# PART 500

# CONTRACT MAINTENANCE

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# SECTION 503
# CATIONIC QUICKSET SLURRY SEAL

## 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. Chat shall consist of mine run or screened tailings produced during the milling of lead and zinc ores in the mining district of Southeast Kansas, Southwest Missouri, and Northeast Oklahoma. Chat shall be graded such that when mixed with the other aggregates the combined gradation will conform to the specified requirements.

**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** | **Specifications** |
|---|---|---|
| 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 100°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

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

## 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.

**Application Rate:**
The surfacing mixture shall be applied at the rate of 18 lbs/S.Y.

**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. Handwork 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 hand worked 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 squeeged 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.

## 503.9 MEASUREMENT AND PAYMENT

Final quantities of "Slurry Seal" be paid for shall be the actual area in square yards placed and accepted on the project.

Payment for "Slurry Seal" shall be made at the contract unit price bid per square yard of "Slurry Seal", complete and placed, which price shall be full compensation for furnishing all materials; for preparation, mixing and applying these materials, and for all labor equipment, tools, and incidentals necessary to complete and warrant the job as specified herein. The unit bid price for "Slurry Seal" shall include associated traffic control, laboratory design/report and all other work included in the contract but not included in other unit prices set forth in the proposal.

**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 ninety-five percent (95%) of standard density, and shaping and grading of shoulders in accordance with limits, grades and profiles as shown on the plans and identified in these specification subsections 401, 402, 403 and 506.

All costs associated to complete this work including testing requirements are subsidiary to the bid item Reconditioned Roadbed, and measured in-place per square yard, S.Y.

**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 an Independent Testing Laboratory based on analysis of the existing soil at the expense of the Contractor.

**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, unless shown otherwise on the plans.

**c) Calcium Chloride Treatment**
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.

**506.4 TESTING PROCEDURES**
Field determination of the density and moisture content shall conform to ASTM D-1556 or D-2922, and ASTM D-2216 or D-3017 respectfully. Tests used to determine Optimum Moisture content and Standard density shall conform to ASTM D-698.

Unless otherwise shown on the plans, compaction and moisture test frequency will be a minimum of 4 per day per equipment spread, or 1000 ft.

All testing will be completed by an Independent Testing Laboratory on behalf of the Contractor and is subsidiary to the bid item. Copies of all test results will be made available immediately to the City and Engineer.

**SECTION 510**
**CURB AND GUTTER REPAIR**

**510.1 DESCRIPTION**
This work shall consist of removing and replacing curb and gutter as shown on the plans, and specification subsections 406, 407 and 510. All cost associated to complete the curb and gutter repair, including testing is subsidiary to the bid item and measured in-place per linear foot, L.F.

**510.2 MATERIALS**

**Concrete:**

All concrete used in the construction of curb, street pavement, parking lot and driveway pavement on curb and gutter repair project 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 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, 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. See plans for locations of curb removal and reconstruction.

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. In areas of unsuitable subgrade**,** borrow excavation compacted fill (95 percent density) shall be provided to the plan grade limits at no additional cost to the City.

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. 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.

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.

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 the General Conditions. 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, topsoil 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.

**SECTION 511**
**PATCHING – FULL DEPTH ASPHALT**

**511.1 Description**
This work shall consist of patching existing bituminous pavement. All saw cuts, pavement removal, excavation, subgrade preparation, aggregate base, tack coat, bituminous pavement material and labor to complete this work is included.

**511.2 Materials**

**Aggregate Base:**
Materials to be used for aggregate base construction shall consist of virgin crushed stone, recycled Portland cement concrete, or Reclaimed Asphalt Pavement (RAP).

**Stone/Concrete Aggregate:**

**Gradation:**

| Sieve Size | % Retained (by dry weight) |
|---|---|
| 2-1/2" | 0 |
| 3/4" | 20-60 |
| #4 | 50-80 |
| #40 | 80-94 |
| #200 | 90-98 |

**Durability:**
Base material quality shall conform to the requirements specified by the KDOT Subsection 1102 for Durability Class 1.

**Absorption:**
All virgin base material shall have a maximum absorption of four percent (4%).

**Recycled Asphalt Pavement (RAP):**
Recycled Asphalt Pavement (RAP) shall be free of detrimental quantities of organic, non-granular soils and deleterious materials.

The maximum size of the RAP particles shall be 1-1/2 times the maximum aggregate size in the RAP material.

**Bituminous Pavement:**
Materials to be used for bituminous pavement for patching shall consist of Plant Mix Bituminous Mixture - Commercial grade as specified by the KDOT subsection 605.02.

**Tack Coat:**
Materials to be used for tack shall be emulsified asphalt (SS-lH).

**511.3 Equipment**
Equipment used for "Patching - Full Depth Asphalt" shall be that equipment appropriate for the various sizes of patches to be completed.

**511.4 Construction Requirements**

**General:**
The Engineer shall determine and mark the areas of patching.

**Removal:**
The Contractor shall saw cut the existing pavement, full depth, at all removal limits. Existing pavement and soft or yielding subgrade material shall be excavated to a depth to provide a minimum of 10" and maximum of 12" below the existing pavement surface.

**Aggregate Base:**
A minimum of 6" of aggregate base material shall be placed and compacted to provide a stable base for placement of the bituminous pavement.

**Tack Coat:**
Prior to placement of the bituminous material into the pavement cut, the Contractor shall apply a thin coat of tack to the sides of the existing pavement exposed by saw cutting.

**Asphalt Patch:**
A minimum of 4" and maximum of 6" of Plant Mix Bituminous Mixture - Commercial Grade shall be spread, finished, and properly compacted to match the existing pavement edges. The actual depth of asphalt used in the patch will be determined by the Engineer within the specified limits and in no case be less than 4" or greater than 6". The nominal compacted thickness of the bituminous mixture shall not exceed two inches for surface courses and four inches for other courses, unless otherwise specified.

**511.5 Measurement and Payment**

Final quantities of "Patching - Full Depth Asphalt" to be paid for shall be the actual area in square yards, placed and accepted on the project.

Payment for "Patching - Full Depth Asphalt" shall be made at the contract unit bid price per square yard of "Full Depth Asphalt Patching", complete in place, which shall be full compensation for furnishing all materials; for saw cuts, pavement removal, excavation, disposing of all waste materials, subgrade preparation, aggregate base, tack coat, bituminous pavement, compaction; and for all labor, equipment, tools and incidentals necessary to complete and warrant the job as specified herein. The unit bid price for "Patching - Full Depth Asphalt" shall include the associated traffic control.

**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 (see Subsection 409). Locations and exact limits will be shown on the plans, unless otherwise noted. A ½-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 asphalt/concrete base locations needing repaired will be as shown on plans, unless otherwise noted. Saw cut and removal will be considered subsidiary to the project (see Subsection 202).

All work described in this subsection is incidental to the bid item, and measured by the square yard, S.Y.

**512.2 MATERIALS**

**Asphalt Mixture:**

The new surface asphalt–shall meet the City of Bel Aire 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 shown on the plans. 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 designated storage site**,** unless noted otherwise. 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.

All materials and procedures, including testing will conform to Subsection 405, unless noted otherwise on the plans.

**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. See plans for locations and exact limits of overlay.

**513.2 MATERIALS**
**Asphalt Mixture:**
The new surface asphalt shall meet Subsection 405.2.
**Asphalt Emulsion:**
The emulsion shall meet the KDOT Standard Specifications for SS-1H emulsified asphalt.
**Concrete:**
Concrete shall meet Subsection 406.2

**513.3 CONSTRUCTION DETAILS**
**Patching:**
Concrete pavement patching shall meet Section 400.

**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. 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 to a depth that will prevent raveling or spalling of the adjacent pavement. 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 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 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. 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 Bel Aire 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.

**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 thick nesses 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.

**Joints:**
Contraction joints in curb or curb and gutter may be either tooled or new. 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~~ supporting 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 required 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.