

SECTION 1800- PAVEMENT MAINTENANCE

1801 CRACK SEALING AND FILLING.

A. Materials.

1. Material for sealing cracks up to one inch in width shall comply with all requirements of ASTM D6690, Type II.
2. A detack material, as designated or approved by the Engineer, shall be used to remove surface tackiness of the sealant. Approved material includes a soap and water mixture.

B. Installation.

1. All cracks up to one inch in width are to be sealed including transverse, longitudinal, block, reflective cracks and the longitudinal joints/crack between the edge of pavement and toe of the gutter. Wider cracks shall be filled as specified in the Project Special Provisions or indicated on the plans. Where alligator cracking is found, the Engineer will determine if sealing is to be completed.
2. Cracks shall be cleaned to a minimum depth of 2 inches with an air compressor. If an air compressor cannot sufficiently clean and dry the crack, then a hot air lance or other approved equipment shall be utilized to clean and dry the crack immediately ahead of the sealant placement. Air compressor equipment utilized for blowing out cracks and joints shall have a 120 CFM minimum. Contractor shall control dust from cleaning and remove blown debris from adjacent properties.
3. Sealant shall be placed in the clean, dry crack using the methods and equipment recommended by the sealant manufacturer. The crack shall be slightly overfilled and immediately squeegeed to provide a band-aid type effect approximately two (2) inches wide, flush with the pavement surface, and with the edges feathered out. U-shaped squeegees shall be used for leveling the crack seal and fill material unless otherwise approved by the Engineer.
4. Hot asphalt sealer shall be continuously, mechanically agitated during heating so that localized heating does not occur. Crack sealer shall not be placed when the air temperature in the shade is less than forty (40) degrees F. No sealant shall be installed when the air temperature exceeds 90 degrees F.

5. Apply a suitable detack product on freshly installed sealant in accordance with manufacturer's instructions to prevent tracking of material by traffic and to remove the surface tackiness of the material to the satisfaction of the Engineer. Approved methods include spraying the area with a soap and water mixture or other methods approved by the Engineer.
6. Contractor shall cleanup all excess material from the pavement or other adjacent surfaces.

1802 PAVEMENT PATCHING.

- A. General. Areas where base failure of the roadway has occurred, or where the surface is broken out, shall be repaired prior to surfacing operations. The failed sections will be marked by the Engineer.
- B. Materials.
 1. Hot-mix asphaltic patching material shall conform to the requirements of Section 1300 – *Asphaltic Concrete Pavement*.
 2. Concrete patch mixes shall conform to the requirements of Section 2000 – *Concrete*.
- C. Removal.
 1. For surface and full-depth patches, the failed material shall be removed by sawing and/or milling a neat rectangular section into the pavement creating clean vertical sidewalls.
 2. Over-excavate areas where unsuitable subgrade material is encountered then backfill and compact to bottom of pavement with approved material.
 3. Do not remove more area than can be fully patched or plated and reopened to traffic by the end of the workday. Do not leave excavated areas in roadways that are open to traffic unless approved by the Engineer.
 4. All failed asphalt material shall be removed without damage to the adjacent pavement. When existing pavement designated to remain is damaged during the patching process, the pavement shall be repaired by the Contractor at Contractor's expense.
- D. Repair. Patching shall conform to standard city details and as follows.
 1. Prior to placing patch material, all loose material and debris shall be removed.

2. For asphalt patching, all surfaces shall be properly tacked.
3. Asphaltic material shall be placed in layers not to exceed 3 inches and thoroughly compacted before the next layer is placed.
4. The vertical sidewalls of the patch shall be well bonded with the existing pavement and the surface shall be level with the existing pavement.
5. For concrete patching, see Section 1400 – *Concrete Pavement* for placing, finishing, curing, and protection of concrete. Small areas may also be temporarily plated with the approval of the Engineer.

1803 CHIP AND SEAL.

- A. General. Single asphalt surface treatment (chip and seal) shall be completed in accordance with KDOT Standards Section 609.
- B. Materials. Cutback asphalt shall be RC-800 conforming to requirements of KDOT Section 1204. Cover material shall be type CM-K conforming to requirements of KDOT Section 1108.
- C. Procedures. Conform to requirements of KDOT Standards. The Contractor shall include in the unit price the cost of cleaning or sweeping all streets to be sealed.

1804 MICROSURFACING AND SLURRY SEAL.

- A. General. The work shall consist of the application of microsurfacing or slurry seal on existing paved surfaces. Each process shall consist of spreading a properly proportioned mixture of emulsified asphalt, mineral aggregate and water on a prepared surface in accordance with this specification and as directed by the Engineer. Microsurfacing shall be a polymer modified asphalt emulsion.
 1. Phasing Plan. A minimum of two weeks prior to beginning surfacing work, Contractor shall submit a phasing plan identifying specific lane closures and sequencing of streets and subdivisions. No work shall be performed until the phasing plan has been reviewed and accepted by the Engineer. Work shall not begin before 8:00 a.m. and must be completed and streets open to traffic by 6:00 p.m. Changes to the phasing plan must be requested in writing a minimum of three (3) business days in advance of implementation.

2. Property Owner Notification. Contractor shall supply and place door tags on doors of all residences and/or businesses affected by microsurfacing operations 48 hours prior to beginning work. Submit a sample door tag for approval at the pre-construction conference.
3. Maintenance of Traffic. All streets shall have one thru-lane open to traffic at all times. Cul-de-sacs may be completely closed until the material has cured adequately to allow traffic. The Contractor shall provide adequate advance signing, barricades, and/or flaggers to control traffic around and through the construction area. Directions for allowable travel paths shall be clearly indicated. Adequate trained personnel shall be available on-site to oversee traffic control. Any damage done by traffic to the surfacing shall be repaired by the Contractor at the Contractor's expense.

B. Materials.

1. Emulsified Asphalt.
 - a. For microsurfacing, the emulsified asphalt shall be a quick polymer modified cationic type CSS-1H emulsion and shall conform to the requirements specified in ASTM D2397. The cement mixing test shall be waived for this emulsion. The polymer material shall be milled or blended into the asphalt or emulsifier solution prior to the emulsification process.

The emulsified asphalt shall have not less than 62% residue after distillation when tested in accordance with ASTM D244 at a temperature below 280° F. Emulsified asphalt shall have a penetration of between 40 and 90 when tested in accordance with ASTM D2397 at 77° F and shall have a minimum softening point of 135° F when tested in accordance with ASTM D36. Contractor shall submit to Engineer a certificate of analysis/compliance matching the material used in the mix design for each load of emulsified asphalt delivered to the project.

- b. For slurry seal, emulsified asphalt shall be either Grade SS-1h conforming to ASTM D977, or CSS-1h conforming to ASTM D2397.
2. Aggregate. The aggregate shall be natural or manufactured crushed granite, slag or chat which is a by-product from the milling of lead and zinc ores and shall conform to one of the following gradations for the specific surfacing method. The percent passing shall not go from the high end to the low end of the range for any two consecutive screens. Unless otherwise specified in the Project Special

Provisions, aggregate shall be Type I (fine) for slurry seal and the aggregate for microsurfacing per current KDOT specifications.

Sieve Size	Amount Passing Sieves, % by Weight		
	Type I (Fine) For Slurry Seal	Aggregate For Microsurfacing (per KDOT)	Tolerance
3/8 inch	100	99-100	
No. 4	100	86-94	±5%
No. 8	90-100	45-70	±5%
No. 16	65-90	25-50	±5%
No. 30	40-65	15-35	±5%
No. 50	25-42	10-25	±4%
No. 100	15-30	---	±3%
No. 200	10-20	5-15	±2%

a. Aggregate quality shall meet the following requirements.

Quality	Required	Test No.
Sand Equivalent	65 min.	ASTM D2419
Soundness	15% max. w/NA ₂ SO ₄ or 15% max. w/ MgSO ₄	ASTM C88
Abrasion Resistance	30% max.	ASTM C131

b. Engineer may obtain samples for gradation testing from aggregate stockpiles designated by the Contractor for use. Samples for asphalt content may be taken from the completed mix. The frequency of sampling and testing will be established by the Engineer. Precautions shall be taken to ensure that stockpiles do not become contaminated. The mineral aggregate shall be screened to remove any over-sized aggregate or foreign material at the Contractor's stockpile.

3. Mineral Filler. Mineral filler shall be any recognized brand of non-air/entrained Portland cement that is free from lumps and accepted upon visual inspection.
4. Water. Water shall be potable and shall be free from harmful soluble salts or contaminants.
5. Polymer Modifier. For microsurfacing, polymer material, certified from an approved source, shall be milled or blended into the asphalt or emulsifier solution prior to the emulsification process.

6. Other Additives. Additives may be added to the emulsion mixture or any of the component materials for microsurfacing to provide the specified properties. Additives must be included as part of the mix design and be compatible with the other components of the mix.

C. Mix Design. The Engineer shall approve the mix design and all materials prior to use. The component materials shall be within the following limits. The mix design shall be made with the same materials the Contractor will be using on the project.

1. Microsurfacing.

Mineral Aggregate	18.0 lbs to 25.0 lbs per square yard dry aggregate weight
Residual Asphalt	8.0% to 13.5% by weight of dry aggregate
Mineral Filler	0.5% to 2.0% by weight of dry aggregate
Polymer Based Modifier	Minimum of 3.0% solids based on asphalt weight content
Water	As required to provide proper consistency
Additives	As needed

2. Slurry Seal.

Mineral Aggregate	8.0 lbs to 12.0 lbs per square yard dry aggregate weight
Residual Asphalt	10.0% to 16.0% by weight of dry aggregate
Mineral Filler	1.5% to 3.0% by weight of dry aggregate
Water	As required to provide proper consistency

D. Construction.

1. Weather Limitations. The material shall be spread only when either the ambient air temperature or the pavement temperature is at least fifty (50°) degrees F and rising, the weather is not foggy or rainy, and there is no forecast of temperatures below thirty-two (32°) degrees F within twenty-four (24) hours from the time of placement of the mixture.
2. Surface Preparation. The area to be sealed shall be thoroughly cleaned of all debris, trash, vegetation, loose aggregate and soil.

Sweep pavement just prior to surfacing. Water used in pre-wetting the surface shall be applied at a rate to dampen the entire surface without any free-flowing water ahead of the spreader box.

3. Equipment.

Each mixing unit used on the project shall be calibrated prior to construction. Contractor shall submit calibration documentation indicating individual calibration for each material at various settings, which can be related to the machine metering devices. No mixing machine will be allowed on the project until a calibration has been completed. Final calibration sheets shall be submitted to the Engineer.

Individual volume or weight controls for proportioning each material to be added to the mix shall be provided and properly marked.

Appropriate hand tools, which will provide the required results, shall be used to spread the mixture where machine spreading is not possible.

Power brooms, pickup sweepers, power blowers, air compressors and hand brooms may be used to provide a clean surface; however, care must be taken with power equipment to minimize dust and minimize debris blown onto adjacent properties. All debris from cleaning the surface must be removed from the project site.

- a. Microsurfacing. The mixing machine shall be specifically designed and manufactured to lay microsurfacing. The machine shall be a self-propelled, continuous flow mixing unit able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, additives and water to a revolving multi-blade double shafted mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler, additives and water to maintain adequate supply to the proportioning controls.

Spreading equipment shall include a surfacing box with twin-shafted paddles or spiral augers fixed in the spreading box. A flexible front seal shall be provided to insure no loss of mixture at the road surface contact point. The rear flexible seal shall act as a final strike-off and shall be adjustable in width. The spreader box and rear strike-off shall be so designed and operated that a uniform consistency is achieved to produce a free flow of material to the rear strike-off box. The box shall have suitable means provided to side-shift the box to compensate for variations in

pavement geometry. A secondary strike-off shall be provided to improve the surface texture. It shall have the same leveling adjustments as the spreader box.

- b. Slurry Seal. The mixing machine shall be a continuous flow mixing unit and shall be capable of accurately delivering a predetermined proportion of aggregate, water and asphalt emulsion to the mixing chamber and to discharge the thoroughly mixed product on a continuous basis. The equipment shall be capable of pre-wetting the aggregate immediately prior to mixing with the emulsion. The mixing unit of the mixing chamber shall be capable of thoroughly mixing all components together without violent mixing. The mixing machine shall be equipped with an approved fines feeder that includes an accurate metering device or method to introduce a predetermined proportion of mineral filler into the mixer. The mineral filler shall be fed at the same time and location as the aggregate. The fines feeder shall be required whenever added mineral aggregate is a part of the aggregate blend. The mixing machine shall be equipped with a water pressure system and fog-type spray bar, adequate for completing fogging of the surface receiving slurry treatment.

Attached to the mixer shall be a mechanical-type squeegee distributor, equipped with flexible material in contact with the surface of the pavement to prevent loss of slurry from the distributor. It shall be maintained so as to prevent loss of slurry on varying grades and crown by adjustments to insure uniform spread. There shall be a steering device and a flexible strike-off. The spreader box shall have an adjustable width. The box shall be kept clean and build-up of asphalt and aggregate on the box or in the corners shall not be permitted. Use of burlap drags or other drags shall be approved by the Engineer.

Slurry seal mixing machine may be either truck mounted or continuous run design and shall be able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, and water to a revolving mixer and to discharge the mixed product on a continuous flow basis.

The spreader box shall have suitable means provided to side shift the box to compensate for variations in the pavement geometry. A burlap drag or other approved screed may be attached to the rear of the spreader box to provide a uniform, highly textured mat.

4. Application.

- a. The aggregate shall be weighed before delivery to the job site. Emulsified asphalt shall be weighed or measured by volume. Individual volume or weight controls for proportioning each item to be added shall be provided. Each material control device shall be calibrated and properly marked as such. They shall be readily accessible for ready calibration and placed so that the Engineer may determine the amount of material used at all times.
- b. The mixture shall be spread to fill cracks and minor surface irregularities and leave a uniform skid resistant application of aggregate and asphalt on the surface.
- c. All longitudinal and transverse joints shall be uniform and neat in appearance.
- d. All excess material shall be removed immediately from the end of each run. All excess material that overruns in gutters shall be removed or squeegeed back onto the surface and burlap mopped as directed by the Engineer.
- e. All drag material shall be changed as required to prevent streaks or slick spots. No streaks or slick spots shall be left in the uncured pavement surfacing.
- f. When needed, all joints, radii, ends and returns will be squeegeed and burlap mopped as required to provide complete and uniform coverage.
- g. All discolored curbs and sidewalks shall be cleaned immediately before material sets up and all material tracked or lost past ends of job site shall be cleaned up before sealing crew leaves for next location. All removed material shall be disposed of properly at an off-site location.
- h. The surface of all structures, monument boxes, manhole and valve covers, and other roadway appurtenances shall be protected to prevent them from being damaged, splattered or covered with asphalt material. If damage occurs, the Contractor shall restore and/or replace the appurtenances at their expense. After the mixture has been placed at the above-mentioned locations, it shall be tapered by a squeegee to improve ride quality.
- i. Test Strip for Microsurfacing. The contractor shall construct a test strip one lane in width, 500 feet in length, to be evaluated by the Engineer. When multiple machines are used, each machine shall

be required to lay a test strip that will be compared to the other machines for variance in surface texture and appearance. Test strip will not be acceptable if any of the conditions listed under Final Acceptance exist.

- j. A sufficient amount of surfacing material shall be carried in the spreader box at all times to obtain complete, uniform coverage. No lumping, balling, or unmixed aggregate shall be permitted. The mixture shall be free of excess water and emulsion, and free of segregation of the emulsion and aggregate fines from the coarser aggregate.
- k. Application Rates. Daily reports on yields shall be submitted to the Engineer to confirm the rate at which material was placed as per the approved mix design or otherwise specified application rate.

5. Curing. Adequate means shall be provided to protect the slurry seal or microsurfacing from damage by traffic until the mixture has cured sufficiently so that it will not adhere to or be picked up by the tires of vehicles. Any damage done by traffic to the slurry seal or microsurfacing shall be repaired by the Contractor.

- E. Final Acceptance. After the microsurfacing or slurry seal has been completely cured, the roadway surface shall provide a uniform surface texture. It shall be free of objectionable longitudinal lines, and shall be free of any objectionable transverse lines or grooves. The surface will not be considered acceptable if any of the following conditions exist.
- More than 1 surface irregularity that is 1/4 –inch or wider and 10 feet or longer in any 100-foot section of surfacing;
 - More than 3 surface irregularities that are 1/2-inch or wider and more than 6 inches long in any 100-foot section of surfacing; or
 - Any surface irregularity that is 1 inch or wider and more than 4 inches long.

Joints will not be considered acceptable if any of the following conditions exist.

- Buildup of surfacing material at the joints;
- Uncovered areas at the joints;
- Longitudinal joints with more than 1/2-inch vertical space between the surface and a 4-foot straightedge placed perpendicular to the joint; or
- Transverse joints with more than 1/4-inch vertical space between the surface and a 4-foot straightedge placed perpendicular to the joint.

If determined by the Engineer that the final surface or joints do not provide an acceptable riding surface, the Contractor shall be required to correct the unacceptable area(s) at the Contractor's expense.

The Contractor is responsible for maintaining all streets sealed for thirty (30) days after application. This includes removing or adding cover material as required by the Engineer or authorized representative.

1805 COLD MILLING.

- A. Equipment. Milling the surface of pavements shall be completed by the use of a milling machine conforming to the following:
1. The cold milling machine shall be self-propelled and shall have in combination the means of milling and cutting (without softening the old surface) and blading the cuttings into a single windrow, or depositing them directly into a truck.
 2. The machine shall be equipped with a dust suppression system including water storage tanks and high-pressure spray bars. Additional measures for dust suppression may be required by the Engineer.
 3. It is desirable that the cutting width be greater than six (6) feet. In the event the cutting width is less than six (6) feet a system of electronic grade control for consecutive passes will be required.
 4. The cutting drum shall be totally enclosed to prevent discharge of any loosened material on adjacent work areas.
 5. In localized areas where use of the milling machine is not feasible, other equipment may be used as approved by the Engineer.
- B. Construction.
1. Utilities and Monuments. Street surfaces adjacent to manholes, water valves, other utility facilities and monument boxes shall be completely removed to the full depth of cut specified for the street unless otherwise specified by the Engineer.
 2. Milling Depth. Sufficient passes, shall be made such that all irregularities or high spots are eliminated, and that 100% of the surface is milled to a depth of two (2) inches over the entire street section unless specified otherwise. Removal of additional material below the 2-inch milling depth shall be accomplished by methods acceptable to the Engineer within 2 working days of the initial milling

operation. Payment for the additional removal shall be as indicated in the bid form.

3. Milling Area. Mill only the area that can be patched and paved within the specified time limits at any one time. Contractor must plan work accordingly to include adequate number of mobilizations for milling operations in the bid price for milling.
3. Surface Conditions. The drum lacing patterns shall produce a smooth surface finish after milling, with groove depths not to exceed one fourth (1/4) inch and groove spacing not to exceed one (1) inch unless otherwise approved by the Engineer.
4. Cleanup. The material windrowed by the machine shall be removed immediately from the surface of the pavement and properly disposed of by the Contractor. All trash, loose material from milling operations, and other debris shall be removed from the street surface and curb and gutter by the end of each day. Any material and debris that adheres to the curb and gutter shall be removed. Additional dust suppression measures may be required by the Engineer to minimize impacts on adjacent properties.
6. Maintenance of Milled Surface. It shall be the responsibility of the Contractor to maintain the street once the pavement surface is milled. Such responsibilities include, but are not limited to, the timely filling of potholes, removing rebar, correcting damaged areas that pose a hazard to the traveling public, and maintenance of temporary pavement markings where required, as deemed necessary by the Engineer to prevent further pavement damage. The Contractor shall be responsible for repairing damaged areas prior to the overlay at Contractor's expense.

1806 OVERLAY.

1. Materials. Asphaltic concrete, leveling course and tack oil for overlay shall conform to Section 1300 – *Asphaltic Concrete Pavement*. Overlay pavement shall conform to the requirements for surface course materials and installation.
2. Construction.
 - a. Conform to requirements of Section 1300 of these specifications for equipment, placement, compaction and finishing of pavement.
 - b. All manholes and valves shall be accessible to the owning utility through all phases of the work.

- c. The surface of all structures, monument boxes, manhole and valve covers, and other roadway appurtenances shall be protected to prevent them from being damaged, splattered or covered with asphalt material. If damage occurs, the Contractor shall restore and/or replace the appurtenances at their expense. Hot mix asphalt, or other method or material approved by the Engineer, shall be used for wedging adjacent to all appurtenances to provide an acceptable temporary riding surface.
- d. Temporary patches applied to maintain milled surface shall be removed and replaced with permanent patches in accordance with the plans and specifications prior to placing the overlay.
- e. All milled surfaces shall be overlaid within five (5) working days of completion of milling. Streets that require pavement patching shall be overlaid within ten (10) working days. If the Contractor fails to adhere to this stipulation, the Engineer will direct the Contractor to place a hot mix asphalt leveling course over the entire milled area at the Contractor's expense. As directed by the Engineer, any additional full depth patching required, because the placement of the asphalt overlay was not achieved in the required time period, will be completed by the Contractor at the Contractor's expense. Additional liquidated damages may apply for failure to meet these deadlines if specified in the Project Special Provisions.

1807 CONCRETE CURB AND GUTTER REPLACEMENT.

- 1. Materials.
 - a. Concrete materials for curb and gutter shall conform to requirements of Section 2000 – *Concrete* of these specifications.
 - b. Topsoil behind curb shall be free of all debris, roots, vegetation, foreign material, concrete, rocks, stones, and clods.
- 2. Construction.
 - a. Curb and gutter to be removed shall be neatly sawed to the full depth of existing pavement. Use appropriate equipment to minimize removal of adjacent pavement with the curb and gutter. When existing pavement designated to remain is damaged during the removal and replacement of the curb and gutter, the pavement shall be repaired by the Contractor at Contractor's expense.
 - b. Contractor shall provide temporary surfacing at drives for access.

- c. New curb and gutter shall be installed per plans.
- d. The new curb and gutter shall be constructed within five (5) working days of the removal of the existing curb and gutter. Contractor shall not remove more curb and gutter than can be replaced within the five (5) working day limit. As directed by the Engineer, any additional damage that occurs to the existing pavement, because the placement of the curb and gutter was not achieved in the required time period, will be repaired by the Contractor at the Contractor's expense. Additional liquidated damages may apply for failure to meet these deadlines if specified in the Project Special Provisions.
- e. All curb and gutter shall be backfilled with topsoil between 4 and 10 working days after the new curb and gutter has been constructed. Topsoil may be clean on-site material stockpiled for the purpose but shall be tilled before seeding to remove clods, breakup roots, etc. The topsoil shall be placed to a minimum of 1 foot wide, up to a maximum of 15 feet wide, behind the curb in order to achieve positive drainage.
- f. All disturbed ground shall be seeded, fertilized, and mulched. Mulch must be punched into the topsoil. All seeded and mulched areas shall be watered at least once after mulch is secured.
- g. New curb and gutter shall NOT be paid for until backfilling is complete, the area has been cleaned and prepared for seeding, and all debris taken off site.

1808 ULTRATHIN BONDED ASPHALT SURFACE (UBAS).

A. General Description.

- 1. Construct the Ultrathin Bonded Asphalt Surface (UBAS) as designated in the Contract Documents.
 - a. Bid Item, Units.
 Ultrathin Bonded Asphalt Surface (UBAS)(Collector-Arterial), SY
 Ultrathin Bonded Asphalt Surface (UBAS)(Residential), SY
- 2. The KDOT 2015 Standard Specifications for State Road and Bridge Construction shall govern the construction of UBAS overlays as described in Section 613 of the Standard Specifications except as otherwise modified herein. References made herein to Appendices,

Divisions, Sections and Tables are to the Standard Specifications. All testing required by this specification including mix design and field verification of the mix shall be the responsibility of the Contractor. The mix designation and nominal thickness of the UBAS is specified to be Type B and 5/8 inches, respectively.

C. Contractor Quality Control Requirements.

1. General. Provide qualified personnel and sufficient equipment complying with the requirements listed in Part V to conduct quality control testing that complies with Appendix A. The Contractor will conduct quality control tests on a per lot basis at the frequencies shown in Appendix A.
 - i. Allow the Engineer access to the Contractor's laboratory to observe testing procedures, calculations, test documentation and plotting of test results.
 - ii. Calibrate and correlate the testing equipment with prescribed procedures, and conduct tests in compliance with specified testing procedures as listed in the KDOT Construction Manual.
 - iii. Maintain quality control test results on an ongoing basis. At the completion of the project, all documentation shall become the property of the City. Provide the following test data to the City's Project Representative by electronic mail:
 1. Copies of all test results for the lot under production within 12 hours.
 2. Copies of all failing test results.
2. Testing Facilities. UBAS Design shall be the responsibility of the Contractor's Laboratory. The laboratory shall be a commercial testing laboratory or a Contractor-owned laboratory meeting the requirements of ASTM D 3666-05a. The manager of the laboratory shall submit a signed certificate stating that the laboratory has a current certificate stating that the laboratory meets the ASTM D 3666-05a requirements. The laboratory shall have past experience in testing materials and making UBAS or Superpave Asphaltic Concrete mix designs. The laboratory shall be approved by the City Engineer. The laboratory shall establish the mix design using the criteria specified herein. Certified test results of the mix design and materials shall be submitted 30 days prior to commencing construction for review by the City Engineer. The test results shall include all detailed raw calculations for the composition of the mix design and shall include all specific gravity calculations. The calculations must be legible but not necessarily typed.

3. Testing Requirements for Production Lots.

- i. A lot is defined as 400 tons or the amount of material produced in one day if the daily volume of production is less than 400 tons.
- ii. Take all samples for tests at the rate specified in Appendix A. Provide the Engineer with the random locations before obtaining the sample. The Engineer reserves the right to generate the random locations. If the Engineer generates the random locations, the Contractor will be notified of which truck to sample after the aggregate has left the cold feeds, and before the truck is finished loading.
- iii. Conduct the tests for mixture properties, aggregate gradation and binder content on representative portions of the Hot Mix Asphalt (HMA), quartered from the larger sample of HMA. Take a random sample weighing a minimum of 55 pounds using a method to retain heat to facilitate sample quartering procedures.
- iv. Testing of Split Samples. At the City's discretion, split samples will taken for testing. The City will have their laboratory test their portion of the split sample. The City's laboratory will determine Gmm, perform ignition burnoff, evaluate the mix gradation and complete calculations. At a minimum, compare Gmm, binder content, and film thickness results. The acceptable difference for the Gmm results is 0.019. If the test results do not compare favorably, the City and the Contractor will investigate the differences in test results together and take appropriate action.

D. Materials.

1. Asphalt Binder. Provide Asphalt Binder that complies with DIVISION 1200. Post a legible copy of the latest bill of lading for the Asphalt Binder in the Contractor's Field Lab. 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 Engineer. Notify the Engineer if the mixing or compaction temperature changes. The asphalt binder shall be Performance Graded Asphalt Binder PG 70-28. Provide Emulsion Bonding Liquid (EBL) that complies with DIVISION 1200.
2. Reclaimed Asphalt Pavement (RAP) and Reclaimed Asphalt Shingles (RAS). Do not use RAP or RAS in the UBAS.
3. Aggregates. Provide aggregates that comply with SECTION 1103. The contractor shall submit a copy of current aggregate

quality and consensus tests for aggregates used in the mix. The quality test must have been run within 12 months of the date of a mix design submission or a volumetric test report.

4. Combined Aggregates. Provide combined aggregates for the mixes required in the Contract Documents as shown in TABLE 613-1. Mixes may use any combination (except as noted below) of aggregate and mineral filler supplements complying with the applicable requirements in TABLES 1103-1 and 1103-2. When coarse aggregates are blended from 1 or more sources, or if more than 1 type, each source or type shall meet the coarse aggregate properties (CAA, LA Abrasion, and micro-deval) in TABLE 1103-3. The minimum Uncompacted Void Content of the Fine Aggregate "U" Value, of the combined aggregate is 45%. The minimum sand equivalency (SE) of the combined aggregates is 45%. 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. No natural sand will be used in the UBAS.

Traveled way mixes shall include:

- i. a minimum of 40% primary aggregate based on total aggregate weight;
 - ii. a minimum of 50% of the plus No. 4 mesh sieve material in the mixture shall be from the primary aggregate;
 - iii. a minimum of 45% of the plus No. 8 mesh sieve material in the mixture shall be from the primary aggregate; and
 - iv. 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 on the shoulder.
5. Asphalt Pavement Patching. Provide asphalt that complies with City of Lawrence Section 1300 – *Asphaltic Concrete Pavement*.
 6. Contractor Trial Mix Design. A minimum of 10 working days before the start of UBAS production, submit in writing to the City for review and approval, a proposed Job Mix Formula (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 613-1 for the designated mix type at the Recommended Percent Asphalt (Pbr). Submit the proposed JMF on forms used by KDOT. Submit the worksheets used in the design process to include at a minimum the individual coarse aggregate properties listed in TABLE 1103-3, the fine aggregate properties listed in TABLE

1103-4, and the mix properties listed in TABLE 613-2. Contact the City to determine if additional material is needed for additional design checks. For each aggregate used in the mix design, determine the specific gravity using KT-6.

TABLE 613-1: COMBINED AGGREGATE REQUIREMENTS FOR ULTRATHIN BONDED ASPHALT SURFACE*											
Mix Designation / Nom Thickness	Percent Retained – Square Mesh Sieves										Asphalt Content (%)
	¾"	½"	⅜"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	
Type A - ⅝"		0	0-7	45-60	68-78	75-85	82-90	87-92	90-94	94.0-96.0	5.0 to 6.2
Type B - ⅝"	0	0-7	0-25	62-75	73-83	77-85	82-90	87-92	90-94	94.0-96.0	4.8 to 6.2
Type C - ⅝"	0	0-25	20-50	62-75	73-83	77-85	82-90	87-92	90-94	94.0-96.0	4.6 to 6.2

*For flat and elongated particles in the combined coarse aggregate, use the ratio of 3:1 in lieu of 5:1 shown in KT-59. Do not exceed 25% for the total sample.

TABLE 613-2: MIX PROPERTIES		
Property	Test Method	Limits
Total Amine Value of Antistrip Agent (mg/g of KOH, min) ^a	ASTM D2074	500
Design Film Thickness (µm, min.)	KDOT Construction Manual	9.0 ^b
Drain Down (% max.)	KT-63	0.10
Gyratory Compacted Revolutions, N _{max}	KT-58	100 ^c
Emulsion Bonding Liquid (EBL), (gal/sy)	Equation 1	(0.20 ± 0.07) ^d

a – The asphalt binder used in the mix will contain a minimum of 0.25% of an amine based antistripping agent by weight of the asphalt binder.

b – Calculate using the film thickness equation in Section 5.10.4 of the “KDOT Construction Manual”.

c – Compact gyratory specimen to 100 gyrations. Calculate the percent air voids using KT-15, Procedure IV.

d – Calculate the target EBL Shot Rate (S_{ebi} (gal.sy)), using Equation 1; however, the value must be within the limits in this table.

$$\text{Equation 1: } S_{ebi} = 3.93 * P_s * \frac{(V_a + MF)}{100}$$

The particle size (P_s), and the mix factor (MF) are based on the mix designation as shown in the TABLE 613-3.

TABLE 613-3: VARIABLES IN EBL SHOT RATE EQUATION		
Mix Designation	Particle Size (P _s)	Mix Factor (MF)
Type A	0.250	3.2
Type B	0.375	3.2
Type C	0.500	3.2

Consider adjusting the EBL spray rate based on the condition of the existing surface as listed in the TABLE 613-4. Consult the supplier of the EBL to obtain the recommended adjustment to the spray rate.

TABLE 613-4: EBL ADJUSTMENT CONSIDERATIONS		
Existing Pavement Type	Condition	Adjustment Rate (gal/sy)
PCCP	Smooth	0.00
	Textured	+0.02 to +0.04
HMA	Flushed	-0.02 to -0.04
	New	0.00

	Matte and OGFC	+0.02
	Dry	+0.03
	Milled	+0.02 to +0.04
Surface Recycle & Cold Recycle	Flushed	-0.02 to -0.04
	Black	+0.02
	Dry	+0.03
Chip Seal	Flushed	-0.02 to -0.04
	Black	+0.02
	Dry	+0.03

E. Construction Requirements.

1. Plant Operation. Adjust all plant operations to operate continuously.
 - i. 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.
 1. 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 City's representative for testing. Do not use the asphalt binder until approved, and when needed, a new mix design evaluation is completed.
 2. Asphalt Binder Sources. Before changing asphalt binder sources on a project, obtain approval from the City. A new JMF may be required.
 3. 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 antistrip 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.

- ii. Preparation of Mineral Aggregate. When the mineral aggregate is composed of 2 or more ingredients, combine as shown in the approved JMF.
 - 1. 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 City. The minimum temperature may be revised by the City 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.
- iii. Preparation of HMA. Introduce asphalt binder into the prepared aggregate in the proportionate amount determined by the Pbr in the JMF.
 - 1. 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 of the Standard Specifications.
 - 2. 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].
 - 3. 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.
 - 4. 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.

5. 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.
- iv. 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 and mineral filler; the tons of asphalt binder, and the tons of anti-strip agent used for the project during the day. The dry weight is the tons of the material less the water content.

2. Road Surface Preparation.

- i. Preparation of an Existing Asphalt Pavement. Clean the surface to remove all foreign material. Broom and blow surface to remove dust. The joint between the existing pavement and the curb and gutter shall be blown free of all debris immediately prior to placing UBAS. All existing asphalt material and all debris shall be removed from existing pavement, curb and gutter, sidewalk ramps, medians, and median noses immediately prior to paving. Excavate areas shown in the Contract Documents or as determined by the Engineer to be patched to a depth directed by the Engineer. Fill with HMA and compact. HMA mixture used for patching shall be preapproved by the Engineer. All patching shall be completed prior to the texturing operation. Patches will be a minimum of 2 inches in depth and shall be placed to be flush with the existing surface prior to texturing. Patches shall be a minimum of 2 feet in width. Patch quantities may be adjusted by the Engineer. All areas excavated for patching shall be patched during the same working day.
- ii. 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.
- iii. A sweeper shall be kept for immediate use as needed with each patching, texturing and UBAS operation and as required by the engineer for general cleanup.

3. Weighing Operations. See subsection 109.1 of the Standard Specifications for details regarding weighing operations.

4. 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.
5. Paving Operations.
 - i. Technical Support. Provide personnel familiar with the process to provide technical support for production and placement of the UBAS.
 - ii. Equipment. Use a transfer device between the haul units and the paver to assist in maintaining continuous placement on thoroughfares. Use equipment such as a shuttle buggy, material transfer vehicle or mobile conveyor (The material will not be deposited on the roadway and a pick-up device used to transfer the material to the paver). The use of a transfer device is not permitted for work on residential streets. Use a self-priming paver, designed and built for applying the UBAS and approved by the Engineer.

Use a paver with the following requirements:

1. with a receiving hopper, feed conveyor, asphalt emulsion storage tank, a system for measuring the EBL volume applied, a spray bar, and a heated, variable width, vibratory screed;
2. capable of spraying the EBL, applying the hot mix surface course and leveling the surface of the mat in one pass;
3. capable of placing the hot mix surface course within 5 seconds after the application of the EBL;
4. capable of paving at a controlled speed from 30-100 feet/minute;
5. equipped so no wheel or other part of the paving machine is in contact with the EBL before the hot mix surface course is applied; and
6. equip the screed with the ability to crown the pavement at the center and have vertically adjusted extensions to accommodate the desired pavement profile.

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.

- iii. Application. Spray the EBL by a metered mechanical pressure spray bar at the temperature specified in TABLE 601-1 of the Standard Specifications, or as recommended by the EBL supplier. Use a sprayer that accurately and continuously monitors the rate of spray and provides a uniform application across the entire width to be overlaid. The Engineer may make adjustments to the spray rate based upon the existing pavement surface conditions and the recommendations of the EBL supplier.

Apply the UBAS at a temperature of 290-330°F and spread over the EBL immediately after the application of the EBL. Place the UBAS over the full width of the EBL with a heated vibratory screed. Adjust the screed and its extensions to eliminate variances in surface texture caused by density segregation. Operate the paver as continuous as possible to reduce the possibility of screed indentations in the finished mat.

The target application rate of the UBAS will be stated in the Contract Documents. Use a field application rate as necessary to minimize fracturing of the top size aggregate by the screed. The Engineer will determine the acceptable extent of fracturing at the edge of the paving for tapering purposes.

The finished asphalt surface shall be free of oversized material. The Engineer will determine the extent of the oversized material in the UBAS. Take immediate corrective action to eliminate the source. If the source of the oversized material is determined to be a stockpile or a process of plant operations, cease production until corrective actions are complete.

Spread the UBAS 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.

- iv. Compaction. Roll the UBAS with a minimum of 1 pass and a maximum of 3 passes with 2-axle tandem steel rollers having a minimum weight of 10 tons, before the material temperature has fallen below 195°F. The Engineer will determine the number of passes necessary based on appearance of the rolled material. Do not allow the roller or rollers to remain stationary on the freshly placed UBAS. Perform rolling immediately following the placement of the UBAS with approved asphalt rollers. Supply adequate roller units so the rolling will be accomplished promptly following the placement of the material. A release agent (added to the water system)

may be required to prevent adhesion of the fresh mix to the roller drum and wheels. Normally, perform rolling in the static mode. Do not excessively roll the driving lanes, to the extent of aggregate degradation. The Engineer will determine the acceptable extent of fracturing at the edge of the pavement from the rolling operation. Do not open the new pavement to traffic or allow any roller to sit idle on the pavement until the rolling operation is complete and the material has cooled below 160°F.

- v. Damaged Areas. Replace any defective areas, as determined by the Engineer, at no additional cost to the City.
 - vi. Construction Joints.
 - 1. Transverse Construction Joints. Use a method of making transverse construction joints which provide a thorough and continuous bond and provide an acceptable surface texture. 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.
 - 2. Longitudinal Joints. Construct well bonded and sealed longitudinal joints to obtain maximum compaction at the joint.
 - vii. Adjustment of Manholes and Valves. When required, this work will be performed and paid in accordance with “Manhole Adjustment” and “Valve Adjustment”.
6. Treatment of Adjacent Areas. Pave side roads, 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.
7. Pavement Smoothness. UBAS is excluded from profilograph testing.

F. Process Control.

- 1. General. Establish gradation limits and proportions for each individual aggregate and mineral filler, 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 the Engineer issue instructions to the Contractor or producer as to setting of dials, gauges, scales and meters. The City will collect and test

verification samples and assurance samples and inspect the Contractor's quality control operations.

2. 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 613-1 for the specified mix designation. When necessary, adjust on a lot basis. Report the new JMF to the Engineer.

TABLE 613-5: SPECIFICATION WORKING RANGES (QC/QA)	
Mix Characteristic	Tolerance from JMF and Specification Limits
	Single Test Value
Binder Content (Maximum deviation from JMF)	±0.3%
Film Thickness	n/a
Gradation**	n/a
Course Aggregate Angularity (CAA)	zero tolerance
Fine Aggregate Uncompacted Voids (FAA)	zero tolerance
Sand Equivalent	zero tolerance
**The maximum deviation for UBAS from the JMF for the sieves with a ± tolerance shall be as listed in TABLE 613-6 . Only the No. 16, 30, 50 and 100 sieves may exceed the limits listed in TABLE 613-1 provided the minimum retained percentage shown in TABLE 613-6 is met.	

TABLE 613-6: SPECIFICATION WORKING RANGES FROM THE JMF										
Mix Designation	Percent Retained – Square Mesh Sieves									
	¾"	½"	⅜"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
Type A				±5	68 - 78	75 min	82 min.	87 min.	90 min.	94.0 – 96.0
Type B			±5	±4	73 - 83	77 min.	82 min	87 min.	90 min.	94.0 – 96.0
Type C		±5	±5	±4	73 - 83	77 min.	82 min	87 min.	90 min.	94.0 – 96.0

3. EBL Shot Rate Specification. Periodically determine the application rate of the EBL. The Engineer will verify the application rate. Acceptable tolerance of the application rate is the target rate ±0.02 gal/sq yd. Check for proper coverage at least twice per day by applying the EBL to the road surface for a minimum distance of 20 feet. When the Engineer verifies the coverage meets specification, back up the paver and shoot not more than 1/4 of the EBL shot rate over the previously tacked segment.

G. Weather Limitations. Do not place UBAS on any wet or frozen surface or when weather conditions otherwise prevent the proper handling and finishing of the mixture. Only place UBAS when either the minimum

ambient air temperature is 50°F or the minimum road surface temperature is 55°F.

H. Mixture Acceptance.

1. General. Test the UBAS at each plant for compliance with TABLE 613-1. Acceptance will be made on a lot by lot basis contingent upon satisfactory test results. Obtain quality control and verification samples of the UBAS using KT-25 sampling procedure C.1 Plant Discharge or C.2 Truck Bed. 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.
2. 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 1 test result.
3. 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 the City's test results. The information from additional testing (including testing of in-place HMA) may be used to define unacceptable work according to subsection 105.5 in the 2007 Standard Specifications for State Road and Bridge Construction. The Engineer may initiate corrective action. When a deficiency within a lot is determined to exist, the Engineer will decide on the disposition of each lot as to the acceptance, rejection or acceptance at an adjusted payment. The Engineer's decision is final.
4. 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.
5. Lot Size. A standard size mix production lot consists of 400 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 lot and utilize it to determine disposition.
6. Pre-Production Mix. Test and evaluate a pre-production mix, limited to a maximum of 85 tons. The pre-production test material will be placed at a location off of city property at the Contractor's expense. Evaluate the pre-production mix at initial start-up and after suspension of production resulting from failing test results. Limit pre-production quantities to 100 tons following a suspension

of production. Provide a pre-production mix that complies with the "Single Test Value" in TABLES 613-5 and 613-6. Except for initial start-up, normal delivery of material to the project before completion of certain test results on preproduction mixes may be authorized by the City.

7. Suspension of Mix Production. Suspend production of the mix and the mixture shall be redesigned whenever any of the following occurs:
 - i. Three consecutive sets of tests show the binder content in the compacted mix exceeds the tolerance shown for the single test value column of Table 613-5.
 - ii. Three consecutive sets of tests show the minimum design film thickness is less than 9.0 μm .
 - iii. Three consecutive sets of tests show the gradation to be outside of the specification limits shown in TABLE 613-6. The JMF may only be adjusted, when requested by the Contractor, and when approved by the Engineer. For significant changes in the JMF, as determined by the Engineer, a new mix design may be required by the Engineer before the JMF is approved. 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 shall subject all subsequent material to rejection by the Engineer or acceptance at a reduced price, as determined by the Engineer.
8. Non-Complying Materials. Establish and maintain an effective and positive system for controlling noncomplying material, including procedures for its identification, isolation and disposition. Reclaim or rework noncomplying materials according to procedures acceptable to the Engineer. This could include removal and replacement of in-place pavement. Positively identify all non-complying materials and products to prevent use, shipment and intermingling with complying materials and products. Provide holding areas, mutually agreeable to the Engineer and Contractor.

I. Measurement and Payment.

1. UBAS. The Engineer will measure UBAS by the square yard. Payment for "Ultrathin Bonded Asphalt Surface (UBAS)(Collector-Arterial)", and "Ultrathin Bonded Asphalt Surface (UBAS)(Residential)" at the contract unit price is full compensation for the specified work, including quality control testing.

2. Asphalt Pavement Patching. The Engineer will measure “Asphalt Pavement Patching” by the ton. Payment for “Asphalt Pavement Patching” at the contract unit price is full compensation for the specified work including removal of existing asphalt.

APPENDIX A: SAMPLING AND TESTING FREQUENCY CHART FOR UBAS	
TESTS REQUIRED (record to)	FREQUENCY
Binder Sampling (KT-26)	1 per project
Binder Content (by ignition) (0.1 g or 0.01% of mass) (KT-57)	1 per lot
Mix Gradation (after ignition) (0.1 g or 0.01% of mass)	1 per lot
Theoretical Max. Sp. Gr. (Rice) (Gmm=0.001) (KT-39)	1 per lot (if more than 1 test is performed, use average)
Sand Equivalent (1%)(KT-55)	1 per project
Coarse Aggregate Angularity (0.1% of mass) (KT-55)	1 per project (if specified, 1 per week or per 10,000 tons)
Uncompacted Voids Content of Fine Aggregates (0.1%)(KT-50)	1 per project
Gradation of individual aggregate (1%, 0.1% for No. 200, of mass)(KT-2)	1 per project per individual aggregate
% Moisture in Mixture (0.1 g or 0.01% of mass)(KT-11)	1 per project
%Moisture in Combined Virgin Aggregate (0.1g or 0.01% of mass)(KT-11)	1 per project
PI of Mineral Filler (0.01g or 0.01% of mass)(KT-10)	1 per project
Gradation of Mineral Filler (1%, 0.1% for No. 200, of mass)(KT-2)	1 per project

General Note: All sampling and testing frequencies are minimums. Additional quality control, verification and assurance tests will be performed, when necessary, to provide effective control of the work. When any quality control, verification or independent assurance test fails to comply with the specification requirements then the next lot of production after obtaining the failing test results will be sampled and tested, regardless of any lesser frequency specified in Appendix A.