last 4 tests prior to the end of the day). When starting a mix and less than 4  $G_{mm}$  values have been determined, use the average value of those available at the end of each day.

(ii) HMA Surface, HMA Base and HMA Pavement. For lots 3 and greater, the lower specification limit (LSL) value for density is given in **subsection 602.9c**, along with the appropriate density pay adjustment factor equations. The LSL value is given as a percentage of  $G_{mm}$ . Lot density is determined using the measured density values for all sublots in a lot. The standard lot size is 10 density tests. Smaller lot sizes may result as outlined in **TABLE 602-10**. Normally, the  $G_{mm}$  value used to calculate the density percentage is the average value of all  $G_{mm}$  tests conducted the same day the lot was placed and compacted. If less than 3  $G_{mm}$  values were obtained that day, use the moving average value (last 4 tests prior to the end of the day). When starting a mix and less than 4  $G_{mm}$  values have been determined, use the average value of those available at the end of each day.

(b) For mixes with a specified thickness less than 1 1/2 inches:

These mixes will not have a density pay adjustment. Control density using an approved rolling procedure with random nuclear gauge density determinations. Include a method for controlling density in the QCP.

Designate a "Compaction Foreman". This person shall control compaction procedures, review nuclear gauge results as they are obtained, adjust compaction procedures as needed to optimize compaction and report any changes in the compaction process and results of nuclear gauge testing to the Engineer. The compaction foreman may also be the nuclear gauge operator. The nuclear gauge operator shall continuously monitor compaction procedures. As a minimum, take 10 random nuclear gauge density determinations per day and report results to the Engineer. Throughout the day, nuclear gauge results shall be available for review by the Engineer. The

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compaction foreman shall document at a minimum of once every 2 hours that the approved rolling sequence is being followed. Documentation includes roller passes, the mat temperature at each pass, amplitude setting of rollers and roller speed. Provide the documentation to the Engineer.

Determine and periodically update an approved rolling procedure and periodically, as outlined in this section. As a minimum, evaluate the initial rolling procedure using 3 rollers. If the hot mix plant is operating at over 275 tons per hour, use a minimum of 4 rollers in the initial evaluation. Operate vibratory rollers according to **SECTION 151**. Evaluate HMA paver screed operation with the nuclear gauge at various vibration settings. For screed evaluation, take the nuclear gauge readings directly behind the screed and before rolling. The Compaction Foreman and Engineer will evaluate the densities obtained with the various roller combinations and screed settings to determine the initial approved rolling procedure.

Together, the Compaction Foreman and Engineer will determine when new rolling procedures are required. HMA production may be stopped by the Compaction Foreman or Engineer whenever rolling is not being performed according to the approved rolling procedure.

(c) For all lots, achieve the maximum density before the temperature of the HMA falls below 175°F. When using WMA, achieve the maximum density before the temperature of the WMA falls below 165°F. Do not crush the aggregate. When the mat temperature falls below 175°F or 165°F for WMA, roller marks may be removed from the mat with a self-propelled static steel roller.

<b>TABLE 602-10: DAILY PRODUCTION VS NUMBER OF SUBLOTS AND TEST REQUIREMENTS</b>			
<b>Daily Production (tons)</b>	<b>Number of SUBLots</b>	<b>No. of Cores or Nuclear Density Tests **</b>	<b>No. of Verification Cores or Nuclear Density Tests **</b>
0-599	3*	6*	3*
600-999	4*	8*	4*
1000 or more	5	10	5

\*Minimum number for mixes with a specified thickness of 1½ inches or greater: The Contractor may choose to obtain the number required for 1000 or more tons. If the Contractor chooses to test 5 sublots (10 tests), KDOT will obtain 5 verification tests.

\*\*For mixes with a specified thickness less than 1½ inch: Verification testing may be performed, but is not required. Additional testing may be performed by the Contractor. A minimum of 10 tests are required.

(7) Contact Surfaces. Coat contact surfaces of curbing, gutters, manholes and similar structures with a thin uniform coating of asphalt material. Place the HMA uniformly high near the contact surfaces so that after compaction it shall be approximately ¼ inch above the edge of such structures.

(8) Adjustment of Manholes (Set Price). When required, this work will be performed and paid for under **SECTION 816**.

(9) Construction Joints.

(a) Transverse Construction Joints. Use a method of making transverse construction joints to provide a thorough and continuous bond, provide an acceptable surface texture and meet density requirements. Do not vary the surface elevation more than 3/16 inch in 10 feet, when tested longitudinally across the joint. When required, repair the joints or paving operations will be suspended.

(b) Longitudinal Joints. Construct well bonded and sealed longitudinal joints to obtain maximum compaction at the joint. If deemed necessary by the Engineer to properly seal the joint, apply a light coat of asphalt emulsion or asphalt binder to the exposed edge before the joint is made.

Before placing the fresh HMA against a cut joint or against old pavement, spray or paint the contact surface with a thin uniform coat of asphalt emulsion or asphalt binder. Where a finishing machine is used, make the longitudinal joint by depositing a sufficient amount of HMA to form a smooth and tight joint.

Offset the longitudinal joint in successive courses by 6 to 12 inches. Comply with traffic lane edges for the width of the surface of top course placement.

(10) Shoulder Surfacing and Widening. When the placement width of shoulders or uniform width widenings is less than can be accomplished with a regular paver, spread each course with a mechanical spreading device.

(11) Rumble Strips. When designated, construct rumble strips according to the Contract Documents.

**f. Maintenance of Traffic.** Maintain traffic according to **DIVISION 800** and the following:

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Maintain one-way traffic, and restrict traffic speeds to 20 miles per hour in the vicinity of workers, unless otherwise designated. Use pilot cars to lead traffic through the area of paving and rolling operations, and if directed, through a curing area. The use of flaggers is allowed through patching operations, unless the patching area or distance between flaggers exceeds ½ mile, in which case the use of a pilot car shall be required. On overlay projects with 2 lanes or more in each direction for traffic use, the Engineer may waive the pilot car requirements.

Station one flagger ahead of the application of the tack coat and one flagger ahead of the area being protected from traffic. Take adequate protection for traffic on side roads approaching the tack area.

**g. Treatment of Adjacent Areas.** Pave sideroads, entrances and turnouts for mailboxes as shown in the Contract Documents. Overlay all widening areas designated in the Contract Documents or ordered by the Engineer.

**h. Pavement Smoothness.** Evaluate pavement smoothness according to **SECTION 603** and the following:

<b>TABLE 602-11: MAXIMUM VARIATION OF THE SURFACE</b>	
<b>Length (feet)</b>	<b>Maximum Variation of the Surface (inches)</b>
10	3/16
25	5/16

Correct all humps or depressions exceeding the specified tolerance by removing the defective work and overlaying with new material, or by other means approved by the Engineer. All necessary corrections are at the Contractor’s expense.

**602.5 PROCESS CONTROL**

**a. General.** Establish gradation limits and proportions for each individual aggregate, mineral filler and RAP and RAS, when applicable. Specify the limits and proportions such that the material produced complies with the applicable requirements of the designated mix type. The Contractor is responsible for all process control operations including testing. At no time will KDOT’s representative issue instructions to the Contractor or producer as to setting of dials, gauges, scales and meters. KDOT will collect and test verification samples and assurance samples and inspect the Contractor’s quality control operations.

**b. JMF Adjustments.** Produce a mixture of uniform composition closely complying with approved design JMF to obtain the specified properties when compacted. If, during production, results from quality control tests demonstrate a need to make adjustments to the mix design, then make adjustments to the design JMF single point gradation and binder content to achieve the specified properties. The JMF adjustments shall produce a mix that complies with **TABLE 602-1** for the specified mix designation. When necessary, adjust on a subplot basis. Report the new JMF to KDOT’s field representative and the DME before making such changes, and submit a new mix design for review and approval if required by the DME.

**c. Specification Working Ranges.** Establish acceptable limits for field test results by applying the tolerances shown in **TABLE 602-12** to the JMF or adjusted JMF for binder content. Establish acceptable limits for the other listed mix characteristics by applying the tolerances shown in **TABLE 602-12** to the requirements of **TABLE 602-1**.

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<b>TABLE 602-12: SPECIFICATION WORKING RANGES (QC/QA)</b>				
<b>Mix Characteristic</b>	<b>Tolerance from JMF</b>			
	<b>Single Test Value</b>	<b>Plot</b>	<b>4 Point Moving Average Value</b>	<b>Plot</b>
Binder Content	±0.6%	*	±0.3%	*
<b>Mix Characteristic</b>	<b>Tolerance for Specification Limits</b>			
	<b>Single Test Value</b>	<b>Plot</b>	<b>4 Point Moving Average Value</b>	<b>Plot</b>
Gradation (applicable sieves in TABLE 602-1)	N/A	*	zero tolerance	*
Air Voids @ N <sub>des</sub> gyrations	±2.0%	*	N/A	
Voids in Mineral Aggregate (VMA)	1.0% below min.	*	zero tolerance	*
Voids Filled with Asphalt (VFA)	N/A		zero tolerance	*
Course Aggregate Angularity (CAA)	zero tolerance		N/A	
Sand Equivalent (SE)	zero tolerance		N/A	
Fine Aggregate Uncompacted Voids (FAA)	zero tolerance		N/A	
%Tensile Strength Ratio (%TSR)	zero tolerance	*	N/A	
Density @ N <sub>ini</sub> and N <sub>max</sub>	N/A		zero tolerance	
Dust to Effective Binder (D/B) Ratio	zero tolerance	*	zero tolerance	*

\* Plot data according to **subsection 106.4**.

For gradations, as a minimum, plot the No. 4, 8, 30 and 200 sieves.

Plot G<sub>mm</sub> to third decimal point.

Indicate Job Mix Formula (JMF) and specification working range limits for single test results on the control charts using a green ink dotted line.

Indicate the specification working range limits for the 4-point moving average results with a green ink solid line.

**d. Mixes with Reclaimed Asphalt Pavement (RAP).** The intent of this section is to prevent more RAP going into a mix than is allowed in the Contract Documents. Totalizers are used to determine the %RAP in mix; however, this does not preclude the Engineer from using other methods for determining the %RAP in a mix.

Provide the Engineer with the totalizer readings at the end of each day of production. These shall include the final daily readings for the RAP, virgin aggregates and asphalt binder.

The %RAP will be checked a minimum of twice a day by the Engineer. Take the readings a minimum of 2 hours apart and a maximum of 6 hours apart. Do not take the readings within the first hour of start-up as adjustments to the plant are most frequent within this time frame.

Calculate RAP percentages using the plant totalizers for the virgin aggregates (AGG<sub>v</sub>), and the RAP as follows:

$$\text{Equation A: } \% \text{RAP} = \frac{\text{RAP} * 100}{\text{RAP} + \text{AGG}_v}$$

%RAP is the percent RAP in the total aggregates (Virgin and RAP) rounded to the nearest tenth.

RAP is the difference between the current and last reading of the RAP totalizer in tons.

AGG<sub>v</sub> is the difference between the current and last reading of the Virgin Aggregate totalizer in tons.

%RAP is considered out of compliance when any of the following occurs:

- Any single test exceeds the maximum percentage allowed by specs by 3%.
- The 4-point moving average exceeds the maximum percentage allowed by specifications.

Actions to be taken if the %RAP is out of compliance:

- If any single test exceeds 3% of the maximum allowed %RAP stop production, perform the “0 check run” on the belts in the presence of the Engineer, and make adjustments to correct the discrepancy.
- If the 4-point moving average exceeds the maximum allowed %RAP three consecutive times, stop production, perform the “0 check run” on the belts in the presence of the Engineer, and make adjustments to correct the discrepancy.

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- If the 4-point moving average exceeds the maximum allowed %RAP by more than 1% then the Contractor will be assessed the following penalty.

**Equation B:**      Contract Deduct = 
$$\frac{BP * Q * (\%RAP_4 - \%RAP_{max})}{100}$$

Contract Deduct is the Dollar amount to be subtracted from the contract.

BP is the Bid Price of the mix.

Q is the Quantity, in tons, of material represented by the 4-point moving average. This value shall be based on the weigh tickets taken from the time of the 1<sup>st</sup> test of the 4-point moving average through the time of 4<sup>th</sup> test.

%RAP<sub>4</sub> is the 4-point moving average of %RAP.

%RAP<sub>max</sub> is the Maximum %RAP from the Project Special Provision.

Contract Deducts for RAP will be an item added to the contract.

Any time production is stopped due to non-compliant %RAP, restart the 4-point moving average provided the belt had the “0 check run” performed in the presence of the Engineer, and adjustments were made to the mix proportioning to correct previous discrepancies. The initial start-up at the beginning of each work day does not constitute a stop in production due to non-compliant %RAP.

If at any time the Contractor chooses to stop production in order to correct discrepancies in the mix proportioning concerning the %RAP, the most recent data (not to exceed 4 points) will be averaged. If the average exceeds the maximum allowed %RAP by more than 1% then a Contract Deduct will be assessed as calculated above with the following substitutions:

In the case where less than 4-points are available for the 4-point moving average, the most recent test is substituted for the 4<sup>th</sup> test, and the %RAP<sub>4</sub> may be a single test, a 2-point moving average or a 3-point moving average.

**e. Mixes with Reclaimed Asphalt Pavement (RAP) and Recycled Asphalt Shingles (RAS).** The intent of this section is to prevent more RAP and RAS going into a mix than is allowed in the Contract Documents. Totalizers are used to determine the %RAP and %RAS in a mix; however, this does not preclude the Engineer from using other methods for determining the %RAP and %RAS in a mix.

Provide the Engineer with the totalizer readings at the end of each day of production. These shall include the final daily readings for the RAP, RAS, virgin aggregates and asphalt binder.

The %RAP and %RAS will be checked a minimum of twice a day by the Engineer. Take the readings a minimum of 2 hours apart and a maximum of 6 hours apart. Do not take the readings within the first hour of start-up as adjustments to the plant are most frequent within this time frame.

Calculate RAP percentages using the plant totalizers for the virgin aggregates (AGG<sub>v</sub>), RAP and the RAS as follows:

**Equation C:**      %RAP = 
$$\frac{RAP * 100}{RAP + RAS + AGG_v}$$

%RAP is the percent RAP in the total aggregates (Virgin, RAP and RAS) rounded to the nearest tenth.

RAP is the difference between the current and last reading of the RAP totalizer in tons.

RAS is the difference between the current and last reading of the RAS totalizer in tons.

AGG<sub>v</sub> is the difference between the current and last reading of the Virgin Aggregate totalizer in tons.

%RAP is considered out of compliance when any of the following occurs:

- Any single test exceeds 13%.
- The 4-point moving average exceeds 10%.

Actions to be taken if the %RAP is out of compliance:

- If any single test exceeds 13% stop production, perform the “0 check run” on the belts in the presence of the Engineer, and make adjustments to correct the discrepancy.

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- If the 4-point moving average exceeds 10% three consecutive times, stop production, perform the “0 check run” on the belts in the presence of the Engineer, and make adjustments to correct the discrepancy.
- If the 4-point moving average exceeds 11% then the Contractor will be assessed the following penalty.

**Equation D:**      Contract Deduct = 
$$\frac{BP * Q * (\%RAP_4 - \%RAP_{max})}{100}$$

Contract Deduct is the Dollar amount to be subtracted from the contract.

BP is the Bid Price of the mix.

Q is the Quantity, in tons, of material represented by the 4-point moving average. This value shall be based on the weigh tickets taken from the time of the 1<sup>st</sup> test of the 4-point moving average through the time of 4<sup>th</sup> test.

%RAP<sub>4</sub> is the 4-point moving average of %RAP.

%RAP<sub>max</sub> is 10%.

Calculate RAS percentages using the plant totalizers for the virgin aggregates (AGG<sub>v</sub>), RAP and the RAS as follows:

**Equation E:**      %RAS = 
$$\frac{RAS * 100}{RAP + RAS + AGG_v}$$

%RAS is the percent RAS in the total aggregates (Virgin, RAP and RAS) rounded to the nearest tenth.

RAP is the difference between the current and last reading of the RAP totalizer in tons.

RAS is the difference between the current and last reading of the RAS totalizer in tons.

AGG<sub>v</sub> is the difference between the current and last reading of the Virgin Aggregate totalizer in tons.

%RAS is considered out of compliance when any of the following occurs:

- Any single test exceeds 6%.
- The 4-point moving average exceeds 5%.

Actions to be taken if the %RAS is out of compliance:

- If any single test exceeds 6% stop production, perform the “0 check run” on the belts in the presence of the Engineer, and make adjustments to correct the discrepancy.
- If the 4-point moving average exceeds 5% three consecutive times, stop production, perform the “0 check run” on the belts in the presence of the Engineer, and make adjustments to correct the discrepancy.
- If the 4-point moving average exceeds 6% then the Contractor will be assessed the following penalty.

**Equation F:**      Contract Deduct = 
$$\frac{BP * Q * 5 * (\%RAS_4 - \%RAS_{max})}{100}$$

Contract Deduct is the Dollar amount to be subtracted from the contract.

BP is the Bid Price of the mix.

Q is the Quantity, in tons, of material represented by the 4-point moving average. This value shall be based on the weigh tickets taken from the time of the 1<sup>st</sup> test of the 4-point moving average through the time of 4<sup>th</sup> test.

%RAS<sub>4</sub> is the 4-point moving average of %RAS.

%RAS<sub>max</sub> is 5%.

The deduct for RAP and RAS will each be paid for under a separate Contract Deduct bid item.

Any time production is stopped due to non-compliant %RAP or %RAS, restart the 4-point moving average provided the belt had the “0 check run” performed in the presence of the Engineer, and adjustments were made to the mix proportioning to correct previous discrepancies. The initial start-up at the beginning of each work day does not constitute a stop in production due to non-compliant %RAP or %RAS.

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If at any time the Contractor chooses to stop production in order to correct discrepancies in the mix proportioning concerning the %RAP or %RAS, the most recent data (not to exceed 4 points) will be averaged. If the average exceeds the maximum allowed %RAP or %RAS by more than 1% then a Contract Deduct will be assessed as calculated above with the following substitutions:

In the case where less than 4-points are available for the 4-point moving average, the most recent test is substituted for the 4<sup>th</sup> test, and the moving average may be a single test, a 2-point moving average or a 3-point moving average.

**602.6 COMPACTION TESTING**

**a. General.** Make the density determination of the compacted mixture using test results on random samples selected by the Contractor or Engineer (see **subsection 602.2i.(1)**) from each lift placed. Select sites according to the approved QCP. Take the nuclear density tests or core samples before placement of the next lift and before opening to construction or public traffic, and no later than the next working day following the date of placement.

Exception to coring after any traffic on the overlay. Do not use this procedure more than twice on any one project or tied projects, unless approved by the Engineer. The Contractor may request re-evaluation by coring. (Testing and coring shall be subsidiary items.) When coring is requested, the follow these procedures for the lot under re-evaluation.

(1) Immediately prior to coring, determine nuclear gauge densities in the presence of the Engineer in the locations previously tested. The average nuclear gauge density after traffic will be determined. A Contractor density correction factor will be calculated as follows: the average nuclear gauge density after traffic minus the average nuclear gauge density before traffic. If the calculated Contractor density correction factor is a negative value, the Contractor's density correction factor will be set equal to zero (normally the density correction factor will be a positive number).

(2) Immediately before coring, nuclear gauge densities will be determined by the Engineer in the presence of the Contractor in the locations previously tested. The average nuclear density after traffic will be determined. A KDOT density correction factor will be calculated as follows, the average nuclear gauge density after traffic minus the average nuclear gauge density before traffic. If the calculated KDOT density correction factor is a negative number, KDOT's density correction factor will be set equal to zero.

(3) Determine the Traffic Density Correction Factor. It will be the larger of the Contractor's density correction factor or KDOT's density correction factor determined in **subsections 602.6a.(1)** and **(2)**.

(4) With the Engineer present, obtain 1 core from each of the Contractor and KDOT nuclear gauge locations. Mark each core as they are taken. Take the cores to KDOT's field laboratory for drying and evaluation. Together, the Contractor and Engineer will determine the density of each core. Determine the corrected core density for each Contractor and KDOT core as follows: the core density minus the Traffic Density Correction Factor.

(5) Using the corrected Contractor core densities and the corrected KDOT core densities, the Engineer will re-evaluate this lot using the procedures outlined in **subsection 602.9**. Based on this re-evaluation, the Engineer will inform the Contractor of the lots disposition and density pay adjustment factor.

For shoulders with a plan width of less than or equal to 3 feet and placed at the same time as the traveled way, the density pay adjustment factors for the traveled way applies. Acceptance of or pay adjustment for density on all shoulders with a plan width greater than 3 feet and any shoulder not placed at the same time as the traveled way shall be according to **subsection 602.9**.

A lot consists of a day's production for each lift placed and contains the number of density locations as outlined in **TABLE 602-11**. Base lot acceptance on 2 test results from each subplot unless the Engineer's results (1 test per subplot) are used.  $V_a$  lots and density lots are normally of different sizes.

If the lane being placed is to be opened to traffic that day, the Engineer and the Contractor may predetermine the subplot size based on anticipated production. If actual production does not meet anticipated production, the subplot size will be adjusted. The number of tests shall be as outlined in **TABLE 602-11**.

The minimum number of density tests is as listed in **TABLE 602-11**. The Contractor has the option to take additional tests to provide 10 test results to determine payment. The density pay adjustment factors are computed using formulas in **subsection 602.9**. The density pay adjustment factors do not apply to sideroads, entrances, crossovers and other incidental surfacing.

**b. Nuclear Density Tests (For mixes with a specified thickness of 1½ inches or greater.).** Take 2 nuclear density tests at random within each subplot. The Engineer will take 1 random nuclear density verification test



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per subplot. Perform nuclear density testing to be used in the determination of the traveled way pay adjustment factors and control of shoulder density. Do not take nuclear gauge readings within 1 foot of a longitudinal joint or edge, nor within 20 feet of a transverse joint. For shoulders with a plan width of less than or equal to 3 feet, and placed at the same time as the traveled way, do not take nuclear density readings on the shoulder nor within 1 foot of the shoulder unless the pavement section is uniform across the entire roadway. Mark the outline of the nuclear gauge on the pavement at each location tested with a method of marking that shall last a minimum of 24 hours. Take the nuclear density test at the random location. Do not move the gauge from this location to maximize or minimize the density results. If the Contractor doubts the accuracy of any of the nuclear density test results, the pavement may be cored at the nuclear gauge test locations. If coring is chosen to determine the density for pay adjustment purposes, then all nuclear density test results representing the lot shall be voided and cores taken as prescribed in **subsection 602.6c**.

Take verification nuclear density tests, 1 per subplot, at random locations selected by the Engineer. Payment factors will be based on the Contractor's nuclear density test results, provided those results are validated by KDOT's nuclear density tests.

The Engineer will determine a calibration factor for the Contractor's nuclear density device at the same time as a calibration factor is determined for KDOT's device. The Contractor will be afforded the opportunity to observe the calibration procedure whether it is performed at the district laboratory or on the project site. The Engineer should provide calibration factors by the end of the working day following the date of collecting the cores. In cases where this is not possible, the Contractor and the Engineer may agree in advance to accept a zero pay adjustment for the concerned lots.

The Engineer and Contractor will compare nuclear density test results before any traffic is allowed on the roadway. If the Contractor or KDOT density values are suspect, the Engineer may approve re-testing the locations in question. When re-testing is approved, substitute the new nuclear density values for the values in question. Before traffic is allowed on the roadway, the Contractor needs to determine if cores will be taken.

**c. Cores (For mixes with a specified thickness of 1½ inches or greater.)** Take 2 cores at random locations within each subplot. It may be necessary to chill the compacted mixture before coring so that the samples may be removed intact without distortion. Cut the samples using a 4-inch coring device, unless a 6-inch coring device is approved by the Engineer. Mark all samples with the lot number, subplot number and core number.

Transport the cores to the laboratory as soon as possible to prevent damage due to improper handling or exposure to heat. Cut all cores including the Engineer's verification cores. The Contractor will be paid only for cores cut to calibrate the nuclear gauge, when requested by the Engineer. Use KT-15 Procedure III to determine core density.

Do not take cores within 1 foot of a longitudinal joint or edge, nor within 20 feet of a transverse joint. For shoulders with a plan width of less than or equal to 3 feet, and placed at the same time as the traveled way, do not take cores on the shoulder nor within 1 foot of the shoulder unless the pavement section is uniform across the entire roadway.

Take 1 verification core per subplot (at locations selected by the Engineer) for testing at KDOT's laboratory. Density pay adjustment factors and control of shoulder density are based on the core results, provided those results are validated by the verification cores sent to KDOT's laboratory.

Dry the core holes, tack the sides and bottom, fill with the same type of material and properly compact it by the next working day.

**602.7 WEATHER LIMITATIONS**

Do not place HMA on any wet or frozen surface or when weather conditions otherwise prevent the proper handling and finishing of the mixture.

Only place HMA when either the minimum ambient air temperature or the road surface temperature shown in **TABLE 602-13** is met.

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TABLE 602-13: MINIMUM HMA PLACEMENT TEMPERATURES							
Paving Course	Thickness (inches)	Air Temperature (°F)			Surface Temperature (°F)		
		HMA	WMA Foam	WMA Chem	HMA	WMA Foam	WMA Chem
Surface	All	50	45	40	55	50	45
Subsurface	<1.5	50	45	40	55	50	45
Subsurface	≥1.5 and < 3	40	35	30	45	40	35
Subsurface	≥ 3	30	30	30	35	32	32

**602.8 MIXTURE ACCEPTANCE**

**a. General.** Test each mix designation at each plant for compliance with **TABLE 602-1**. Acceptance will be made on a lot by lot basis contingent upon satisfactory test results. Obtain test samples of the mix designation from the roadway behind the paving operation before compaction. The sampling device and procedures used to obtain the samples must be approved by the Engineer. Use KT-25 for obtaining HMA from the roadway and splitting of the sample. The Contractor’s quality control tests will be used for acceptance provided those results are verified by KDOT.

A load or loads of mixture which, in the opinion of the Engineer, are unacceptable for reasons such as being segregated, aggregate being improperly coated, foaming aggregate or being outside the mixing temperature range may be rejected. Verification samples will be taken by the Engineer at randomly selected locations from behind the paver. Fill all sample locations before compaction.

The  $V_a$  test values will also be used to determine  $V_a$  pay adjustments according to **subsection 602.9d**.  $V_a$  pay adjustments apply to the HMA placed on the traveled way and shoulders (including ramps and acceleration and deceleration lanes).

**b. Lot Definition for Mix Production Sampling and Testing.** A lot is defined as an isolated quantity of a specified material produced from a single source or operation. Each lot shall normally be represented by 4 contiguous test results. A lot may be represented by test results on samples taken from 1 or more day’s production.

**c. Lot Investigation.** The Engineer may examine materials represented by individual test results which lie beyond the Contractor’s normal quality control testing variation. The investigation may be based on either Contractor or KDOT test results. The information from additional testing (including testing of in-place HMA) may be used to define unacceptable work according to **SECTION 105**. The Engineer may apply appropriate price reductions or initiate corrective action.

For any test, if a dispute exists between the Engineer and Contractor about the validity of the other’s test results, the KDOT District Materials Laboratory or the MRC will perform referee testing, except for nuclear density dispute resolution and  $V_a$  dispute resolution. If the disputed KDOT test results were generated at the District Laboratory, the MRC will perform the referee tests. If the disputed KDOT test result was generated at the MRC, an independent laboratory agreeable to both parties will be selected. The Laboratory shall be accredited by the AASHTO Accreditation Program in the appropriate testing category.

If referee testing indicates that KDOT test results are correct, the Contractor pays for the additional testing, including referee testing performed at the MRC. This will be paid using the bid item Contract Deduct which will be an item added to the contract.

If the referee testing indicates that Contractor test results are correct, KDOT pays for the additional testing. Pay the independent lab for the testing and submit the paid invoice to KDOT. The Engineer will reimburse the Contractor (based on the invoice price) as Extra Work, **SECTION 104**.

(1) For nuclear density dispute resolution (the statistical comparison fails and the Contractor questions KDOT’s results), the following procedure applies:

- Discard pay factors previously established with the nuclear gauge, and use the core results to establish the pay factors.
- With the Engineer present, take 1 core from each of the locations previously tested with the Contractor’s nuclear gauge and KDOT’s nuclear gauge (normally 15 cores). Mark all cores with the lot number, subplot number and core number.

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- Take the cores to the field laboratory and dry to a constant weight before testing. The Contractor and the Engineer, working together, will determine the core densities (KT-15, Procedure III).
- A statistical comparison will be made between Contractor and KDOT core results. If the t-test passes, KDOT will pay for all cores. The Contractor's test results will be used to calculate the density pay factors. If the t-test fails, KDOT will not pay for the cores. KDOT test results will be used to calculate the density pay factors.

(2) For  $V_a$  dispute resolution (the statistical comparison fails and the Contractor questions KDOT results), the following procedure applies for the lots in question:

- Determine which lots to dispute. Only dispute the lot produced immediately prior to the lot currently under production and being tested. Notify the Engineer, prior to the completion of all Contractor  $V_a$  testing for this lot. (When production is completed for any mix, the last lot may be challenged the day production is completed). When the hot mix plant shuts down for the winter, the Contractor has a maximum of 7 calendar days to dispute the last lot produced prior to winter shut down.
- Discard  $V_a$  and  $V_a$  pay adjustment factors previously determined within the lots being questioned.
- All saved gyratory compacted  $V_a$  quality control and verification samples and back half of samples within the lots in question will be taken by KDOT to the District Materials Laboratory. All back half of samples shall be a minimum of 35 pounds. Failing to obtain enough material removes the right to dispute resolution. Copies of all paperwork, including work sheets, associated with previous  $V_a$  calculations for the disputed lots will also be taken to the District Materials Laboratory.

The following retesting will be completed by KDOT:

- Check the samples to be sure they are dry before retesting. Reweigh the original gyratory compacted  $V_a$  quality control and verification samples. Determine the  $G_{mb}$  at  $N_{des}$  revolutions for all saved gyratory plugs. Compare retest results with original test results. Use this information to isolate potential testing errors, but continue with the remainder of the retesting steps.
- Determine the  $G_{mm}$  using the back half of all samples within each lot being questioned. Normally, there will be 5 back halves (4 Contractor's and 1 KDOT) to test within each lot.
- Compact the back halves to  $N_{max}$  revolutions and determine the  $G_{mb}$  at  $N_{des}$  revolutions.
- Use  $G_{mm}$  determined above and the  $G_{mb}$  determined from the recompacted samples to calculate  $V_a$  at  $N_{des}$  revolutions for the lots in question.
- Using the retest  $V_a$  results, a statistical comparison will be made. If the t-test passes, the Contractor's retest results will be used to calculate the pay factor and KDOT will pay for all retesting. Use the procedures shown in **subsection 602.9d**. If the t-test fails, KDOT's retest results will be used to calculate the pay factor, and the Contractor will pay for all retesting.

**d. Resampling of Lots.** Take no samples for retest for pay adjustment purposes except as noted in **subsections 602.6b.** and **602.8c.**

**e. Multiple Projects.** If multiple projects are supplied from 1 or more plants using the same mix, carry over the lots at each hot mix plant from project to project.

**f. Lot Size.** A standard size mix production lot (density test lots are defined in **subsection 602.6a.(5)**) consists of 4 equal sublots of 750 tons each of HMA (lot size is 3,000 tons).

It is anticipated that lot size shall be as specified. However, with the Engineer's approval, the Contractor may re-define lot size for reasons such as, but not limited to, change in contract quantities or interruption of the work. Take 1 sample during production of each sublot and utilize it to determine disposition of the lot in which it occurs.

**g. Increased Lot Size.** After 8 consecutive sublots have been produced within the tolerance shown for all mix characteristics listed in **TABLE 602-12** and without a  $V_a$  penalty, the subplot size may be increased to 1,000 tons (lot size of 4,000 tons), provided the normal production rate of the plant is greater than 250 tons per hour. Provide immediate notification of lot size changes to the Engineer any time a change is made.

After 8 additional consecutive sublots have been produced at the 1,000 ton subplot size, the subplot size may again be increased to 1,250 tons per subplot ( lot size of 5,000 tons), provided all 8 consecutive 1,000 ton sublots have been produced within the tolerances shown for all mix characteristics listed in **TABLE 602-12**, without a  $V_a$

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penalty, production rates for the previous 2 days have been greater than 3,750 tons per day, and a minimum of 2 of the last 3 segregation profile checks comply with **TABLE 602-14**.

<b>TABLE 602-14: SEGREGATION PROFILE CHECKS FOR INCREASED SUBLOT SIZE</b>		
<b>Mix Designation</b>	<b>Maximum Density Range (highest minus lowest)</b>	<b>Maximum Density Drop (average minus lowest)</b>
All	3.1 lbs./cu. ft.	1.9 lbs./cu. ft.

If subsequent test results fall outside the tolerances shown for any mix characteristic listed in **TABLE 602-12** or a  $V_a$  penalty is incurred, decrease the subplot size to 750 tons. If the production rates fall below 3,750 tons per day for 2 consecutive days or a minimum of 2 of the last 3 segregation profile checks fail the above requirements, then reduce the 1,250 ton sublots size to 1,000 ton per subplot provided the **TABLE 602-12** criteria is met and no  $V_a$  penalty is incurred.

When the increased lot size criteria are again met for 4 consecutive sublots, the subplot may be increased as the limits given above.

**h. Decreased Lot Size for Small Quantities.** This is to be used when a small quantity (less than 3,000 tons) of a particular mix will be used. Use the plan quantity for the lot size. Reduce the subplot size below 750 tons by dividing the lot into 3 or 4 equal sublots. Before beginning production, provide the Engineer with the number and size of the sublots.

**i. Pre-Production Mix.** Test and evaluate a pre-production mix, limited to a maximum of 200 tons from each plant and type of mix before production of that mix. Evaluate the pre-production mix at initial start-up and after suspension of production resulting from failing test results. Do not adjust  $V_a$  payment for pre-production mixes. Provide a pre-production mix that complies with the gradation, D/B ratio, binder content, VMA, level of compaction for  $N_{ini}$ ,  $N_{des}$ ,  $N_{max}$  and laboratory  $V_a$  requirements prior to starting or resuming production. For binder content,  $V_a$  at  $N_{des}$  and VMA, use the "Single Test Value" listed in **TABLE 602-12** for comparison. For the other tests listed, use the values listed in **TABLE 602-1** for each mix. Except for initial start-up, normal delivery of material to the project before completion of certain test results on pre-production mixes may be authorized by the DME.

Place the material produced for the pre-production mix in locations approved by the DME. On projects where HMA is paid by the ton, consider placing the pre-production mix in non-critical areas such as side roads, entrances, shoulders or deep in the base. The Engineer will pay for material as the material produced, not in the location placed. However to prevent potential cost overruns, do not run an excessive number of "higher cost" pre-production mixes (as determined by the Engineer) on shoulders or entrances.

On projects in which the HMA is paid by the square yard, place pre-production mixes where required by the Contract Documents. A higher quality pre-production mix may be placed at no additional expense to KDOT. If HMA materials which are designated to be placed in the top 4 inches of the pavement structure are placed deeper than 4 inches as a pre-production mix, do not count the material toward the requirement to place the material in the top 4 inches of the pavement section.

At the direction of the Engineer, remove the pre-production mix if it is both out of specification and the material shortens the pavement life or changes the intended function. The Engineer will pay for the replacement of one pre-production mix at 100% of the contract unit price for each mix in the contract (not each mix design). If the HMA is paid by the square yard, then the removed material will be paid for at a rate of \$40 per ton. The Engineer will create a change order (**SECTION 104**) adding the item of work with a unit price of \$40/ton. The payment will be full compensation to the Contractor for the placement and removal of that pre-production mix. KDOT will not be financially responsible for any subsequent failed pre-production mixes (that require removal) for that mix. The removed material is the property of the Contractor.

The Engineer will not pay for pre-production mixes that are required to be replaced due to poor workmanship or equipment failure. The Engineer will make the final decision to remove a failed pre-production mix with input from the Contractor.

**j. Suspension of Mix Production.** Suspend production of the mix until appropriate corrections have been made, if 2 consecutive test results for any single mix characteristic fail to fall within the limits established by the tolerances shown in the single test value column of **TABLE 602-12**. Additionally, suspend production of the mix

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until appropriate corrections have been made, if any 4-point moving average value for any single mix characteristic fails to fall within the limits established by the tolerances shown in the 4-point moving average value column of **TABLE 602-12**. Production remains suspended pending the satisfactory results of a pre-production mix, unless waived by the DME.

The Engineer may stop production of HMA at any time the mix or process is determined to be unsatisfactory. Make the necessary corrections before production will be allowed to resume. Failure to stop production of HMA subjects all subsequent material to rejection by the Engineer, or acceptance at a reduced price, as determined by the Engineer.

**602.9 BASIS OF ACCEPTANCE**

**a. General.** Acceptance of the mixture will be contingent upon test results from both the Contractor and KDOT. The Engineer will routinely compare the variances (F-test) and the means (t-test) of the verification test results with the quality control test results for  $V_a$ ,  $G_{mm}$  and density using a spreadsheet provided by KDOT. If KDOT verification test results do not show favorable comparison with the Contractor's quality control test results, then KDOT test results will be used for material acceptance, material rejection and the determination of any pay adjustment on the  $V_a$  and roadway density. Disputed test results will be handled according to **subsection 602.8c**.

KDOT will use a spreadsheet program to calculate pay adjustments for density and  $V_a$ , and to compare Contractor QC and KDOT QA test results (including  $G_{mm}$ ). KDOT will provide a copy of this program to the Contractor, when requested. Microsoft Excel software is required to run this program; it is the Contractor's responsibility to obtain the correct software. Values computed using equations referenced in this specification may vary slightly from the spreadsheet values due to rounding of numbers. In such cases, the numbers computed by the spreadsheet will govern.

The comparison of quality control and verification tests will be completed using the t-tests to compare their population means and the F-test to compare their variances. The F & t tests, along with the Excel Spreadsheet used to compare the Contractor's QC results and KDOT's QA results, are described in Section 5.2.6 – Comparison of Quality Control and Verification Tests, Part V. (Examples of Air Voids F & t tests, along with Density F & t tests are shown in this section.) Additional information on the program may be obtained from the Bureau of Construction and Materials.

**b. Asphalt Density Pay Adjustment for "HMA Overlay" Bid Items.** Mixes with specified thickness of less than 1½ inches are not subject to the asphalt density pay adjustments.

For mixes with specified thickness of 1½ inches or greater: Asphalt density pay adjustment for compaction of the completed pavement shall be by lot, based on the percentage of  $G_{mm}$  obtained. Compute the asphalt density pay adjustment (incentive or disincentive) by multiplying the density pay adjustment factor ( $P_D$ ) times the number of tons included in the lot times \$40 per ton. (Air voids lots and density lots are normally of different sizes.) This adjustment will be paid for under the bid item Asphalt Density Pay Adjustment.

Density pay factors will be determined from **TABLE 602-15**. (For **TABLE 602-15**, average the percent of  $G_{mm}$  values to 0.01% and calculate the density pay adjustment factors rounded to the thousandths).

<b>TABLE 602-15: DENSITY PAY FACTORS FOR SPECIFIED THICKNESS<sup>4</sup></b>			
<b>Specified Thickness →</b>	<b>≥ 2"</b>	<b>≥ 1½"</b>	
	<b>All</b>	<b>Continuous Action<sup>5</sup></b>	<b>No Continuous Action<sup>6</sup></b>
<b>% of <math>G_{mm}</math> Average of 10 Density Tests<sup>1</sup></b>	<b>Pay Factor<sup>2</sup></b>		<b>Pay Factor<sup>2</sup></b>
93.0% or greater	1.040		1.040
92.0 to 92.9%	A1		A1
91.0 to 91.9%	1.000		1.000
90.0 to 90.9%	A2		1.000
89.0 to 89.9%	0.840 or Remove <sup>3</sup>		A3
less than 89.0%	0.840 or Remove <sup>3</sup>		0.840 or Remove <sup>3</sup>

<sup>1</sup>For low daily production rates less than 1000 tons, or when the Engineer's verification tests are to be used for asphalt density pay determination, the lot sample size is as determined in **TABLE 602-11**.

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<sup>2</sup>Shoulders: For shoulders with a plan width greater than 3 feet and any shoulder not placed at the same time as the traveled way, compact the HMA in the lot to a minimum of 90.00% (if specified thickness is  $\geq 2$ " ) or 89.00% (if the specified thickness is from 1½" to 1⅞") of the  $G_{mm}$ . Otherwise, the Engineer will determine whether the HMA in the lot may remain in place or be removed. Any such material left in place shall have a density pay factor of 0.950 or less.

<sup>3</sup>Low Density: The Engineer will determine if the traveled way, shoulders with a plan width of 3 feet or less and placed with the traveled way, ramps, acceleration and deceleration lanes may remain in place or be removed. The Engineer will notify the Contractor before 11:00 AM of the next working day if the area is to be removed. Any such material left in place shall have a density pay factor of 0.840.

<sup>4</sup>Specified thickness is the total thickness shown in the Contract Documents for the mix being placed.

<sup>5</sup>Use for  $\geq 1\frac{1}{2}$ " when another continuous action, such as milling, surface recycling, cold recycling or overlay is completed ahead of this overlay.

<sup>6</sup>Use for  $\geq 1\frac{1}{2}$ " when another continuous action is not completed before the overlay.

**Calculations for Density Pay Factors A1, A2 and A3:**

$$A1 = [100 + 4 (\% \text{ of lot } G_{mm} - 92.00)] \div 100$$

$$A2 = [84 + 16 (\% \text{ of lot } G_{mm} - 90.00)] \div 100$$

$$A3 = [84 + 16 (\% \text{ of lot } G_{mm} - 89.00)] \div 100$$

**Density Pay Adjustment Factor Calculation:**

$$\text{Density Pay Adjustment Factor } (P_D)^* = \text{Density Pay Factor} - 1.000$$

\* $P_D$  rounded to the nearest thousandth

**c. Asphalt Density Pay Adjustment for "HMA Surface", "HMA Base" and "HMA Pavement" Bid Items.** Asphalt Density Pay Adjustment for compaction of the completed pavement shall be by lot, based on the percentage of  $G_{mm}$  obtained. This adjustment will be paid for under the bid item Asphalt Density Pay Adjustment. Compute the Asphalt Density Pay Adjustment (positive or negative) by multiplying the Density Pay Adjustment factor ( $P_D$ ) times the number of tons included in the lot times \$40 per ton. The Asphalt Density Pay Adjustment will be added or subtracted on the pay estimate. For shoulders with a plan width of less than or equal to 3 feet, and placed at the same time as the traveled way, the  $P_D$  for the traveled way will apply. The  $P_D$  does not apply to sideroads, entrances, crossovers and other incidental surfacing. Use KDOT test results for the lot to determine the  $P_D$  when the statistical comparison between the quality control and the verification tests fail (see **subsection 602.9a.**).

**Lot Size:** A lot shall normally be comprised of the results of 10 tests performed on a day's placement of a given mix placed in a given lift. Lot size is defined in **subsection 602.6.** (Air void lots and density lots are normally of different sizes).

**Shoulders:** For all shoulders with a plan width greater than 3 feet and any shoulder not placed at the same time as the traveled way, the lower specification limit (LSL) is 90.00%. When the lower percent within limits ( $PWL_{LD}$ ) is 50.00% or more for the lot,  $P_D$  is zero. When the  $PWL_{LD}$  is less than 50.00% for the lot, the Engineer will determine whether the HMA in the lot may remain in place or be removed. Any such material left in place will have a  $P_D$  of -0.050, unless the Engineer establishes lower values for  $P_D$  (-0.100, -0.200, -0.300, etc.) as a condition of leaving the material in place.

Determination of  $P_D$  and  $PWL_{LD}$ : Calculate the lower density quality index ( $Q_{LD}$ ) for each lot using Equation 1 and round to hundredths. Locate the  $Q_{LD}$  value in the left column of the Percent Within Limits (PWL) Table in Section 5.2.1 - Statistics, Part V. Select the appropriate  $PWL_{LD}$  value by moving across the selected quality index row to the column representing the number of samples in the lot.

If  $Q_{LD}$  is greater than the largest quality index value shown in the table, use 100.00 as the value for  $PWL_{LD}$ .

If  $PWL_{LD}$  is less than 50.00% for the lot, the Engineer will determine if the material in the lot may remain in place. If the material is left in place, the value of  $P_D$  for the lot will be equal to -0.160, unless the Engineer establishes lower values for  $P_D$  (-0.200, -0.300, etc.) as a condition of leaving the material in place. Otherwise, calculate  $P_D$  using Equation 2 and round to thousandths.

**Equation 1:** 
$$Q_{LD} = \frac{\bar{X} - LSL}{S}$$

$\bar{X}$  is the average measured percent of  $G_{mm}$  of all samples within a lot rounded to hundredths.

LSL is the lower specification limit for density and is defined as 91.00% of  $G_{mm}$  for traveled way plan thickness 2 inches and less and 92.00% of  $G_{mm}$  for traveled way plan thickness greater than 2 inches.

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S is the standard deviation of the measured density of all samples within a lot and is calculated using equation (4) in Section 5.17.09, Part V, rounded to hundredths.

**Equation 2:** 
$$P_D = (PWL_{LD} * 0.004) - 0.360$$

**d. Asphalt Air Void Pay Adjustment.** Asphalt Air Void ( $V_a$ ) Pay Adjustment will be made on a lot basis and based on measured  $V_a$  from samples of plant produced material. This adjustment will be paid for under the bid item Asphalt Air Void Pay Adjustment. The  $V_a$  pay adjustment factor ( $P_V$ ) (positive or negative) will be determined and used to compute the  $V_a$  Pay Adjustment by multiplying  $P_V$  times the number of tons included in the lot times \$40 per ton. The  $V_a$  Pay Adjustment will be added or subtracted on the pay estimate. When the statistical comparison between the quality control and the verification tests pass, use the procedures in **subsection 602.9d.(1)** to compute  $P_V$ . When the statistical comparison fails, calculate  $P_V$  using procedures in **subsection 602.9d.(2)**.

**Lot Size:** A lot shall normally be comprised of the results of 4 contiguous individual  $V_a$  tests performed on gyratory compacted samples of a given mix design. Lot size is defined in **subsections 602.8f, 602.8g, and 602.8h**. When there are 1 or 2 tests remaining, such as at the end of a project or season, combine them with the previous 4 tests to create a 5 or 6 test lot, respectively. When there are 3 tests remaining, combine the 3 tests into a lot. (Air voids lots and density lots are normally of different sizes).

(1) Air Voids Pay Adjustment Factor (Passing t-test). Calculate the upper and lower  $V_a$  quality indices ( $Q_{UV}$  and  $Q_{LV}$ ) for each lot using Equations 3 and 4, respectively and round to hundredths. Locate the  $Q_{UV}$  value in the left column of the Percent Within Limits (PWL) Table in Section 5.2.1 – Statistics, Part V. Select the appropriate upper percent within limit value ( $PWL_{UV}$ ) by moving across the selected quality index row to the column representing the number of samples (N) in the lot. Repeat the process using the  $Q_{LV}$  value and select the appropriate value for the lower percent within limits ( $PWL_{LV}$ ). If the  $Q_{UV}$  or  $Q_{LV}$  value is greater than the largest quality index value shown in the table, then a value of 100.00 is assigned as the value for  $PWL_{UV}$  or  $PWL_{LV}$ , respectively. If both  $Q_{UV}$  and  $Q_{LV}$  exceed the values shown in the table, a value of 100.00 is assigned as the value for both  $PWL_{UV}$  and  $PWL_{LV}$ . If either  $Q_{UV}$  or  $Q_{LV}$  is a negative value or  $PWL_{UV} + PWL_{LV}$  is less than 150.00, the Engineer will determine if the material in the lot may remain in place. If the Engineer determines that the material may remain in place then the maximum value of  $P_V$  for the lot will be equal to -0.120. The Engineer may establish lower values for  $P_V$  (-0.200, -0.300, etc.) in such instances. Otherwise, calculate  $P_V$  using Equation 5 and round to thousandths.

**Equation 3:** 
$$Q_{UV} = \frac{USL - \bar{X}}{S}$$

**Equation 4:** 
$$Q_{LV} = \frac{\bar{X} - LSL}{S}$$

$\bar{X}$  is the average measured  $V_a$  of all samples within a lot rounded to hundredths.

USL is the upper specification limit for  $V_a$  and is defined as 5.00%.

LSL is the lower specification limit for  $V_a$  and is defined as 3.00%.

S is the standard deviation of the measured  $V_a$  for all samples within a lot and is calculated using equation (4) in Section 5.2.1 - Statistics, Part V, rounded to hundredths.

**Equation 5:** 
$$P_V = ((PWL_{UV} + PWL_{LV} - 100.00)(0.003)) - 0.270$$

$PWL_{UV}$  is the upper percent within limits value for  $V_a$ .

$PWL_{LV}$  is the lower percent within limits value for  $V_a$ .

(2) Air Voids Pay Adjustment (Failing t-Test). If the t-test fails, KDOT's test result will be used to calculate the  $P_V$  for the lot. Follow the procedures given in **subsection 602.9d.(1)** to determine the  $P_V$  or disposition of the lot. Use the values from **TABLE 602-16** to calculate  $Q_{UV}$ ,  $Q_{LV}$ ,  $PWL_{UV}$  and  $PWL_{LV}$  in Equations 3, 4 and 5 in **subsection 602.9d.(1)**.

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<b>TABLE 602-16: Statistical Values for Air Voids Pay Adjustment for Failing t-Test</b>		
<b>Term</b>	<b>Definition</b>	<b>Value</b>
$\bar{X}$	Average or Mean	KDOT's test result for the lot
S	Standard Deviation	0.50
USL	Upper Specification Limit	5.50%
LSL	Lower Specification Limit	2.50%
N	Sample Size	3

**602.10 DETERMINATION OF THICKNESS, THICKNESS PAY ADJUSTMENT AND AREA PAY ADJUSTMENTS FOR "HMA PAVEMENT" AND "HMA PAVEMENT SHOULDER" BID ITEMS**

**a. General.** Construct the pavement to the dimensions shown in the Contract Documents. Inform the Engineer when a section is ready for coring and measurement of width and length. Complete all paving of the shoulder and driving lanes within this section, unless otherwise approved by the Engineer.

A driving lane is defined as mainline lanes, acceleration lanes (including tapers), deceleration lanes (including tapers), auxiliary lanes, ramp lanes or combination thereof.

When shoulders, medians and widenings are placed monolithically with the adjacent driving lane, and there is not a separate bid item for shoulders, then the shoulders are considered as part of the driving lane, and are subjected to the same unit price adjustment as the driving lane.

**b. Measurements.** The Engineer will divide the projects into lots. A lot is comprised of 5 sublots with the same plan thickness. A subplot is defined as a single driving lane or a single shoulder, with an accumulative length of 1000 feet. If the last lot has 1 or 2 sublots (such as at the end of a project or season), combine them with the previous lot to create a lot with 6 or 7 sublots, respectively. Consider as a single lot if there are 3 or 4 sublots in the final lot.

The Engineer will generate 1 random location for coring within each subplot. Do not take a core within 1 foot of a longitudinal joint or edge. Obtain the cores with the Engineer present.

Take a 4-inch diameter core from the selected sites. Mark each core with its lot and subplot number, and transport to the KDOT field lab.

For information only, the Engineer will determine the thickness of each HMA mixture and the total HMA base for each core.

The Engineer will determine the total core thickness for pay by taking 3 caliper measurements at approximately 120° apart and record each to the nearest 0.1 inch. The average of the 3 caliper measurements rounded to the nearest 0.1 inch shall represent the average measured thickness. The Engineer will use the total pavement thickness measurements to determine thickness pay adjustment factors.

The Engineer will provide a copy of the results to the Contractor before the end of the following working day.

Prior to coring, the Contractor may request that areas trimmed without automatically controlled equipment be handled separately. (This would require the Contractor to designate the area as a lot before knowing the actual core thickness.) When requested and approved by the Engineer, each area will be considered a lot. Divide the area into 5 sublots and obtain 1 core from each subplot.

For Percent Within Limits (PWL) thickness analysis, if any subplot thickness exceeds the design thickness by more than 1.0 inch, the Excel spreadsheet will automatically consider that subplot thickness to be 1.0 inch more than the design thickness. The spreadsheet will recalculate a new lot mean and sample standard deviation based on the adjusted value.

Dry the core holes, tack the sides and bottom, fill them with a HMA mixture (approved for the project) and properly compact it by the end of the next working day.

**c. Deficient Measurements for Driving Lanes.** When any full depth core for driving lanes is deficient by 1.0 inch or greater from the specified thickness, take exploratory cores at intervals a minimum of 50 feet in each direction (parallel to the centerline) from the deficient core.

Continue to take exploratory cores in each direction until a core is taken that is deficient a maximum of 0.5 inch. Exploratory cores are used only to determine the length of pavement in a lot that is to be overlaid, as approved by the Engineer.



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The minimum overlay length (with surface mix) shall be equal to the distance between the cores that are deficient by a maximum of 0.5 inch, and the width to be paved shall be full width of the roadway (driving lanes and shoulders) when this occurs.

The minimum overlay thickness is 3 times the nominal maximum aggregate size.

Complete the overlay to the satisfaction of the Engineer. Mill butt joints on the ends of the overlay area. The Engineer will not pay for any milling costs.

The exploratory cores are not used to determine thickness pay adjustment factors. Randomly select another core (outside the overlay area) to represent the subplot.

**d. Deficient Measurements for Shoulders.** When any full depth core taken from the shoulders is deficient by greater than 1.5 inches, take exploratory cores at intervals a minimum of 50 feet in each direction (parallel to the centerline) from the deficient core.

Continue to take exploratory cores in each direction until a core is only deficient a maximum of 0.8 inches.

Exploratory cores are used only to determine the length of pavement in a lot that is to be removed and replaced, or accepted at a reduced price (in addition to any disincentive assessed on that lot), as approved by the Engineer.

The minimum repair length is equal to the distance between the cores that are deficient a maximum of 0.8 inches, and the full width of the shoulder.

Mill butt joints on the ends of the overlay area. The Engineer will not pay for any milling costs. Unless approved by the Engineer, replacing includes complete removal of all HMA within the area defined by the results of the exploratory cores. Rework, stabilize (if required) and regrade the subgrade. When required, reconstruct the base and replace all HMA mixes shown in the Contract Documents. Obtain 1 random core within this subplot and use its core length to determine the thickness pay adjustment factor.

**e. Asphalt Pavement Area Pay Adjustment.** Determine the areas for pay and pay adjustment as shown in **TABLE 602-18**. The KDOT spreadsheet program will calculate these areas. This adjustment will be paid for under the bid item Asphalt Pavement Area Pay Adjustment.

Irregularly shaped areas may have to be calculated outside the program and the area entered into the program. Compute pay per lot for areas placed and not placed (deducted) as shown in Equations 10, 11, 12 and 13.

**Equation 10:** Pay for Driving Lane =  $(\sum PDLA)(BP)$   
**Equation 11:** Pay Deduct for Driving Lanes =  $2(\sum PDLDA)(BP)$   
**Equation 12:** Pay for Shoulder =  $(\sum PSA)(BP)$   
**Equation 13:** Pay Deduct for Shoulder =  $2(\sum PSDA)(BP)$

$\sum PDLA$  = Pay Driving Lane Area per Lot, Square Yard  
 $\sum PDLDA$  = Pay Driving Lane Deduct Area per Lot, Square Yard  
 $\sum PSA$  = Pay Shoulder Area per Lot, Square Yard  
 $\sum PSDA$  = Pay Shoulder Deduct Area per Lot, Square Yard

BP = Bid Price for either the driving lanes or the shoulder, as applicable

<b>TABLE 602-17: HMA AREA ABBREVIATIONS</b>			
<b>Abbreviation</b>	<b>=</b>	<b>Definition</b>	<b>Units</b>
PDLA	=	Pay Driving Lane Area per Sublot	Sq Yd
PDLDA	=	Pay Driving Lane Deduct Area per Sublot,	Sq Yd
PSA	=	Pay Shoulder Area per Sublot	Sq Yd
PSDA	=	Pay Shoulder Deduct Area per Sublot	Sq Yd
MDLW	=	Measured Driving Lane Width	Ft
MSW	=	Measured Shoulder Width	Ft
MTLW	=	Measured Total Lane Width (includes shoulder, if any)	Ft
PDLW	=	Plan Driving Lane Width	Ft
PSW	=	Plan Shoulder Width	Ft
PTLW	=	Plan Total Lane Width (includes shoulder, if any)	Ft
EDLW	=	Excess Driving Lane Width	Ft
SL	=	Sublot Length	Ft

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<b>TABLE 602-18: HMA AREA SUBLOT CALCULATIONS<sup>1</sup></b>				
<b>Condition</b>	<b>PDLA<sup>2</sup></b>	<b>PDLDA<sup>2</sup></b>	<b>PSA<sup>2</sup></b>	<b>PSDA<sup>2</sup></b>
	<b>(Sq Yd)</b>	<b>(Sq Yd)</b>	<b>(Sq Yd)</b>	<b>(Sq Yd)</b>
<b>Projects with a Separate Bid Item for Shoulder</b>				
<b>Narrow Driving Lane</b>				
MSW is less than PSW	(SL)(MDLW)	(SL)(PDLW-MDLW)	(SL)(MSW)	(SL)(PSW-MSW)
MSW is greater than PSW	(SL)(MDLW)	(SL)(PDLW-MDLW)	(SL)(MSW <sup>3</sup> )	0
<b>Wide Driving Lane</b>				
MSW + EDLW is less than PSW	(SL)(PDLW)	0	(SL)(MSW+EDLW)	(SL)(PSW-MSW-EDLW)
MSW + EDLW is greater than PSW	(SL)(PDLW)	0	(SL)(MSW+EDLW <sup>4</sup> )	0
<b>Projects without a Separate Bid Item for Shoulder<sup>5</sup></b>				
Narrow Driving Lane and Shoulder	(SL)(MTLW)	(SL)(PTLW-MTLW)	N/A	N/A
Wide Driving Lane and Shoulder	(SL)(MTLW <sup>6</sup> )	0	N/A	N/A

<sup>1</sup>Deductions will be made for unplaced areas.

<sup>2</sup>Calculate the areas to the nearest 0.01 square yards. Measure the lengths and widths to the nearest 0.01 feet. Divide the result of all equations in this table by 9 so that the resulting units are square yards.

<sup>3</sup>MSW shall be between PSW and PSW + 0.25 feet. Any excess width over 0.25 feet will not be included in PSW.

<sup>4</sup>MSW+ EDLW shall be between PSW and PSW + 0.25 feet. Any excess width over 0.25 feet will not be included in PSW.

<sup>5</sup>Shoulder is normally 0.00 feet to 3.00 feet wide and placed at the same time as the driving lane. PTLW = PDLW + PSW

<sup>6</sup>MSTLW shall be between PTLW and PTLW + 0.25 feet. Any excess width over 0.25 feet will not be included for pay.

**f. Asphalt Pavement Thickness Pay Adjustment.** Compute the Asphalt Thickness Pay Adjustment for the driving lanes (TPA<sub>DL</sub>) and shoulders (TPA<sub>SH</sub>) using Equation 6 or 7, respectively. Compute the Asphalt Thickness Pay Adjustment factor (P<sub>T</sub>) as shown in Equation 9. Determine area calculations for the driving lanes and shoulders as shown in **TABLE 602-18**. **TABLE 602-17** provides the definition for the abbreviations used in **TABLE 602-18**. Enter the measured values into the spreadsheet program to determine PDLA and PSA.

This adjustment will be paid for under the bid item Asphalt Pavement Thickness Adjustment.

**Equation 6:**  $TPA_{DL} = P_T (\sum PDLA) (\$1.90) (\text{Plan Thickness})$

**Equation 7:**  $TPA_{SH} = P_T (\sum PSA) (\$1.70) (\text{Plan Thickness})$

TPA<sub>DL</sub> = Thickness Pay Adjustment per Lot for Driving Lane

TPA<sub>SH</sub> = Thickness Pay Adjustment per Lot for Shoulder

∑PDLA = Pay Driving Lane Area per Lot, Square Yard

∑PSA = Pay Shoulder Area per Lot, Square Yard

Plan Thickness = HMA Thickness shown on Plans, Inches

KDOT will use a spreadsheet program to calculate thickness pay adjustments. KDOT will provide a copy of this program to the Contractor, when requested. It is the Contractor's responsibility to obtain the Microsoft Excel software required to run this program. Values computed using equations referenced in this specification may vary slightly from the spreadsheet values due to rounding of numbers. In such cases the numbers computed by the spreadsheet take precedence.

**Thickness Quality Index (Q<sub>T</sub>) Computation.** In each lot, calculate Q<sub>T</sub> for the total pavement thickness using Equation 8 and round to hundredths.

**Equation 8:**  $Q_T = \frac{\bar{X} - LSL}{S}$

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$\bar{X}$  = Average total core length of all samples representing a lot, rounded to the nearest 0.1 inch. (Adjust core length before averaging, as shown in **subsection 602.10b.**)

LSL = Lower specification limit for thickness. For driving lanes use 0.5 inch less than the total plan driving lane thickness shown on the typical section. For shoulders, use 0.8 inch less than the total plan shoulder thickness shown on the typical section.

S = Sample standard deviation of the measured core lengths of all samples representing a lot and is calculated using equation (4) in Section 5.2.1 – Statistics, Part V, rounded to hundredths.

Use the computed  $Q_T$  to determine the thickness Percent Within Limits value ( $PWL_T$ ) by locating the  $Q_T$  in the left column of the Percent Within Limits (PWL) Table in Section 5.2.1 - Statistics, Part V. Select the appropriate  $PWL_T$  by moving across the selected  $Q_T$  row to the column representing the number of samples in the lot.

If the computed  $Q_T$  is a negative value, then the lot and all adjacent areas (full width of roadway) shall be overlaid as determined by the Engineer. After the lot has been overlaid, randomly select another core for each subplot, and calculate a new pay factor. For lots that have been entirely overlaid, the maximum pay factor is zero.

If the computed  $Q_T$  is greater than the largest  $Q_T$  shown in the PWL Table, a value of 100.00 is assigned as the  $PWL_T$  for thickness.

For each lot and all lanes and shoulders, compute the thickness pay factor ( $P_T$ ) for the total pavement thickness using Equation 9 and round to nearest thousandth. No bonus will be paid for shoulders, thus use  $P_T = 0.000$  whenever  $P_T$  calculates greater than 0.000 for shoulders.

**Equation 9:** 
$$P_T = \left( \frac{(PWL_T) * 0.30}{100} \right) - 0.270$$

**g. Minimum Quantity of HMA for Square Yard Projects with "HMA Pavement" and HMA Pavement Shoulder" Bid Items.** For the total project, supply a minimum of 93% of  $G_{mm}$  required by the surface course of driving lanes and shoulders and the top base course of driving lanes and shoulder. Calculate the minimum quantity of those 2 mixes, individually as follows:

**Equation 14:** 
$$\text{Minimum Quantity (Tons)} = \frac{0.93 (A) (T) (G_{mm})}{42.7}$$

A = Area in square yards for each of the mixes.

T = Plan thickness in inches of surface course and the top base course of driving lanes and shoulders.

$G_{mm}$  = Theoretical maximum specific gravity equals the average  $G_{mm}$  value used in the first 5 lots or the average  $G_{mm}$  for ½ of the project (whichever is less) for the 4 mixes listed in "T" in Equation 14. Determine the average  $G_{mm}$  from the Excel worksheet titled "Density F & T Test Worksheet".

If this minimum quantity of surface course or base course is not placed, a deduction of \$40 per ton will apply to the quantity not placed for each mix. This will be paid using the bid item Contract Deduct which will be an item added to the contract.

**602.11 MEASUREMENT AND PAYMENT**

**a. "HMA Base", "HMA Surface" and "HMA Overlay" Bid Items.** The Engineer will measure HMA Base, HMA Surface and HMA Overlay by the ton of material at the time of delivery to the road. Batch weights will not be allowed as a method of measurement unless all the following conditions are met:

- the plant is equipped with an automatic printer system approved by the Engineer;
- the automatic printer system prints the weights of material delivered; and
- the automatic printer system is used in conjunction with an automatic batching and mixing control system approved by the Engineer.

Provide a weigh ticket for each load. Due to possible variations in the specific gravity or weight per cubic foot of the aggregates, the tonnage used may vary from the proposal quantities and no adjustment in contract unit price will be made because of such variances.

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Payment for "HMA Base (\*)(\*\*)(\*\*\*)", "HMA Surface (\*)(\*\*)(\*\*\*)" and "HMA Overlay (\*)(\*\*)(\*\*\*)" at the contract unit prices is full compensation for the specified work. Any pay adjustments will both be applied and the payment adjusted accordingly.

Sideroads, entrances and mailbox turnouts that are not shown in the Contract Documents that are to be surfaced shall be paid for at 1½ times the unit price for "HMA Surface (\*)(\*\*)(\*\*\*)" or "HMA Base(\*)(\*\*)(\*\*\*)".

**b. "HMA Pavement" and "HMA Shoulder" Bid Items.** The Engineer will measure HMA Pavement and HMA Pavement Shoulder by the square yard of the measured in-place material. All lifts, except the surface course, will be measured by the Contractor and verified by the Engineer. The Engineer will measure the surface course.

Measure each shoulder width, each driving lane width and subplot length separately. Measure the lengths (to the nearest 0.1 inch) a minimum of once per subplot. The location of the width measurements will be the same location as the mainline cores which were established using random numbers. Before the end of the next working day, type and submit to the Engineer, the Contractor's individual measurements and the sum of the 2 driving lanes. Likewise, when the surface course is completed the Engineer will provide a typed copy of the surface course measurements to the Contractor before the end of the next working day.

If the driving lane and shoulder (measured from centerline) is less than 0.25 feet (per side) deficient, a deduction will be assessed. If the roadway is greater than 0.25 feet (per side) deficient, correction will be required. The correction will be proposed by the Contractor and must be approved by the Engineer. After satisfactory correction by the Contractor, the deduction for the narrow roadway will be eliminated for the areas corrected.

The Engineer will measure the subplot length and width (to the nearest 0.01 feet). Measure the width from the construction joint to the top of the slope of HMA pavement. Calculate the pay area for each lot to the nearest square yard. Unless the Engineer authorizes in writing to increase the area of HMA pavement, the Engineer will use dimensions shown in the Contract Documents and as measured in the field to calculate the final pay quantity. If the Engineer authorizes in writing to increase the area of HMA pavement or shoulder, the additional area will be measured and paid for as "HMA Pavement (#) (##)" or "HMA Pavement (#) Shoulder", respectively. The length will be measured horizontally along the centerline of each roadway or ramp.

Payment for "HMA Pavement (#) (##)" and "HMA Pavement (#) Shoulder" at the contract unit prices is full compensation for the specified work.

The Asphalt Pavement Thickness Adjustment and Asphalt Pavement Area Pay Adjustment will be entered on the Contractor's Payment Vouchers (intermediates and final) after each lot of the surface course (driving lanes and shoulders) has been completed.

The Contractor will receive no additional compensation for overlaying or for removing and replacing areas of deficient thickness. Exploratory cores and cores taken to determine pavement thickness will not be measured for payment. The Engineer will apply a Contract Deduct for surface course (driving lanes and shoulders) and top base course (driving lanes and shoulders) mix not placed on the project as determined using Equation 14. The Contract Deduct will be computed by the spreadsheet and be an item added to the contract.

If the project has a large amount of grinding required for pavement smoothness, the Engineer may require the Contractor to cut cores after the grinding is complete. These cores will be used in the spreadsheet in place of the cores originally cut.

**c. Emulsified Asphalt.** The Engineer will measure emulsified asphalt used for tack by the ton. Payment for "Emulsified Asphalt" at the contract unit price is full compensation for the specified work.

**d. Asphalt Core (Set Price).** The Engineer will measure each asphalt core required by the Engineer to calibrate the nuclear density gauges (typically 3 cores for each calibration). No payment will be made for cores deemed unsuitable for calibrating the nuclear density gauges. No payment will be made for cores taken at the Contractor's option to determine density.

If during nuclear density dispute resolution, the Contractor's test results are used for payment, each core taken will be measured for payment at 1 ½ times the Asphalt Core (Set Price). If KDOT's test results are used for payment, then no payment for cores will be made for nuclear density dispute resolution.

Payment for "Asphalt Core (Set Price)" at the contract set unit price is full compensation for the specified work.

**e. Material for HMA Patching (Set Price).** When the Contractor is required to remove any existing base course, subgrade or surface course (unless damaged by the Contractor) and provisions are not made in the Contract

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Documents, the Engineer will measure the material used for repair and patching (either HMA-Commercial Grade or a specified mix on the project) separately, by the ton at the time of delivery to the road. The Engineer will not measure the quantity of material used in the repair of damage due to the Contractor's negligence. The Engineer will measure HMA materials by the ton. For mixes containing Reclaimed HMA Pavement (RAP) or Recycled Asphalt Shingles (RAS), compute the HMA material contained in the RAP and RAS using the binder content determined from ignition oven testing. Maintain this information for materials tracking purposes. No separate payment for HMA material in RAP and RAS will be made. Combined gradation results will be used for acceptance in accordance with **TABLE 602-1**.

Payment for "Material for HMA Patching (Set Price)" at the contract set unit price includes all excavation, compaction of subgrade or subbase if required, disposal of waste material and all material (including emulsified asphalt for tack), all labor, equipment, tools, supplies, incidentals and mobilization necessary to complete the work. Pay adjustments will not be applied to this material.

**f. Quality Control Testing (HMA).** The Engineer will measure Quality Control Testing (HMA) performed by the Contractor on a per ton basis of HMA Surface, HMA Base, HMA Overlay and HMA Pavement placed on the project. No adjustment in the bid price will be made for overruns or underruns in the contract quantity. The bid price will constitute payment for all necessary mix design testing, field process control testing, the testing laboratory and all necessary test equipment.

The Engineer will not measure for payment Quality Control Testing (HMA) for the bid item Material for HMA Patching (Set Price).

Payment for "Quality Control Testing (HMA)" at the contract unit price is full compensation for the specified work.

## 611 - HOT MIX ASPHALT (HMA)-COMMERCIAL GRADE

### SECTION 611

#### HOT MIX ASPHALT (HMA)-COMMERCIAL GRADE

##### 611.1 DESCRIPTION

Construct the designated class of HMA-Commercial Grade asphalt pavement, as shown in the Contract Documents.

Class A HMA-Commercial Grade is intended for all areas that are not Class B locations. Class A includes permanent traffic areas and temporary traffic areas with moderate to high volumes of vehicular traffic such as driving lanes, auxiliary lanes and shoulders.

Class B HMA-Commercial Grade is intended for non-traffic areas and short-term temporary traffic areas with a low volume of vehicular traffic.

##### BID ITEMS

HMA-Commercial Grade (Class \*)  
 HMA-Commercial Grade (Class \*) (Patching)  
 \*A or B

##### UNITS

Ton  
 Ton

##### 611.2 MATERIALS

**a. Aggregates.** Provide individual aggregates that comply with **DIVISION 1100**.

**b. Asphalt.** Provide performance graded asphalt binder that complies with **DIVISION 1200**. Provide asphalt for tack coat suitable for the intended use and approved by the Engineer.

**c. Mix Design.** Using forms provided by KDOT, submit a mix design for the designated class of HMA-Commercial Grade to the DME for review and approval. When requested by the Engineer, submit a sufficient quantity of materials to verify the mix design.

Submit a mix design that complies with these requirements:

(1) **TABLE 611-1**, Class A and Class B HMA-Commercial Grade Mix Criteria: Unless the Engineer approves otherwise or shown elsewhere in the Contract Documents, use a SM-12.5A or SR-12.5A (**TABLE 611-2**) for Class A. Use any mix designation listed in **TABLE 611-2** for Class B.

<b>TABLE 611-1: HMA-COMMERCIAL GRADE CLASS A and CLASS B MIX CRITERIA</b>				
	<b>CLASS A</b>		<b>CLASS B</b>	
<b>AGGREGATE:</b>				
Coarse Angularity (min.%)	75		50	
Uncompacted Voids-Fine (min. %)	42		40	
Sand Equivalent (min. %)	40		40	
Natural sand (max. %)	35		-	
Reclaimed Asphalt Pavement (RAP) (max. %)	25		50	
<b>Binder:</b>	PG64-22 or PG58-28 <sup>1</sup>		PG58-28 or PG64-22	
<b>COMPACTION REVOLUTIONS:</b>		(A) <sup>3</sup>		(B) <sup>3</sup>
N <sub>ini</sub>	7		6	
N <sub>des</sub>	75		50	
N <sub>max</sub>	115		75	
Level of Compaction at N <sub>ini</sub>	≤90.5		≤91.5	
<b>MIX:</b>				
VFA	65 – 78		66-80	
Tensile Strength Ratio (TSR) (min. %)	80 <sup>2</sup>		-	

<sup>1</sup>In permanent locations with an asphalt mixture containing Recycled Asphalt Shingles (RAS) or 16% to 25% RAP, use PG58-28. In all other locations, the Contractor may use either grade of binder.

<sup>2</sup>Meet the minimum TSR requirement for design only. Depending on the anticipated exposure to the environment, the DME may waive the TSR requirement.

<sup>3</sup>Use either column A or B, Contractor's option.

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If RAP or RAS is used, inform the Engineer as to the source and type of RAP and RAS. Provide RAP that is reasonably free of contamination, uniform in composition (similar to RAP gradation shown on mix design) and has passed through a 2 1/4" screen or grizzly. The Engineer will accept the RAP and RAS based on a visual inspection.

The Engineer may approve the use of an asphalt mixture (listed in **TABLE 611-2**) that is produced, tested and complies with **SECTION 602**. If used, QC/QA testing is required.

(2) **TABLE 611-2**, Mix Design Requirements.

<b>TABLE 611-2: MIX DESIGN REQUIREMENTS (Master Grading Limits and VMA)</b>								
Nominal Maximum Size & Mix Designation	Percent Retained - Square Mesh Sieves							Min. VMA (%)
	1"	3/4"	1/2"	3/8"	No. 4	No. 8	No. 200	
SM-9.5A			0	0-10	10 min.	33-53	90.0-98.0	14.5
SR-9.5A			0-2	0-10	10 min.	33-53	90.0-98.0	14.5
SM-9.5T			0	0-10	10 min.	53-68	90.0-98.0	14.5
SR-9.5T			0-2	0-10	10 min.	53-68	90.0-98.0	14.5
SM-12.5A		0	0-10	10 min.		42-61	90.0-98.0	13.5
SR-12.5A		0-2	0-10	10 min.		42-61	90.0-98.0	13.5
SM-19A	0	0-10	10 min.			51-65	92.0-98.0	13.0
SR-19A	0-2	0-10	10 min.			51-65	92.0-98.0	13.0

- Meet the minimum VMA requirements with design only.
- Use an air void target of 4% (at  $N_{des}$ ) to establish binder content.
- Using the combined gradation (RAP and RAS, if any, and virgin aggregate), select a single point for each sieve within the master grading limits and the No. 16, No. 30, No. 50 and No. 100 sieves. Also, provide the combined virgin aggregate gradation.
- When controlling a virgin mix by cold feed gradation testing, apply single point tolerances in **TABLE 611-3** to the design single points for the virgin aggregate. Do not exceed the tolerances for the Master Grading Limits.
- When controlling a mix that contains RAP or RAS by cold feed virgin gradation testing, apply single point tolerances in **TABLE 611-3** to the design single points for the virgin aggregate. The tolerances may exceed the Master Grading Limits.
- If RAP is used, calculate the Effective Specific Gravity ( $G_{se}$ ) of the RAP as shown in subsection 5.10.4 – Calculations for the Marshall Mix Design of Bituminous Mixtures, Part V and used as the  $G_{sb}$  of the RAP. If RAS is used, calculate the Effective Specific Gravity ( $G_{se}$ ) of the RAS as shown in subsection 5.10.4, Part V and use as the  $G_{sb}$  of the RAS.

<b>TABLE 611-3: SINGLE POINT TOLERANCES</b>								
Nominal Maximum Size & Mix Designation	Percent Retained - Square Mesh Sieves							
	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
SM-9.5A or SR-9.5A		±5	±5	±5	±4	±4	±3	±2
SM-9.5T or SR-9.5T		±6	±5	±5	±4	±3	±3	±2
SM-12.5A or SR-12.5A	±6	±6	±5	±5	±4	±4	±3	±2
SM-19A or SR-19A	±6	±6	±5	±5	±4	±4	±4	±2

Comply with the certification requirements for the appropriate categories listed in the Policy and Procedure Manual for the Certified Inspection and Testing Training (CIT<sup>2</sup>) Program. Use calibrated testing equipment with prescribed procedures in the KDOT Construction Manual, Part V, Section 5.2.7.

## 611 - HOT MIX ASPHALT (HMA)-COMMERCIAL GRADE

**d. Process Control.** Prior to making a single point or proportion change, receive approval from the Engineer. Depending upon the change, the Engineer may require another mix design before granting approval. On the first Lot only of production of any mix designation, any gradation penalty for the entire Lot will be assessed on the basis of the revised design job-mix (if any), provided no change in asphalt content is required as a result of the revision. For changes made in the design job-mix on subsequent Lots, computation of adjusted payment will not be retroactive within the Lots. Make any gradation change for the Lot before starting the gradation testing for that Lot.

During mix production on non-QC/QA projects, the Engineer may conduct tests (randomly located) to verify compliance with the approved mix design, and make adjustments to the binder content (Note: Plant produced mix may have a lower VMA and require a reduction in binder content.).

On projects with less than 500 tons of commercial grade asphalt mixture, testing (QC/QA or cold-feed gradations) is at the Engineer's discretion. On projects with 500 tons or more, testing of the asphalt mixture is required:

- The Engineer will test the combined virgin gradation at a frequency of 1 test for each 500 ton Lot or fraction thereof.
- On projects with more than 2000 tons of HMA–Commercial Grade mixture the Contractor may request the lot be increased to 750 ton provided the following criteria are met:
  - The plant is producing more than 500 tons of HMA–Commercial Grade mixture per day;
  - Previous 3 consecutive lots were produced without penalty; and
  - Provide immediate notification of lot size change to the Engineer any time a change is made.
- If any lot fails to meet all of the above criteria, the lot size shall resort to 500 tons until such time that the aforementioned criteria are met.
- Or, the Contractor and Engineer will test (QC/QA respectively) the asphalt mixture according to the testing requirements and frequencies in Part V, Appendix B.

KDOT will perform tests at the Contractor's lab or at a location agreed to by the Engineer and Contractor. Testing will be completed and the results reported to the Contractor within 24 hours. If the test results indicate there is non-compliant material, make the appropriate adjustments to the mix proportions to comply with the approved mix design.

**e. Suspension of Mixture Production.** If the results of 2 consecutive cold-feed gradation tests fail to meet the single point tolerances, or QC/QA test results fail to comply with **SECTION 602**, suspend the production of that mix pending satisfactory results of a pre-production sample. Such suspension will constitute Lot termination.

**f. Additives.** Provide a method for the Engineer to continually monitor the percent of each additive being added.

When more than 25% of the mix is comprised of siliceous virgin aggregates and/or RAP, add anti-strip to the mix. The minimum amount of anti-strip required in the mix is 0.01% for every percent of natural sand and RAP in the mix. Thus, if 25% natural sand and 10% RAP is in a mix, then 0.35% anti-strip by weight of virgin asphalt binder is required in the mix.

If during production, the TSR values (both KDOT and Contractor) exceed 85%, then the Contractor and the DME, working together, may decide on a lower amount of anti-strip.

Provide Warm Mix Asphalt (WMA) additives or processes that comply with **DIVISION 1200**. The Contractor is permitted to use WMA unless otherwise shown on the plans.

For mixes containing Warm Mix Asphalt (WMA) additives, submit for the Engineer's review and approval, the additive or process used, the recommended rate of application, and the temperature ranges for mixing and compaction.

Mixing temperature range is provided by the Asphalt Binder Supplier. When using WMA, the mixing temperature may be reduced no more than 30°F for WMA water foaming processes, and no more than 70°F for WMA chemical and organic additives. The minimum mixing temperature for WMA is 220°F.

### 611.3 CONSTRUCTION REQUIREMENTS

- a. General.** Prepare the road surface according to **subsection 602.4b**.



## 611 - HOT MIX ASPHALT (HMA)-COMMERCIAL GRADE

Use equipment that complies with **DIVISION 150** to produce, haul, spread and compact the HMA-Commercial Grade mixture.

**Lift Thickness.** Except for leveling courses or when shown otherwise in the Contract Documents, **TABLE 602-9** applies. The Engineer may adjust lift thickness to utilize the most efficient method of acquiring specified density and surface quality. The minimum lift thickness for any HMA mixture is 3 times the nominal maximum aggregate size, unless otherwise designated in the Contract Documents or approved by the Engineer.

<b>TABLE 602-9: NOMINAL COMPACTED THICKNESS</b>	
<b>Lift</b>	<b>Maximum Nominal Compacted Thickness</b>
Surface	2 inches
Base	4 inches

Use a minimum of 2 rollers to compact the mixture to the maximum density before the mixture temperature falls below 175°F. When using WMA, achieve the maximum density before the temperature of the WMA falls below 165°F. Do not crush the aggregate. On incidental or miscellaneous work, the Engineer may waive the minimum roller requirement if conditions warrant. Roller marks may be removed with a self-propelled static roller when the pavement surface temperature falls below 175°F or 165°F for WMA, roller marks may be removed from the mat with a self-propelled static steel roller.

**b. Weather Limitations.** Do not place asphalt mixtures on any wet or frozen surface or when weather conditions otherwise prevent the proper handling and finishing of the mixture.

Only place asphalt mixtures when either the ambient air temperature or the road surface temperature is equal to or greater than that shown in **TABLE 611-4**.

<b>TABLE 611-4: ASPHALT PLACEMENT TEMPERATURE LIMITATIONS</b>							
<b>Paving Course</b>	<b>Thickness (inches)</b>	<b>Air Temperature (°F)</b>			<b>Surface Temperature (°F)</b>		
		<b>HMA</b>	<b>WMA Foam</b>	<b>WMA Chem</b>	<b>HMA</b>	<b>WMA Foam</b>	<b>WMA Chem</b>
Surface	All	50	45	40	55	50	45
Subsurface	<1.5	50	45	40	55	50	45
Subsurface	≥1.5 and < 3	40	35	30	45	40	35
Subsurface	≥ 3	30	30	30	35	32	32

**c. Pavement Smoothness.** Evaluate pavement smoothness according to **SECTION 603** and the following:

Excluding side roads, entrances and non-traffic areas, the Engineer may test the completed surface with a 10 foot straightedge, and the maximum allowable surface variation is 3/16 inch in 10 feet. Correct areas that exceed the allowable variation as directed by the Engineer.

HMA Commercial Grade is not eligible for pay adjustments.

### 611.4 MEASUREMENT AND PAYMENT

The Engineer will measure HMA-Commercial Grade and HMA-Commercial Grade (Patching) by the ton.

Payment for "HMA-Commercial Grade (Class\*)" at the contract unit prices is full compensation for the specified work (including emulsified asphalt for tack). Payment for and "HMA-Commercial Grade (Class \*) (Patching)" includes all excavation, compaction of subgrade or subbase if required, disposal of waste material and all material (including emulsified asphalt for tack), all labor, equipment, tools, supplies, incidentals and mobilization necessary to complete the work.

If the gradation test results or air void test results indicate there is non-compliant material, the Engineer will compute and assess either an Aggregate Price Adjustment or an Air Void Price Adjustment that will be an item added to the contract.

(1) Aggregate Price Adjustment. Use **TABLE 611-5**, on each Lot of asphalt mixture represented by non-compliant cold-feed gradation (acceptance) tests:

- Determine the absolute value of the deviation between the acceptance test results (rounded to the nearest 0.01%) and the design virgin aggregate single point for the No. 4, No. 8, No. 30 and the No 200 pay sieves.
- Use the 1 Test Column in **TABLE 611-5** to determine payment for the Lot.
- Use the deviation from the sieve that produces the greatest price adjustment.

**611 - HOT MIX ASPHALT (HMA)-COMMERCIAL GRADE**

<b>TABLE 611-5: SCHEDULE OF ADJUSTED PAYMENT FOR ASPHALT MIXES</b>					
		<b>Accumulated Deviation of the Acceptance Tests from the Design Job-Mix Single Point</b>			
<b>Tolerance</b>	<b>Pay Factor</b>	<b>1 Test</b>	<b>2 Tests</b>	<b>3 Tests</b>	<b>4 Tests</b>
± 7	1.00	0.00 - 7.00	0.00 - 9.00	0.00 - 12.12	0.00 - 14.00
	0.98	7.01 - 7.50	9.91 - 10.60	12.13 - 12.99	14.01 - 15.00
	0.95	7.51 - 8.00	10.61 - 11.32	13.00 - 13.86	15.01 - 16.00
	0.92*	8.01 - 8.50	11.33 - 12.02	13.87 - 14.73	16.01 - 17.00
	0.88*	over 8.50	over 12.02	over 14.73	over 17.00
± 6	1.00	0.00 - 6.00	0.00 - 8.48	0.00 - 10.38	0.00 - 12.00
	0.98	6.01 - 6.50	8.49 - 9.20	10.39 - 11.25	12.01 - 13.00
	0.95	6.51 - 7.00	9.21 - 9.90	11.26 - 12.12	13.01 - 14.00
	0.92*	7.01 - 7.50	9.91 - 10.60	12.13 - 12.99	14.01 - 15.00
	0.88*	over 7.50	over 10.60	over 12.99	over 15.00
± 5	1.00	0.00 - 5.00	0.00 - 7.08	0.00 - 8.61	0.00 - 10.00
	0.98	5.01 - 5.50	7.09 - 7.78	8.62 - 9.54	10.01 - 11.00
	0.95	5.51 - 6.00	7.79 - 8.48	9.55 - 10.38	11.01 - 12.00
	0.92*	6.01 - 6.50	8.49 - 9.20	10.39 - 11.25	12.01 - 13.00
	0.88*	over 6.50	over 9.20	over 11.25	over 13.00
± 4	1.00	0.00 - 4.00	0.00 - 5.66	0.00 - 6.93	0.00 - 8.00
	0.98	4.01 - 4.50	5.67 - 6.36	6.94 - 7.80	8.01 - 9.00
	0.95	4.51 - 5.00	6.37 - 7.08	7.81 - 8.67	9.01 - 10.00
	0.92*	5.01 - 5.50	7.09 - 7.78	8.68 - 9.54	10.01 - 11.00
	0.88*	over 5.50	over 7.78	over 9.54	over 11.00
± 3	1.00	0.00 - 3.00	0.00 - 4.24	0.00 - 5.19	0.00 - 6.00
	0.98	3.01 - 3.20	4.25 - 4.52	5.20 - 5.55	6.01 - 6.40
	0.95	3.21 - 3.40	4.53 - 4.80	5.56 - 5.97	6.41 - 6.80
	0.92*	3.41 - 3.80	4.81 - 5.38	5.98 - 6.57	6.81 - 7.60
	0.88*	over 3.80	over 5.38	over 6.57	over 7.60
± 2.5	1.00	0.00 - 2.50	0.00 - 3.54	0.00 - 4.32	0.00 - 5.00
	0.98	2.51 - 2.70	3.55 - 3.82	4.33 - 4.68	5.01 - 5.40
	0.95	2.71 - 2.90	3.83 - 4.10	4.69 - 5.01	5.41 - 5.80
	0.92*	2.91 - 3.30	4.11 - 4.66	5.02 - 5.73	5.81 - 6.60
	0.88*	over 3.30	over 4.66	over 5.73	over 6.60
± 2	1.00	0.00 - 2.20	0.00 - 3.12	0.00 - 3.81	0.00 - 4.40
	0.95	2.21 - 2.40	3.13 - 3.40	3.82 - 4.17	4.41 - 4.80
	0.92*	2.41 - 2.75	3.41 - 3.88	4.18 - 4.77	4.81 - 5.56
	0.88*	over 2.75	over 3.88	over 4.77	over 5.56

\*If approved by the Engineer, the Contractor may accept the indicated partial pay. KDOT may require removal and replacement at no additional cost. At any time, the Contractor may remove and replace at no cost to KDOT.

(2) Air Void Price Adjustment. The Engineer will assess an Air Void Price Adjustment (negative price adjustment only), as outlined in **SECTION 602**, on the asphalt material (taken from each QC/QA Lot) represented by non-compliant QC/QA (acceptance) tests.

833 - PAVEMENT PATCHING

SECTION 833

PAVEMENT PATCHING

833.1 DESCRIPTION

a. General. Patch the existing PCCP pavement as shown in the Contract Documents or at locations directed by the Engineer. Patches will be either full depth or partial. The purpose is to repair surface spalls at joint and cracks or repair joints and slabs that are cracked or shattered.

b. Asphalt Pavement Patching of PCCP. This procedure is for the repair of PCCP pavement. This should be considered temporary in nature.

c. PCCP Patching (Full Depth). This procedure is for patching full depth deterioration of PCCP at joints and cracks.

d. PCCP Edge Joint Patching.

1. PCCP Edge Joint Patching (Partial Depth). This procedure is for repair of longitudinal joints or pavement edges with shallow spalls or honeycombing that are in the upper half of the pavement.

2. PCCP Edge Joint Patching (Full Depth). This procedure is for patching full depth deterioration or honey-combed pavement edges.

e. PCCP Joint and Crack Patching.

1. PCCP Joint and Crack Patching (Partial Depth). This procedure is for the repair of joint spalls, midpanel cracks and interior surface spalls (high steel).

2. PCCP Joint and Crack Patching (Full Depth). This procedure is for patching of full depth deterioration of transverse and longitudinal joints and their intersections.

f. Extra Work Saw Cuts. Make additional saw cuts, when required, to expand a patch, or to change a partial depth patch to a full depth patch.

BID ITEMS

- Asphalt Pavement Patching of PCCP
PCCP Patching (Full Depth) (\*) (\*\*)
PCCP Edge Joint Patching (\*\*\*)
PCCP Joint and Crack Patching (\*\*\*)
Extra Work Saw Cuts (Set Price)
\*Thickness
\*\*Sound or Unsound
\*\*\*Partial Depth or Full Depth

UNITS

- Ton
Square Yard
Square Yard
Square Yard
Linear Foot

833.2 MATERIALS

Provide materials that comply with the applicable requirements.

Table with 2 columns: Material Name and Reference Section/Division. Includes items like HMA-Commercial Grade, Emulsified Asphalt, Concrete (AE), Aggregates for Concrete On Grade, Concrete Curing Materials, Joint Sealer and Filler Material, Reinforcing Steel, Rapid-Set Concrete Patching Material, Cement, Grade 2 Calcium Chloride, and Bond Breaker.

\*Unless specified otherwise in the Contract Documents.

## 833 - PAVEMENT PATCHING

### 833.3 CONSTRUCTION REQUIREMENTS

**a. General.** Prepare the areas for patching according to the Contract Documents. Unless otherwise provided in the Contract Documents, restrict the pavement patching operations to 1 traffic lane at all times.

Schedule the patching operations so that the areas prepared for patching are patched the same day the deteriorated pavement is removed. If unavoidable delays prevent patching the same day, and traffic will be routed back onto the lane, fill the excavated areas with a compacted (temporary) asphalt mixture before nightfall. If there are safety issues with adjacent traffic encroaching on the prepared patch areas, fill the excavated areas before nightfall with a compacted (temporary) material such as AB-3, reclaimed concrete or asphalt millings, or as approved by the Engineer

Delineate the limits of the patch by sawing the existing pavement to the depth indicated before removing the deteriorated pavement. Use a saw that will produce a smooth cut for the required depth. Coordinate the pavement sawing and patching operations so that the sawed areas are patched within 3 working days.

Prepare the areas for patching by removing the deteriorated pavement to the limits designated in the Contract Documents. If the removal of the deteriorated pavement to the designated limits reveals further deterioration in the existing pavement, extend the limits of the patch to include the exposed deficient pavement, as directed by the Engineer.

When removing the deteriorated pavement, do not damage the remaining pavement. Repair or replace any damaged, remaining pavement. Do not disturb the base or subgrade while preparing the areas for patching, except to accommodate the thickness of pavement patching shown in the Contract Documents. If the base or subgrade is disturbed, adjust and re-compact the base or subgrade to the required lines and grades.

- If the subgrade is crushed stone subgrade, bring back to line and grade with Aggregates for Backfill.
- If the base is cement treated base or aggregate base, bring back to line and grade with AB-3.
- If the base is granular base, bring back to line and grade with Aggregate for Granular Base.
- If the base is asphaltic treated base, bring back to line and grade with HMA.
- If the base is bound drainable base, bring back to line and grade with Coarse Aggregate for Structural Concrete SCA-4, **TABLE 1102-2**.

Adjusting, re-compacting and bringing back base or subgrade to the required lines and grades is subsidiary to the patching item.

When consecutive multiple slabs are being replaced and lane closure time needs to be limited, at the Contractor's option and with the Engineer's approval, concrete may be used to fill the removed base material. Concrete used to fill the base is subsidiary to the patching item.

Remove all waste materials the same day they are excavated.

**b. Asphalt Pavement Patching of PCCP.** After the location of the patch is defined, saw and remove the deteriorated pavement. Then, clean the exposed edges of the existing pavement. Before placing the HMA patch, apply a thin tack coat of emulsified asphalt to the clean edges of the existing pavement.

Place the HMA in uniform layers of 3 inches or less in thickness. Compact each layer until no further consolidation is observed. Clean the surface of the preceding layer of compacted HMA before the succeeding layer of asphalt material is placed.

**c. PCCP Patching Location.** Reference the location of the existing joints in the concrete pavement before removing the deteriorated pavement. During the patching operations, establish new joints at the same locations as the original joints.

**d. PCCP Patching Removal.**

(1) Full Depth Patches. Define and saw the limits of full depth patches the full depth of the existing concrete pavement. If the existing concrete pavement will receive an overlay the same construction season, a rock saw is allowed for the sawing. If the boundaries of consecutive areas to be repaired are less than 6 feet apart, also remove and replace the areas between the patches.

(2) Partial Depth Patches. The minimum patch size for partial depth patches is 4 inches by 12 inches. Delineate the limits of partial depth patches a minimum of 2 inches beyond the area of deteriorated pavement. If areas defined for partial depth patches are less than 12 inches apart, include the areas into a single patch.

(a) Removal (Longitudinal Joint).

## 833 - PAVEMENT PATCHING

- **Saw and Jackhammer.** Saw the limits of partial depth patches according to the Contract Documents. Use jackhammers to remove the deteriorated pavement to the depth shown in the Contract Documents. Cut out or chip away the connecting edges below the sawed portion to as near true lines with vertical faces, as possible; or
- **Saw, Mill and Jackhammer.** Saw the limits of partial depth patches according to Contract Documents. Mill within the limits of the sawcut without damaging the vertical edges of the patch. Carefully, jackhammer any material left at the edges; or
- **Mill.** The Engineer may approve a milling process based on the satisfactory performance of the equipment and the Contractor's process. The operation shall result in minimal edge spalling at the surface.

(b) Removal (Transverse Joint).

- **Saw and Jackhammer.** Saw the limits of partial depth patches according to contract documents. Use jackhammers to remove the deteriorated pavement to the depth shown in the Contract Documents. Cut out or chip away the connecting edges below the sawed portion to as near true lines with vertical faces as possible; or
- **Saw, Mill and Jackhammer.** Saw the limits of partial depth patches according to Contract Documents. Mill within the limits of the sawcut without damaging the vertical edges of the patch. Carefully, jackhammer any material left at the edges.

Use jackhammers (30 pounds maximum size) to remove the deteriorated pavement to the depth shown in the Contract Documents.

Use only self-propelled milling machines designed to perform only milling operations. Mills attached to other equipment are prohibited, except in small irregular areas.

After the deteriorated pavement is removed to the saw or mill depth, use a steel-faced hammer or steel chain drag to check for unsound concrete below this depth. If unsound concrete is detected, use jackhammers (30 pounds maximum size) to remove the deteriorated pavement below the saw or mill depth.

If the unsound concrete encountered is more than 4 inches deep and constitutes more than 50% of the surface area of the patch, the Engineer will determine if the patch should be repaired according to **subsection 833.3d.(1) Full Depth Patches.**

If the pavement patch is started according to the details for Joint and Crack Patching (Partial Depth) and the Engineer changes the patch to a full depth patch, construct the full depth patch according to the details for Full Depth Joint and Crack Patching. See PCCP Joint and Crack Patching standard details.

If the pavement patch is started according to the details for Edge Joint Patching (Partial Depth) and the Engineer changes the patch to a full depth patch, construct the full depth patch according to the details for Full Depth Edge Joint Patching. See PCCP Edge Joint standard details.

**e. PCCP Patch Preparation.** Clean the partial depth patches using compressed air or a stiff rotary broom. Sandblast the cavities of the partial depth patches to expose aggregate and mortar. Clean with compressed air as the final preparation prior to placing the grout and concrete.

When required, place edge forms and joint fillers before concrete placement.

Apply bondbreaker to exposed dowel bars.

If required, drill holes and grout the specified steel reinforcement into the existing concrete pavement according to **SECTION 842.**

**f. PCCP Patch Concrete Placement.** For partial depth patches, apply concrete grout (1 part cement, 3 parts water by weight) to the prepared surfaces of the patch just prior to concrete placement. If the grout dries before the concrete is placed, remove the dried grout by sandblasting and re-apply fresh grout. Place and consolidate the specified concrete in the areas prepared for patching, strike-off the concrete flush with surface of the existing pavement, and finish the surface with a wooden float or another method approved by the Engineer. Provide a broom or burlap drag surface texture to the plastic concrete.

Remove the backer board from formed joints or flush sawed joints with water. Sand blast the vertical faces of the joints to be sealed. Clean the sand blasted joints with compressed air and seal the joints according to the Contract Documents.

Do not place concrete patches if the ambient air temperature is below 40°F. If the ambient air temperature is below 60°F when the concrete patches are placed, the Engineer may require additional curing time. Uniformly consolidate the concrete without voids. Apply the curing materials before the undue loss of moisture occurs.

## 833 - PAVEMENT PATCHING

**g. Finishing.** Secure a smooth surface, correcting surface variations exceeding  $\frac{1}{8}$  inch in 10 feet by use of an approved profiling device, or other method approved by the Engineer. Check variations of the pavement patch and 5 feet into the abutting, existing pavement.

**h. PCCP Patch Curing.** Unless directed otherwise by the Engineer, cure the concrete patches by applying liquid membrane-forming compound at the rate of 1 gallon per 100 square feet to the finished patch. If the existing concrete pavement will be overlaid with HMA in the near future, the Engineer may require that concrete patches are cured with emulsified asphalt.

**i. Joints.** When repairs include joints in existing pavement, re-establish the joint in the plastic concrete, or saw when the concrete has reached sufficient strength according to the Contract Documents. "Early entry" saws may be required to cut joints in green concrete to match existing joints.

- (1) Patches to be overlaid. Do not seal joints.
- (2) Patches not overlaid. See KDOT standard drawing.

**j. Opening to Traffic.** Perform testing to determine when the patch can be opened to traffic.

- When a minimum flexural strength of 380 psi or minimum compressive strength of 1800 psi is obtained from properly cured specimens.
- If the temperature falls below 60°F during the cure period, use the Schmidt rebound hammer to determine when the patch can be opened to traffic. The patch may be opened to traffic when the results of the rebound hammer test equal or exceed results obtained on materials previously tested and known to meet the strength requirements or 60% of the rebound on adjoining pavement.
- When maturity is used to determine when the patch is opened to traffic, make cylinders from the same mix to be used. Cure and break the cylinders under a time and temperature plan to develop a concrete maturity curve. Use the concrete maturity curve to determine when the patch has gained the strength to be opened to traffic.
- If Grade 2 calcium chloride is used, see **subsection 401.3i.(1)**.
- When approved by the Engineer, other methods may be used to determine when the patch has gained the strength to be opened to traffic.

### 833.4 MEASUREMENT AND PAYMENT

The Engineer will measure asphalt pavement patching of PCCP by the ton of HMA used.

The Engineer will measure the various types of concrete pavement patching by the square yard.

Removal of the existing pavement for either asphalt or concrete pavement will not be measured for separate payment.

If the Contractor chooses to use a milling machine to remove the deteriorated pavement, and the area removed is greater than the area originally defined for the partial depth patch, the Engineer will base the measurements of the partial depth patch on the dimensions originally defined for the patch.

The Engineer will measure a patch started as partial depth patch, but completed as a full depth patch, as a full depth patch.

A patch started according to the details for Joint and Crack Patching (Partial Depth) and completed as a full depth patch is measured and paid as Joint and Crack Patching (Full Depth).

A patch started according to the details for Edge Joint Patching (Partial Depth) and completed as a full depth patch is measured and paid as Joint and Crack Patching (Full Depth).

Patches started according to Partial Depth, but completed as Full Depth due to Contractor's negligence will be measured as Partial Depth patches.

If additional saw cuts are required to expand a patch, or to change a partial depth patch to a full depth patch, the Engineer will measure the additional saw cuts by the foot.

Payment for "Asphalt Pavement Patching of PCCP", "PCCP Patching (Full Depth)", "PCCP Edge Joint Patching" and "PCCP Joint and Crack Patching" at the contract unit prices and "Extra Work Saw Cuts (Set Price)" at the contract unit set price is full compensation for the specified work.

## 1103- AGGREGATES FOR HOT MIX ASPHALT (HMA)

### SECTION 1103

#### AGGREGATES FOR HOT MIX ASPHALT (HMA)

##### 1103.1 DESCRIPTION

This specification covers the quality, composition and gradation requirements of aggregates for hot mix asphalt (HMA) on QC/QA projects.

##### 1103.2 REQUIREMENTS

**a. Composition Individual Aggregates.** Use aggregate from each source that complies with the gradation requirements listed in **TABLE 1103-1**.

(1) Crushed Aggregates. Limit crushed aggregates to the following materials.

(a) Produce Crushed Stone (CS-1) and Crushed Stone Screenings (CS-2) by crushing limestone, sandstone, porphyry, (rhyolite, basalt, granite, and Iron Mountain Trap Rock are examples of porphyry) or other types of stone.

(b) Produce Crushed Gravel (CG) by crushing siliceous gravel containing not more than 15% non-siliceous material. If 95% or more of crushed gravel is retained on the #8 (2.65 mm) sieve, then the material must have a minimum Uncompacted Void Content of Coarse Aggregate (UVA) value of 45 when tested in accordance with KT-80. Testing will be the same frequency as KT-50. Do not use material with a UVA value less than 45.

(c) Provide Chat (CH-1) obtained during the mining of lead and zinc ores in the tri-state mining district.

(d) Consider materials complying with Mineral Filler Supplements MFS-1, MFS-2, MFS-4, and MFS-7 as crushed aggregate.

(e) Produce Crushed Steel Slag (CSSL) by crushing electric furnace steel slag. Some sources of steel slag are angular when produced and may be treated the same as crushed gravel and manufactured sand. Use steel slag with an Uncompacted Void Content of the Fine Aggregate "U" Value, determined by test method KT-50, of more than 42.00 and the Coarse Aggregate Angularity greater than the minimum specified value. The maximum allowable quantity of crushed steel slag is 50% of the total aggregate weight.

(f) Manufactured sand shall have an Uncompacted Void Content of the Fine Aggregate "U" Value, determined by test method KT-50, greater than or equal to 42.00. Produce manufactured sand by crushing siliceous sand and gravel (designate as crushed gravel (CG-2, CG-3, etc) in the mix design), or by washing or screening crushed stone (designate as crushed stone (CS-2, CS-3, etc) in the mix design), or by washing or screening chat (designate as chat (CH-2, CH-3, etc) in the mix design).

(2) Uncrushed Aggregates. Limit uncrushed aggregates to the following materials.

(a) Produce Sand-Gravel (SSG) by mixing natural sand and gravel formed by the disintegration of siliceous and/or calcareous materials.

(b) Provide Natural Sand consisting of particles formed by the natural disintegration of siliceous and/or calcareous materials. Use natural sand with an Uncompacted Void Content "U" value of less than 42.

(c) Provide Grizzly (Grizzly Waste) consisting of the matrix or bedding material occurring in conjunction with calcitic or dolomitic cemented sandstone "Quartzite", generally separated from the sandstone prior to crushing.

(d) Provide Wet Bottom Boiler Slag (WBBS) consisting of a hard angular by-product of the combustion of coal in wet-bottom boilers. Quality requirements do not exist for this material. Obtain written approval by the Chief of Construction and Materials for use in HMA. The use of WBBS does not modify the requirements for minimum contents of either crushed stone or natural sand.

(3) Mineral Filler Supplement. Provide a mineral filler supplement that is easily pulverized and free of cemented lumps, mudballs, and organic materials that complies with the following and the general requirements in **subsection 1103.2c**. Do not blend 2 or more materials to produce mineral filler supplement. Provide only 1 mineral filler supplement in each HMA design.

**1103- AGGREGATES FOR HOT MIX ASPHALT (HMA)**

- (a) Mineral Filler Supplement designation MFS-1 is Portland cement, blended hydraulic cements, or crushed stone.
- (b) Mineral Filler Supplement designation MFS-2 is crushed limestone.
- (c) Mineral Filler Supplement designation MFS-3 is water or wind deposited silty soil material.
- (d) Mineral Filler Supplement designation MFS-4 is Hydrated lime. The minimum allowable quantity of MFS-4 or Hydrated Lime is 1% of the total aggregate weight when required as a supplement on the Contract Documents.
- (e) Mineral Filler Supplement designation MFS-5 is volcanic ash containing a minimum of 70% glass shard. The maximum allowable quantity of MFS-5 is 5% of the total aggregate weight when specified as acceptable mineral filler supplement.
- (f) Mineral Filler Supplement designation MFS-6 is fly ash. Fly ash is the finely divided residue resulting from the combustion of ground or powdered coal and is transported from the boiler by flue gasses. The maximum allowable quantity of MFS-6 is 3% of the total aggregate weight when specified as acceptable mineral filler supplement.
- (g) Mineral Filler Supplement designation MFS-7 is processed chat sludge that has been dewatered at the source of supply, and does not exceed 15% moisture content by weight at the time of shipping.

(4) Reclaimed Asphaltic Pavement (RAP). Use RAP in HMA only when such an option is permitted by Contract Special Provision. Subject the RAP to the limitations (i.e. source, max. percent allowed in mix, etc.) shown on the Contract Documents and contained in the appropriate Contract Special Provisions. Screen the RAP through a 2 ¼ inch screen or grizzly before it enters the HMA plant.

Fractionated Reclaimed Asphaltic Pavement (FRAP) is defined as having two or more RAP stockpiles, where the RAP is divided into a minimum of two fractions consisting of coarse and fine fractions. Subject the FRAP to the same limitations shown on the Contract Documents and contained in the appropriate Contract Special Provisions for RAP. Comprise the maximum percentage of FRAP of coarse or fine FRAP or a combination of coarse and fine FRAP, unless otherwise stated in the Contract Documents. Utilize a separate cold feed bin for each stockpile of FRAP used. Add FRAP to the mix through the RAP collar. Include the processing requirements for each FRAP stockpile within the Quality Control Plan.

(5) Recycled Asphalt Shingles. Recycled Asphalt Shingles (RAS) are allowed in any mixture specified to use RAP. The Contractor may use the %RAP as shown in the Contract Special Provision or a maximum of 5% RAS and 10% RAP.

Follow the guidelines in AASHTO PP 53 except as modified in this Special Provision. Drop the grade of the virgin binder one grade from both the top and the bottom grade specified for 0% RAP. For example, if a PG 64-22 is specified for 0% RAP, then the virgin grade of the binder for up to 5% RAS and 10% RAP is PG 58-28.

Comply with the Kansas Department of Health and Environment’s Bureau of waste Management Policy 2011-P3 or current version and other regulations pertaining to the recycling of shingles.

Grind the shingles to a minus 3/8-inch size. Remove deleterious materials from waste, manufacturer, or new shingles. Use post-consumer RAS that contains less than 0.5% wood by weight or less than 1.0% total deleterious by weight. Determine the gradation of the aggregate by extraction of the binder or by using TABLE 2 as a standard gradation:

<b>TABLE 1103-1: SHINGLE AGGREGATE GRADATION</b>	
<b>Sieve Size</b>	<b>Percent Retained</b>
3/8 in.	0
No. 4	5
No. 8	15
No. 16	30
No. 30	50
No. 50	55
No. 100	65
No. 200	75

**b. Quality of Individual Aggregates.**

- Soundness, minimum (KTMR-21) ..... 0.90



## 1103- AGGREGATES FOR HOT MIX ASPHALT (HMA)

Soundness requirements do not apply to aggregates having less than 10% material retained on the No. 4 mesh sieve.

- Wear, maximum (AASHTO T 96).....40%  
Wear requirements do not apply to aggregates having less than 10% retained on the No. 8 sieve.
- Absorption, maximum (KT-6) .....4.0%  
Test aggregates for absorption as follows:
  - Crushed Stone (CS-1) .....Test Method KT-6, Procedure I
  - Screenings (CS-2) .....Test Method KT-6, Procedure II
  - Sand Gravel (SSG)/Crushed Gravel (CG) .....Test Method KT-6, Procedures I & IIApply the specified maximum absorption to both the fraction retained on the No. 4 sieve and the fraction passing the No. 4. Screenings produced concurrently with CS-1 will be accepted without tests for absorption.  
Crushed aggregates with less than 10% materials retained on the No. 4 sieve (excluding mineral filler supplements) must be produced from a source complying with the official quality requirements of this Section prior to crushing.
- Plasticity Index, the maximum P.I. for MFS-1, MFS-2, MFS-3, MFS-5, and MFS-7 is 6.

### c. Product Control of Individual Aggregates

(1) Size Requirements. Produce each individual aggregate that complies with **TABLE 1103-2 and 1103-3**

(2) Deleterious Substances. Provide combined aggregates free from alkali, acids, organic matter, or injurious quantities of other foreign substances that does not exceed the following maximum percentages by weight.

- Shale or Shale-like (KT-8) ..... 1.0%
- Clay lumps and friable particles (KT-7) ..... 1.0%
- Sticks (wet) (KT-35) ..... 0.1%
- Coal (AASHTO T-113) ..... 0.5%

**1103- AGGREGATES FOR HOT MIX ASPHALT (HMA)**

<b>TABLE 1103-2: REQUIREMENTS FOR INDIVIDUAL AGGREGATES</b>								
<b>Designation</b>	<b>Material</b>	<b>Percent Retained – Square Mesh Sieves</b>						
		<b>1”</b>	<b>½”</b>	<b>3/8”</b>	<b>No. 4</b>	<b>No. 8</b>	<b>No. 30</b>	<b>No. 200</b>
CS-1	Crushed Stone	0						95.5-100.0
CS-2	Crushed Stone Screenings		0	0 - 5				60-100
CG	Crushed Gravel	Blend gradation with other aggregates in the mix.						
CH-1	Chat	Blend gradation with other aggregates in the mix						
SSG	Sand & Sand Gravel	0						80-100
WBBS	Wet Bottom Boiler Slag		0	Blend gradation with other aggregates in the mix.				
CSSL	Crushed Steel Slag	Blend gradation with other aggregate in the mix.						

<b>TABLE 1103-3: REQUIREMENTS FOR MINERAL FILLER SUPPLEMENTS</b>								
<b>Designation</b>	<b>Material</b>	<b>Percent Retained – Square Mesh Sieves</b>						
		<b>1”</b>	<b>½”</b>	<b>3/8”</b>	<b>No. 4</b>	<b>No. 8</b>	<b>No. 30</b>	<b>No. 200</b>
MFS-1	Cement or Crushed Stone			0		0-5	0-8	0-40
MFS-2	Crushed Limestone			0		1-10		60-80
MFS-3	Silt			0	0-5			0-40
MFS-4	Hydrated Lime	Blend gradation with other aggregate in the mix						
MFS-5	Volcanic Ash			0		0-5	0-8	0-40
MFS-6	Fly Ash	Blend gradation with other aggregate in the mix						
MFS-7	Processed Chat Sludge			0		0-5	0-8	0-40

**d. Stockpiling.** Stockpile and handle aggregates in such a manner to prevent detrimental degradation and segregation, the incorporation of appreciable amounts of foreign material, and the intermingling of stockpiled materials.

**e. Special Requirements for aggregates used in ultrathin bonded asphalt surface (UBAS).**

<b>TABLE 1103-4: INDIVIDUAL COARSE AGGREGATE PROPERTIES</b>		
<b>Property</b>	<b>Test Method</b>	<b>Limits</b>
Coarse Aggregate Angularity (% min.)	KT-31	95/90 <sup>a</sup>
Los Angeles Abrasion (% max.) <sup>b</sup>	AASHTO T 96	35 <sup>c</sup>
Micro-Deval, (% max.) <sup>b</sup>	AASHTO T 327	18 <sup>d</sup>
Soundness (% min.)	KTMR-21	0.90 <sup>d</sup>
Absorption (% max.)	KT-6	4.0 <sup>d</sup>
Methylene Blue (% max.)	AASHTO T 330	10 <sup>e</sup>
An individual aggregate will be considered a coarse aggregate source if it contributes more than 5% of the total plus No. 4 sieve material of the combined aggregate (individual aggregate contribution No. 4 / total JMF retained No. 4 > 5%).		
a – 95% of the coarse aggregate has one fractured face & 90% has two or more fractured faces.		
b – Sample from stockpiled material with top size aggregate not larger than the maximum aggregate size for the mix designation type from <b>TABLE 613-1</b> .		
c - For calcitic or dolomitic cemented sandstone “quartzite”, the maximum percent is 40.		
d - May use KDOT’s Official Quality results		
e – Perform this test on all individual aggregates that contribute more than 1.0% to the JMF for the material passing the No. 200 sieve.		

## 1103- AGGREGATES FOR HOT MIX ASPHALT (HMA)

<b>Property</b>	<b>Test Method</b>	<b>Limits</b>
Methylene Blue (% max.)	AASHTO T 330	10
Soundness (% min.)	KTMR-21	0.90 <sup>a</sup>
Los Angeles Abrasion (% max.)	AASHTO T 96	40 <sup>a</sup>
Absorption (% max.)	KT-6	4.0 <sup>a</sup>

a –May use KDOT’s Official Quality results.

- The above requirements for wear do not apply for aggregates having less than 10% material retained on the No. 8 sieve.
- The above requirements for soundness do not apply for aggregates having less than 10% material retained on the No. 4 sieve.

### 1103.3 TEST METHODS

Test aggregates according to the applicable provisions of **SECTIONS 1115 and 2501**.

### 1103.4 PREQUALIFICATION

Prequalify aggregate sources according to **subsection 1101.4**.

### 1103.5 BASIS OF ACCEPTANCE

Aggregates covered by this subsection are accepted based on the procedure described in **subsection 1101.5**.

**1107 - AGGREGATES FOR BACKFILL**

**SECTION 1107**

**AGGREGATES FOR BACKFILL**

**1107.1 DESCRIPTION**

This specification covers aggregate for backfill. Use this when structures, pipe, mechanically stabilized earth (MSE) walls (panel or modular), underdrain, permeable or crushed stone backfill requirements are specified in the Contract Documents.

**1107.2 REQUIREMENTS**

**a. Structures or Pipe.**

(1) Composition. Provide singly or in combination sand, gravel, or crushed stone. Consider limestone, calcite-cemented sandstone, rhyolite, basalt, and granite as crushed stone.

(2) Quality<sup>1</sup>.

- Soundness<sup>2</sup>, minimum (KTMR-21) ..... 0.85
- Wear<sup>3</sup>, maximum (AASHTO T 96) ..... 45%

For Structures Backfill Only:

- Coarse Aggregate Angularity<sup>4</sup>, minimum (KT-31) ..... 75%
- Fine Aggregate Angularity<sup>4</sup>, minimum (KT-50) ..... 40%

<sup>1</sup>Crushed aggregates with less than 10% material retained on the No. 4 sieve (excluding mineral filler supplements) must be produced from a source complying with the official quality requirements of this Section prior to crushing.

<sup>2</sup>The above requirements for soundness do not apply for aggregates having less than 10% material retained on the No. 4 sieve.

<sup>3</sup>The above requirements for wear do not apply to aggregates having less than 10% material retained on the No. 8 sieve.

<sup>4</sup>Required testing for sand and gravel.

(3) Product Control.

(a) Gradation and Plasticity.

<b>TABLE 1107-1: AGGREGATES FOR STRUCTURES OR PIPE BACKFILL</b>										
Type	Percent Retained-Square Mesh Sieves									Plasticity Index (Max.)
	2"	1 1/2"	1"	3/4"	3/8"	No. 4	No. 8	No. 40	No. 200	
SB-1	0	0-10		15-40	50-75		95-100			
SB-2			0	0-20	40-70	75-100	95-100			
SB-3	0	0-5		5-30		35-60	45-70	60-84	80-92	8
PB-1 <sup>1</sup>	0	0-10		15-40	50-75		95-100			
PB-2 <sup>1</sup>			0	0-20	40-70	75-100	95-100			
PB-3 <sup>1</sup>			0	0-30		35-60	50-75	70-90	90-100	8

<sup>1</sup>Use of PB is required for PE and PVC pipe backfill.

(b) Deleterious Substances.

- Shale or shale-like material, maximum (KT-8) ..... 3.0%
- Clay Lumps and friable particles, maximum (KT-7) ..... 3.0%
- Sticks (wet), maximum (KT-35) ..... 1.0%

(4) Foundation Stabilization. Use SB aggregates at those locations where the use of SB aggregates for foundation stabilization is specified elsewhere in the Contract Documents. When the preceding sentence applies, use SB-3 when the expected depth of foundation stabilization is less than 6 inches.

Except at the locations described above, the use of alternate granular materials (except chat) may be permitted, but only with the approval of the District Materials Engineer.

**1107 - AGGREGATES FOR BACKFILL**

**b. MSE Walls:** Precast Panel and Modular Block with Steel Soil Reinforcing Mesh or Steel Reinforcing Strips and Tie Strips.

(1) Composition. Use granular backfill material in the structure volume of sand, sand-gravel, or crushed stone, reasonably free from organics or other deleterious materials, and complies with the following:

(2) Quality. Submit representative material samples for the following tests to the Materials and Research Center, 2300 Van Buren, Topeka, KS 66611 (ATTENTION: Geotechnical Engineer) for acceptance prior to utilizing this material on the project.

- (a) The Plasticity Index (P.I.) is 6 maximum, determined by KT-10.
- (b) An angle of internal friction of 34 degrees or greater, as determined by the standard direct shear test – AASHTO T 236, utilizing a sample of the material compacted to 95 percent of AASHTO T 99 Methods C or D (with oversize correction, as outlined in Note 9 in AASHTO T 99) at optimum moisture content.
- (c) Soundness. Use material substantially free of shale or other soft, poor durability particles as determined in accordance with **SECTION 1115**. “Freeze and Thaw”, minimum 0.90 as determined in **DIVISION 1100**.
- (d) Wear. Los Angeles Wear Abrasion, maximum 40%.
- (e) Provide material that complies with **TABLE 1107-2**.

<b>TABLE 1107-2: ELECTROCHEMICAL REQUIREMENTS (PANEL)</b>	
<b>Requirements</b>	<b>Test Method</b>
Resistivity > 5000 ohm-cm	AASHTO T 288
pH: 5.0 to 10.0	AASHTO T 289
Organic Content < 1%	AASHTO T 267

If the resistivity is less than 5000 ohm-cm, but greater than 3000 ohm-cm, the backfill material can be accepted if it complies with **TABLE 1107-3**.

<b>TABLE 1107-3: ADDITIONAL ELECTROCHEMICAL REQUIREMENTS</b>		
<b>Property</b>	<b>Requirements</b>	<b>Test Method</b>
Chlorides	< 100 parts per million	ASTM D 4327
Sulfates	< 200 parts per million	ASTM D 4327

- (3) Product Control.
  - (a) Gradation.

<b>TABLE 1107-4: AGGREGATES FOR PANEL MSE WALLS BACKFILL</b>		
<b>Percent Retained – Square Mesh Sieves</b>		
<b>4”</b>	<b>No. 40</b>	<b>No. 200</b>
<b>0</b>	<b>40 - 100</b>	<b>95 - 100</b>

(b) Coefficient of Uniformity. Provide material with a minimum coefficient of uniformity of 4.0 as defined by ASTM D 2487 for systems that utilize steel reinforcing strips and tie strips (Reinforced Earth). Material with a coefficient of uniformity less than 4.0 may be accepted based on the results of pullout tests conducted by the University of Kansas, Civil Engineering Department, Geotechnical Section. (Contact: Dr. Jie Han @ 785-864-3714 or Dr. Bob Parsons @ 785-864-2946.)

- (4) Use only crushed stone in District 1.

For select granular backfill material composed of crushed stone, submit a proposed project gradation with single-point gradations and tolerances for approval. For sand and sand-gravel combinations, a project gradation will be issued that will specify gradation tolerances after the proposed material is approved. Any quality assurance samples which fall outside the tolerances will necessitate re-approval to be in compliance with **subsection 1108.2 b.(2)**.

**1107 - AGGREGATES FOR BACKFILL**

**c. MSE Walls: Modular Block with Soil Reinforcing Geogrid.**

(1) Composition. Use granular backfill material in the structure volume of sand, sand-gravel, or crushed stone, reasonably free from organics or otherwise deleterious materials, and complies with the following:

(2) Quality. Submit representative material samples for the following tests to the Materials and Research Center, 2300 Van Buren, Topeka, KS 66611 (ATTENTION: Geotechnical Engineer) for acceptance prior to utilizing this material on the project.

- (a) The Plasticity Index (P.I.) is 6 maximum, determined by KT-10.
- (b) An angle of internal friction of 34 degrees or greater, as determined by the standard direct shear test – AASHTO T 236, utilizing a sample of the material compacted to 95% of AASHTO T 99 Methods C or D (with oversize correction, as outlined in Note 9 in AASHTO T 99) at optimum moisture content.
- (c) Soundness. “Freeze and Thaw”, minimum 0.90 as determined in **DIVISION 1100**.
- (d) Wear. Los Angeles Wear Abrasion, maximum 40%.
- (e) Provide material that complies with **TABLE 1107-5**.

<b>TABLE 1107-5: ELECTROCHEMICAL REQUIREMENTS (Block)</b>		
	<b>Requirements</b>	<b>Test Method</b>
(Mesa)	pH > 3.0	AASHTO T 289
(Anchor Landmark)	pH: 3.0 to 9.0	AASHTO T 289
	Organic Content < 1%	AASHTO T 267

- (3) Product Control.
  - (a) Gradation.

<b>TABLE 1107-6: AGGREGATES FOR MODULAR BLOCK MSE WALLS BACKFILL</b>			
<b>Type of Material</b>	<b>% Retained – Square Mesh Sieves</b>		
	<b>1”</b>	<b>No. 40</b>	<b>No. 200</b>
Sand	0	40-100	95-100
Crushed Stone	0	40-100	95-100

Limit the maximum particle size to ¾ inch for geosynthetic reinforced structures and for epoxy or PVC coated reinforcements. Use only crushed stone in District 1.

For select granular backfill material composed of crushed stone, submit a proposed project gradation with single-point gradations and tolerances for approval. For sand and sand-gravel combinations, a project gradation will be issued that will specify gradation tolerances after the proposed material is approved. Any quality assurance samples which fall outside the tolerances will necessitate re-approval to be in compliance with **subsection 1108.2 c.(2)**.

**d. Underdrain, Permeable or Granular Backfill.**

(1) Composition. Provide washed aggregate Type BD-1 and Type UD-1 composed of crushed or uncrushed gravel, or crushed stone.

- (2) Quality.
  - Soundness, minimum (KTMR-21) ..... 0.90
  - Wear, maximum (KTMR-24) ..... 40%

(3) Product Control. Provide aggregate that complies with **TABLE 1107-7**

<b>TABLE-1107-7: AGGREGATES FOR UNDERDRAIN AND OTHER PERMEABLE BACKFILL</b>										
<b>Type</b>	<b>Percent Retained-Square Mesh Sieves</b>									
	<b>1 ½”</b>	<b>1”</b>	<b>¾”</b>	<b>3/8”</b>	<b>No. 4</b>	<b>No. 8</b>	<b>No. 16</b>	<b>No. 30</b>	<b>No. 50</b>	<b>No. 100</b>
BD-1*	0	0-10	10-40		80-100		90-100		93-100	98-100
UD-1			0	0-15		40-60		70-95		98-100

\*BD-1 is intended for use with a filter fabric.

**1107 - AGGREGATES FOR BACKFILL**

(4) Deleterious substances.

- Shale or shale-like material, maximum (KT-8) ..... 3.0%
- Clay Lumps and friable particles, maximum (KT-7) ..... 3.0%
- Sticks (wet), maximum (KT-35) ..... 1.0%

**e. Crushed Stone.**

(1) Composition. Provide material produced by the crushing of any type of stone complying with the following.

(2) Quality.

- Soundness, minimum (KTMR-21) ..... 0.70
- Wear, maximum (AASHTO T 96) ..... 50%

(3) Product Control.

(a) Size Requirements. Provide uniformly graded crushed stone, from coarse to fine, for backfill that complies with **TABLE 1107-8:**

<b>TABLE 1107-8: CRUSHED STONE BACKFILL</b>		
<b>Percent Retained-Square Mesh Sieves</b>		
<b>2"</b>	<b>3/8"</b>	<b>No. 16</b>
0	20 - 50	50 - 100

(b) Deleterious Substances.

- Clay lumps and friable particles, maximum (KT-7) ..... 5.0%

**1107.3 TEST METHODS**

Test aggregates according to the applicable provisions of **SECTION 1115.**

**1107.4 PREQUALIFICATION**

Prequalify aggregate sources according to **subsection 1101.4.**

**1107.5 BASIS OF ACCEPTANCE**

Aggregates covered by this subsection are accepted based on the procedures described in **subsection 1101.5.**

## 1201 - GENERAL REQUIREMENTS FOR DIVISION 1200 - ASPHALT MATERIALS

### SECTION 1201

#### GENERAL REQUIREMENTS FOR DIVISION 1200 – ASPHALT MATERIALS

##### 1201.1 DESCRIPTION

This specification covers general requirements for asphalt materials specified in **DIVISION 1200**.

##### 1201.2 REQUIREMENTS

**a. Storage and Heating.** Provide storage tanks, pipelines and loading facilities for asphalt materials that are equipped with adequate heating equipment that will not damage the material.

**b. Shipping Facilities.** Provide shipping containers that are equipped with appropriate hoses and pumps, are insulated and are equipped for heating the contents when requested by the KDOT. Do not heat asphalt materials in transit by open flame heaters on tank trucks.

Before loading, examine the shipping container and remove all remnants of previous cargoes that might contaminate the material to be loaded.

For each shipment to KDOT projects, maintain a loading log showing the following items: contract or project number, date, time, ticket number, shipping container number, contractor, grade and quantity. Mail a copy of the log to the Engineer of Tests monthly during the shipping season.

**c. Weighing Equipment.** For quantities measured by weight, provide a scale having a platform of adequate length to weigh the longest truck or truck-trailer combination in one operation. Calibrate the scales through the range of use by an approved scale company as often as necessary to verify their accuracy, with intervals not greater than six months. For manufacturers not operating through the winter, calibrate the scales before the production season and thereafter at intervals not greater than 6 months for the duration of the production season. Provide a copy of the calibration report to the Engineer of Tests.

##### **d. Sampling and Inspection.**

(1) General. The Engineer will perform the sampling of asphalt materials. Permit inspection of all tanks, tank cars, tank trucks, blending units, loading lines and other items relating to the production and loading of asphalt materials being shipped to KDOT work.

(2) Tests by Producer. Provide a testing laboratory with laboratory and sampling equipment complying with the appropriate AASHTO or ASTM specifications to be available to all production and terminal facilities servicing KDOT projects. The laboratory must be staffed with competent personnel who can conduct tests to verify all asphalt material intended for shipment to KDOT projects complies with the specifications before it is shipped. Perform testing necessary to maintain continuous quality control.

The minimum quality control testing and reporting requirements for each product that is shipped to KDOT projects is described in the following sections.

##### **e. Performance Graded Asphalt Binder (PGAB).**

(1) Definition of testing levels.

Complete AASHTO Specification Compliance (SC) test for PGAB:

Original Binder:

Flash Point (COC)

Brookfield Viscosity, 275°F

Dynamic Shear

Separation Test, 325°F, 48 hours (Polymer modified only)

Rolling Thin Film Oven Residue:

Mass Loss

Dynamic Shear

Elastic Recovery, 77°F (Polymer modified only)

Pressure Aging Vessel Residue:

Dynamic Shear

Creep Stiffness, S, 60s



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Slope, m

Quality Control (QC) Tests for PGAB:

DSR on Original Binder

DSR after RTFO

Any other short-term test(s) the producer has found to provide useful information for quality control of the product.

(2) When shipping from Refineries and Blending Facilities, use the following guidelines:

(a) For a tank which is filled before beginning shipping, and then emptied before more material is added, perform 1 complete AASHTO SC test per tank when filled, and weekly QC tests.

(b) For a tank being continually filled while continuous shipping is made from the tank, perform 1 complete AASHTO SC test per week, and daily QC tests

(c) When blending directly into a tanker, sample every third truck for QC tests, and perform 1 complete AASHTO SC test per week.

(d) Under any of the operations described above, if the results of any of the QC tests indicate the product may be out of specification, stop shipment from that source immediately. Perform a complete AASHTO SC test to ascertain the product status and re-certify the source.

(3) When shipping from Terminals, use the following guidelines:

(a) For operations where a tank is filled before beginning shipping, and then emptied before more material is added, perform a complete AASHTO SC test at the refinery on the material being shipped. When the shipment arrives at the terminal, run the QC tests to verify the material as it is being unloaded. After that, perform the QC tests weekly until the tank is emptied.

(b) For operations where a tank is being continually filled while continuous shipping is being made from the tank, perform a complete AASHTO SC test at the refinery on the material being shipped. When the shipment arrives at the terminal, run the QC tests to verify the material as it is being unloaded. Perform the QC tests on the contents in the tank weekly. Perform a complete AASHTO SC test on the contents in the tank once per month.

(c) Under any of the operations described above, if the results of any of the QC tests indicate the product may be out of specification, stop shipment from that source immediately. Perform a complete AASHTO SC test to ascertain the product status and re-certify the source.

### f. Emulsions and Asphalt Rejuvenating Agents.

(1) Perform 1 complete AASHTO test each time a batch of material is produced. A tank must be tested each time new material is added to it.

(2) A complete AASHTO test for Emulsions is defined as follows:

Saybolt Furol Viscosity, 77°F or 122°F

Residue by Distillation

Oil Distillate-**WHEN REQUIRED**

Storage Stability, 1 day-**WHEN REQUIRED**

Sieve Test

Demulsibility-**WHEN REQUIRED**

Tests on Distillation Residue:

Penetration, 77°F

Solubility-**WHEN REQUIRED**

Ductility, 39°F or 77°F-**WHEN REQUIRED**

Elastic Recovery - **EMULSIONS with a "P" DESIGNATION**

(3) A complete AASHTO test for asphalt rejuvenating agents is defined as follows:

Viscosity, Saybolt-Furol, 77°F

Residue by Distillation

Oil Distillate

Sieve Test

Storage Stability

Tests on Residue:

Penetration @39°F, 50g, 5 sec.

Asphaltenes

Elastic Recovery

## 1201 - GENERAL REQUIREMENTS FOR DIVISION 1200 - ASPHALT MATERIALS

### **g. Cutbacks.**

- (1) For a tank being filled and emptied before more material is added, perform 1 complete AASHTO test per tank, and weekly tests for 140°F viscosity.
- (2) For a tank being continually filled while continuous shipping is made from the tank, perform 1 complete AASHTO test per week, and daily tests for 140°F viscosity.
- (3) When blending directly into a tanker, sample every third truck for 140°F viscosity, and perform 1 complete AASHTO test per week.
- (4) A complete AASHTO test for cutback asphalt is defined as follows:
  - Kinematic Viscosity, 140°F
  - Flash Point, TOC
  - Distillation Test:
    - Distillates
    - Residue
  - Tests on Distillation Residue:
    - Vacuum Viscosity, 140°F and/or Penetration, 77°F
    - Ductility, 77°F or 60°F

**h. Reports.** For all types of products discussed above, prepare quarterly summary reports for all quality control and specification compliance testing performed during that period, including any statistical analysis associated with process control. Retain the reports for a minimum of 1 year. Submit them to KDOT if requested.

### **i. Asphalt Cement (AC).**

- (1) Definition of testing levels.
  - Complete AASHTO Specification Compliance (SC) test for AC:
    - Viscosity, 140°F
    - Penetration, 77°F
    - Flash Point, COC
    - Solubility
  - Tests on Residue from TFOT
    - Loss on heating
    - Viscosity, 140°F
    - Ductility, 77°F
  - Quality Control (QC) Tests for AC:
    - Viscosity @ 140°F
    - Penetration @ 77°F
- (2) When shipping from Refineries and Blending Facilities, use the following guidelines:
  - (a) For a tank which is filled before beginning shipping, and then emptied before more material is added, perform 1 complete AASHTO SC test per tank when filled, and weekly QC tests.
  - (b) For a tank being continually filled while continuous shipping is made from the tank, perform 1 complete AASHTO SC test per week, and daily QC tests
  - (c) When blending directly into a tanker, sample every third truck for QC tests, and perform 1 complete AASHTO SC test per week.
  - (d) Under any of the operations described above, if the results of any of the QC tests indicate the product may be out of specification, stop shipment from that source immediately. Perform a complete AASHTO SC test to ascertain the product status and re-certify the source.
- (3) When shipping from Terminals, use the following guidelines:
  - (a) For operations where a tank is filled before beginning shipping, and then emptied before more material is added, perform a complete AASHTO SC test at the refinery on the material being shipped. When the shipment arrives at the terminal, run the QC tests to verify the material as it is being unloaded. After that, perform the QC tests weekly until the tank is emptied.
  - (b) For operations where a tank is being continually filled while continuous shipping is being made from the tank, perform a complete AASHTO SC test at the refinery on the material being shipped. When the shipment arrives at the terminal, run the QC tests to verify the material as it is being unloaded. Perform the QC tests on the contents in the tank weekly. Perform a complete AASHTO SC test on the contents in the tank once per month.

## 1201 - GENERAL REQUIREMENTS FOR DIVISION 1200 - ASPHALT MATERIALS

(c) Under any of the operations described above, if the results of any of the QC tests indicate the product may be out of specification, stop shipment from that source immediately. Perform a complete AASHTO SC test to ascertain the product status and re-certify the source.

(4) Asphalt cement containing particulate modifiers may be susceptible to separation of the modifier. Provide appropriate circulation or agitation in storage if separation of the modifier is expected, suspected or if the modified asphalt will be stored at elevated temperature for more than one day before use.

### 1201.3 TEST METHODS

As described in the specification for each type of asphalt material.

### 1201.4 PREQUALIFICATION

**a.** Producers are required to submit qualification samples of any type or grade of material provided under this specification that has not previously been produced by them, or which has not been used on KDOT projects within the last 12 months. PGAB producers will also be required to submit material that complies with **SECTION 1202**. For each material being qualified or re-qualified, submit samples taken from a production batch, along with a copy of the producer's complete AASHTO test results on the same material to the Engineer of Tests. The Engineer will test the sample and compare the results. The producer will be notified of the results in writing.

**b.** Any change in formulation will require requalification. Changes in base stock or major components may require requalification. Contact the Engineer of Tests' Chief Chemist to determine if requalification is necessary.

**c.** All producers supplying material to KDOT projects must have a written quality control plan addressing the requirements of this specification. Producers of performance graded asphalt binder must also address any requirements in the latest edition of AASHTO R 26 that are not specifically covered here.

Submit a copy of the written quality control plan to the Bureau of Construction and Materials for review and approval. Quality control plans and the testing information contained therein will be maintained as confidential by KDOT. An approved plan is a required prerequisite to prequalification of any product.

In addition to the requirements specified in AASHTO R 26, include provisions in the QC plan for maintaining the mixing and compaction temperature ranges using the following guidelines:

(1) Unmodified PGAB Suppliers: Record the initial mixing and compaction temperature ranges on the certificate. Once 3 sets of tests for temperature ranges have been accumulated, then maintain a 3-point moving average. Maintain the mixing and compaction temperature ranges constant unless there is a change to any component (example: upper compaction temperature) of the 3-point moving averages by more than 40°F. If this occurs, then replace all of the old temperature ranges with the 3-point moving average temperature ranges.

Provide a monthly copy of all individual and 3-point moving average temperature ranges to the Chief Chemist at the Materials and Research Center. Provide the Contractor with the most current mixing and compaction temperature ranges as outlined above.

(2) Modified PGAB Suppliers: In addition to the requirements stated in (1) above, include a detailed description of the method used by your laboratory to determine the modified PGAB mixing and compaction temperature ranges in the QC Plan.

**d.** The Bureau of Construction and Materials will maintain a list of producers that are qualified to supply specific types and grades of materials. Qualified producers will be permitted to supply qualified materials on a certification basis. Monthly loading logs and results of the producer's quality control testing are required to be forwarded to the Engineer of Tests to maintain status on the prequalified list. In addition, suppliers of CRS-1HP and EBL are to submit up to two samples per year to the Engineer of Tests at the Materials and Research Center at the request of the Chief Chemist to maintain status on the prequalified list.

**e.** An annual split-sample testing program will be conducted for each producer on the Prequalified List. Producers must participate in this program for each type of material they have prequalified. When notified by KDOT, producers will be required to split a sample, test the material according to specifications, and send KDOT a portion to test along with their test results. The 2 sets of test results will be compared using the precision and bias guidelines outlined by AASHTO. If there are any discrepancies in the test results that cannot be resolved, a

## 1201 - GENERAL REQUIREMENTS FOR DIVISION 1200 - ASPHALT MATERIALS

laboratory inspection may be necessary. Producer laboratories that are AMRL certified will be exempt from this program.

f. Results of the split sample testing program, producer quality control testing required by **subsection 1201.2d.(2)** and verification testing conducted by the KDOT will be used to determine the reliability of the producer's certifications. If any of these data indicate that the certifications are not reliable, permission granted to the producer to supply asphalt materials on the basis of certification will be withdrawn. The producer may still supply asphalt materials, but the contents of each shipping container must be sampled and tested by KDOT before acceptance for use. This procedure will be followed until the producer has provided to the Bureau Chief of Construction and Materials, adequate indication that future certifications will be reliable.

### 1201.5 BASIS OF ACCEPTANCE

a. For producers prequalified as required by **subsection 1201.4** above, asphalt materials covered by this specification will be accepted upon receipt and approval by the Field Engineer of a certification prepared by the producer to cover the quality and quantity of material in each shipping container. Certifications must be based on the results of the producer's quality control testing as required in **subsection 1201.2d.(2)**.

b. For producers who are not prequalified, asphalt materials covered by this specification will be accepted based on the results of tests by the Materials and Research Center on samples from each shipping container. Testing must be completed before incorporation of the product into the project.

**1202 - PERFORMANCE GRADED ASPHALT BINDER**

**SECTION 1202**

**PERFORMANCE GRADED ASPHALT BINDER**

**1202.1 DESCRIPTION**

This specification covers performance graded asphalt binder (PGAB).

**1202.2 REQUIREMENTS**

a. Provide material\* that complies with the applicable requirements of **SECTION 1201** and AASHTO M

320. Polymer modified binders must meet the additional requirements shown in **TABLE 1202-1**.

\*Perform all tests after adding 0.5% high molecular weight amine antistripping agent (by weight) to the PGAB. Contact the Chief Chemist, Bureau of Construction and Materials, for a list of acceptable high molecular weight amines.

<b>TABLE 1202-1: ADDITIONAL REQUIREMENTS</b>					
<b>Temperature Spread<sup>1</sup>, °C</b>	<b>86</b>	<b>92</b>	<b>98</b>	<b>104</b>	<b>110</b>
Separation, ASTM D 5976, °C max. Run on Original Binder	2	2	2 <sup>2</sup>	2	2
Elastic Recovery, ASTM D 6084, Procedure A, % min. Run on RTFO Residue	50	60	65	75	80
<sup>1</sup> Temperature Spread is determined by subtracting low temperature from high temperature; for example PG 64-28: 64-(-28) = 92 <sup>2</sup> For PG 70-28 RCI, separation test requirement no greater than 6.					

b. Provide the grade of material designated in the Contract Documents. KDOT will not make changes in the grade of asphalt. The Contractor may substitute PGAB that complies with or exceeds the upper and lower grade designations for the grade specified. For example, if a maintenance overlay specifies a PG 58-22, a PG 64-22 or a PG 58-28 will also be accepted. Such substitutions require advance approval by the Engineer and a no-cost change order.

**1202.3 TEST METHODS**

Test according to the applicable provisions of ASTM D 5976, D 6084 and AASHTO T 48, T 240, T 313, T 315, T 316, and R 28.

**1202.4 PREQUALIFICATION**

Prequalify material according to **SECTION 1201**.

**1202.5 BASIS OF ACCEPTANCE**

See applicable requirements under **SECTION 1201**.

**1203 - EMULSIFIED ASPHALT**

**SECTION 1203**

**EMULSIFIED ASPHALT**

**1203.1 DESCRIPTION**

This specification covers emulsified asphalt used for asphalt mixes, surface sealing, microsurfacing and tack coats.

**1203.2 REQUIREMENTS**

**a. General.** Provide emulsified asphalt that is an intimate, homogenous mixture of base asphalt and emulsifying agent held suspended in water. Certain emulsified asphalt grades may contain petroleum distillates.

The grade of material is designated in the Contract Documents. The KDOT reserves the right to change the grade and class as necessary due to aggregate type, road surface or weather conditions. Make the required change after being notified in writing by the KDOT.

Provide emulsified asphalt that remains homogenous and stable during transportation, storage and distribution. Material that performs unsatisfactorily in any of the above situations will be rejected even if the material passes all laboratory tests.

**b. Chemical and Physical Requirements.** Provide emulsified asphalt that complies with **TABLES 1203-1, 1203-2 and 1203-3.**

<b>TABLE 1203-1: SPECIFICATIONS FOR ANIONIC EMULSIFIED ASPHALT</b>								
	<b>RS-1H/ RS-1HP</b>		<b>SS-1H</b>		<b>MS-1</b>		<b>SS-1HP</b>	
	<b>Min.</b>	<b>Max.</b>	<b>Min.</b>	<b>Max.</b>	<b>Min.</b>	<b>Max.</b>	<b>Min.</b>	<b>Max.</b>
Viscosity, Saybolt Furol								
At 77°F, sec. . . . .	----	----	10	100	----	----	10	75
At 122°F, sec. . . . .	75	300	----	----	100	400	----	----
Residue by Distillation, (% by Mass).....	65	----	57	----	65	----	57	----
Oil Distillate, (% by Volume) .	----	----	----	----	----	8	----	----
Storage Stability, % <sup>1</sup> . . . . .	----	1	----	1	----	1	----	----
Demulsibility:								
35 ml of 0.02 N CaCl <sub>2</sub> , % . .	60	----	----	----	----	----	----	----
50 ml of 0.1 N CaCl <sub>2</sub> , % . . .	----	----	----	----	75	----	----	----
Sieve Test, % Retained. . . . .	----	0.50	----	0.50	----	0.50	----	0.1
Tests on Distillation Residue:								
Penetration, 77°F, 100g, 5 sec.	75	150	75	125	300	----	75	150
Solubility, % . . . . .	97.5	----	97.5	----	97.5	----	----	----
Ductility, 77°F, mm. . . . .	800	----	800	----	----	----	----	----
Ductility, 39°F, mm	----	----	----	----	----	----	100	350
Elastic Recovery @ 50°F, 20 cm elongation, %	60 <sup>2</sup>	----	----	----	----	----	25	----

<sup>1</sup> If the Contractor's storage tanks are equipped with a mechanical propeller type agitation device, and the entire contents of the tank are thoroughly mixed before each day's use, the requirement for satisfactory compliance with the storage stability test will be waived.

<sup>2</sup> RS-1HP only

**1203 - EMULSIFIED ASPHALT**

<b>TABLE 1203-2: SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALT</b>								
	<b>CRS-1H/ CRS-1HP</b>		<b>CSS-1H/ CSS-1HM</b>		<b>CMS-1</b>		<b>CSS-Special</b>	
	<b>Min.</b>	<b>Max.</b>	<b>Min.</b>	<b>Max.</b>	<b>Min.</b>	<b>Max.</b>	<b>Min.</b>	<b>Max.</b>
Viscosity, Saybolt-Furol:								
At 77°F, sec. . . . .	----	----	10	60	----	----	----	----
At 122°F, sec. . . . .	75	300	----	----	100	400	----	----
Residue by Distillation, (% by Mass).....	65	----	57	----	65	----	64.0 <sup>1</sup>	66.0 <sup>1</sup>
Oil Distillate, (% by Volume).	----	3	----	----	----	8	----	0.5
Storage Stability, % . . . . .	----	1	----	1	----	1	----	----
Sieve Test, % Retained. . . . .	----	0.50	----	0.50	----	0.50	----	0.1
Tests on Distillation Residue:								
Penetration, 77°F, 100g, 5 sec	75	150	50	100	300	----	-25% <sup>2</sup>	+25% <sup>2</sup>
Solubility, % . . . . .	97.5	----	97.5	----	97.5	----	----	----
Ductility, 77°F, mm. . . . .	800	----	800	----	----	----	----	----
Viscosity, Saybolt-Furol, 180°F, sec. . . . .	----	----	----	----	300	700	----	----
Elastic Recovery @50°F, 20 cm elongation, %	60 <sup>3</sup>	----	----	----	----	----	----	----

<sup>1</sup> Use modified AASHTO T 59 procedure – distillation temperature of 350°F with a 20 minute hold.

<sup>2</sup> Penetration will be determined by the producer and submitted to the Chief Chemist at the time of prequalification.

<sup>3</sup> CRS-1HP only

<b>TABLE 1203-3: SPECIFICATIONS FOR EMULSION BONDING LIQUID</b>		
	<b>EBL</b>	
<b>Tests on Emulsion:</b>	<b>Min.</b>	<b>Max.</b>
Viscosity, Saybolt-Furol @ 122°F, sec	25	125
Storage Stability Test <sup>1</sup> , 24 h, %		1
Sieve Test <sup>2</sup> , % Retained		0.3
Residue by Distillation, %	63	
Oil Distillate by Distillation, %		2
Demulsibility, % (35 ml, 0.02 N CaCl <sub>2</sub> ) (Anionic Version)	60	
Demulsibility, % (35 ml, 0.8% Dioctyl Sulfosuccinate) (Cationic Version)		
Tests on Distillation Residue:	Min.	Max.
Penetration, 77°F, 100g, 5 sec	90	150
Elastic Recovery <sup>3</sup> , %	60	

<sup>1</sup> After sitting undisturbed for 24 hours, the sample shall show no more than 5 ml of the white latex residue.

<sup>2</sup> The sieve test is waived if successful application of the material has been achieved in the field.

<sup>3</sup> Elastic recovery, AASHTO T 301, 50°F, 20 cm elongation, 5 minute hold, % min., run on Distillation Residue.

**c. Mixing Grade Emulsions.** Formulate mixing emulsions (MS-1 and CMS-1) for use with regional aggregate types. In general, these will be crushed limestone and/or dolomite with sand for the eastern section of the state and sand-gravel with mineral filler for the central and western sections. Formulate emulsions for use by both windrow and plant mixing methods and for either damp or dry aggregates. Provide an emulsion formulated for the intended end use if these conditions cannot be met by a single formulation. Provide an emulsion that enables material in a stockpile to easily be removed at temperatures as low as 39°F for an extended period of time after mixing.

## 1203 - EMULSIFIED ASPHALT

### **d. Modified Emulsions, RS-1HP, CRS-1HP and CSS-1HM and CSS-Special**

(1) Provide anionic emulsified asphalt (RS-1HP) that complies with **TABLE 1203-1** or cationic emulsified asphalt (CRS-1HP or CSS-1HM) that complies with **TABLE 1203-2**.

(2) Provide a modified emulsion that contains a minimum of 3.0 percent polymer solids by weight of asphalt.

(3) Provide a modified emulsion that shows no more than 5 ml of the white latex residue after sitting undisturbed for 24 hours.

(4) For use in Microsurfacing. Formulate the modified emulsified asphalt so that if the paving mixture is applied at a thickness of 1 inch, and the relative humidity is not more than 50 percent with the ambient air temperature at least 75°F, it will cure sufficiently so rolling traffic can be allowed on the pavement in 1 hour with no damage to the surface. It must show no separation after mixing.

### **1203.3 TEST METHODS**

**a.** Test in accordance with the applicable provisions of AASHTO T 44, T 49, T 51, and T 59.

**b.** When testing modified emulsions, test the Elastic Recovery using AASHTO T 301. In addition, modify the distillation procedure of AASHTO T 59 as follows:

“Slowly bring the temperature of the lower thermometer to  $350 \pm 9^\circ\text{F}$  and maintain for 20 minutes. Complete the distillation in  $60 \pm 15$  minutes from the first application of heat.”

### **1203.4 PREQUALIFICATION**

Prequalify material under this specification according to **SECTION 1201**.

### **1203.5 BASIS OF ACCEPTANCE**

See applicable requirements under **SECTION 1201**.



## 1204 - CUTBACK ASPHALT

### SECTION 1204

#### CUTBACK ASPHALT

##### 1204.1 DESCRIPTION

This specification covers cutback asphalt used for bituminous mixes and surface sealing.

##### 1204.2 REQUIREMENTS

**a. General.** Provide material that complies with the applicable requirements of **SECTION 1201**. Provide the grade of material designated in the Contract Documents. The KDOT reserves the right to change any grade of asphalt due to the characteristics of the roadbed, seasons of the year or weather conditions. This change will be to obtain a material having the characteristics of the next higher or lower grade of cutback asphalt of the same type (RC or MC). Make the required change after being notified in writing by the KDOT.

**b. Rapid Curing Cutback Asphalt.** Provide Rapid Curing Cutback Asphalt consisting of an asphaltic base fluxed with suitable petroleum distillates. Provide a material that shows no separation before use and complies with all requirements for the designated grade shown in AASHTO M 81, Table 1.

**c. Medium Curing Cutback Asphalt.** Provide Medium Curing Cutback Asphalt consisting of an asphaltic base fluxed with suitable petroleum distillates. Provide a material that shows no separation before use and complies with all requirements for the designated grade shown in AASHTO M 82, Table 1.

##### 1204.3 TEST METHODS

Test according to the applicable provisions of AASHTO M 81 and M 82.

##### 1204.4 PREQUALIFICATION

Prequalify material under this specification according to **SECTION 1201**.

##### 1204.5 BASIS OF ACCEPTANCE

See applicable requirements under **SECTION 1201**.

## 1205 - ASPHALT REJUVENATING AGENT

### SECTION 1205

#### ASPHALT REJUVENATING AGENT

##### 1205.1 DESCRIPTION

This specification covers materials to be used as an emulsified polymer-modified asphalt rejuvenating agents for the use in hot in-place recycling of asphalt pavements.

##### 1205.2 REQUIREMENTS

Provide material that has a record of satisfactory performance based on the capability of the material to increase the ductility and lower the viscosity of the asphalt binder in the pavement surface. Provide an asphalt rejuvenating agent composed of a polymer-modified asphalt emulsion. Modify the asphalt base stock with a minimum of 3.0% styrene-butadiene solution polymer. Blend the polymer modified base stock with process oils or other additives before emulsification to achieve the desired finished product properties. The material must comply with the following physical and chemical requirements in **TABLE 1205-1**:

<b>TABLE 1205-1: ASPHALT REJUVENATING AGENT</b>	
<b>Property</b>	<b>Requirement</b>
Viscosity, Saybolt-Furol at 25°C, sec	15 – 100
Residue, % min. <sup>1</sup>	60
Sieve Test, % max.	0.10
Oil Distillate, % max.	2
Storage Stability, 24 hrs., % max.	1
<b>Tests on Residue from Distillation:</b>	
Asphaltenes, % max.	25
Penetration @ 4°C, 100g, 5 sec.	50 – 150
Elastic Recovery, AASHTO T 301, 4°C, 20 cm elongation, % min. Run on Distillation Residue	60

<sup>1</sup>Use modified AASHTO T 59 procedure – distillation temperature of 350°F with a 20 minute hold.

##### 1205.3 TEST METHODS

Test in accordance with the applicable provisions of AASHTO T 59, ASTM D 4402 and KT-MR20, “Chemical Analysis of Asphalt Rejuvenating Agents”.

##### 1205.4 PREQUALIFICATION

Prequalify material under this specification according to **SECTION 1201**.

##### 1205.5 BASIS OF ACCEPTANCE

See applicable requirements under **SECTION 1201**.

# 1501 - HOT JOINT SEALING COMPOUND

## SECTION 1501

### HOT JOINT SEALING COMPOUND

#### 1501.1 DESCRIPTION

This specification covers hot joint sealing compound for use in sealing joints and cracks in asphalt and portland cement concrete pavements.

#### 1501.2 REQUIREMENTS

**a. General.** Provide a joint sealing compound that is a homogeneous blend of elastomers and other plasticizers and agents blended to result in a product that seals cracks in pavements from water intrusion. The sealant must retain adhesion and flexibility during extremes of expansion and contraction of the crack through a temperature range of 0°F to 140°F. Heat and apply the material according to manufacturer's recommendations.

**b. Bond.** When tested at -20°F to 200% extension of 1/2 inch to 1-1/2 inch for 3 cycles, the material exhibits no cracking, separation, or other opening that at any point is greater than 1/4 inch deep in the sealer or between the sealer and the mortar block. A minimum of 2 test specimens in a set of 3 representing a given sample must comply with this requirement.

**c. Flow.** 5 mm maximum.

**d. Resilience.** 50 – 80% recovery.

**e. Cone Penetration.** 0°F, 150 grams, 5 seconds: 18 - 80

**f.** Provide material capable of a minimum 12-hour pot life at application temperature and of being re-heatable at least once (in a normal field application) without experiencing changes in application characteristics, polymer and oil separation, balling or other signs of gelling.

**g.** Package the material in pails or boxes clearly marked with recommended pouring temperature, maximum heating temperature, shelf life if appropriate, and batch number. The size of a batch, which is any well-defined quantity produced by essentially the same process during a designated amount or time (such as an 8-hour shift), must be a minimum of 10,000 lbs.

**h.** Lots from the same manufacturer may be commingled during application. Do not commingle materials from different manufacturers.

#### 1501.3 TEST METHODS

**a. Sample Preparation.** ASTM D5167, sample size of 5 lbs. Maintain the material at the manufacturer's recommended pouring temperature for 6 hours for both initial and reheat, before preparing the specimens.

**b. Bond.** ASTM D5329, Section 9. In forming the bond test specimens, space the blocks  $0.50 \pm 0.01$  inch apart by means of suitable spacer strips to enclose a space of  $2.0 \pm 0.05$  inch by  $2.0 \pm 0.05$  inch.

**c. Flow.** ASTM D5329, Section 8.

**d. Resilience.** ASTM D5329, Section 12.

**e. Cone Penetration.** ASTM D5329, Section 6 with the following variations:

(1) Pour the sample into a 6 oz. tin flush with the top and allow to cool overnight.

(2) Place the specimen in a freezer at 0°F for 4 hours. Place the cone in the freezer for the last hour before the test.

## 1501 - HOT JOINT SEALING COMPOUND

(3) At the end of the 4-hour period, remove the cone from the freezer, place the specimen on the stand, and penetrate immediately.

(4) Return the specimen to the freezer, clean the cone, and return the cone to the freezer for 30 minutes before making each successive penetration.

**f. Reheat.** Allow the remainder of the sample to cool to room temperature until the next working day. Repeat subsections 1501.3a. through 1501.3e. Results of tests must meet requirements, and be consistent with those from the first set of specimens.

### 1501.4 PREQUALIFICATION

**a.** Manufacturers interested in prequalifying material under this specification must provide a thirty pound sample to the Engineer of Tests for laboratory testing. Include a copy of the quality control test report for the batch of material the sample represents, material safety data sheets, and a complete set of heating and installation recommendations and instructions. Include any conditions and limits to the number of re-heating cycles for the material.

**b.** Results of testing from the AASHTO National Transportation Product Evaluation Program (NTPEP) will be accepted in lieu of the sample requested above. Include the most recent NTPEP test report along with the other documentation requested. Include evidence that the product being offered is identical to the one reported in the NTPEP report.

**c.** The material will be evaluated for compliance with this specification, and the manufacturer will be notified of the results. The Bureau of Construction and Materials will maintain a list of qualified materials. Products will remain on the prequalified list as long as the results of batch testing and field performance are satisfactory. Report any changes in formulation to the Engineer of Tests for review and evaluation to determine if requalification is necessary.

### 1501.5 BASIS OF ACCEPTANCE

**a.** Prequalification as required in subsection 1501.4.

**b.** Receipt and approval of manufacturer's certification for minimum pot life and reheatability requirements. The manufacturer must certify that the material is capable of a minimum 12-hour pot life at application temperature and is re-heatable at least once (in a normal field application) without experiencing changes in application characteristics, polymer and oil separation, balling or any other signs of jelling. The manufacturer must designate any conditions and limits to the number of re-heating cycles for the material.

**c.** Satisfactory results of tests conducted at the Materials and Research Center on each batch of material. Samples will be obtained by a representative of KDOT and must be available for testing at the Materials and Research Center a minimum of 10 working days before the date the material is required for installation.

**d.** Visual observation of performance in the field.

## **2402 – WATER FOR MISCELLANEOUS USES**

### **SECTION 2402**

#### **WATER FOR MISCELLANEOUS USES**

##### **2402.1 DESCRIPTION**

This specification covers water requirements for use with:

- Aggregate Base
- Cement Treated Base
- Cold In-Place Recycled Asphalt Construction
- Earthwork Compaction
- Emulsified Asphalt
- Flexible Pavement
- Fly Ash Treated Subgrade
- Hydrated or Quicklime
- Lime Treated Subgrade
- Stabilized Shoulders
- Subgrade Modification

##### **2402.2 REQUIREMENTS**

Use water that is reasonably clear, compatible with the materials to which it is to be added and free from excessive quantities of oil or vegetable matter. Approval of the water source by the Engineer is required before use.

##### **2402.3 METHOD OF TEST**

None Specified.

##### **2402.4 PREQUALIFICATION**

None Required.

##### **2402.5 BASIS OF ACCEPTANCE**

Acceptance of water will be based on visual examination by the Field Engineer and its performance during the progress of the work.

## 2601 - MATERIALS CERTIFICATIONS

### SECTION 2601

#### MATERIALS CERTIFICATIONS

##### 2601.1 DESCRIPTION

This specification governs the requirements for the content and distribution of certifications when dictated, in part or in whole, as the basis of acceptance for a material.

##### 2601.2 REQUIREMENTS

###### a. General

(1) The contractor is responsible for obtaining all certifications and arranging for their delivery to the proper destinations prior to use of the material and allowing sufficient time for review as stated herein.

(2) **Provide the following information on all certifications regardless of type.**

(a) Identification of the organization submitting the certification.

(b) KDOT project number and KDOT contract number.

(c) Name of contractor.

(d) Identification markings on the shipment. As a minimum, this must include the name of the manufacturer. Also include the lot or heat number referenced in the certification, the serial number if applicable, and the date of manufacture if available.

(e) Quantity of material represented by the certification. If multiple lot/heat numbers are submitted, the quantity should be listed per lot/heat number.

(f) KDOT Contract line number (bid item) and item code number of the material represented by the certification.

(g) Statement that all material complies with the applicable specifications. List the specifications by responsible organization, number, section reference or other appropriate identification.

(h) Additional information as required in the specification for the material, or as added requirements for the various types of certifications in **subsection 2601.2b** below.

(3) The general information outlined above may be provided by the supplier on a cover sheet to the manufacturer's certification(s). An example of a cover sheet is included at the end of this specification. Verify that the cover sheet and certification(s) are so well cross referenced and identified as a unit that they can be reunited if accidentally separated.

(4) When lot or heat numbers are required in a certification, the manufacturer is required to provide information with regard to the typical quantity of material and production time intervals represented by these numbers. Also include the dates of manufacture for the lots or heats involved. This information will be evaluated by the KDOT and may constitute a basis for rejection if the quantities or time intervals are considered excessive.

(5) A signature is not required on laboratory reports or manufacturer's certifications unless specifically required by other applicable specifications. However, the document must clearly identify the organization submitting the report or certification. The organization submitting certifications, reports, and related written statements is responsible for the contents of these documents whether they are signed or not.

###### b. Types of Certifications.

(1) Type "A" certification. This certification is to include a copy of the results of tests conducted by the manufacturer's or other qualified laboratory on samples obtained from the lot or lots of material in the shipment.

When a mill test report is submitted as the laboratory report, the quantity in the shipment does not need to be included on the report, provided that the identifying heat or lot numbers involved are roll stamped, embossed, or durably affixed to each item of material in the shipment represented by the report. In this case, provide the necessary quantity information on a cover sheet, clearly identifying the quantity of each heat or lot in the shipment.

(2) Type "B" certifications. This certification is to include a current summary of the maximum to minimum range of the manufacturer's quality control test results as determined by the manufacturer's or other qualified laboratory. These summaries must provide data on all major specification requirements. Also include the range of lots and manufacture dates represented by the data. When combining multiple components into a single item, submit a detailed parts summary indicating the lot/heat number, part description and quantity for each part. Summary reports dated more than six months prior to the date of manufacture or shipment of the product will not be

## 2601 - MATERIALS CERTIFICATIONS

accepted. The Engineer of Tests may also request copies of detailed test reports for material produced during a specified time interval for verification of the certification.

(3) Type "C" certifications. This certification is to include a statement certifying that the material in the shipment is essentially the same as material that is prequalified.

(4) Type "D" certifications. This certification is to comply with **subsection 2601.2a**.

(5) Type "E" certifications. This certification applies to assemblies or structures that are composed of two or more components or materials. These components or materials have been approved previously on an individual basis for KDOT projects, but lose their identity when they are incorporated into an assembly or structure. This certification would apply to signs, overhead sign and lighting structures, etc. The certification is to state that all the components or materials used in the fabrication of the represented assembly or structure were previously approved for KDOT use.

**c. Responsibility for Preparation.** The manufacturer of the individual item is responsible for preparing certifications of Type "A", Type "B", Type "C", and Type "D" certifications. The fabricator or assembler of individual items is responsible for preparing a Type "E" certification.

**d.** The Engineer reserves the right to sample and test any material or product that is governed by a certification. If deviations from the applicable specifications are found, the results will be reviewed by the Engineer to determine the final disposition of the material or product. Serious deviations may be cause for removal from prequalified status.

**e. Distribution of Certifications.**

(1) Types "A" and "B" certifications.

(a) Submit one copy of the certification via hard copy or e-mail to:

Materials and Research Center  
Attn: Materials Certification Technician  
2300 Van Buren  
Topeka, KS 66611  
E-mail address: typeABCerts@ksdot.org

These certifications will be evaluated for compliance with the applicable specifications as well as this section. The appropriate personnel will be notified of a certification's disposition status through the issue of a hardcopy or electronic report, whichever is most expedient.

(b) Submit one copy to the Field Engineer responsible for the project construction.

(2) Types "C," "D" and "E" certifications.

(a) Issue one copy to the Field Engineer responsible for the project construction.

(b) Do not issue these certifications to the Bureau of Construction and Materials, the Materials Certification Technician, or the Engineer of Tests unless they are specifically requested.

**f. Certification of Aggregates.** Provide the Engineer a certification for each classification of aggregate utilized in a project.

(1) Aggregates Delivered to the Site: Certify each classification of aggregate delivered to a project or product preparation site. Prepare these certifications under the signature of the aggregate producer or their designated representative.

(a) Certify aggregates that are tested at their destination to determine final disposition as to the locations of the deposits from which they were produced.

(b) Certify aggregates that are tested at their production site to determine final disposition. These certifications state that the aggregates were removed from a KDOT tested and approved stockpile at the production site, or that they were removed from a plant while it was producing aggregate that was in compliance with the applicable specifications.

(2) Aggregates Incorporated into the Project: At locations where aggregates and products that incorporate aggregates are produced for KDOT **and** non-KDOT use, provide certifications stating that only KDOT tested and approved aggregate was provided for the KDOT projects.

(3) Frequency of Certification:

(a) Prior to the initial delivery of aggregates to a project or product preparation site, provide the Engineer a certification. This certification is to be under the signature of the aggregate producer or

## 2601 - MATERIALS CERTIFICATIONS

their designated representative and state that all aggregates to be provided for the project are in compliance with all the applicable KDOT specifications.

(b) Upon completion of the project, provide certifications as specified in **subsection 2601.2f.(1) and (2)** of this specification to the Engineer. These certifications apply to all aggregates that were delivered to the project or product preparation site and ultimately used in the project.

These certifications are to indicate the approximate quantities in tons or cubic yards of each aggregate delivered to the project and the approximate quantities in tons or cubic yards of each aggregate delivered to the product preparation site and incorporated into a product that was utilized in the project.

### 2601.3 TEST METHODS

Not applicable.

### 2601.4 PREQUALIFICATION

Not applicable.

### 2601.5 BASIS OF ACCEPTANCE

When certifications are incorporated into a material or product specification, acceptance will be based on the following:

**a.** All applicable requirements are complied with. This includes the requirements of this section as well as the requirements of specifications unique to the product or material.

**b.** The final disposition of any product or material will be completed at the final destination as the result of inspection for the quality of workmanship and the delivery condition.





February 2024

A-N/A  
Fort Hays State University  
Gross Coliseum/Cunningham Hall Parking Lot Repairs

**APPENDIX B**

Crafco, Inc.  
Installation Instructions, PolyPatch Products, 2014.

**POLYPATCH and POLYPATCH FINE MIX**

PART NOS.	PolyPatch	34282
	PolyPatch Fine Mix	34285

NOVEMBER 2014

**READ BEFORE USING THIS PRODUCT**

**GENERAL:** These instructions are for Crafcro PolyPatch and PolyPatch Fine Mix. PolyPatch products are hot-applied, pourable, self-adhesive materials used for preservation, maintenance and repair of asphalt and portland cement concrete pavements and bridge deck surfaces. These products are specially formulated to repair distresses which are larger than those typically repaired by crack or joint sealing, but smaller than those requiring remove and replace patching procedures. To use, PolyPatch is removed from the box, heated to installation temperature in an appropriate melter, applied to prepared pavement surfaces and allowed to cool. PolyPatch forms well bonded, flexible, load resistant and lasting pavement repairs. PolyPatch products are supplied in two grades: PolyPatch and PolyPatch Fine Mix. PolyPatch Fine Mix has finer aggregate than PolyPatch, for improved edge feathering in thinner installations.

**MELTING, HEATING AND AGITATING:** PolyPatch is supplied in boxes containing 30 lbs (13.6 kg) of pre-measured polymer modified binder and aggregate. To use, the contents of each box are placed into and heated in an appropriate indirectly heated melter with sufficient agitation (Crafcro Patcher I, Crafcro Patcher II, or other approved melter). **If inappropriate melters are used, application difficulties, pump system damage, and extreme wear can result.** During melting and heating, the heat transfer oil should be heated to 450°F – 525°F (232°C – 274°C). PolyPatch is then added to the melter. When material has melted sufficiently for the agitator to turn, agitation should begin. PolyPatch is then heated to the application temperature range of 375°F – 400°F (190°C – 204°C) prior to applying to the pavement. It is recommended that a secondary device be used to measure temperature of material (i.e. infrared heat gun, hand held thermometer, etc.) prior to application. For maximum production, jobs should begin with the melter nearly full of PolyPatch that has been heated to application temperature. At application temperature, PolyPatch is a thick, grainy appearing slurry. During use of PolyPatch, as the quantity in the melter decreases, additional product can be added. Caution: Do not agitate when adding additional PolyPatch. If the material temperature in the melter drops below 375°F (190°C) when additional PolyPatch is added, installation should stop until the correct application temperature range is once again reached. During installation, agitation should be constant, except for when adding additional product.

**PAVEMENT TEMPERATURES:** Apply PolyPatch when pavement temperature exceeds 40°F (4°C). Lower temperature may reduce adhesion due to presence of moisture or ice. If pavement temperature is less than 40°F (4°C), warm with a heat lance (Crafcro Part No. 45650) that puts no direct flame on the pavement. If installing at night, assure that dew is not forming on the pavement surface. Applied product should be checked by qualified personnel to assure that adhesion is adequate.

**TRAFFIC CONTROLS:** Place appropriate traffic controls in accordance with Part 6, Temporary Controls, of the FHWA Manual on Uniform Traffic Control Devices (MUTCD) to protect the work site for the duration of the repairs.

**INSTALLATION PROCEDURES:**

1. Only apply PolyPatch to clean, sound, dry surfaces. Avoid highly distressed areas in need of reconstruction. All areas must be clean from dust and debris. All areas to be repaired shall be blown clean with dry, oil free compressed air at 90 psi (620 kpa) minimum. If compressed air does not remove all debris or dust coatings, additional cleaning procedures such as sweeping with a stiff or wire bristle broom, sandblasting or routing are recommended. Work areas must be as clean, or cleaner than with sealants. **(If sealant won't adhere, neither will PolyPatch.)** PCCP shall be abrasive cleaned to achieve best adhesion.
2. Preheating shall be used in wet/freeze climates on all applications. This technique is also required on all applications in all other areas when ambient temperature is less than 40°F (4°C) or if moisture is present. A heat lance is recommended due to the high BTU's for quick heating and so the area can be blown with compressed air at the same time, eliminating a second operation. Asphalt concrete pavement should be heated so a slight bleeding effect occurs. This bleeding brings some of the asphalt binder to the surface, which enhances the adhesive bond between PolyPatch and road surface. However, caution should be taken to prevent overheating/oxidizing the asphalt brought to the surface as this could be detrimental to adhesion performance. Heating the pavement will also remove moisture assuring a dry surface. Elevating the pavement temperature also slows the cooling process and allows PolyPatch to remain molten longer enabling the binder to adequately drain assuring positive contact with the pavement. PolyPatch should be applied within ten minutes of preheating the work area. PCCP should be warmed slowly and cautiously to avoid mixture damage.
3. Heated PolyPatch is then installed in the pavement. PolyPatch can be poured into the prepared area directly from the melter, poured from the melter into an appropriate bucket such as the Crafcro TechCrete Bucket (Part No 32263) and then applied, or poured into the Crafcro Material Handler (Part No. 57650) and installed. When surface patching distressed areas, PolyPatch must be applied at least six inches beyond the distressed work area to sound pavement surfaces. For placing PolyPatch in wide cracks, Crafcro Shoebox applicators can be used (Part Nos. 32350-32353, 32255, 32250, 32252, or 32253). Always apply PolyPatch within the application temperature range of 375 to 400oF ( 190-204oC)
4. PolyPatch must be applied to a thickness exceeding 3/8 in (1cm). This enables longer heat retention and proper adhesion of the binder. Just after applying to the pavement, PolyPatch must be leveled to the surface level using a metal squeegee, Crafcro Ironing Wand (Part No 32243), or a Crafcro Shoebox. PolyPatch should not be overworked due to cooling and segregation that may affect adhesion. Avoid down pressure on the leveling tool while leveling material. Slight lifting of the tool reduces indentations and reduces overworking the material. When possible, keep the leveling tool full of hot material, which helps maintain proper material temperature and reduces overworking.

## INSTALLATION INSTRUCTIONS - POLYPATCH and POLYPATCH FINE MIX

5. **Optional** - Routing a +/-3 in (7.5 cm) wide by minimum 3/8 in (1 cm) deep reservoir at the edges of the work area assures proper PolyPatch thickness at edges, creates a clean and sound bond line, helps to maintain straight work area borders and results in a finished application flush with the surrounding pavement. (Contact CrafcO for more details)
6. All edges shall be heated and melted after application. This is performed with the lance or torch while the PolyPatch is still warm, which will reduce the amount of heating required. Heating assures that the repair is well adhered and encapsulated along the edges and will eliminate surface moisture from migrating under the PolyPatch. Do not overheat.
7. Apply CrafcO Detack to allow quick opening of the area to traffic. Make sure PolyPatch has cooled sufficiently to support loads prior to opening to traffic.

**USES AND INSTALLATION CONFIGURATIONS:** The general use of PolyPatch is to repair pavement deficiencies which are larger than those that can be appropriately filled with pavement sealants, but smaller than those where conventional remove and replace patching procedures are used. Typical uses include (but are not limited to):

- 1) Filling pavement cracks or joints over 1.5 in (3.8 cm) wide,
- 2) Filling potholes,
- 3) Leveling depressed thermal cracks,
- 4) Repairing deteriorated longitudinal joints,
- 5) Skin patching,
- 6) Pretreatment of cracked areas prior to surface treatments,
- 7) Repairs prior to surface treatments
- 8) Leveling manhole covers, bridge deck approaches, or other settlement at structures,
- 9) Capping settled utility cuts,
- 10) Filling spalls, popouts, and corner breaks

Note: Polypatch products shall not be used for surface skin patch repairs at intersections unless followed by a surface treatment.

PolyPatch Fine Mix is generally used for installations less than 2 in (5 cm) deep, and where a feathered edge is desired. Minimum installation depth for PolyPatch Fine Mix is 3/8 in (1 cm). PolyPatch is generally used for installations over 2 in (5cm) deep. Minimum installation depth for PolyPatch is 1 in (2.5 cm). PolyPatch installations over 4 in (10 cm) deep can be bulked by adding up to 25% by volume of CrafcO Structural Aggregate (Part No. 34033) to the patch in layers for improved stability and quicker cooling. PolyPatch Fine Mix installations over 2 in (5cm) deep can also be bulked.

PolyPatch binder is self-adhesive and develops a strong bond to the pavement. Approximately 5% shrinkage will occur as PolyPatch cools to ambient.. No compaction is required. After application, time must be given for the product to cool before opening the area to traffic. Cooling time varies depending on installation size and ambient temperature. Allow approximately 30 to 60 minutes of cooling for each 1 in (2.5cm) of material depth. For installations over 2.5 in (6.2cm) deep, PolyPatch should be applied in layers not exceeding 2.5 in (6.2cm) thick with cooling to 200oF (93oC) maximum before applying the next layer. The final layer to pavement surface level should be ½ to 1 in (1.2 to 2.5 cm) thick. Layering reduces material shrinkage during cooling. Roofing felt or other similar strips can be used along the work area boundaries to create neat, well defined edges. Strips should be removed immediately after application before material cools.

**APPLICATION LIFE:** Application life at application temperatures is approximately 12 to 15 hours. Application life may be extended by adding additional product as quantity in the melter decreases. The material may be reheated to application temperature once, after the initial heat up. Additional reheating of the material may result in degradation of properties. At the end of the installation day, it is recommended that the melter be as empty as possible. Product volume of no more than 25% of melter capacity should be left in the melter for reheating. When reheating, a volume of PolyPatch equal to or greater than the amount being reheated should be added to the melter for the next installation. When the application life has been exceeded, PolyPatch will begin to thicken, become "stringy" and may then gel. If this occurs, the material should immediately be removed from the melter and discarded.

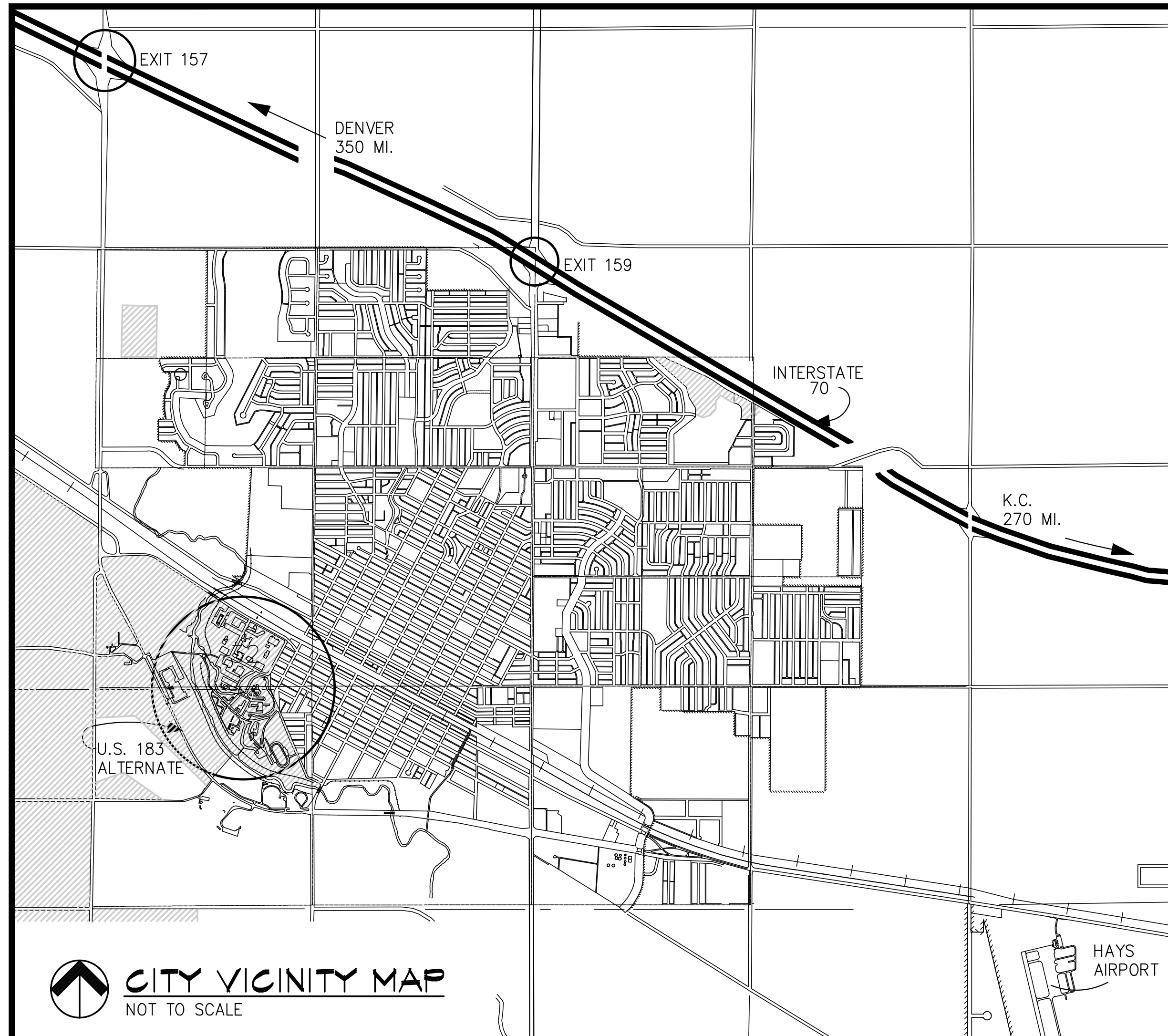
**PRECAUTIONS:** PolyPatch products will soften, become sticky, and track if exposed to fuel or oil spillage; therefore, they should not be used in areas subject to fuel or oils.

**STORAGE:** Pallets of PolyPatch are protected with a weather resistant covering and can be stored outside. During storage, the protective wrap must be kept on the pallets to prevent boxes from getting wet. If boxes are subjected to moisture, they may lose strength and crush resulting in pallet leaning. If rips in the pallet covering occur during handling, they should be repaired to help maintain packaging integrity. Pallets should be stored on a level surface which is dry and has good drainage. Pallets should not be stacked because crushing may occur. PolyPatch material properties are not affected by packaging deterioration.

**SAFETY PRECAUTIONS:** Since PolyPatch is heated to elevated temperatures, it is essential that operations be conducted in manners which assure safety of personnel. All associated with use of the material need to be aware of the hazards of using hot applied materials and safety precautions. Before use, the crew should read and understand product use and safety information on each box of material and the product SDS. This sheet which is supplied with each shipment, describes the characteristics of the product as well as any potential health hazards and precautions for safe handling and use. User should check D.O.T. requirements for transportation of product at elevated temperatures (above 212°F (100°C)).

**HAZARDS ASSOCIATED WITH HOT APPLIED MATERIALS:** Skin contact with hot applied materials causes burns. Over exposure to fumes may cause respiratory tract irritation, nausea, or headaches. Appropriate precautions need to be taken to prevent contact with the hot material and to avoid inhalation of fumes for everyone in the vicinity of the work area operation. Safety precautions should include: 1. Protective clothing to prevent skin contact with hot material. 2. Care when adding product to melters to reduce splashing. 3. Careful operation and control of tools which are used to apply product. 4. Traffic and pedestrian control measures which meet or exceed MUTCD requirements to prevent access to work areas while product is still in a molten state. 5. Avoidance of material fumes. 6. Proper application configurations with a minimum amount of excesses of material. 7. Appropriate clean up of excessive applications or product spills.

**ADDITIONAL INFORMATION:** Additional information regarding these products is available by contacting your distributor or CrafcO, Inc. This information includes 1) Product Data Sheets, 2) Safety Data



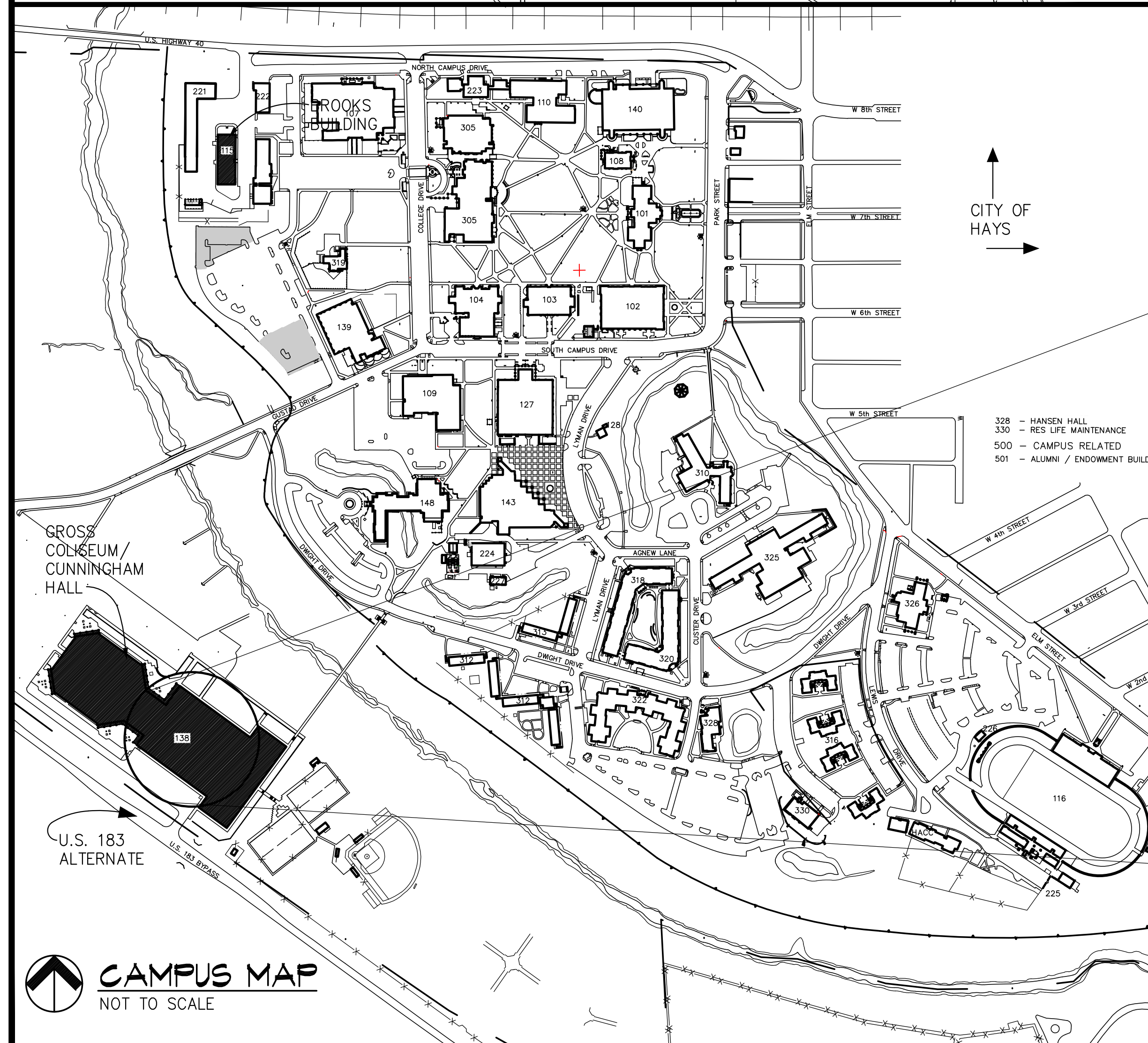
**CITY VICINITY MAP**  
NOT TO SCALE

# GROSS COLISEUM/CUNNINGHAM HALL PARKING LOT REPAIRS

FORT HAYS STATE UNIVERSITY  
HAYS, KANSAS

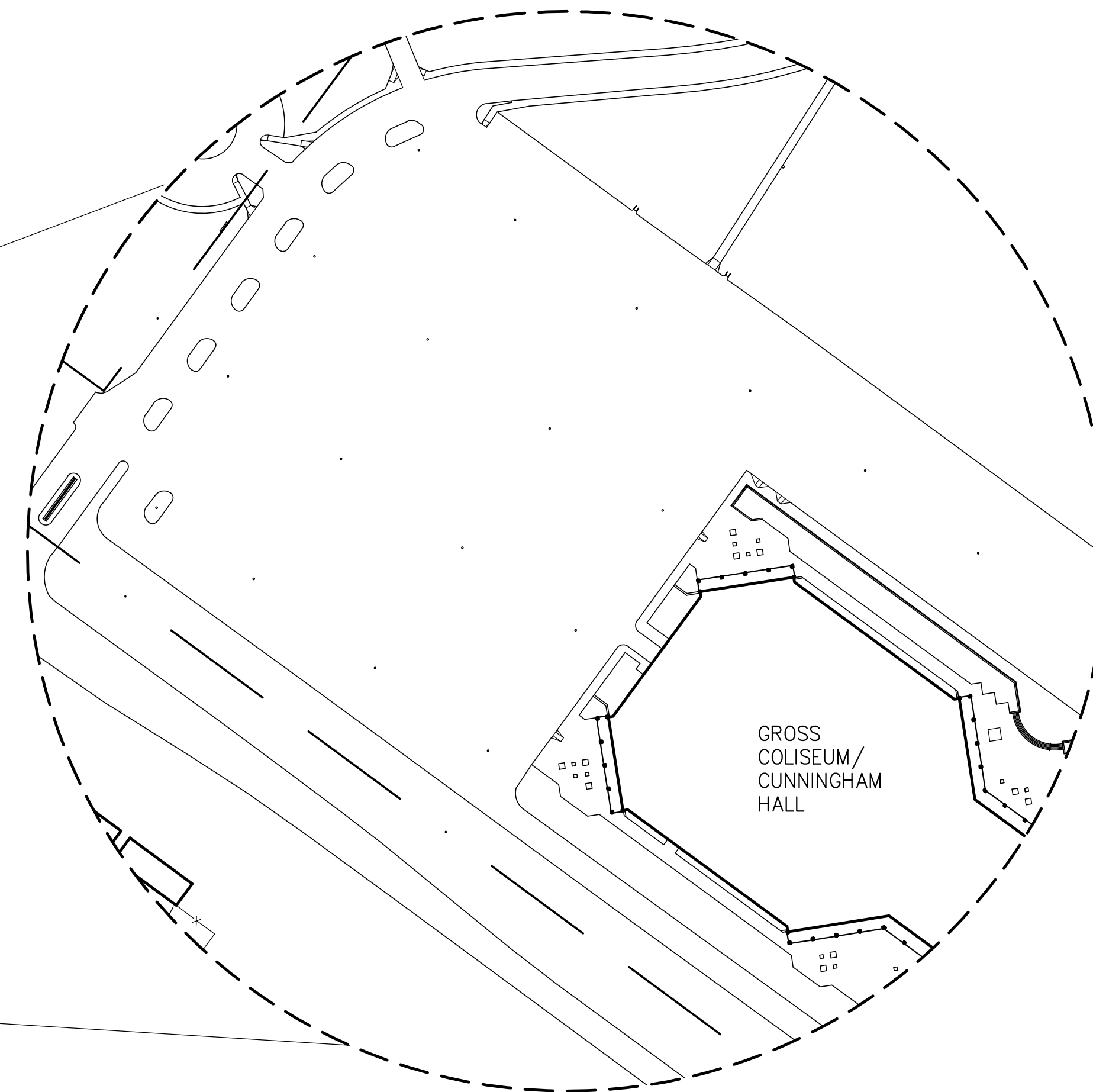
**OWNER**  
Kansas Department of Administration  
Office of Facilities and Property Management,  
Design, Construction & Compliance  
700 Harrison, Suite 1200  
Topeka, Kansas 66603  
Telephone (785) 296-8899

**ARCHITECTS**  
Fort Hays State University  
Office of Facilities Planning  
600 Park Street  
Hays, Kansas 67601  
Telephone (785) 628-4424  
Fax (785) 628-4048



**CAMPUS MAP**  
NOT TO SCALE

**ENLARGED CAMPUS MAP**  
1" = 100'-0"



## INDEX TO SHEETS

GENERAL INFORMATION

T1.1 TITLE SHEET

ARCHITECTURAL

A1.1 CONSTRUCTION PLAN

FORT HAYS STATE UNIVERSITY  
OFFICE OF  
**FACILITIES PLANNING**

600 PARK STREET HAYS, KS 67601 785-628-4424

DEPARTMENT OF ADMINISTRATION  
OFFICE OF FACILITIES & PROPERTY  
MANAGEMENT & COMPLIANCE  
CONSTRUCTION & COMPLIANCE  
700 HARRISON, SUITE 1200  
TOPEKA, KANSAS 66603  
TELE: 785-296-8899

FORT HAYS STATE UNIVERSITY  
**GROSS COLISEUM/CUNNINGHAM HALL**  
PARKING LOT REPAIRS  
BUILDING NUMBER(S): 24800-00188

DATE: FEB. 2024 DRAWN BY: TJS CHECKED BY: DAC REV:

TITLE SHEET

A-N/A

T1.1

ORIGINAL CONTRACT DOCUMENTS

**CONSTRUCTION NOTES:**

- DO NOT SCALE DRAWINGS.
- CONTRACTOR SHALL VISIT EACH AREA OF WORK TO VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS.
- STAGING AND PARKING AREAS OF WORK VEHICLES AND EQUIPMENT TO BE DIRECTED BY OWNER.
- CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND ERECTING ALL BARRICADES AND WARNING SIGNS AS REQUIRED FOR MAINTAINING PUBLIC SAFETY.
- QUANTITIES BASED ON AVERAGE PATCHING WIDTH OF 3'-0". REDUCE OR INCREASE WIDTH BASED ON CONSTRUCTION METHOD AND PAVEMENT CONDITION.
- IF NEWLY EXPOSED SUBGRADE IS UNSUITABLE, OVER EXCAVATE AND REPLACE WITH COMPACTED MILLINGS.
- ALL WORK INCIDENTAL TO PAVEMENT PATCHING INCLUDING: SAW CUTTING, MILLING, COMPACTION, EXCAVATION AND ANY OTHER WORK NECESSARY SHALL BE SUBSIDIARY TO THE BID ITEM PAVEMENT PATCHING.
- ALL CRACKS FROM 1/4" TO 1 1/2" SHALL BE CRACK SEALED.
- ALL CRACKS GREATER THAN 1 1/2" WITH CLEAN EDGES AND THAT DO NOT SHOW SIGNS OF CURPING, PAVEMENT DETERIORATION, OR VISIBLE SUBGRADE FAILURE SHALL BE FILLED WITH CRAFGO POLYPATCH OR EQUIVALENT AND THEN CRACK FILLED.
- ALL CRACKS REGARDLESS OF SIZE THAT EXHIBIT SIGNS OF CURPING, PAVEMENT DETERIORATION, ALLIGATOR CRACKING OR SUBGRADE FAILURE SHALL BE PATCHED ON AN ONLY AS REQUIRED BASIS ALSO.

**GENERAL NOTES:**

THE FIELD SURVEY DOES NOT INCLUDE UTILITY LOCATIONS. THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES PRIOR TO THE COMMENCEMENT OF WORK TO VERIFY THE EXACT LOCATION AND DEPTH OF ALL BURIED UTILITIES PRIOR TO CONSTRUCTION OPERATIONS. UTILITIES ENCOUNTERED DURING CONSTRUCTION WHICH REQUIRE RELOCATION SUCH AS TELEPHONE, POWER LINES AND GAS LINES SHALL BE ADJUSTED BY THE OWNER UNLESS NOTED OTHERWISE ON THE PLANS. THE CONTRACTOR SHALL NOTIFY THE UTILITY COMPANY OF ANY UTILITIES THAT MUST BE REMOVED OR RELOCATED, IN TIME FOR SAID UTILITY COMPANY TO PERFORM THE WORK SO AS NOT TO DELAY THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL USE CAUTION IN THE AREA OF ALL OVERHEAD OR BURIED POWER FACILITIES.

THE CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE THE EXISTING SURFACE OF THE ADJACENT STREETS AND PARKING LOT WITH EQUIPMENT DURING CONSTRUCTION, AND IF DAMAGED THE CONTRACTOR SHALL REPAIR OR REPLACE THE SURFACE TO ITS ORIGINAL CONDITION AT NO COST TO THE OWNER. THE CONTRACTOR SHALL USE CAUTION WHEN WORKING IN THE AREA OF ANY STRUCTURE ALONG AND ADJACENT TO THE PROJECT.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING TRAFFIC OFF ANY RECENTLY PLACED MATERIALS. THE CONTRACTOR SHALL REPAIR ANY DAMAGES THAT ARISE BECAUSE OF TRAFFIC AT NO ADDITIONAL COST TO THE OWNER.

ALL OBSTRUCTIONS ENCOUNTERED WITHIN THE LIMITS OF THE WORK SUCH AS PARKING BUMPERS, STREET MARKERS, SIGNS, ETC. SHALL BE REMOVED AND REPLACED BY THE CONTRACTOR IN COMPLIANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS. THIS WORK WILL BE SUBSIDIARY TO OTHER ITEMS IN THE PROPOSAL UNLESS NOTED OTHERWISE.

THE CONTRACTOR SHALL COMPLY WITH O.S.H.A. REGULATIONS THAT APPLY TO ALL WORK PERFORMED ON THE PROJECT.

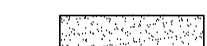


ALL DISPOSAL SITES MUST BE APPROVED BY THE KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT. MATERIAL EITHER STOCKPILED OR DISPOSED OF IN A FLOOD PLAIN WOULD REQUIRE A KANSAS STATE BOARD OF AGRICULTURE PERMIT. ANY MATERIAL DUMPED IN WATERS OF THE UNITED STATES OR WETLANDS IS SUBJECT TO U.S. CORPS OF ENGINEERS PERMITTING REGULATIONS.

ALL REMOVED MATERIAL SHALL BECOME PROPERTY OF THE CONTRACTOR. EXACT LIMITS OF REMOVAL TO BE FIELD DETERMINED AND APPROVED BY THE OWNER.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MATERIAL SAMPLING AND TESTING, AS REQUIRED BY THE CONTACT DOCUMENTS. SAMPLE LOCATIONS TO BE DETERMINED BY THE OWNER. SAMPLING AND TESTING PROCEDURES TO COMPLY WITH APPROPRIATE ASTM REQUIREMENTS, AS AGREED UPON BY THE OWNER. ALL TESTS TO BE AT THE CONTRACTOR'S EXPENSE.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR RE-STRIPING ALL PARKING STALLS AND MARKINGS WITHIN ALL PARKING LOTS AT THE GROSS COLISEUM/CUNNINGHAM HALL LOCATION. RE-STRIPING PAINT SHALL BE A TYPE SUITABLE FOR TRAFFIC SITUATIONS AND AS REQUIRED FOR THIS TYPE OF WORK.

**LEGEND**

-  FULL DEPTH PATCHING COMPLETED IN 2016
-  CRAFGO POLYPATCH OR EQUIVALENT COMPLETED IN 2016
-  CRACK SEAL COMPLETED IN 2016

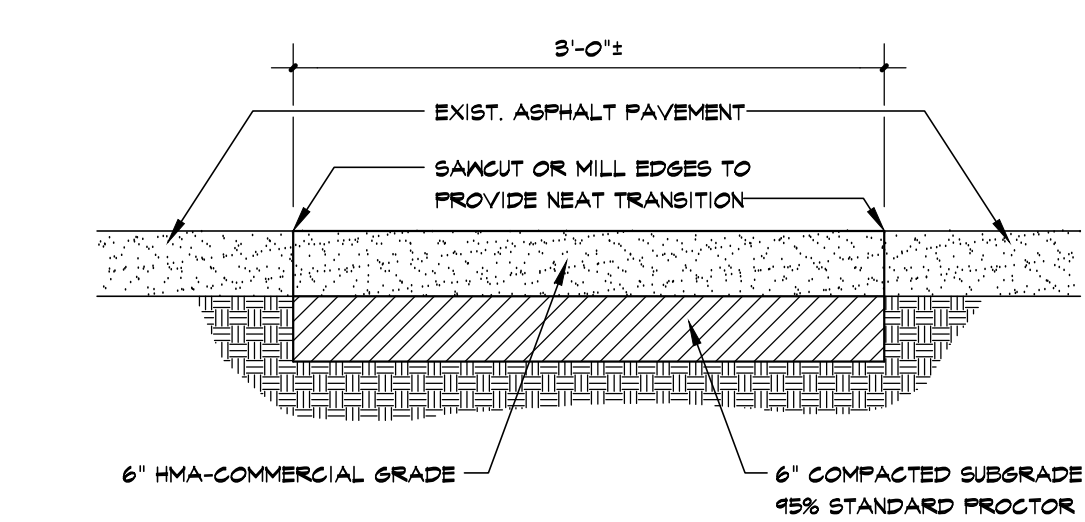
**BASE BID:**

- POLYPATCH ALL CRACKS GREATER THAN 1 1/2" WITHIN SPECIFIED PARKING LOTS.
- CRACK SEAL ALL CRACKS 1/4" TO 1 1/2" WITHIN SPECIFIED PARKING LOTS.
- RE-STRIP ALL PARKING STALLS AND MARKINGS IN ALL SPECIFIED PARKING LOTS.

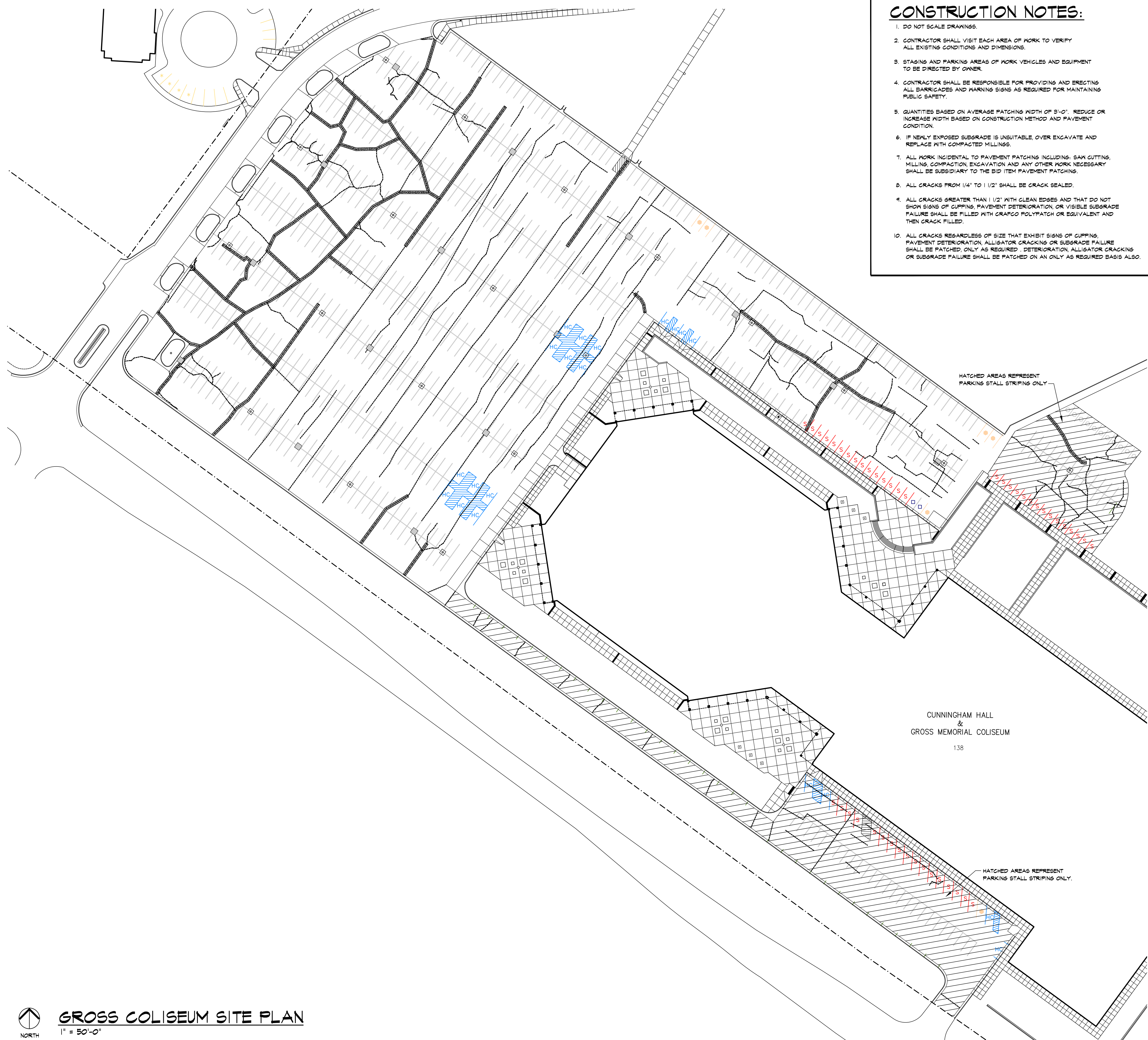
**UNIT PRICE BID:**

UNIT PRICE BID TO INCLUDE PRICING AS REQUESTED BELOW THOSE AREAS OF THE SPECIFIED PARKING LOT WHERE ASPHALT CUTTING & PATCHING IS REQUIRED. SEE TYPICAL DETAIL BELOW.

- PAVEMENT PATCHING, 1-500 SQUARE FEET.
- PAVEMENT PATCHING, 500-1000 SQUARE FEET.
- PAVEMENT PATCHING, 1000-2000 SQUARE FEET.



**TYPICAL PATCH SECTION**  
NOT TO SCALE \*AS REQUIRED



CUNNINGHAM HALL & GROSS MEMORIAL COLISEUM  
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HATCHED AREAS REPRESENT PARKING STALL STRIPING ONLY.

## TERMS AND CONDITIONS

1. It is the intent of Fort Hays State University (FHSU) to permit competitive bidding. It is the bidder's responsibility to advise the FHSU Purchasing Office, in writing, no later than three (3) business days before the bid closing date, if any specification or requirement described herein limits bidding to a single source.
2. Unless otherwise specified, Fort Hays State University reserves the right to accept or reject all or any part of your quotation, and to waive technicalities.
3. Offered payment discounts will NOT be considered in determining the low bid. The discount period begins on the date of delivery, or acceptance, or receipt of a correct invoice by the receiving agency, whichever is later.
4. Except as otherwise indicated, the merchandise quoted is in new condition.
5. Fort Hays State University reserves the right to award purchases by item, by group, or by lot, whichever is deemed to be in the university's best interest.
6. In the event of a tie for the low bid, the award will be made to the Kansas bidder.
7. Unit price will prevail in the event of extension error(s).
8. If awarded a purchase order, the bidder agrees to furnish the item(s) or provide the service(s) enumerated hereon at the price(s) quoted and in accordance with the conditions indicated.
9. If a bid indicates that an item quoted is functionally equivalent and it is purchased and found not to be comparable, Fort Hays State University reserves the right to return that item at the bidder's expense, and the bidder will be billed for the difference in cost between this bid and the successful bid.
10. If any portion of this bid is provided by a vendor other than the bidder, the bidder remains the prime contractor responsible for fulfilling all requirements of this bid.
11. Contracts or purchase orders resulting from this quotation may not be assigned without prior written consent of the FHSU Director of Purchasing.
12. The seller agrees to protect Fort Hays State University from all damages arising out of alleged patent infringement.
13. Partial payments will not be made, unless otherwise specified.
14. Bid results are available by written request with a check payable to Fort Hays State University for five dollars (\$5.00) per request, tax included, with a stamped, self-addressed envelope. Unless otherwise requested, your canceled check will serve as your receipt.
15. Any conviction for a criminal or civil offense that indicates a lack of business integrity or business honesty which currently, seriously and directly affects responsibility as a state contractor must be disclosed. This is to include (1) conviction of a criminal offense as an incident to obtaining or attempting to obtain a public or private contract of subcontract or in the performance of such contract of subcontract; (2) conviction under state or federal statutes of embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property; (3) conviction under state or federal antitrust statutes; and (4) any other offense to be serious and compelling as to affect responsibility as a state contractor. For the purpose of this section, an individual or entity shall be presumed to have control of a company or organization if the individual or entity directly or indirectly, or action in concert with one or more individuals or entities, owns or controls twenty-five percent (25%) or more of its equity, or otherwise controls its management or policies. Failure to disclose an offense may result in disqualification of the bid or termination of the contract.
16. If any part of this contract (including any required installation) is fulfilled by any other contractor, the successful bidder remains responsible for completing all aspects of the work described herein.
17. Vendors who are new to the university should complete a vendor registration form found at: <https://vrapp.vendorregistry.com/Vendor/Register/Index/fort-hays-state-university-ks-vendor-registration>. A copy of the vendor's W-9 should also be submitted with your bid: <http://www.irs.gov/pub/irs-pdf/fw9.pdf?portlet=3>.

## TAX CLEARANCE

Fort Hays State University strongly supports the State of Kansas Tax Clearance Process. Vendors submitting bids or proposals which exceed \$25,000 over the term of the contract shall include a copy of a Tax Clearance Certification Form with their submittal. Failure to provide this information may be cause for rejection of vendor's bid or proposal.

A "Tax Clearance" is a comprehensive tax account review to determine and ensure that the account is compliant with all primary Kansas Tax Laws administered by the Kansas Department of Revenue (KDOR) Director of Taxation. Information pertaining to a Tax Clearance is subject to change(s), which may arise as a result of a State Tax Audit, Federal Revenue Agent Report, or other lawful adjustment(s).

**To obtain a Tax Clearance Certificate, you must:**

- Go to <https://www.kdor.ks.gov/apps/taxclearance/Default.aspx> to request a Tax Clearance Certificate
- Return to the website the following working day to see if KDOR will issue the certificate
- If issued an official certificate, print it and attach it to your bid response
- If denied a certificate, engage KDOR in a discussion about why a certificate wasn't issued

**Bidders (and their subcontractors) are expected to submit a current Tax Clearance Certificate with every event response.**

*Please Note: Individual and business applications are available. For applications entered prior to 5:00 PM Monday through Friday, results typically will be available the following business day. Tax clearance requests may be denied if the request includes incomplete or incorrect information.*

*Please Note: You will need to sign back into the KDOR website to view and print the official tax clearance certificate.*

**A copy of the Certification of Tax Clearance form received from the Kansas Department of Revenue should be sent along with the bid response(s) to:**

Fort Hays State University  
Purchasing Office  
601 Park Street, Sheridan Hall 318  
Hays, KS 67601

Failure to provide this information may be cause for rejection of vendor's bid or proposal.

Information about Tax Registration can be found at the following website:

<http://www.ksrevenue.org/forms-btreg.html>.

The FHSU Purchasing Office reserves the right to confirm tax status of all potential contractors and subcontractors prior to the release of a purchase order or contract award.

In the event that a current tax certificate is unavailable, the FHSU Purchasing Office reserves the right to notify a bidder (one that has submitted a timely event response) that they have to provide a current Tax Clearance Certificate within ten (10) calendar days, or FHSU may proceed with an award to the next lowest responsive bidder, whichever is determined by the Purchasing Director to be in the best interest of FHSU and the State.



**CERTIFICATION REGARDING  
IMMIGRATION REFORM & CONTROL**

All Contractors are expected to comply with the Immigration and Reform Control Act of 1986 (IRCA), as may be amended from time to time. This Act, with certain limitations, requires the verification of the employment status of all individuals who were hired on or after November 6, 1986, by the Contractor as well as any subcontractor or sub-subcontractor. The usual method of verification is through the Employment Verification (I-9) Form. With the submission of this bid, the Contractor hereby certifies without exception that Contractor has complied with all federal and state laws relating to immigration and reform. Any misrepresentation in this regard or any employment of persons not authorized to work in the United States constitutes a material breach and, at the State's option, may subject the contract to termination and any applicable damages.

Contractor certifies that, should it be awarded a contract by the State, Contractor will comply with all applicable federal and state laws, standards, orders and regulations affecting a person's participation and eligibility in any program or activity undertaken by the Contractor pursuant to this contract. Contractor further certifies that it will remain in compliance throughout the term of the contract.

At the State's request, Contractor is expected to produce to the State any documentation or other such evidence to verify Contractor's compliance with any provision, duty, certification, or the like under the contract.

Contractor agrees to include this Certification in contracts between itself and any subcontractors in connection with the services performed under this contract.

\_\_\_\_\_  
Signature, Title of Contractor

\_\_\_\_\_  
Date

State of Kansas  
Fort Hays State University  
DA-146a (Rev. 12/19)

### CONTRACTUAL PROVISIONS ATTACHMENT

Important: This form contains mandatory contract provisions and must be attached to or incorporated in all copies of any contractual agreement. If it is attached to the vendor/contractor's standard contract form, then that form must be altered to contain the following provision:

"The Provisions found in Contractual Provisions Attachment (Form DA-146a, Rev. 12/19), which is attached hereto, are hereby incorporated in this contract and made a part thereof."

The parties agree that the following provisions are hereby incorporated into the contract to which it is attached and made a part thereof.

1. **Controlling Provisions:** It is expressly agreed that the terms of each and every provision in this attachment shall prevail and control over the terms of any other conflicting provision in any other document relating to and a part of the contract in which this attachment is incorporated. Any terms that conflict or could be interpreted to conflict with this attachment are nullified.
2. **Disclaimer Of Liability:** No provision of this contract will be given effect that attempts to require Fort Hays State University or any of its affiliates ("University") to defend, hold harmless, or indemnify any contractor or third party for any acts or omissions. The terms, conditions, and limitations of liability of the State of Kansas, the University, and their employees are defined under the Kansas Tort Claims Act (K.S.A. 75-6101 et seq.).
3. **Termination Due To Lack Of Funding Appropriation:** If, in the judgment of the Director of Accounts and Reports, Department of Administration, sufficient funds are not appropriated to continue the function performed in this agreement and for the payment of the charges hereunder, the University may terminate this agreement at the end of its current fiscal year. The University agrees to give written notice of termination to contractor at least 30 days prior to the end of its current fiscal year, and shall give such notice for a greater period prior to the end of such fiscal year as may be provided in this contract, except that such notice shall not be required prior to 90 days before the end of such fiscal year. Contractor shall have the right, at the end of such fiscal year, to take possession of any equipment provided under the contract for which it has not been paid. The University will pay contractor all regular contractual payments incurred through the end of such fiscal year, plus contractual charges incidental to the return of any such equipment. Upon termination of the agreement under this provision, title to any such equipment shall revert to contractor at the end of the University's current fiscal year. The termination of the contract pursuant to this paragraph shall not cause any penalty to be charged to the agency or the contractor.
4. **Kansas Law and Venue:** All matters arising out of or related to this agreement shall be subject to, governed by, and construed according to the laws of the State of Kansas, and jurisdiction and venue of any suit arising out of or related to this agreement shall reside only in courts located in the State of Kansas.
5. **Required Non-Discrimination Provision:** Contractor agrees to comply with all applicable state and federal anti-discrimination laws. Contractor specifically agrees: (a) to comply with the Kansas Act Against Discrimination (K.S.A. 44-1001 et seq.) and the Kansas Age Discrimination in Employment Act (K.S.A. 44-1111 et seq.) and the applicable provisions of the Americans With Disabilities Act (42 U.S.C. 12101 et seq.) (ADA) and to not discriminate against any person because of race, religion, color, sex, disability, national origin or ancestry, or age in the admission or access to, or treatment or employment in, its programs or activities; (b) to include in all solicitations or advertisements for employees, the phrase "equal opportunity employer"; (c) to comply with the reporting requirements set out at K.S.A. 44-1031 and K.S.A. 44-1116; (d) to include those provisions in every subcontract or purchase order so that they are binding upon such subcontractor or vendor; (e) that a failure to comply with the reporting requirements of (c) above or if the contractor is found guilty of any violation of such acts by the Kansas Human Rights Commission or if it is determined that the contractor has violated applicable provisions of ADA, such violation(s) shall constitute a breach of contract and the contract may be cancelled, terminated or suspended, in whole or in part, by the University. The provisions of this paragraph (except the provisions relating to the ADA) are not applicable to a contractor who employs fewer than four employees during the term of such contract or whose contracts with the University cumulatively total \$5,000 or less during the fiscal year.

**Contractor shall abide by the requirements of 41 CFR §§ 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities, and prohibit discrimination against all individuals based on their race, color, religion, sex, or national origin. Moreover, these regulations require that covered prime contractors and subcontractors take affirmative action to employ and advance individuals in employment without regard to race, color, religion, sex, national origin, protected veteran status or disability.**

6. **Acceptance Of Contract:** This contract shall not be considered accepted, approved or otherwise effective until the statutorily required approvals and certifications have been given.
7. **Arbitration, Damages, Warranties:** Notwithstanding any language to the contrary, no interpretation of this contract shall find that the University has agreed to binding arbitration, or the payment of damages or penalties. Further, the University does not agree to pay attorney fees, costs, or late payment charges beyond those available under the Kansas Prompt Payment Act (K.S.A. 75-6403), and no provision will be given effect that attempts to exclude, modify, disclaim or otherwise attempt to limit any damages or rights of action available to the University at law, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.
8. **Authority To Contract:** By signing this contract, the representative of the contractor thereby represents that such person is duly authorized by the contractor to execute this contract on behalf of the contractor and that the contractor agrees to be bound by the provisions thereof.
9. **Responsibility For Taxes:** The University shall not be responsible for, nor indemnify a contractor for, any federal, state or local taxes which may be imposed or levied upon the subject matter of this contract.
10. **Insurance:** The University shall not be required to purchase any insurance against loss or damage to property or any other subject matter relating to this contract, nor shall this contract require the University to establish a "self-insurance" fund to protect against any such loss or damage.
11. **Information/Confidentiality:** As a state agency, the University's contracts are generally public records. Accordingly, no provision of this contract shall restrict the University's ability to produce this contract in response to a lawful request or from otherwise complying with the Kansas Open Records Act (K.S.A. 45-215 et seq.). Moreover, no provision of this contract shall be construed as limiting the Legislative Division of Post Audit from having access to information pursuant to K.S.A. 46-1101 et seq.
12. **The Eleventh Amendment:** The Eleventh Amendment is an inherent and incumbent protection of the State of Kansas and need not be reserved, but the University here reiterates that nothing in or related to this contract shall be deemed a waiver of the Eleventh Amendment.
13. **Campaign Contributions / Lobbying:** Funds provided through a grant award or contract shall not be given or received in exchange for the making of a campaign contribution. No part of the funds provided through this contract shall be used to influence or attempt to influence an officer or employee of any State of Kansas agency or a member of the Legislature regarding any pending legislation or the awarding, extension, continuation, renewal, amendment or modification of any government contract, grant, loan, or cooperative agreement.
14. **Privacy of Student Records:** Contractor understands that the University is subject to FERPA (Family Educational Rights and Privacy Act, 20 U.S.C. § 1232g) and agrees to handle any student education records it receives pursuant to this Agreement in a manner that enables the University to be compliant with FERPA and its regulations. Contractor agrees to protect the privacy of student data and educational records in a commercially reasonable manner and shall not transmit, share, or disclose any data about a student without the student's written consent, except to other University officials who seek the information within the context of his/her professionally assigned responsibilities and used within the context of official University business. Contractor shall promptly report to the University any disclosure of University's student educational records.
15. **Boycotts of Israel Prohibited:** Kansas 2018 HB 2482 generally prohibits the University from entering into a contract with a company to acquire or dispose of services, supplies, information technology or construction, unless such company submits a written certification that such company is not currently engaged in a boycott of Israel. For the purposes of this Section, "company" means an organization, association, corporation, partnership, venture or other entity, its subsidiary or affiliate, that exists for profitmaking purposes or to otherwise secure economic advantage. Accordingly, by executing this contract, Contractor hereby certifies that it is not currently engaged in a boycott of Israel.

16. **Harassment Policy:** Fort Hays State University prohibits sexual harassment, discrimination, and retaliation. The University's applicable policies on sexual harassment, discrimination, and retaliation are available at <https://fhsu.edu/policies/documents/harassment-policy/index.pdf> and include the procedures for submitting a complaint of sexual harassment, discrimination, or retaliation, including an anonymous complaint. Contractor and its employees, officials, agents, or subcontractors shall at all times comply with the University's policies on sexual harassment, discrimination, and retaliation.