PART 500
CONTRACT MAINTENANCE

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SECTION 501

LATEX MODIFIED MICRO-SURFACING OF ASPHALT CONCRETE PAVEMENT

501.1 DESCRIPTION

This specification covers all materials, equipment, construction and application procedures for rut-filling and/or surfacing of existing paved surfaces. Micro-surfacing shall be a mixture of cationic natural latex modified asphalt emulsion, mineral aggregate, mineral and field control additives, and water, properly proportioned, mixed and spread on the paved surface in accordance with this specification and as directed by the Engineer.

501.2 MATERIALS

Water
Water shall be potable and free of harmful soluble salts.

Emulsified Asphalt
The emulsified asphalt shall be a quick-set natural latex modified cationic type CPE (Cold Paving emulsion) and shall conform to the requirements of these specifications. It shall pass all applicable storage and settlement tests. The latex shall be milled into the emulsion. The cement mixing test shall be waived for this emulsion. The emulsion shall comply with the following requirements:

	Min	Max
Viscosity, Saybolt Furol, 25C (77°F), Sec.	20	100
Storage Stability test, one day, percent	--	1
Particle charge test	Positive	
Sieve test, percent	--	0.1
Distillation:		
Oil distillate, by volume of emulsion, %	--	0.5
Residue %	62	--
Test on Residue from Distillation:		
Penetration, 77°F, 100g., 5 seconds	55	90
Ductility, 77°F, 5 cm/min, cm	70	--
Solubility in trichloroethylene, %	97	--
Softening Point, R. & B., F	140	--
Viscosity, absolute 60°C (140°F), Poise	8000	

Special Residue Properties:
Distillation of residue will be at a temperature of 35°F for 20 minutes.

Aggregate
The mineral aggregate used shall be chat and conform to Subsection 405.2.

a) **Physical Properties -** To limit the permissible amount of clay-like fines in an aggregate, a sand equivalent value of 65 or higher is required when tested by ASTM 2419.

The aggregate shall have a weighted loss of not more than 15 percent when the sodium sulfate test is used or 20 percent when the magnesium sulfate test is used.
The aggregate wear, from resistance to abrasion, shall be a maximum of 35 percent when using AASHTO T96 or ASTM C131 test methods.

b) Gradation - The aggregate including natural fines when tested by AASHTO methods T11 or Ts7, or ASTM C117 or C136, should meet the following gradation.

Sieve	**Percentage**
Retained on 1/2" Sieve	0%
Retained on 3/8" Sieve	0-1%
Retained on No. 4 Sieve	6-14%
Retained on No. 8 Sieve	35-55%
Retained on No. 16 Sieve	54-75%
Retained on No. 30 Sieve	65-85%
Retained on No. 50 Sieve	75-90%
Retained on No. 200 Sieve	85-95%

501.3 ENGINEERING

General
Before work commences, the Contractor shall submit a signed mix design covering the specific material to be used on the project. This design shall be performed by a qualified laboratory. All costs for laboratory testing required to develop the design mix will be the Contractor's responsibility. Once the materials are approved, no substitution will be permitted unless first tested and approved by the laboratory preparing the mix design.

Mix Design
The qualified laboratory shall develop the job mix design and present certified test results for the Contractor's approval. Compatibility of the aggregate and latex modified emulsion shall be verified by the mix design. The job mix formula shall provide a minimum Marshall stability of 1,800 pounds and a flow of 6 to 16 units when tested according to the ASTM 1559 or AASHTO 245 procedure as modified. All component materials used in the mix design shall be representative of the material proposed by the Contractor for use on the project.

Specifications
The Engineer shall approve the design mix and all materials and methods prior to use. The component materials shall be within the following limits.

Material	**Limits**
Residual Asphalt	6 to 9 percent by dry weight of aggregate
Chat Aggregate	15 to 30 lbs. per square yard
Mineral Filler	1.5 to 3 percent by dry weight of aggregate
Latex Modifier	As required to provide specified properties, with 3% minimum rubber solids by weight.
Field Control Additive	As required to provide the specified properties
Water	As required to produce consistency

Chat aggregate application rate to be determined by the Engineer based on the condition of the surface to be sealed.

Modifier
Special quick-setting emulsifier agents shall be milled into the asphalt emulsion. The emulsified asphalt shall be so formulated that when the paving mixture is applied at a thickness of one inch with the relative humidity at not more than 50 percent and the ambient air temperature of at least 75°F, the material will cure sufficiently so that rolling traffic can be allowed in one hour with no damage to the surface, as verified by the Engineer. Additional time may be required in areas where turning movements are common.

Additives
A mineral filler shall be introduced to the mineral aggregate and may be any recognized brand of non-air entrained Portland cement that is free of lumps. It may be accepted upon visual inspection. The amount of mineral filler needed shall be determined by the laboratory mix design and will be considered as part of the material gradation requirement.

A liquid field control additive shall be introduced and blended with water to provide effective control of the required quick-set properties. This additive shall be made available by the chemical supplier or emulsion manufacturer and certifiable as being compatible with the mixture.

501.4 EQUIPMENT

General
All equipment, tools, and machines used in the performance of this work shall be maintained in satisfactory working condition at all times to ensure a high quality product.

Mixing Equipment
The material shall be mixed by a self-propelled surfacing and mixing machine which shall be a continuous flow mixing unit able to accurately deliver, meter and proportion the aggregate, emulsified asphalt, mineral filler and field control additives, and water to a revolving multi-blade twin shafted mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient capacity for aggregate, emulsified asphalt, mineral filler and field control additives, and water to maintain an adequate supply to the proportioning controls. The machine shall be equipped with self-loading devices which provide for the loading of materials while continuing to lay the mixture, thereby minimizing construction joints.

Proportioning Devices
Individual volume or weight controls for proportioning each material to be added to the mix, i.e., aggregate, emulsified asphalt, mineral filler and field control additives, and water shall be provided and properly marked. These proportioning devices may be revolution counters or similar devices and are used in material calibration and determining the materials output at any time.

Emulsion Pump
The emulsion pump shall be a positive displacement type.

Spreading Equipment
The surfacing mixture shall be spread uniformly by means of a mechanical-type spreader box attached to the mixer, equipped with paddles to agitate and spread the materials throughout the box. A front seal shall be provided to insure no loss of the mixture at the road contact point. The rear seal shall act as a strike off and shall be adjustable. The mixture shall be spread to fill cracks and minor surface irregularities and leave a uniform skid resistant application of material on the surface. 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. The longitudinal joint where two passes join shall be neat appearing, uniform and lapped a maximum of 3". All excess material shall be removed from the job site prior to opening the road. The spreader box shall have suitable means provided to side shift the box to

compensate for variations in pavement width and longitudinal alignment. The water pump shall be equipped with two valves, one to control the flow and the other, a quick acting valve, to start and stop the flow.

The spreader box shall be equipped with a secondary strike off screed immediately behind the rear seal. This screed shall be constructed of a material that will give an even, uniform finish to the surface material.

The spreader box shall also be equipped with internal skids that will allow application of the mixture without gouging a line in the previously laid material adjacent to the pass being laid.

Auxiliary Equipment
Suitable crack and surface cleaning equipment, traffic control equipment, hand tools, and any support equipment shall be provided as necessary to perform the work, including burlap hand mops.

501.5 MACHINE CALIBRATION

Each mixing unit to be used in performance of the work shall be calibrated in the presence of the Engineer prior to construction, or previous calibration documentation covering the exact materials to be used may be acceptable provided they were made during that calendar year. The documentation shall include the individual calibration of each material at various settings, which can be related to the machine metering devices.

501.6 WEATHER LIMITATIONS

The material shall be spread only when the road surface and atmospheric temperatures are at least 60°F and rising and the weather is not foggy or rainy and there is no forecast of temperatures below 45°F within 48 hours from the time of placement of the mixture.

501.7 SURFACE PREPARATION

General
The area to be surfaced shall be thoroughly cleaned of vegetation, loose aggregate and soil, particularly soil that is bound to the surface.

Tack Coat
When the surfaces to be sealed are brick or concrete, the Contractor shall apply a tack coat of diluted SS-1H emulsified asphalt, consisting of one part emulsion and three parts water with a distributor at .10-.15 gallons per square yard. Emulsified asphalt for tack coat shall be SS-1H conforming to Section 1202 of the KDOT Standard Specifications. Some minor areas with severe rutting may require filling with a rut box as directed by the Engineer. Material placed with a rut box shall be paid for at the same rate as other surfacing material. The use of the rut box shall be considered subsidiary to other bid items of work.

501.8 STOCKPILE

Precautions shall be taken to insure that stockpiles do not become contaminated. The mineral aggregate shall be screened prior to being weighed for job site delivery. This weight shall be done by means of a scale approved by the Engineer.

501.9 APPLICATION

General

The surface should be pre-wetted by fogging ahead of the spreader box when required by local conditions. The rate of application of the fog spray shall be adjusted during the day to suit temperatures, surface texture, humidity, and dryness of the pavement surface. Spraying shall meet the requirements of ASTM D3910.

The surfacing mixture shall be of the desired consistency upon leaving the mixer and no additional materials should be added. A sufficient amount of material shall be carried in all parts of the spreader at all times so that a complete coverage is obtained. Overloading of the spreader shall be avoided. No lumping, balling, or unmixed aggregate shall be permitted.

No streaks, such as those caused by oversized aggregate or dirty strike-off screed will be left in the finished surface. If excessive oversize develops, the job will be stopped until the contractor proves to the Engineer that the situation has been corrected.

The Engineer may direct that the surface treatment for any location be applied in two separate applications due to the condition of the surface to be treated. The first treatment shall be considered a leveling type treatment applied at a higher application rate as specified by the Engineer. The second treatment shall be considered a surface treatment applied at a lower application rate as specified by the Engineer. A minimum of 48 hours will be required to elapse between the two separate applications.

Manholes, valve boxes and inlet grates in the paving area shall be covered with a protective layer of plastic sheeting prior to the application of the seal coat. The protective layer shall be removed as soon as the seal has set sufficiently. All discolored curb and/or sidewalk shall be cleaned immediately.

All excess material shall be removed from the job site prior to opening the road.

Joints

No excessive buildup, uncovered areas or unsightly appearances shall be permitted on longitudinal or transverse joints. The Contractor shall provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the project. When possible, longitudinal joints shall be placed on lane lines. Half passes and odd widths passes will be used only in minimum amounts. If half passes are used, they shall not be the last pass of any paved area.

Longitudinal joints shall not overlap more than 4" and build up shall be struck off with a hand tool if necessary.

Mix Stability

The surfacing mixture shall possess sufficient stability so that premature breaking of the material in the spreader box does not occur. The mixture shall be homogeneous during and following mixing and spreading. It shall be free of excess water or emulsion and free of segregation of the emulsion and aggregate fines from the coarser aggregate. The completed surface will cure sufficiently so that traffic can be allowed on the surface in one hour for chat aggregate application rates of 25 pounds per square yard.

Hand Work

Areas which cannot be reached with the mixing machine shall be surfaced using hand squeegees to provide complete and uniform coverage. Hand work also may be required ahead of the sealing operation in areas where there has been excessive vertical displacement of the existing pavement surface to improve the ride quality of the completed work. The area to be handworked shall be lightly dampened prior to mix placement. Care shall be exercised to leave no unsightly appearance from handwork.

The same type finish as applied by the spreader box shall be required. Handwork shall be completed at

the time of the machine applying process.

Lines
Care shall be taken to insure straight lines along curbs and shoulders. No run-off on these areas will be permitted. Lines at intersections will be kept straight to provide a good appearance. Stained gutter shall be cleaned immediately.

501.10 QUALITY CONTROL

Materials
The Contractor will permit the Engineer to take samples of the aggregate and asphalt emulsion to be used in the project at the Engineer's discretion. Gradation and sand equivalent tests may be run on the aggregate and residual asphalt content test on the emulsion. Test results will be compared to the design mix. The Engineer must notify the Contractor immediately if any test fails to meet the specifications.

Surfacing Mixture
Samples of the mixture may be taken directly from the mixing unit(s). Consistency and residual asphalt content tests may be made on the samples and compared to the design mix. The Engineer must notify the Contractor immediately if any test fails to meet specifications.

The Engineer may use the recorders and measuring facilities of the unit to determine application rates, asphalt emulsion content, mineral and field control additives, and water.

Non-Compliance
If any two successive tests fail on the stockpile material, the work shall be stopped. It is the responsibility of the Contractor, at his own expense, to prove to the Engineer that the conditions have been corrected. If any two successive tests on the mix from the same machine fail, the use of the machine shall be suspended. It will be the responsibility of the Contractor, at his own expense, to prove to the Engineer that the problems have been corrected and that the machine is working properly.

501.11 PERFORMANCE WARRANTY AND REPAIR WORK

The Contractor warrants that all workmanship and all materials furnished under the Contract comply fully with requirements of these Surfacing Specifications. If at any time within two years after the date of the final inspection, any unfaithful or defective work should appear, which in the opinion of the City is due to inferior materials or workmanship, the Contractor warrants to do whatever is necessary to remedy the defects immediately without cost to the City. The City will notify the Contractor in writing of the defects and the repairs to be made, and the Contractor will begin repairs within a mutually agreed time frame.

Any 100 square yard of travel lane which contains more than two square yards of the following defects shall be repaired:

a) Surface skid number of less than 35 measured by ASTM E-274 at 40 mph
b) Severe bleeding or flushing
c) Debonding, delamination or skipped spots
d) Weathering or raveling
e) Tire tracks
f) Ridges or severe drag marks

All repairs shall be at the Contractor's expense and shall be full lane width, consisting of an overlay of original material placed with a spreader box using methods identical to that used for new applications. Patch work shall be uniform and blend in with the original application.

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SECTION 502

POLYMER MODIFIED CHIP SEAL OF ASPHALT CONCRETE PAVEMENT

502.1 DESCRIPTION

The work shall consist of sweeping, the application of bituminous material and cover material to an existing street surface which has previously been treated with bituminous material or to streets previously surfaced with asphaltic concrete, and the removal of excess cover material.

502.2 MATERIALS

Emulsion

Bituminous material for seal course shall be an approved polymer modified emulsified asphalt CRS-2. CRS-2 emulsified asphalt shall meet the requirements of KDOT Standard Specifications, Section 1202. The polymer modified emulsified asphalt CRS-2 shall have a minimum elastic recovery of 50 percent when tested by the procedure as identified below. The emulsified asphalt supplier will be required to furnish the City with certification that the emulsified asphalt conforms to the above specifications.

ELASTIC RECOVERY TEST

Scope: The elastic recovery of a polymer modified asphalt cement is evaluated by the percentage of recoverable strain measured after elongation during a conventional ductility test. Unless otherwise specified, the test shall be made at a temperature of 77°F $\pm$ 0.9°F (25°C $\pm$ 0.5°C) and with a speed of 5 cm/min $\pm$ 5.0%.

Referenced Documents

ASTM D113: Ductility of Bituminous Materials
ASTM E11: Specifications for Wire Cloth Sieves for Testing Purposes

Apparatus

Mold - The mold shall be similar in design to that described for use in the ductility test (ASTM D113), Figure 1, except that the sides of the mold assembly, parts a and a' shall have straight sides producing a test specimen with cross-sectional area of 1 cm^2

Water Bath - The water bath shall be maintained at the specified test temperature, varying not more than 0.18°F (0.1°C) from this temperature. The volume of water shall be not less than 10 cm and shall be supported on a perforated shelf not less than 5 cm from the bottom of the bath.

Testing Machine - For pulling the briquet of bituminous material apart, any apparatus may be used which is so constructed that the specimen will be continuously immersed in water as specified while the two clips are pulled apart at a uniform speed without undue vibration.

Thermometer - An ASTM 63°C or 63°F thermometer shall be used.

Scissors - Any type of conventional scissors capable cutting polymer modified asphalt at the test temperature.

Procedure

Prepare test specimens and condition as prescribed by ASTM D113.

Elongate the test specimen at the specified rate to a deformation of 10 cm.

Immediately cut the test specimen into two halves at the midpoint using the scissors. Keep the test specimen in the water bath in an undisturbed condition for one hour.

After the one hour time period, move the elongated half of the test specimen back into position near the fixed half of the test specimen so the two pieces of polymer modified asphalt just touch.

Record the length of the test specimen as X.

Report Calculate the percent recovery by the following procedure:

$$\text{Recovery, \%} = \frac{10 - X}{10} \times 100$$

Aggregate

Aggregate for cover material shall be crushed limestone aggregate.

a) Physical Properties -

Absorption less than 1.5%
Los Angles wear less than 30%
Mag Sulfate less than 10%
Deleterious substances less than 5%

b) Gradation - Gradation requirements, percent retained on square mesh sieves:

3/4" - 0%
1/2" - 0-5%
3/8" - 0-20%
#4 - 30-100%
#8 - 85-100%

Aggregate shall be washed and free of dust.

Lightweight Aggregate

Lightweight aggregate shall consist of expanded shale processed by the rotary kiln method with 100 percent Fractured Faces and 100 percent Ceramic coating.

a) Physical Properties - Lightweight aggregate shall conform to the following specifications:

Dry-loose weight at 35 to 55 lbs per cubic foot
Absorption less than 4%
Los Angeles wear less than 25%
Soundness ration max. 0.90

b) Gradation - 100% minus 3/8" and less than 15% minus #4. Material should be clean and uniform with nearly single size.

502.3 MAINTENANCE OF TRAFFIC

Detouring of traffic for this work will not be provided, and closing of streets for this work shall be as approved by the Engineer and so coordinated to result in the least practicable delay and inconvenience to traffic. Sufficient flagmen, warning signs and barricades shall be provided by the Contractor to properly control traffic and to prevent traffic from traveling in the freshly applied materials. All signs shall be attached securely to barricades. Signs reading "Loose Gravel Ahead" must be posted on all streets sealed. Such signs shall be left in place until the excess aggregate is removed from each individual location.

On major traffic streets only one lane in each direction may be sealed at the same time. The lanes sealed must be kept barricaded for the balance of the day.

502.4 SURFACE PREPARATIONS

Previous to the distribution of bituminous materials, the surface to be treated shall be cleaned with approved mechanical sweepers and/or hand brooms until it is free from dust as practicable; if necessary a blade will be used to remove any objectionable material such as caked or packed mud and grass, etc.

502.5 WEATHER LIMITATIONS

Seal coats shall not be applied when the air temperature is below 70°F and falling and may be applied when the air temperature is above 60°F and rising. The temperature being taken in the shade and away from artificial heat. No surface moisture shall be present.

502.6 EQUIPMENT

All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory condition at all times to ensure a high quality product.

Emulsion Distributor
The distributor shall be equipped with attachment to maintain constant spray bar height throughout the entire spread of bituminous material. Pump pressure gauge and tachometer must be used to coordinate speed with pump output to produce a uniform spread of bituminous material. The spray bar shall be set at a height from the road surface to make a double or triple lap with adjacent nozzle. All nozzles must be clean and set at identical angles to the spray bar.

Calibration
The Engineer shall be furnished a satisfactory record of the calibration of the distributor and after the beginning of work, should the yield on the bituminous material appear to be in error, the distributor shall be calibrated in a manner satisfactory to the Engineer before proceeding with the work.

Aggregate Spreader
The aggregate cover spreader shall be a self-propelled front-drop chip spreader equipped with rate controls and a material storage hopper. Drop gates shall all operate so that ridges and bare streaks do not result behind the spreader.

Rollers
Steel rollers shall be not less than 8 to 12-ton rating and pneumatic rollers shall be not less than 5 to 7-ton rating.

502.7 STOCKPILE

General precautions shall be taken to ensure that stockpiles do not become contaminated. At the direction of the Engineer, cover aggregate shall be screened prior to the job site. Pre-wetting the stockpile when using lightweight aggregate will aid in emulsion retention and reduce dusting. In no case should cover material delivered to the job site contain free water.

502.8 APPLICATION

Emulsion Application
Bituminous material of the type and grade specified and at the rate as directed by the Engineer shall be applied on the cleaned surface by an approved pressure distributor so operated as to distribute the material in the quantity specified evenly and smoothly. The amount to be applied may be varied by the

Engineer from a minimum of 0.25 gallons per square yard to 0.38 gallons per square yard. Satisfactory methods for preventing overlapping of bituminous materials may be used with the permission of the Engineer. If paper or similar method is not used to prevent overlaps at ends of tie-ins, the Contractor shall be required to completely remove all overlaps and oversprays that do occur. Regardless of the method used to prevent overlapping, the distributor shall be in motion and traveling at the desired speed at the time it crosses the end of the previous spread of bituminous material and when distribution is begun, standing starts of the distributor at the beginning of distribution shall be prohibited.

Overshooting loose chips in center lines and cross intersections will not be tolerated. If any occurs during the operation they will be completely removed then patched as needed before moving into next zone.

Application of bituminous material will be permitted only when aggregate is immediately available for spreading over the freshly-applied bituminous material.

The spread of bituminous material shall not be more than six (6) inches wider than the width covered by the cover coat material from the spreading device. Under no circumstances shall operations proceed in such a manner that bituminous material will be allowed to chill, set up, dry or otherwise impair retention of the cover coat.

All widenings, irregular widths or radius shall be hand sprayed as requested by the Engineer.

Aggregate Application

Cover material of the type specified and in the amount directed by the Engineer shall be immediately applied and spread by self-propelled spreaders of an approved type at the rates directed by the Engineer. The moisture content in aggregate applied directly to the surface of the bituminous material shall not exceed three (3) percent by weight plus one-half (1/2) the water absorption of the aggregate at the time of delivery to the project. In no case shall free moisture be draining from the truck bed. If directed, the cover material shall be moistened with water to eliminate or reduce the dust coating of the aggregate; however, the moisture content shall not exceed three (3) percent by weight at the time of application. Moistening shall be done the day before the use of the aggregate. Aggregate application rate will vary between the limits of 20 to 23 pounds per square yard. After the work is completed as specified, there should be a slight excess of aggregate on the surface.

502.9 MANIPULATION

Following the application of aggregate and bituminous materials, there shall be two (2) manipulation periods designed to spread the aggregate uniformly, to blot up free asphalt and to embed as much of the aggregate into the asphalt as possible.

The first period of manipulation shall follow immediately after the application of the bituminous material and aggregate to the surface, before the asphalt becomes tacky and at a time when conditions are most favorable for producing the best results. The first rolling shall be accomplished with a steel roller and shall continue until the surface has been rolled at least two (2) times over unless the surface is rough and irregular and in that case, the first rolling should be with a pneumatic-tired roller immediately after the application of cover material. On comparatively true uniform surfaces, the steel roller should be used first. Rollers should not be over 500 feet behind chat spreader.

Drag brooms or light blades shall not be used to shift the cover material until the initial rolling with pneumatic-tired and steel rollers has been completed and the bituminous material has cooled and set up sufficiently to hold the cover material, preferably not earlier than the day following the application of material. However, the entire surface shall be kept completely covered at all times to prevent traffic from picking up the bituminous materials. If necessary and when directed by the Engineer, additional material shall be added and the additional material shall receive additional rolling.

If prior to the first rolling, a rearrangement of the cover material is necessary to provide uniform distribution and complete coverage of bituminous material, the rearrangement should be done by hand.

A sufficient number of rollers shall be furnished so that the initial rolling consisting of two (2) complete coverages with steel rollers shall be completed within 30 minutes after the cover material is applied. The steel rolling shall be followed immediately by rolling with pneumatic-tired rollers. The sequence of rolling with steel and pneumatic-tired rollers may be varied by the Engineer.

When using lightweight aggregate, all manipulation will be done with pneumatic rollers. **NO STEEL ROLLERS** will be allowed on lightweight aggregate.

502.10 MAINTENANCE OF COMPLETED WORK

General

The Contractor shall be responsible for the maintenance of the surface and the removal of the excess aggregate. The cleanup of excess aggregate shall be on those streets designated by the Engineer and must be accomplished not sooner than four (4) days or later than seven (7) days after material is placed on the surface. A minimum of 95 percent of the loose excess aggregate shall be removed from the area designated for clean-up. All holes or failures in the seal coat surface shall be repaired by use of additional bituminous material and aggregate and all fat or bleeding surfaces shall be covered with mason sand or other approved cover materials in such manner that the bituminous materials will not adhere to or be picked up by or on the wheels of vehicles until the work is accepted by the Engineer. All piles or windrows in street shall be barricaded and not be left in the street overnight.

Liquidated damages in the amount of $200 per calendar day shall be charged for each day that streets remain uncleaned after the 7-day maximum time limit. Steps shall be taken to reduce dust sweeping operations.

Liability for Damage

Damage to vehicles or private property caused by loose aggregate shall be the Contractor's responsibility.

502.11 MEASUREMENT

Bituminous materials for seal course will be measured in gallons at the applied temperatures. A copy of all oil invoices will be required and given to the inspector or City representative on a daily basis.

Aggregate materials will be measured in tons of cover material, in the vehicle at the time and place of unloading or at such other points and in such other manner as may be designated by the Engineer. Weight tickets shall be furnished with each load of aggregate for the inspector or City representative. Moisture in the cover material shall be within specification requirements at the time the pay weight is determined. Weight or moisture shall be eliminated for pay purposes.

Lightweight aggregate materials will be measured in cubic yards of cover material in place on the job. Some written record of volume will be presented to the inspector for each load placed on the site.

502.12 WARRANTY

Any bleeding of streets during the first year from the date of sealing will be the responsibility of the Contractor to correct and will be blotted upon request of the Engineer. Contractor will be required to re-

seal any street which has more than 20 percent of the cover material removed by traffic at the end of one year after the original seal was placed. Re-sealing of such streets shall conform to the same specifications as the original seal.

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SECTION 503

CATIONIC QUICKSET SLURRY SEAL OF ASPHALT CONCRETE PAVEMENT

503.1 DESCRIPTION

The Bituminous slurry surface shall consist of properly portioned and mixed mineral aggregate, asphalt emulsion, mineral filler, and water spread evenly on the surface, as specified herein and as directed by the Engineer. The slurry when cured shall have a homogeneous appearance, fill all cracks, adhere firmly to the adjacent surface, and have skid resistance texture.

503.2 MATERIALS

Water
Water used in making the slurry shall be free of dissolved ingredients that may be harmful.

Emulsion
The emulsified asphalt shall be a CQS-1H with physical properties conforming to the requirement of ASSHTO and ASTM Specifications for type CSS-1H except that the residual asphalt having a penetration of 40-90 shall constitute at least 60 percent of the emulsion by weight, and that the Saybolt Furol Viscosity of the emulsion at 77°F shall be between 15 and 90 seconds. The Cement Mix Test is dropped. All material and mix design specifications must be met.

Aggregate
The mineral aggregate used shall be chat and conform to Subsection 405.2.

a) **Physical Properties -** To limit the permissible amount of clay-like fines in an aggregate, a sand equivalent value of 65 or higher is required when tested by ASTM 2419.

The aggregate shall have a weighted loss of not more than 15 percent when the sodium sulfate test is used or 20 percent when the magnesium sulfate test is used.

The aggregate wear, from resistance to abrasion, shall be a maximum of 35 percent when using AASHTO T96 or ASTM C131 test methods.

b) **Gradation -** The aggregate including natural fines when tested by AASHTO methods T11 or Ts7, or ASTM C117 or C136, should meet the following gradation.

Sieve	Percentage
Retained on 1/2" Sieve	0%
Retained on 3/8" Sieve	0-1%
Retained on No. 4 Sieve	6-14%
Retained on No. 8 Sieve	35-55%
Retained on No. 16 Sieve	54-75%
Retained on No. 30 Sieve	65-85%
Retained on No. 50 Sieve	75-90%
Retained on No. 200 Sieve	85-95%

Mineral Filler

Mineral fillers such as Portland cement, limestone dust, lime, fly ash, and others shall be considered as part of the blended aggregate and shall be used in the minimum amount required. They shall meet the gradation requirements of AASHTO M-17 or ASTM D-242. Mineral fillers shall be used for one or more of the following reasons only: to improve the gradation of the aggregate; to control time of break of emulsion, to provide improved stability and workability of the slurry; or to increase the durability of the cured slurry.

503.3 ENGINEERING

General

Before prepared work commences, the contractor shall submit a mix design by the head of the laboratory, covering the specific materials to be used on the project. This design shall be prepared by a laboratory qualified in slurry seal mix designing and testing approved by the Engineer. Once the materials are approved by the Engineer, no substitution will be permitted, unless first tested and approved by the laboratory preparing the mix design. All material to be applied throughout the course of this project shall be in strict accordance with these specifications. If required by the Engineer, the Contractor shall provide documentation verifying the compliance with these specifications.

Mix Design

The qualified laboratory shall develop the job mix design and present certified test results for the Engineer's approval. Compatibility of the aggregate and emulsion shall be verified by the mix design. All component materials used in the mix design shall be representative of the material proposed by the Contractor for use on the project.

Laboratory Testing

The laboratory report will show the results of tests performed on the individual materials and mix, comparing their values to those required by this specification. The report will provide the following information on the slurry seal mixture.

Test Purpose	Method	Specification
Slurry Seal Consistency	ISSA T-106	2 - 3 cm
Wet Stripping Test	ISSA T-114	90% + Coated Surface
Compatibility	ISSA T-115	*Pass
Quick Set Emulsion	ISSA T-102	**Pass
Excess Asphalt Loaded Wheel	ISSA T-109	50 gms./sq.ft. max.
Min. Asphalt		***
Cohesion Test	ISSA T-139	12 kg./cm. @ 30 min. & 20 kg./cm. @ 4 hours

* Mixing tests must pass at the maximum expected air temperature of 00°F.
** Using job aggregate only.
*** As approved by the Engineer.

The laboratory shall further report the quantitative effects of moisture content on the unit weight of the aggregate (bulking effect). The laboratory report must clearly show the proportions of aggregate, mineral filler (min. and max.), water (min. and max.), additives(s) (usage), and optimum and allowable range of asphalt emulsion based on the dry aggregate weight.

Specifications

The Engineer shall approve the design mix and all materials and methods prior to use. The component materials shall be within the following limits:

Material	Specification
Residual Asphalt	7.5% to 10.5% by dry weight of aggregate
Mineral Filler	0.5% to 3% by dry weight of aggregate
Additive	As required to provide the specified properties
Water	As required to produce proper mix consistency and achieve cohesion
Chat Aggregate	15 to 17 lbs. per square yard

Modifier

Special quick-setting emulsifier agents shall be milled into the asphalt emulsion. The emulsified asphalt shall be so formulated that when the paving mixture is applied at a thickness of one inch with the relative humidity at not more than 50 percent and the ambient air temperature of at least 75°F, the material will cure sufficiently so that rolling traffic can be allowed in one hour with no damage to the surface, as verified by the Engineer. Additional time may be required in areas where turning movements are common.

503.4 EQUIPMENT

General

All equipment, tools, and machines used in the performance of this work shall be maintained in satisfactory working condition at all times to ensure a high quality product.

Mixing Equipment

The material shall be mixed by a self-propelled surfacing and mixing machine which shall be able to accurately deliver, meter and proportion the aggregate, emulsified asphalt, mineral filler, field control additives and water. The machine shall have sufficient capacity for aggregate, emulsified asphalt, mineral filler, field control additives, and water to maintain an adequate supply to the proportioning controls.

Proportioning Devices

Individual volume or weight controls for proportioning each material to be added to the mix, i.e., aggregate, emulsified asphalt, mineral filler and field control additives, and water shall be provided and properly marked. Proportioning devices shall be equipped with revolution counters or similar devices to determine the output at any time.

Emulsion Pump

The emulsion pump shall be of the positive displacement type and shall be equipped with a revolution counter or similar device so that the amount of emulsion used may be determined at any time.

Spreading Equipment

The surfacing mixture shall be spread uniformly by means of a mechanical-type spreader box attached to the mixer. A front seal shall be provided to insure no loss of the mixture at the road contact point. The rear seal shall act as final strike off and shall be adjustable. The mixture shall be spread to fill cracks and minor surface irregularities and leave a uniform skid resistant application of material on the surface. 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. The longitudinal joint where two passes join shall be neat appearing, uniform and lapped a maximum of 3". All excess material shall be removed from the job site prior to opening the road. The water pump shall be equipped with a minimum of two valves. One valve shall establish the water flow and the other valve shall be a quick acting valve to start and stop the flow.

Auxiliary Equipment

Suitable crack and surface cleaning equipment, traffic control equipment, hand tools, and any support equipment shall be provided as necessary to perform the work.

Machine Calibration
Each mixing unit to be used in performance of the work shall be calibrated in the presence of the Engineer prior to construction, or previous calibration documentation covering the exact materials to be used may be acceptable provided they were made during that calendar year. The documentation shall include the individual calibration of each material at various settings, which can be related to the machine metering devices.

503.5 WEATHER LIMITATIONS

The material shall be spread only when the road surface and atmospheric temperatures are at least 60°F and rising and the weather is not foggy or rainy and there is no forecast of temperatures below 45°F within 48 hours from the time of placement of the mixture.

503.6 SURFACE PREPARATION

General
The area to be surfaced shall be thoroughly cleaned of vegetation, loose aggregate and soil, particularly soil that is bound to the surface.

Tack Coat
When the surfaces to be sealed are brick or concrete, the Contractor shall apply a tack coat conforming to the requirements for tack coat in Subsection 405.6.

503.7 STOCKPILE

Precautions shall be taken to insure that stockpiles do not become contaminated. The mineral aggregate shall be screened prior to being weighed for job site delivery.

503.8 APPLICATION

General
The surface should be pre-wetted by fogging ahead of the spreader box when required by local conditions. The rate of application of the fog spray shall be adjusted during the day to suit temperatures, surface texture, humidity, and dryness of the pavement surface. Spraying shall meet the requirements of ASTM D3910.

The surfacing mixture shall be of the desired consistency upon leaving the mixer and no additional materials should be added. A sufficient amount of material shall be carried in all parts of the spreader at all times so that a complete coverage is obtained. Overloading of the spreader shall be avoided. No lumping, balling, or unmixed aggregate shall be permitted.

No streaks, such as those caused by oversized aggregate, dirty strike-off screed or dirty burlap drag will be left in the finished surface. If excessive oversize develops, the job will be stopped until the contractor proves to the Engineer that the situation has been corrected. Burlap drag material shall be installed behind the strike-off screed as directed by the Engineer.

The Engineer may direct that the surface treatment for any location be applied in two separate applications due to the condition of the surface to be treated. The first treatment shall be considered a leveling type treatment applied at a higher application rate as specified by the Engineer. The second treatment shall be considered a surface treatment applied at a lower application rate as specified by the

Engineer. A minimum of 48 hours will be required to elapse between the two separate applications.

Manholes, valve boxes and inlet grates in the paving area shall be covered with a protective layer of plastic sheeting prior to the application of the seal coat. The protective layer shall be removed as soon as the seal has set sufficiently. All discolored curbs and/or sidewalks shall be cleaned immediately.

All asphalt approaches that lead to concrete mat, dirt, or closures shall be sealed at the same time as the through streets.

Joints
No excessive buildup, uncovered areas or unsightly appearances shall be permitted on longitudinal or transverse joints. The Contractor shall provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the project. When possible, longitudinal joints shall be placed on lane lines. Half passes and odd widths passes will be used only in minimum amounts. If half passes are used, they shall not be the last pass of any paved area.

Mix Stability
The surfacing mixture shall possess sufficient stability so that premature breaking of the material in the spreader box does not occur. The mixture shall be homogeneous during and following mixing and spreading. It shall be free of excess water or emulsion and free of segregation of the emulsion and aggregate fines from the coarser aggregate. The completed surface will cure sufficiently so that traffic can be allowed on the surface in one hour for chat aggregate application rates of 13 pounds per square yard.

Hand Work
Areas which cannot be reached with the mixing machine shall be surfaced using hand squeegees to provide complete and uniform coverage. Hand work also may be required ahead of the sealing operation in areas where there has been excessive vertical displacement of the existing pavement surface to improve the ride quality of the completed work. The area to be handworked shall be lightly dampened prior to mix placement. Care shall be exercised to leave no unsightly appearance from handwork.

The same type finish as applied by the spreader box shall be required. Handwork shall be completed at the time of the machine applying process.

Lines
Care shall be taken to insure straight lines along curbs and shoulders. No run-off on these areas will be permitted. Lines at intersections will be kept straight to provide a good appearance.

When needed, all joints, radii, ends and returns will be squeegeed and burlap mopped as directed by the City.

Repairs
Skips, bare spots or tire tracks shall be repaired at the Contractor's expense using the full width spreader box and methods identical to new applications to give a uniform patch which will blend in with the original application.

503.9 QUALITY CONTROL

Materials
The Contractor will permit the Engineer to take samples of the aggregate and asphalt emulsion to be used in the project at the Engineer's discretion. Gradation and sand equivalent tests may be run on the aggregate and residual asphalt content test on the emulsion. Test results will be compared to the design mix. The Engineer must notify the Contractor immediately if any test fails to meet the specifications.

Surfacing Mixture

Samples of the mixture may be taken directly from the mixing unit(s). Consistency and residual asphalt content tests may be made on the samples and compared to the design mix. The Engineer must notify the Contractor immediately if any test fails to meet specifications.

The Engineer may use the recorders and measuring facilities of the unit to determine application rates, asphalt emulsion content, mineral and field control additives, and water.

Non-Compliance

If any two successive tests fail on the stockpile material, the work shall be stopped. It is the responsibility of the Contractor, at his own expense, to prove to the Engineer that the conditions have been corrected. If any two successive tests on the mix from the same machine fail, the use of the machine shall be suspended. It will be the responsibility of the Contractor, at his own expense, to prove to the Engineer that the problems have been corrected and that the machine is working properly.

503.10 PERFORMANCE WARRANTY

The Contractor warrants that all workmanship and all materials furnished under the Contract comply fully with requirements of these Surfacing Specifications. If at any time within two years after the date of the final inspection, any unfaithful or defective work should appear, which in the opinion of the City is due to inferior materials or workmanship, the Contractor warrants to do whatever is necessary to remedy the defects immediately without cost to the City. The City will notify the Contractor in writing of the defects and the repairs to be made, and the Contractor will begin repairs within a mutually agreed time frame.

SECTION 504

ASPHALT HEATER SCARIFICATION AND RESURFACING

504.1 DESCRIPTION

Work on this project consists of re-surfacing the streets by a method of heating and scarifying existing asphalt surface and relaying the scarified material as a leveling course with a minimum of 3/4-inch of asphaltic concrete overlay.

504.2 MATERIALS

Asphalt Mixture
The new surface asphalt, conventional or polymer modified, shall meet the City of Wichita Standard Specifications for Surface Mix Asphalt Concrete (See Subsection 405.2).

Asphalt Emulsion
The emulsion shall meet the requirements of the KDOT Standard Specifications for SS-1H or CS-1H emulsified asphalt.

504.3 EQUIPMENT

General
All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory working condition at all times to ensure a high quality product. The Contractor shall supply a single machine capable of performing all required functions. The only exception would be a separate pre-heater, provided it is used immediately ahead of the main machine.

Operating Width
The operating width shall be at a width of up to 13 feet maximum.

Machine Functions
The Contractor's machine must be able to heat the existing pavement surface, scarify the heated surface, add asphalt emulsion, relay the loose scarified material and cover the surface with a layer of new asphalt concrete material. The laydown portion of the machine shall have spreading augers, a screed and automatic controls equal to laydown machines used for new construction laydown.

Compaction Rollers
Compaction shall be by the use of 8 to 12-ton vibrating steel-wheeled tandem rollers.

504.4 SURFACE PREPARATION

Prior to commencing heater scarifying operations, the pavement shall be cleaned of any loose material that could interfere with the work. Any soil or aggregate adhering to the pavement shall be loosened and removed. Power brooming shall be supplemented by hand brooming, if necessary, to render the surface free from deleterious material. Any required patching work designated on the plans or in the proposal shall be completed prior to the beginning of the scarifying process.

504.5 OPERATION

Heating
Heat the surface uniformly in an oxygen free chamber without burning the asphalt cement. All flames shall be shielded from blasting or scrubbing the pavement. The heating chamber shall extend approximately 4 inches (4") beyond the paving width of the machine. Temperature of pavement shall not rise above 475°F Enough heat must be applied to allow the scarifier to penetrate 3/4 to 1-inch average and produce reclaimed mix at an average minimum temperature of 250°F. There shall be no burning of trees, shrubs or adjacent property.

Scarifying
Scarify with pressure loaded scarifiers having teeth spaced less than one inch apart that cut a leveled pattern through the surface conforming to the desired profile of the street. Average depth of cut shall be 3/4 to 1-inch. Scarifiers must be equipped to release pressure on short sections to allow for passing over manholes, water valves, and other such appurtenances in the street surface.

Leveling/Profiling/Mixing
Cut the scarified pavement with a cutting and leveling blade that gathers the reclaimed mix. On curb and gutter pavements where gutter apron is on grade, cutting blade shall expose at least ½-inch of gutter apron edge. Cutting and leveling blade must be controlled to produce a level surface in alignment with desired street profile. Cutting blade shall be equipped with a longitudinal transfer and mixing auger that moves recycled mix to center of machine.

Emulsion Application
Apply a continuous ribbon of liquid asphalt emulsion at the junction of asphalt pavement with the concrete gutter apron (high edge). When required, apply and mix thoroughly liquid asphalt emulsion to the scarified asphalt at the rate specified by the engineer. Application rate must be synchronized with the working speed of the machine. The asphalt emulsion application shall provide for band control to allow for variations in application rates.

Laying Recycled Mix
The windrow of recycled mix shall be spread and compacted by a recycling screed that lays the recycled mix as a leveling course in alignment with the desired profile of the finished pavement.

Paving
Immediately after scarifying, applying liquid asphalt, and leveling, apply approximately 3/4-inch (3/4") hot surface mix asphalt over the entire surface. The temperature of the recycled mix shall be within a 200°F to 250°F temperature range at the time the bituminous course is placed on top of the recycled mix. The amount of new material to be determined by the City of Wichita. The hot mix shall be laid by a heated, adjustable, vibratory screed capable of laying the hot mix to the grade, slope and crown. Minimum compacted density of the asphalt shall be 95 percent (95%) of lab density.

Roller
The Contractor shall compact the newly laid asphalt with an 8-to-12-ton tandem steel-wheeled roller. Compaction of the bituminous surface course shall be completed before the temperature of the mix drops below 180°F.

Pavement Markings
The Traffic Engineering Division will be responsible for furnishing and applying all permanent pavement marking materials. The Contractor shall assist Traffic Engineering, if required, in the process of placing cold-laid plastic markings by rolling the markings to "seat" or inlay the markings in freshly applied hot asphalt surfaces.

Personnel
As a minimum, the contractor shall furnish a superintendent, operator(s) for heating, scarifying, leveling and paving machine(s) and a screed man, two shovel men, two qualified lute men and a roller operator.

Cold Milling
When area or edge cold milling is required, it shall be done within 24 hours of the resurface work. The cold milling operation shall meet the requirements of Section 409.

Utility Adjustment
Storm and sanitary sewer manholes, water valves and gas valves shall be adjusted to meet the new surface.

504.6 QUALITY CONTROL

General
The City Engineer shall take random tests of the scarification depth and the surface thickness at least once per day.

Method
Elevations of various spots on the existing surface shall be taken with a level just prior to scarification. The exact location of these spots will be tied down and re-established just after the new surface is placed, but before compaction. The new surface elevation will then be taken, and a bottom of scarification elevation will be taken. Exact depths of scarification and thickness of overlay shall be calculated from this information and machine controls adjusted according to the results.

504.7 MEASUREMENT

The area of scarification will be measured in the field. Tickets shall be provided by the Contractor to account for tons of asphaltic material and gallons of emulsion.

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SECTION 505

PRESERVATIVE SEAL FOR ASPHALT CONCRETE

505.1 DESCRIPTION

The asphalt concrete preservative seal shall be composed of a penetrating softening agent and sealant to rejuvenate and preserve the asphalt concrete pavement.

Preservative seals are applicable for new and existing asphalt pavements as directed on the plans, special provisions, or the Engineer.

505.2 MATERIALS

Water
All water used in making the emulsion shall be potable and free of dissolved ingredients which may prove harmful.

Asphalt Rejuvenating and Preserving Agent

a) **General -** The rejuvenating and preserving agent shall have a satisfactory written documentation of at least five (5) years of performance.

b) **Specifications –**

	TEST METHOD		REQUIREMENTS	
TESTS	**ASTM**	**AASHTO**	**MIN.**	**MAX.**
Tests for Emulsion:				
Viscosity, @ 25°C, SFS	D-244	T-59	15	40
Residue %w[1]	D-244(Mod)	T-59 (Mod)	60	65
Miscibility Test	D-244(Mod)	T-59 (Mod)	No Coagulation	
Sieve Test, %w[3]	D-244(Mod)	T-59 (Mod)	--	0.1
Particle Charge Test	D-244	T-59		Positive
Percent Light Transmittance[4]	GB	GB	--	30
Tests on Residue from Distillation:				
Flash Point, COC, °C	D-92	T-48	196	--
Viscosity, @ 60°C, cSt	D-445	---	100	200
Asphaltenes, %w	D-2006-70	---	--	1.0
Maltene Distribition Ratio $\frac{PC + A_1}{S + A_2}$[5]	D-2006-70	---	0.3	0.6
PC/S Ratio[3]	D-2006-70	---	0.5	--
Saturated Hydrocarbons, S[5]	D-2006-70	---	21	28

1 ASTM D-244 Modified Exaporation Test for percent of residue is made by heating 50 gram sample to 149°C (300°F) until foaming ceases, then cool immediately and calculate results.
2 Test procedure identical with ASTM D-244-60 except that .02 Normal Calcium Chloride solution shall be used in place of distilled water.
3 Test procedure identical with ASTM D-244 except that distilled water shall be used in place of 2% sodium oleate solution.
4 Test procedure is attached.
5 Chemical composition by ASTM Method D-2006-70: PC = Polar Components, A_1 = First Acidaffins, A_2 = Second Acidafifns, S = Saturated Hydrocarbons

Note: For gal/ton conversion use 242 gal/ton

505.3 ENGINEERING

The rejuvenating agent shall be diluted to a 2:1 ratio for application (two parts oil to one part water) unless otherwise recommended by the manufacturer.

The emulsion shall be applied at a rate of 0.5 gallons per square yard to 0.20 gallons per square yard, to be determined in the Field. The maximum rate used should not prolong the opening of the street to traffic for more than two hours.

505.4 EQUIPMENT

All Equipment, tools, and machines used in the performance of this work shall be maintained in satisfactory working condition at all times to ensure a high quality product.

505.5 WEATHER LIMITATIONS

The material shall be spread only when the road surface and atmospheric temperatures are at least 60°F and rising and the weather is not foggy or rainy and there is no forecast of temperatures below 45°F within 48 hours from the time of placement of the mixture.

505.6 TRAFFIC

The streets may be opened to traffic after sanding. Traffic control signs indicating **"FRESH OIL"** and **"25 mph SPEED LIMIT"** shall be in placed for one to three days or until the road surface has returned to normal.

505.7 COMPARISON AREAS

At the direction of the Engineer, small areas of the existing surface shall be left bare for future comparison with the sealed surface. Size and number of spots shall be determined in the Field.

505.8 SURFACE PREPARATION

The surface shall be clean, dry and free of vegetation.

505.9 APPLICATION

The emulsion shall be applied by an oil distributor truck capable of providing a uniform distribution the length of the spray bar. The spray bar length shall be adjustable to hold overlap to a minimum and present skips or gaps. The personnel applying the rejuvenating agent must have prior experience with the product or on site supervision from the manufacturer or an authorized distributor of the manufacturer shall be required. The surface shall be clean and dry.

All sealed streets shall receive an application of blotting sand, however, the rejuvenator should be allowed to penetrate to its fullest extent before the blotting sand is applied. The penetration time should range from 20 minutes to two hours. Blotting sand should be a very fine, unwashed fill or flow sand applied at a rate of one to two pounds per square yard, with slightly higher application rates at stop signs and traffic lights. The overall application of sand should be uniform.

Blotting sand shall be picked up by the Contractor starting one week after application. Pick up shall be completed not more than two weeks after application. Measures shall be taken to control dust during pick up operations.

505.10 QUALITY

Skips, bare spots or tracks shall be repaired at the Contractor's expense using methods to give an overall uniform appearance. Spray shall be kept off of gutters or other concrete surfaces. Spray shall be cleared off concrete immediately.

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SECTION 506

RECONDITIONED ROADBED

506.1 DESCRIPTION

Work to be performed under this specification involves reconditioning of the existing roadbed by pulverization of existing asphalt pavement and mixing such pulverized pavement with subgrade soil and, if specified, lime, fly ash or calcium chloride into a nine-inch (9") subgrade, compaction of the nine-inch (9") subgrade to inety-five percent (95%) of standard density, and shaping and grading of shoulders in accordance with limits, grades and profiles given (See Detail D506-A).

506.2 MATERIALS

Lime

Lime shall be pebble quicklime and shall have a chemical composition such that the minimum available lime index expressed as percentage by weight of calcium and magnesium oxides (non-volatile basis) shall not be less than ninety percent (90%) and the fineness shall be such that not more than five percent (0.5%) will be retained on a No. 30 sieve or more than twenty percent (20%) will be retained on a No. 200 sieve. Pebble quicklime shall have a chemical composition such that the minimum available lime index expressed as percentage by weight of calcium and magnesium oxides (non-volatile basis) shall not be less than ninety percent (90%). The fineness of the pebble quicklime shall be such that one hundred percent (100%) will pass a 5/8-inch sieve and not less than eighty percent (80%) will be retained on a 1/4-inch sieve. The available lime index expressed as percentage by weight of calcium and magnesium oxides shall be determined by the "Rapid Sugar" test as set out in ASTM C-25. The lime supplier shall certify, in writing, that the lime furnished meets the above specified requirements. The City reserves the right to sample the lime at the construction site and to test it to verify the certification.

Fly ash

Fly ash shall meet the requirements of ASTM C-618, Class C.

Calcium Chloride

The calcium chloride shall be in a liquid form with a concentration of 35% to 38%, to be determined by the supplier to suite weather and soil conditions.

506.3 CONSTRUCTION REQUIREMENTS

All existing asphalt pavement on the roadbed to be reconditioned is to be pulverized and incorporated into the nine-inch (9") subgrade limits. Such existing asphalt pavement material shall be pulverized until all lumps are reduced to a size not greater than one and one-half times that of the maximum sized aggregate in the pavement. The pulverized pavement material shall be thoroughly mixed with subgrade soil, and fly ash or calcium chloride, is specified, to form a homogeneous mixture to a depth of nine inches (9") below the proposed new asphaltic concrete pavement.

Nine-inch (9") subgrade treatment may be completed in one lift if contractor uses rotary tillers which have capabilities for uniform mixing for the full depth of the treatment and special compaction equipment capable of compacting the nine-inch (9") lift to the required density for the full depth. Contractor will be required to work the subgrade treatment in two (2) separate lifts when laboratory tests indicate required mixing and compaction is not being achieved.

When specified, additional asphalt millings may be added to the top of the existing surface prior to the first pulverization to increase the amount of asphaltic concrete in the mixture.

Compaction of the mixed base material may require the use of a sheepsfoot roller to achieve the required density. The surface of the roadbed shall be graded as required during the final compaction process. Excess material generated in the final grading and shaping process is to be equally windrowed on each side of new pavement construction for later use for grading shoulders (See Figure 3).

a) Lime Treatment

Lime shall be placed on the surface prior to pulverizing and shall be thoroughly mixed into the subgrade layer. The application rate shall be determined by the Engineer based on analysis of the existing soil.

b) Fly Ash Treatment

Fly ash shall be placed on the existing surface prior to pulverizing and shall be thoroughly mixed into the subgrade layer. The application rate shall be 75 pounds per square yard, or as directed by the Engineer.

c) Calcium Chloride Treatement

Liquid calcium chloride may be applied through the pulverizing machine or applied directly by distributor truck. The Contractor shall use caution to prevent damage to haul roads from oversized distributor trucks. The subgrade shall then be re-pulverized, compacted and graded. A second application shall be sprayed on the finished surface at the rate of 0.25 gallons per square yard. The finished surface shall be allowed to cure at least two weeks before applying any wearing surface.

SECTION 507

COLD RECYCLED ASPHALT PAVING

507.1 DESCRIPTION

This work shall consist of constructing one or more courses of recycled asphalt pavement material properly portioned and mixed with a rejuvenating emulsion in conformance with the lines, thickness, and cross-section established by the Engineer.

507.2 MATERIALS

Emulsion for Cold Recycled Asphalt Paving Polymer Modified HFE-300P Emulsion
Bituminous material shall be a High Float Emulsion (HFE) with a 300 penetration and polymer modification (300 P) as specified below.

a)	**Test**	**HFE-300P**
	Viscosity, Saybolt Furol @ 50°C (122°F), sec.,	50+
	Sieve Test, retained on No. 20 Sieve, %	0.1-
	Storage Stability Test, 1 day, %	1-
	Residue from Distillation Test to 204°C (400°F) %	65+
	Oil distillate by volume of Emulsion, %	7.0-
b)	**Tests on Residue from Distillation:**	
	Penetration, 25°C (77°F), 100 g. 5 sec., 0.1 mm	300+
	Float Test @ 60°C (140°F), sec.	1200+
	Tensile Stress 4°C (39.2°F), 50 cm/min., 800% elongation, kg/cm, ASTM D0412	0.05+

Recycled Asphalt Pavement
The material shall be reclaimed from existing pavement and shall pass the 1-1/2" sieve. The material shall be free of detrimental quantities of organic, non-granular soils and deleterious materials.

507.3 MIX DESIGN

The Contractor shall submit mix design with gradation and emulsion content. The City will test to assure the product provided meets the design mixture.

507.4 CONSTRUCTION DETAILS

Weather Limitations
The paving mixture shall not be placed when the existing surface temperature is below 60°F or when other weather conditions would prevent proper construction of the pavement.

Site Preparation
The surface shall be graded to proper elevation and slope and shall be hard, dry and free from excess loose material.

Paving Mixture

The asphaltic paving material shall be delivered to the lay-down machine properly sized, proportioned and mixed in a pugmill with provisions for injecting the rejuvenating agent to be mixed with the paving material. The pugmill shall be designed to accurately proportion by volume, so that when the asphalt material and the rejuvenating agent are incorporated in the mix, a thorough and uniform coating will result. The mixer shall be equipped with a positive displacement metering system and equipment to mechanically or electrically control the feed to assure a uniform mixture at all times. The rejuvenating agent shall be added as determined by lab testing and adjusted as necessary to meet field conditions.

Placement

The paving mixture shall be placed with a traveling laydown machine equipped with a screed using controls that shall produce the specified thickness, slope and smoothness.

Compaction

After spreading, the mixture shall be thoroughly and uniformly compacted with a self-propelled steel vibratory roller once a dry appearance exists on the new surface. Compaction shall be completed using a rubber tired roller. The number of roller passes to achieve the desired compaction shall be approved by the Engineer. Rolling may be delayed to allow curing of the rejuvenating agent.

SECTION 508

DIAMOND GRINDING CONCRETE PAVEMENT

508.1 DESCRIPTION

This work shall consist of grinding and texturing the existing Portland cement concrete pavement longitudinally using a diamond grinder.

508.2 CONSTRUCTION REQUIREMENTS

General

The Engineer will designate the areas of pavement surfaces to be ground.

Grinding shall be performed in the longitudinal direction so that grinding begins and ends at lines normal to the pavement centerline. The entire pavement surface area and adjacent shoulders shall be uniformly ground and textured until the surface on both sides of the transverse joints and all cracks are in the same plains and meet the required smoothness.

The grinding of auxiliary lanes or ramps shall transition as required from the mainline edge to provide positive drainage and acceptable riding surface. The adjacent shoulders or pavement shall be ground to maintain an adequate cross-slope for drainage.

The surface of the ground pavement shall have parallel corduroy-type texture consisting of grooves between 0.090 and 0.150-inch wide. The land area between the grooves shall be between 0.060 to 0.125-inch. The peaks of the ridges shall be 1/16-inch higher than the bottom of the grooves.

The Contractor shall provide positive means for removal of grinding slurry or residue by vacuum or other continuous methods. The grinding slurry shall not be allowed to flow across lanes being used by traffic. The pavement shall receive a final sweeping with power equipment before opening to traffic.

Grinding slurry material shall be disposed of as approved by the Engineer and in accordance with all local and state requirements.

Equipment

The grinding and texturing machine shall be self-propelled with diamond blades mounted on a multi-blade arbor having a minimum cutting head width of three (3) feet. Equipment that causes excessive ravels, aggregate fractures, spalls, or disturbance of the transverse or longitudinal joints shall be repaired or replaced.

Tolerances

The cross-slope of the pavement shall be uniform and shall not have depressions or miss-alignment of slope greater than 1/8-inch in ten (10) feet when tested by stringline or straightedge placed perpendicular to the centerline.

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SECTION 509

PRESSURES JACKING OF CONCRETE PAVEMENT

509.1 DESCRIPTION

This work consists of hydraulically jacking concrete pavement to correct profile. Jacking is accomplished by drilling injection holes and pumping a cement/fly ash grout under the pavement.

509.2 MATERIALS

Water
Water shall be potable and free from harmful substances.

Portland Cement
Type I cement is required, and shall comply with KDOT Standard Specifications.

Fly Ash
Fly ash shall conform to the requirements of the KDOT Special Provision for Fly Ash.

Submittals
The Contractor shall submit for approval, materials proposed for use. The submittal shall include mill certifications for cement, physical and chemical analysis for fly ash and tests of grout slurry by an approved testing laboratory. Tests shall show 1, 3, and 7-day strengths, flow cone items, shrinkage and expansion observed and time of initial set. The 7-day strength shall be at least 600 psi as measured in accordance with AASHTO T 106.

509.3 DESIGN MIX

a) 1 part Portland Cement
b) 3 parts Fly Ash
c) Water to achieve required fluidity

Fluidity of the grout when measured in accordance with ASTM C939 shall have a time of efflux between 16 and 36 seconds. During initial injection at each hole an efflux time between 9 and 15 seconds will be permitted.

509.4 EQUIPMENT

Grout Plant
The grout plant shall consist of a positive displacement cement injection pump and a high speed colloidal mixing machine. The mixing machine shall operate between 800 and 2,000 RPM, creating a high shearing action and subsequent pressure release to make a homogeneous mixture.

Drilling
An air compressor and rock drills or other devices capable of drilling the injection holes through the pavement are required.

509.5 CONSTRUCTION REQUIREMENTS

Weather Limitations

Weather and Seasonal Limitations: Pavement jacking shall not be performed when pavement surface temperatures are below 35°F, or if the subgrade or base course is frozen. Pavement jacking shall not be performed when the subgrade contains an abnormal amount of moisture from recent rainfall, as evidenced by standing water on the pavement or in the joints or cracks.

Operation

a) **Drilling Holes -** Grout injection holes shall be drilled in a pattern determined by the Contractor. Care shall be taken not to damage the existing reinforcing steel. Holes shall be between 1½ and 2 inches in diameter, drilled vertically and round, to a depth sufficient to penetrate the stabilized base and into the subgrade material. Holes may be washed to create a small cavity, allowing initial spread of grout. Holes shall be drilled in a manner that prevents breakout at the bottom of the pavement. The downward force of the drill shall not exceed 200 pounds.

b) **Pavement Jacking -** String lines shall be established and blocked up from the pavement high points to monitor movement.

An expanding rubber packer or other approved device connected to the discharge from the plant shall be lowered into the hole. The discharge end of the packer or hose shall not extend below the lower surface of the concrete pavement.

The Contractor shall pump in a pattern and in the amount required to raise the pavement to within 0.02 foot of the specified grade. Grade tolerances are applicable to both transverse and longitudinal grades. After the pavement has been raised to the desired elevation, all holes shall be injected to insure complete filling of voids.

Continuous pressures up to 200 psi will be permitted. Pressures up to 300 psi will be allowed only for short periods. If the pavement is bonded to the sub-base, brief pressure rises (10 seconds or less) up to 600 psi will be allowed.

Material shall not be held in the mixer or injection sump pump for more than one hour after mixing. Material held longer shall be wasted and will not be paid for. Additional water shall not be added after initial mixing of grout.

Excessive loss of the grout through cracks, joints or from back pressure in the hose or in the shoulder area will not be tolerated.

If continued grout injection at specific location is no longer feasible due to major voids, the Engineer may direct the Contractor to cease grout injection.

Upon completion of jacking, drill holes shall be filled with a fast setting sand/cement mixture or other approved patch material. Profile corrections extending beyond one lane shall be completely jacked to grade as promptly as possible.

When pavement jacking is being performed adjacent to bridges or bridge approach slabs, care shall be taken so as not to get the jacking slurry into the expansion joints. Any jacking slurry getting into the joints shall be removed by the Contractor at his own expense.

All repair operations shall be conducted in the direction of traffic movement.

Uncontrolled driving and parking of vehicles and equipment on the slopes and in the interchange areas

will not be permitted. Any damages to the vegetation, surfacing and embankment resulting from such uncontrolled use shall be repaired and/or restored by and at the cost of the Contractor to the satisfaction of the Engineer.

509.6 CRACKS AND REPAIR

Radial Cracks

Slab shall not be raised more than ¼-inch while pumping in any one hole at any one time. Cracks emanating radially from the grout injection holes will be presumed to have been caused by improper injection techniques by the Contractor. For each five linear feet of crack measured, the pay quantity will be reduced by one cubic foot of grout.

Transverse Cracks

If cracks develop between adjacent grout inject holes, the Contractor shall repair the cracks by a satisfactory method, at no cost to the City.

Pavement raised above the specified tolerance shall be brought to grade by grinding. If overjacking is greater than 0.10 foot, satisfactory removal and replacement shall be required, at no cost to the City.

509.7 PERFORMANCE WARRANTY

Performance warranty shall meet the requirements described in Subsection 503.10.

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SECTION 510

CURB AND GUTTER REPAIR

510.1 DESCRIPTION

This work shall consist of removing and replacing curb and gutter in accordance with detailed drawings and as directed by the Engineer.

510.2 MATERIALS

Concrete

All concrete used in the construction of curb, street pavement, parking lot and driveway pavement on curb and gutter repair projectw shall conform to the Standard Specifications for such work as specified in Subsection 406.2, except that the mixed concrete shall contain a minimum of 733 pounds of cement per cubic yard.

510.3 CONSTRUCTION DETAILS

The shape of all curb and/or gutter constructed shall match as closely as possible the the shape of such curb and/or gutter being replaced. The curb shall be formed such that the top 4" of the back of curb shall be vertical and smooth. The contractor will be required to remove and replace existing asphalt or brick surfaces adjacent to all gutter to facilitate construction of the gutter line to a true and neat line. Minimum width for removal and replacement of asphalt surfaces shall be one foot from the edge or as necessary to repair surfaces damaged by removal of curb and gutter. All removal limits shall terminate at sawed joints or existing joints. All sawing, removal and reconstruction of asphalt pavement surfaces, as provided above, will not be paid for directly and this cost shall be incidental to the project. Any additional asphalt surface repair outside the limits of work required for construction of the gutter, as directed by the Engineer, shall be paid for at the price bid per ton of Asphalt Surface Repair and shall include saw joint, existing surface removal, tack coat and SC-I asphaltic surface material. Thickness of gutter pans will equal the total thickness of the adjacent pavement except such gutter pans will not be less than 6 inches or more than 9 inches in thickness. Curb removal and reconstruction shall conform to Detail D510-A. Earthwork required to facilitate construction shall be considered as subsidiary to the various pay items of work. The Contractor will be required to furnish suitable borrow material as required for new construction and backfill for such construction. The Contractor shall arrange his construction procedures so that the top 6 inches of any grassed area disturbed by construction will contain earth material suitable for the growth of normal vegetation. Such earth material shall be as approved by the Engineer. Joint patterns in new concrete work shall be consistent with such joints in the concrete that the new construction joins. If adjacent to brick street, a minimum of bricks shall be removed, a neat high edge line shall be struck, and the void between the brick and the high edge shall be filled with asphalt.

Thickness of concrete pavement patching will be the same thickness as the existing pavement to be replaced except such thickness will not be less than 6 inches. Longitudinal joints and contraction joints in new pavement shall be constructed to match such joints in the existing pavement. Longitudinal joints shall be tied with No. 4 bars 2'0" in length and spaced on 2'6" centers. Pavement reinforcement shall be 6 inches by 6 inches W-4/W-4 welded wire fabric. The Contractor will be required to furnish suitable borrow material as required for such new construction. In areas of unsuitable subgrade borrow excavation compacted fill (95 percent density), and excavation shall be provided to the limits directed by the Engineer at no additional cost to the City. Material for sealing joints in the new pavement shall be hot poured material conforming to ASTM D-1190. Where existing reinforced steel cannot be saved, No. 4

bars 2'0" long shall be drilled and grouted into the concrete on 4'0" centers with a minimum of 2 bars in any patch side. Joints to be sealed in patches shall be sawed within 24 hours of construction.

A saw cut of at least ½ the depth of the existing total pavement thickness shall be provided at the locations where proposed construction abuts an existing pavement for which partial removal of that pavement is required.

Sawed joint to facilitate removal within three (3) feet of existing joints will not be permitted and for such instances the limits of removal shall extend to the existing joint. Such saw cuts will not be paid for directly and this cost shall be considered as subsidiary to the removal of the pavement.

Removal operations shall result in a vertical face on the existing surface. Cavities broken back more than one third of the depth shall be re-sawed one foot wide and removed and replaced at the Contractor's expense.

Monolithic edge curb shall match existing curb as closely as possible. All costs for removal and construction of monolithic edge curb repair will be included in the price bid for that item (See Detail D510-B).

ALL CURB AND CURB AND GUTTER SHALL RECEIVE A LIGHT BROOM FINISH. The face and top of curb shall be even and free from irregularities.

510.4 RESTORATION OF DISTURBED AREAS

The Contractor shall promptly and correctly restore areas damaged or disturbed by construction activities in accordance with AR-78 (See Subsection 107.11). Restoration shall include, but not be limited to, cleanup and disposal of materials and debris, re-grading to original condition, backfilling with soil suitable for growth of vegetation, and replacement of lawn/turf damaged or disturbed from construction. Lawn/turf areas shall be restored with the same grass/sod as existing wherever possible. Lawn/turf restoration may include, but not be limited to, top soil preparation, seeding, mulch and/or re-sodding. Disturbed areas shall be restored to original or better condition using techniques and materials which will provide for complete restoration. Restoration of lawn/turf shall be scheduled as soon as possible depending upon the appropriate time relative to grass species and, where required, upon availability of sod.

All work should be performed in such a manner so as to protect shrubs, trees and sod not scheduled to be removed. The Contractor shall work with property owners to ensure that cleanup and restoration work is performed to the reasonable satisfaction of the property owner. However, such agreement shall not relieve the Contractor from provisions and expectations of the contracted work to be performed.

Restoration of lawn/turf areas shall not be paid for directly, but shall be considered subsidiary to other items of work. Final payment will not be made on the project until cleanup and restoration work is completed in a sound and acceptable manner.

510.5 INCIDENTAL WORK

The timely completion of work considered incidental to pay items of work being an essential part of this contract, the Contractor shall not receive payment for bid items completed until such incidental work is also completed.

The following incidental work must be done and accepted as satisfactory by the Engineer to receive compensation for the bid items done:

a) **Combined Curb and Gutter Repair** - Backfilling and site restoration, including sodding/seeding, and asphalt replacement at high edge.
b) **Concrete Pavement Repair** - Joint sealing.
c) **Monolithic Edge Curb** - Back filling and site restoration, including sodding/seeding
d) **6" Min. Driveway Repair** - Back filling and site restoration, including sodding/seeding
e) **4" Sidewalk Repair** - Back filling and site restoration, including sodding/seeding
f) **Wheelchair Ramp Construction** - Back filling and site restoration, including sodding/seeding

It is the Contractor's responsibility to inform the City's representative as to when incidental work is complete and ready for acceptance and measurement for payment.

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SECTION 511

PATCHING AND REPAIRING CONCRETE PAVEMENT

511.1 DESCRIPTION

This work shall consist of removing and replacing concrete pavement edge curb and combined curb and gutter on arterial streets in accordance with detailed drawings and as directed by the Engineer.

511.2 MATERIALS

Concrete
All concrete used in the construction of curb, street pavement, parking lot and driveway pavement on patching and repairing concrete pavement projects shall conform to Subsection 406.2, except that the mixed concrete shall contain a minimum of 733 pounds of cement per cubic yard.

In lieu of welded wire reinforcements, all concrete shall contain polypropylene fibers and conform to Subsection 406.2.

Material for sealing joints in the new pavement shall be hot poured material conforming to ASTM D-1190.

511.3 CONSTRUCTION DETAILS

Patching
Thickness of concrete pavement patching will be the same thickness as the existing pavement to be replaced except such thickness will not be less than 6 inches. Longitudinal joints and contraction joints in new pavement shall be constructed to match such joints in the existing pavement. Longitudinal joints shall be tied with No. 4 bars 2'0" in length and spaced on 2'6" centers. Where existing reinforced steel cannot be saved, No. 4 bars 2'0" long shall be drilled and grouted into the concrete on 4'0" centers with a minimum of 2 bars in any patch side. Joints to be sealed in patches shall be sawed within 24 hours of construction, unless an initial deep groove has been put in at the time of construction. The grooved joint shall be sawed immediately prior to sealing.

A saw cut **the full depth** of the existing total pavement thickness shall be provided at the locations where proposed construction abuts an existing pavement for which partial removal of that pavement is required. Sawed joint to facilitate removal within three (3) feet of existing joints will not be permitted and for such instances the limits of removal shall extend to the existing joint. Such saw cuts will not be paid for directly and this cost shall be considered as subsidiary to the removal of the pavement.

Removal operations shall result in a vertical face on the existing surface. Cavities broken back more than one third of the depth shall be re-sawed one foot wide and removed and replaced at the contractor's expense.

The patch and repair work in this project will be done in areas of questionable structural strength. The Contractor shall use great care not to damage surrounding pavement with removal operations. Equipment and work methods should be carefully chosen so as not to damage pavement outside of the repair patch. Pavement damaged outside of the patch shall be repaired by the Contractor at no cost to the City, unless it is determined by the Engineer that such damage was unavoidable.

The shape of all curb and/or gutter constructed on this project shall match as closely as possible the

shape of such curb and/or gutter being replaced. The curb shall be formed such that the top 4" of the back of the curb shall be vertical and smooth. Thickness of the gutter pan shall match existing pavement except that such gutter pans will not be less than 6 inches or more than 9 inches (See also Subsection 510.3).

When monolithic edge curb is required in connection with a paving patch, the forming and shaping of the curb itself shall be paid for at the price bid for monolithic edge curb construction. The new pavement under the curb shall be paid for as square yards of concrete pavement repair (See also Subsection 510.3).

The unit price bid for Monolithic Edge Curb Repair shall include all costs required for that work, including sawing, removal, earthwork, reinforcing steel, new curb and the pavement under the new curb.

In areas of unsuitable subgrade, the Engineer may direct the Contractor to excavate a portion of such unsuitable subgrade and replace it with AB-3 crushed rock material. When so required, the costs of all excavation, hauling, placing and compaction shall be included in the price bid for the item "AB-3 Rock Base Installed."

The price bid for curb and gutter repair, edge curb repair, reinforced concrete pavement repair, concrete driveway pavement repair, concrete sidewalk repair and wheelchair ramp construction shall include all costs for any removal, earthwork, base preparation and replacement required for new construction to be completed.

All curb or curb and gutter shall match existing as closely as possible. **ALL CONCRETE WORK SHALL RECEIVE A LIGHT BROOM FINISH.** The Face and top of curb shall be even and free from irregularities. Curb determined to be unacceptable by the Engineer shall be removed and replaced at the Contractor's expense.

511.4 RESTORATION OF DISTURBED AREAS

The Contractor shall promptly and correctly restore areas damaged or disturbed by construction activities in accordance with AR-78 (See Subsection 107.11). Restoration shall include, but not be limited to, cleanup and disposal of materials and debris, re-grading to original condition, backfilling with soil suitable for growth of vegetation, and replacement of lawn/turf damaged or disturbed from construction. Lawn/turf areas shall be restored with the same grass/sod as existing wherever possible. Lawn/turf restoration may include, but not be limited to, top soil preparation, seeding, mulch and/or re-sodding. Disturbed areas shall be restored to original or better condition using techniques and materials which will provide for complete restoration. Restoration of lawn/turf shall be scheduled as soon as possible depending upon the appropriate time relative to grass species and, where required, upon availability of sod.

All work should be performed in such a manner so as to protect shrubs, trees and sod not scheduled to be removed. The Contractor shall work with property owners to ensure that cleanup and restoration work is performed to the reasonable satisfaction of the property owner. However, such agreement shall not relieve the Contractor from provisions and expectations of the contracted work to be performed.

Restoration of lawn/turf areas shall not be paid for directly, but shall be considered subsidiary to other items of work. Final payment will not be made on this project until all cleanup and restoration work is completed in a sound and acceptable manner.

Rubble and debris shall be removed from the street and the parking at the end of each day's removal operation. The Contractor shall reimburse the City Liquidated Damages in the amount of $100 per calendar day for debris left over 24 hours.

511.5 INCIDENTAL WORK

The timely completion of work considered incidental to pay items of work being an essential part of this contract, the Contractor shall not receive payment for bid items completed until such incidental work is also completed.

The following incidental work must be done and accepted as satisfactory by the Engineer to receive compensation for the bid items done:

a) **Concrete Pavement Repair** - Joint sealing
b) **Monolithic Edge Curb** - Back filling and site restoration, including sodding/seeding
c) **6" Min. Driveway Repair** - Back filling and site restoration, including sodding/seeding
d) **4" Sidewalk Repair** - Back filling and site restoration, including sodding/seeding
e) **Wheelchair Ramp Construction** - Back filling and site restoration, including sodding/seeding

It is the Contractor's responsibility to inform the City's representative as to when incidental work is complete and ready for acceptance and measurement for payment.

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SECTION 512

MILL AND OVERLAY OF ASPHALT PAVEMENT

512.1 DESCRIPTION

The work consists of cold milling two inches of asphalt street surface and placing a 2-inch minimum asphalt concrete overlay on various streets. Locations and exact limits to be identified by the Engineer. A 1/2-inch average leveling course is to be applied ahead of overlay as required. Leveling courses shall be laid with road graders or tractor drag boxes. Existing concrete base is to be repaired as directed by the Engineer. Saw cut and removal will be considered subsidiary to the project.

512.2 MATERIALS

Asphalt Mixture
The new surface asphalt, conventional or polymer modified, shall meet the City of Wichita Standard Specifications for the surface mix asphalt concrete (See Subsection 405.2).

Asphalt Emulsion
The emulsion shall meet the KDOT Standard Specifications for SS-1H or CS-1H emulsified asphalt.

Concrete
The Concrete for base patching shall be a plasticizer-fly ash mix with a maximum cure time of 36 hours, in accordance with Subsection 406.2

512.3 CONSTRUCTION DETAILS:

Cold milling
Cold milling shall be to the limits indicated in the specifications and as directed by the Engineer. Milling must be done immediately prior to re-surfacing and no traffic will be allowed on the milled surface unless approved otherwise by the Engineer. Cold milling shall conform to the requirements of Subsection 409.

At the completion of the milling operation, all loose milling material shall become the property of the City and shall be delivered to a site directed by the Engineer. If traffic is allowed on the milled surface, wedges of milled material or asphalt material must be constructed or maintained at any drop-off location. Rounded-off transverse joints shall be squared up to a vertical face by jack hammering and sawing as required.

Concrete Base Patching
Concrete base patching shall be identified and started as soon as surface milling reveals areas in need of repair. Damaged areas shall be removed and replaced to a thickness of 1-inch below existing bottom of pavement, with a minimum thickness of 6 inches. Concrete base patch shall be reinforced with No. 4 bars placed on 18-inch centers both ways. Concrete used shall be a plasticizer-fly ash mix with a maximum cure time of 36 hours. The Contractor may use an earlier setting concrete mix with prior approval of the Engineer at no extra cost to the City. Any costs for earthwork required to prepare the subgrade, removal and patch material shall be included in the unit price bid for 6" minimum Reinforced Concrete Base Repair.

Asphalt Concrete

Asphalt concrete shall be placed with a laydown machine having automatic controls for grade and thickness. The new surface should not follow the existing gutter flowline, as that grade may vary. Tack coat should be applied ahead of the laydown in accordance with Subsection 405.6. Any location where the thickness will change more than two inches abruptly or where the thickness will be over four inches should have a level-up course placed ahead of the surface course, which should never be less than 1-1/2 inches or more than four inches thick after compacting the new asphalt at the high edge line should be approximately 1/4-inch above the concrete.

The Contractor shall compact the newly laid asphalt with an 8-to-12-ton tandem steel-wheeled roller. Compaction of the bituminous surface course shall be completed before the temperature of the mix drops below 180^{o}F.

SECTION 513

ASPHALT CONCRETE OVERLAY OF CONCRETE STREETS

513.1 DESCRIPTION

The work consists of patching, edge milling and placing a two-inch minimum polymer modified asphalt overlay on various concrete streets. Locations and exact limits shall be identified by the Engineer.

513.2 MATERIALS

Asphalt Mixture
The new surface asphalt, conventional or polymer modified, shall meet the City of Wichita Standard Specifications for the surface mix asphalt concrete (See Subsection 405.2).

Asphalt Emulsion
The emulsion shall meet the KDOT Standard Specifications for SS-1H emulsified asphalt.

Concrete
Concrete shall meet City of Wichita Material Specifications for Patching and Repairing Concrete Pavement (Subsection 511.2)

513.3 CONSTRUCTION DETAILS

Patching
Concrete pavement patching shall meet City of Wichita Construction Detail Specifications for Patching and Repairing Concrete Pavement (Subsection 511.3)

Edge Milling
Edge milling shall be six feet wide with depth tapering from 0 to 1-1/2 inches deep at a high edge line to be established 2'6" from the back of the curb line (See Detail D513-A). The edge of the milling at the new high edge line shall be straight and neat with a maximum variance of two inches from the desired location. A leveling course is to be applied ahead of the overlay as required. Leveling courses shall be laid with road graders or tractor drag boxes. Vibratory rollers will not be allowed for compaction of the asphalt overlay course. Transverse cold milling 24 feet wide will be performed at the beginning and end of each street overlay to transition to existing street pavement surfaces. Butt joints shall have temporary asphalt wedges constructed immediately after milling and maintained until the new asphalt surface is placed.

Asphalt Overlay
Asphalt concrete shall be placed with a laydown machine having automatic controls for grade and thickness. The new surface should not follow the existing gutter flowline, as that grade may vary. Tack coat should be applied ahead of the laydown in accordance with Subsection 405.2. Any location where the thickness will change more than two inches abruptly or where the thickness will be over four inches should have a level-up course placed ahead of the surface course, which should never be less than 1-1/2 inches or more than four inches thick. New asphalt at the high edge line should be approximately 1/4-inch above the concrete.

The Contractor shall compact the newly laid asphalt with an 8-to-12-ton tandem steel-wheeled roller. Compaction of the bituminous surface course shall be completed before the temperature of the mix drops

below 180°F.

SECTION 514

UTILITY CUT REPAIRS

514.1 DESCRIPTION

The work shall consist of repairing sidewalks, driveways, wheelchair ramps and various types of pavement within the City right-of-way damaged by failed utilities and work done by utility companies.

514.2 MATERIALS

a) Portland cement concrete (Subsection 406.2)
b) Asphalt concrete (Subsection 405.2)
c) Tack coat (Subsection 405.2)
d) Flowable fill (Section 306)

514.3 CONSTRUCTION DETAILS

Removal

Removal shall include complete removal of all temporary patch material and fill material to a depth of two inches (2") below the bottom of adjacent pavement within the limits of the utility excavation. When directed, the Contractor may be required to remove and replace and re-compact additional fill material below the normal depth of the permanent patch.

Boundary lines of all pavement repairs shall terminate at either existing joints or at sawed cuts. All pavement repairs shall extend a minimum of one foot beyond the edge of the excavation, except that when one side of the excavation coincides with the pavement edge of combined curb and gutter, the combined curb and gutter shall remain in place when approved by the Inspector. Pavement removal shall be extended to an additional width when pavement adjacent to the utility cut is fractured or spalled, when vertical displacements in the pavement adjacent to the utility cut can be corrected, when the repair area overlaps into a previous utility cut repair, or when the limits of the repair area is within three feet (3') of an existing joint or pavement edge. Limits of all such removal shall be as approved by the Inspector. Unless otherwise approved or directed, all lines of pavement removal shall be either perpendicular to, or parallel with, the centerline of the street or alley.

Concrete pavement to be removed shall be sawed on straight lines as detailed in the "Concrete Pavement Removal Edge" detail (See Detail D514-A). The depth of the saw cuts shall be such that the results as indicated on the detail sheet can be achieved. If spalling or shattering on existing pavement extends beyond the limits as shown on the detail, additional removal shall be required at the contractor's expense. Saw cuts shall be marked and approved by the Inspector, when required, prior to sawing. Sawing is an incidental item for all repairs in this specification and a unit price will not be required.

Fill material and pavement materials which have been removed shall be disposed at a site or location approved by the Engineer. The Contractor will be required to clean and remove all materials and debris from each job site by the end of the work day.

Brick Surface Reconstruction

The Contractor will be required to repair excavations in brick streets with existing or replacement brick provided by the person or company making the street cut or by the City. Unless otherwise approved or directed, a 6-inch reinforced concrete base shall be placed to support the brick surface. The elevation of the surface of the concrete base shall allow for a 3/4 to 1-inch layer of cold mix asphalt and the thickness

of the brick surface.

Brick shall be laid in the same pattern as the adjacent brick surface. The width of joint spaces between the bricks shall be consistent with such width in the adjacent brick surface. After bricks are laid, they shall be brought to a firm bearing and true surface by rolling or other methods approved by the City. The surface of the brick shall be cleaned after completion of laying and prior to rolling. The brick shall be rolled with a tandem, self-propelled, flatface steel roller weighing between three (3) and eight (8) tons. The Engineer may require an increase or decrease, within the above limits, of the weight of the roller to produce satisfactory results. The Contractor may be required to lay wood planks on the bricks prior to rolling to prevent excessive damage to the bricks. Longitudinal rolling shall begin at the edges of the brick surface and continue toward the center with successive trips of the roller overlapping approximately halfway. Rolling shall be continued until the bricks are firmly and evenly bedded. After rolling, the bricks shall again be inspected, defective brick removed and replaced with new bricks, and the new brick re-rolled or tamped to firm bedding. The brick surface shall be checked with a ten-foot aluminum straight edge, after rolling, and any irregularities of more than 1/4-inch from the true surface, shall be corrected.

After bricks are laid and seated in place, a fine blow sand shall be spread and broomed over the surface to fill all crevices between bricks. The completed appearance of the brick surface repair shall be equal to that of the adjacent brick surface.

Brick surface reconstruction will be paid for at the unit price bid, which price is not to include costs for furnishing brick pavers or reinforced concrete base construction but will include the costs for furnishing and placing the bituminous cushion mixture. Brick pavers will be provided as indicated elsewhere in these specifications. Reinforced concrete base pavement will be measured and paid for as a separate item as provided in the bid form.

Tack Coat

Before placing asphalt into the pavement cut, the Contractor shall apply a thin tack coat of emulsified asphalt (SS-1h) to the sides and bottom of the cut. After making the asphalt patch, the joints between the new surface and the existing surface shall be sealed and dusted with a light coat of sand to prevent water or foreign objects from entering the patched area. Tack shall be considered subsidiary to other items of work.

Asphalt Pavement Repair

Asphalt pavement cuts shall be patched with a minimum of four (4) inches of SC-I asphalt placed over a reinforced concrete base. The reinforced concrete base shall extend below the existing bottom of the full depth asphalt section a minimum of two (2) inches, but in no case shall the thickness of the concrete base be less than six (6) inches. The surface of the base shall be level and smooth.

At the direction of the Engineer, large asphalt areas will be placed with a lay-down machine.

The base repair shall extend at least one foot beyond the excavation edge and the asphalt surface should extend 6" beyond the base edge when asphalt is on an existing concrete base. (See Details D514-B for existing full depth asphalt patch and D514-C for existing asphalt over concrete patch).

Compaction shall be by plate vibrator or street roller, as approved by the Engineer.

When directed by the Engineer, concrete placed as a base course for repair of full depth asphalt pavements may be placed using concrete with zero slump. Such concrete shall be placed in lifts as required to facilitate placement of reinforcement. Each lift of concrete so placed shall be compacted to maximum density using vibratory plate or vibratory roller compacting equipment. Zero slump concrete base shall be topped with asphalt surface within four hours and opened to traffic the same day. Zero slump concrete shall be 733 lbs. mix with minimum water added at the batch plant.

Concrete Pavement Repair

Thickness of concrete pavement patching will be two inches (2") more than the thickness of the existing pavement to be replaced except such thickness will not be less than six inches (6"). Longitudinal joints and contraction joints in new pavement shall be constructed to match such joints in the existing pavement. The Contractor will be required to furnish suitable borrow material as required for such new construction. In areas of unsuitable subgrade borrow excavation, compacted fill (95 percent density), and excavation shall be provided to the limits directed by the Engineer. Material for sealing joints in the new pavement shall be hot poured material conforming to ASTM D-1190. Where existing reinforced steel cannot be saved, No. 4 bars 2'0" long shall be drilled and grouted into the concrete on 4'0" centers with a minimum of 2 bars in any patch side.

Monolithic edge curb required shall match existing curb as closely as possible, in accordance with Section 407.8. All costs for removal and construction of monolithic edge curb will be included in the price bid for that item.

All costs for removal of existing pavement, earthwork, and replacement of pavement shall be included in the price bid for concrete pavement repair, regardless of thickness.

Combined Curb and Gutter

New combined curb and gutter shall match existing curb and gutter as closely as possible. Thickness of gutter pans will equal the total thickness of the adjacent pavement except such gutter pans will not be less than six inches (6") or more than nine inches (9") in thickness. Unit price bid for combined curb and gutter repair shall include all costs for removal, replacement, and earthwork required, regardless of the shape or size of the curb and gutter.

Paving Concrete

Concrete for sidewalk or wheelchair ramps may be standard City of Wichita 6.6 sack paving mix or 8 sack sand mix, with entrained air, in accordance with Subsection 406.2, except when ordered otherwise.

All concrete used in the construction of curb, street pavement, parking lot and driveway pavement shall conform to Subsection 406.2, except that the mixed concrete shall contain a minimum of 733 pounds of cement per cubic yard.

The Contractor should have on hand a supply of various sizes of expansion joint material.

When directed by the Engineer, high early strength concrete shall be used in concrete pavement repairs requiring early opening to traffic, as specified in Subsection 512.2.

All exposed concrete shall receive a light broom finish.

Copies of concrete tickets for special mixes such as flowable fill and high early strength concrete shall be turned into to the inspector to receive payment for these items.

Utility Test Holes

Proposal includes a pay item of work identified as "Utility Test Hole Pavement Repair including Backfill and Compaction (95% Density)." This work consists of pavement repair as it relates to test holes cored and bored to facilitate location and identification of underground utilities. Such holes are generally about two inches (2") in diameter and bored to a normal depth common to underground utility facilities. The Contractor will be required to furnish and compact select material to fill holes to permit patching of the hole cored in the pavement. Backfill shall be compacted to 95% of standard density. Test holes cored in concrete pavement shall be repaired with zero slump concrete mix containing 733.0 lbs. of cement per cubic yard and a super-plasticizer water reduction additive for workability. The thickness of the concrete patch shall be a minimum of 12 inches.

Test holes cored in asphalt pavement or asphalt-surfaced pavement shall be repaired as identified above for concrete pavement except the top two inches (2") of the repair shall consist of asphaltic concrete surface mixture compacted to the standard density. Where the frequency of occurrence of utility test holes is in excess of one hole per square yard, the entire pavement shall be removed and repaired as specified for a normal utility cut repair. Repair of individual utility test holes as described above will be paid for at the unit price bid for this item as identified in the Proposal. Only test holes which have been painted by the inspector shall be paid for.

Flowable Fill

When directed by the Engineer, fill in pipe trenches or voids under pavement shall be filled with Flowable Fill conforming to the requirements of Section 306.

Reinforcement

Reinforcement of concrete driveway and street pavement or base not over utility excavation shall consist of 6" by 6" W4-W4 welded wire fabric. Fabric reinforcement shall be placed such that the distance from the top of the pavement to the top of the fabric is 1/3 of the concrete pavement or base thickness. Fabric reinforcement in driveways shall run continuously through longitudinal and contraction joints. Fabric reinforcement in street pavement shall terminate approximately six inches (6") from longitudinal, contraction, and expansion joints such that the fabric reinforcement will not extend through these joints. Number 4 tie bars 24 inches in length shall be placed along longitudinal joints in street pavement such that the bars are centered on the joint, spaced on 2-foot 6-inch (2'6") intervals, and positioned vertically approximately midway between the top and bottom of the pavement.

All joints in the new pavement shall be located to conform with such joints in the existing pavement.

Reinforcement installed in driveways and street pavement or base over utility excavation, shall consist of No. 6 bars placed on maximum two-foot centers positioned longitudinally and transversely over the utility excavation. Such reinforcement shall run continuously through contraction and longitudinal joints and shall extend a minimum of one foot beyond the limits of the utility excavation. Number 6 bar reinforcement shall be positioned vertically such that the clear distance between the reinforcement and the bottom of the pavement is 1/3 of the total pavement thickness. Bars will be tied with wire ties at all crossings. Bar splices shall be lapped 24 inches and tied with wire ties. All reinforcement shall be supported in the specified vertical position with approved bar chairs. New concrete driveway and street pavement construction shall be tied to existing concrete pavement by drilling and epoxy grouting number 4 bars 24 inches in length 12 inches into the existing pavement on 4-foot intervals in a vertical position halfway between the top and the bottom of the existing pavement.

Wheelchair Ramps

Wheelchair ramp reconstruction or construction will be measured and paid for as 4-inch sidewalk wheelchair ramp construction. Wheelchair ramp construction shall conform to the details as described in Subsection 407.6. All costs incurred in the construction shall be covered by the unit price bid.

Driveways

Driveways and sidewalk sections through driveways will be paid for as driveway pavement for the various thicknesses identified in the bid form and as constructed in accordance with Section 407. Curbs along edges of driveways will not be paid for separately, but shall be included in the price bid for the driveway pavement.

Exploratory Excavation

Exploratory excavation, required to determine ownership of the utility being repaired, will be paid for as indicated on the bid form. Exploratory excavation will be paid for only when such excavation work is ordered by the Inspector. Backfill necessary for exploratory excavation will be by the Contractor and the cost shall be included in the unit price bid for exploratory excavation. Backfill to be compacted to 95% of

standard density.

Stamping
Every continuous pour of concrete, except concrete base, shall be stamped with the Contractor's name and year of construction. The Contractor's name and year shall be in formed letters and numbers as specified in Subsection 407.4.

Joints
Contraction joints in curb or curb and gutter may be either tooled or sawed. The tooling or sawing shall be of an adequate depth to establish a plane of weakness for cracking, and in no case shall the depth be less than 1-1/4-inch. Joints in sidewalks and driveways shall be tooled planes of weakness. All longitudinal and contraction joints in concrete pavement shall be sawed joints conforming to current City standards. All expansion joints shall conform to current City standards. Locations of all joints shall conform to the locations of such joints in the existing pavements. All joints which are sawed and all expansion joints installed in street pavement shall be sealed with the specified hot pour joint sealant.

Covering of Work Site
The Contractor may be required to cover excavated or curing areas with steel plates until such time that these areas can be permanently opened to traffic. If plating is required, the Contractor shall provide adequate strength and size steel plates that can be securely anchored or held in place. Steel plates for protective covering shall be of a size, strength, and thickness required to support maximum legal loads across a clear span of four feet. The plates shall be approved prior to their installation. The Contractor shall construct an asphalt ramp at the edge of the plate to facilitate a smooth ride and traffic flow.

Steel protective plating will be measured by the square yard of the actual area to be protected per each location per each time increment of 24 hours when such protection is directed to be placed by the Engineer. Steel protective plating will be paid for only when its use is ordered by the Engineer. The price paid for steel plating left in place for time periods of less than 24 hours will be prorated based on time of actual use.

Curing and Protection of Concrete
All concrete work shall be protected and cured as specified in Section 408.