

**SECTION 10
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SECTION 10
BITUMINOUS SURFACE COURSE AND BITUMINOUS BASE COURSE

1. AGGREGATE FOR PLANT MIX BITUMINOUS PAVEMENT:

Aggregate for Plant Mix Bituminous Pavement shall meet the requirements specified in Section 2200 of the APWA standard or the MoDOT standard specifications Section 401 Plant Mix Bituminous Base and Pavement. All Aggregate utilized for plant mix for Bituminous Pavement, to meet the requirements of this specification will be “virgin material”, no exceptions.

2. LOCAL STREETS: APWA or BP-1: Use for lifts over 2”thick. To be used only on Local or Residential streets. Not recommended for Parking Lot surfaces.

3. LOCAL, COLLECTORS OR ARTERIAL STREETS:

APWA Type 1-01: Asphaltic Concrete Base as defined in APWA Section 2200.

APWA Type 3-01: Asphaltic Concrete Surface as defined in APWA Section 2200.

Commercial mix similar to this may be used with prior written authorization and approval from the City.

4. SCOPE OF WORK: This section covers bituminous surface course and bituminous base course for roadways and driveways as shown on the Plans.

5. DESCRIPTION: Bituminous surface and base courses shall consist of fine and coarse aggregates and mineral filler uniformly mixed with hot bituminous material, and placed and compacted on a prepared base as specified within the City of Warrensburg standard specifications.

6. BITUMINOUS BASE COURSE: Bituminous base course shall be APWA Type 1-01 Base and shall conform to the current APWA Section 2205. Contractor must submit to the City for approval any variation(s) from this design. Any variation(s) found without prior approval shall be removed at the contractor’s expense.

7. BITUMINOUS SURFACE COURSE: Bituminous surface course shall be APWA Type 3-01 and shall conform to the current APWA Section 2205. RC for surface course is authorized but will not exceed 20%. Contractor must submit to the City for approval any variation(s) from this design. Any variation(s) found without prior approval shall be removed at the contractor’s expense.

8. SAMPLING, TESTING AND APPROVAL OF BITUMINOUS MIXTURES: The bituminous mixtures will be tested for conformance with the specified test properties prior to placing the work without cost to the City. Results shall be reported by an approved testing laboratory on at least three (3) samples for each combination of aggregates and bitumen content. Mixtures that do not conform to the specified test properties will be rejected. All tests shall be by the Contractor and at no cost to the City.

8.1 In lieu of the Contractor having the above referenced bituminous mixture design tests and various aggregate tests performed, the Contractor may submit current test results of bituminous mixture, reflecting aggregate gradation aggregate quality and Marshall criteria for APWA Types 1-01 and 3-01 Asphaltic Pavement as set forth in the current MoDot Specifications Section 401.

8.2 The test results shall be from a project as performed within the past nine months and must be accompanied with a certification from both the Contractor and the supplier that states the data is current and accurate.

8.3 Asphalt Binder material utilized shall be as specified in current MoDot Standard Specification Section 401, using the selection criteria in section 450, and Plant Inspection Sections 460.3.12, 460.3.13, and 460.3.14.

9. OTHER EQUIPMENT:

9.1 Bituminous-materials spreaders shall be the self-propelled type equipped with hoppers, tamping or vibrating devices, distributing screws, adjustable screeds, equipment for heating the screeds, and equalizing devices. The spreader shall be capable of spreading hot bituminous mixtures without tearing, shoving or gouging, and capable of producing a finished surface conforming to the smoothness requirements specified hereinafter. The spreaders shall be capable of confining the edges of the strips to true lines without the use of stationary side forms and capable of placing the course to the required thickness. Spreaders shall be designed to operate forward at variable speeds and in reverse at traveling speeds of not less than 100 feet per minute. The use of a spreader that leaves indented areas or other objectionable irregularities in the fresh-laid mix during operations will not be permitted.

9.1.1 Bituminous materials spreaders shall be equipped with electronic sensing devices for grade control. The device shall be capable of utilizing the string line, long ski sled, joint matcher (short ski sled), and automatic transverse grade control methods for controlling grades. The long ski shall have a minimum length of 25 feet.

9.2 Blowers and brooms shall be of the power type and shall be suitable for cleaning the surface to be paved.

9.3 Saw and core drill shall be of the power type. The saw shall be capable of rapidly cutting pavement samples and trimming joints and edges of pavement. The core drill used for obtaining pavement samples shall have a diamond or carboloy bit capable of rapidly cutting a precision core sample 4 inches in diameter.

9.4 Small tools shall consist of rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heater for heating small tools, wood sandals and stilt sandals of standard type, and other small tools as may be required. A sufficient number of small tools shall be available at all times for use in constructing the bituminous pavements. The lutes shall be constructed of metal and shall consist of a plate or sheet 36 inches by 4 inches attached to a handle properly braced and with sufficient strength to adequately compact the free edge of surface course. Hand tampers shall weigh not less than 25 pounds and shall have a tamping face not larger than 50 square inches.

9.5 Steel-wheel rollers shall be the self-propelled type, weighing not less than ten tons. The wheels shall have adjustable scrapers, water tanks, and sprinkling apparatus to keep the wheels wet and thus prevent the bituminous mixture from sticking to the wheels. The rollers shall be capable of reversing without backlash and shall be free from worn parts. The roller wheels shall not have flat or pitted areas or projections that will leave marks in the pavement.

9.6 Pneumatic-tired rollers shall be of two-axle, self-propelled type having multiple wheels, equipped with smooth tread pneumatic road-roller tires of equal size. The tracking wheels shall have a minimum of one-fourth inch overlap and the wheels of the roller shall be so spaced that one completed coverage equal to the rolling width of the roller is obtained with each pass. Tire inflation pressure shall be maintained uniform in all tires and the tires shall be of a type that will not mark warm asphalt pavement during rolling operations. Pneumatic-tired rollers shall be constructed with sufficient ballast space to provide an operating gross weight of eight tons for nine-wheel rollers, ten tons for eleven-wheel rollers, and 12 tons for thirteen-wheel rollers. At the start of paving operations, the rollers shall be initially weighted to provide a gross weight of not less than 4.5 tons for nine-wheel rollers, 5.5 tons for eleven-wheel rollers, and 6.5 tons for thirteen-wheel rollers. If necessary, additional weight shall be added to improve the effectiveness of the rolling.

10. WEATHER LIMITATION: Bituminous courses shall be constructed only when the base course is dry and when the weather is not rainy. Unless otherwise directed, asphalt courses shall not be constructed when the atmospheric temperature is below 40 degrees F. Bituminous material shall not be mixed or placed when the ambient temperature is below 40 degrees F. or when there is frost in the subgrade or any other time when weather conditions are unsuitable for the type of material being placed. In general, asphaltic materials shall be placed between May 1st and October 15th, unless otherwise approved.

11. RECONDITION OF SUBGRADE: Prior to placing the bituminous base course, the previously constructed subgrade and compacted aggregate base shall conform to moisture and density requirements as specified in the SECTION: EARTHWORK. Prior to laying the bituminous course, the surface shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Ruts or soft, yielding spots that may appear in the subgrade having inadequate compaction, and deviations of the surface from the requirements specified for the subgrade shall be corrected by loosening the affected areas, removing unsatisfactory material where required, and reshaping and recompacting to line and grade and to the specified density requirements, as directed.

12. GRADE CONTROL: The lines and grades shown on the Plans for each pavement category shall be established and maintained by means of line and grade stakes placed at the site of the work by the Contractor in accordance with the SECTION: GENERAL CONDITIONS. Elevations of bench marks for controlling pavement operations at the site of work will be determined, established, and maintained by a licensed surveyor. The finished pavement gradelines and elevations shown on the Plans shall be established and controlled at the site of the work by the Contractor in accordance with bench mark elevations furnished.

13. TRANSPORTATION OF BITUMINOUS MIXTURE: The bituminous mixture shall be transported from the mixing plant to the site in trucks having tight, clean, smooth bodies that have been coated with a minimum amount of a concentrated solution of hydrate lime and water to prevent adhesion of the mixture to the truck bodies. Each load of mixture shall be covered with canvas, or other suitable material, of ample size to protect the mixture from the weather and to prevent loss of heat. Deliveries shall be such that spreading and rolling of all the mixture prepared for a days work can be completed during daylight unless satisfactory artificial light is provided. The mixture shall be delivered to the area to be paved in such manner that the temperature at the time of dumping into the spreader will not be less than hereinafter specified. Loads wet excessively by rain will be rejected. Hauling over freshly laid material will not be permitted.

14. PLACING:

14.1 Layer Thickness: Bituminous base course materials shall be placed in approximate equal thicknesses when more than one course is required. No course shall exceed 4 inches in compacted thickness. Bituminous surfacing materials shall be laid in one course.

14.2 Surface Preparation of Underlying Course: Prior to the laying of any bituminous material, the underlying compacted aggregate base course or subgrade shall be cleared of all foreign or objectionable matter with power blowers, power brooms, or hand brooms as directed and treated with tack coat. The previously laid bituminous base course shall be treated with a tack coat as specified in SECTION: BITUMINOUS TACK COAT.

14.2.1 When compacted aggregate base course material has been used, the surface shall be treated with a prime coat, prior to the placement of any bituminous base or surface course materials. It shall comply with the requirements of AASHTO H116.

14.3 Spraying of Contact Surfaces of Structures: Contact surfaces of previously constructed courses shall be sprayed with a thin coat of hot bituminous material.

14.4 General Requirements for Use of Mechanical Spreader: The range of temperatures of the mixtures when the mixtures are dumped into the mechanical spreader specified herein before shall be a minimum of 235 F. Asphalt mixtures having temperatures less than 235 Degrees F. when dumped into the mechanical spreader will be rejected. The mechanical spreader shall be so adjusted and its speed to regulated that the course being placed will be smooth and continuous without tears and pulling and will be of such depth that, when compacted, the cross section, grade, and contour will be as shown on the Plans. The compacted thickness of a single layer shall not exceed 4 inches. The mixture shall be placed in consecutive adjacent strips of convenient widths to cover the complete area. Unless otherwise directed, the placing shall begin on the high side of areas with a one-way slope or along the centerline of areas to be covered on a crowned section and shall be in the direction of the main traffic flow. Where possible, each strip laid before a succeeding strip shall be of such length that sufficient heat will be retained to make the strip readily compactible to obtain a joint that will conform to the requirements for texture, density and smoothness specified in paragraph "Joint". The length of any strip to be laid prior to the succeeding strip may be decreased or increased as dictated by changes in climatic conditions. Lines shall be established parallel to the centerline of the area to be covered and string lines shall be placed that coincide with the established lines for the spreading machine to follow. Placing of the mixture shall be as nearly continuous as possible, and the speed of placing shall be adjusted, to permit proper rolling. Spreading the mixture by use of a motor grader will not be approved.

14.5 Spreading Requirements for Laying Strips Succeeding Initial Strips: In laying each succeeding strip after the initial strip has been spread and compacted as specified hereinafter, the screed of the mechanical spreader shall overlap the previously placed strip three to four inches and shall be sufficiently raised that compaction effected by rolling will produce a smooth, dense joint. A mixture placed on the edge of the previously laid strip by the mechanical spreader shall be pushed back to the edge of the strip being laid by use of a metal lute. When the amount of mixture on the previously laid strip plus the uncompacted material in the strip being laid is in excess of that required to produce a smooth, dense joint, the excess mixture shall be removed and wasted.

14.6 Shoveling, Raking, and Tamping After Spreading: A sufficient number of experienced shovelers and rakers shall follow the spreading machine, adding hot mixture and raking the mixtures as required to produce a course that, when compacted, will conform to all requirements specified herein. Broadcasting or forming of mixture over areas being compacted will not be permitted. When segregation occurs in the mixture during placing, the spreading operation shall be suspended until the cause is determined and corrected. Irregularities in alignment of the course left by the mechanical spreader shall be corrected by trimming directly behind the machine. Immediately after trimming, the edges of the course shall be thoroughly compacted by tamping laterally with a metal lute. Distortion of the course during tamping will not be permitted.

14.7 Hand Spreading: In areas where the use of machine spreading is impractical, the mixture shall be spread by hand. The mixture shall be dumped on approved dump boards or on an adjacent approved area outside the area to be paved and shall be distributed into place from the dump boards or from the approved area by means of hot shovels. The mixture shall be spread uniformly with hot rakes in a loose layer of a thickness that will conform to the required grade and thickness when compacted. During hand spreading, each shovelful of mixture shall be carefully placed by turning the shovel over in a manner that will prevent segregation. In no case shall the mixture be placed by throwing or broadcasting from a shovel. The loads shall not be dumped faster than can be properly handled by the shovelers and rakers. Rakers without stilt sandals shall not be permitted to stand in the hot mixture while raking the course.

14.8 Safety Precautions: No smoking, fires, or flames other than the heaters that form a part of the equipment shall be permitted within 25 feet of heating, distributing, or transferring operations of bituminous materials.

15. COMPACTION OF MIXTURE: Either a three-wheel or tandem steel wheel roller may be used for the initial longitudinal breakdown rolling. Rolling of the mixture shall begin as soon after placing as the mixture will bear the roller without undue displacement. Delays in rolling freshly spread mixture will not be tolerated. Rolling shall start longitudinally at the extreme sides of the lanes and proceed toward the center of the pavement, overlapping on successive trips by at least one-half the width of the rear wheel of the roller. Alternate trips of the roller shall be of slightly different lengths. Tests for conformity with the specified crown, grade and smoothness shall be made by the Contractor under the supervision of the City immediately after initial compression. Before continuing the rolling, any variations shall be corrected by removing or adding materials as directed by the City. The course shall also be subjected to diagonal rolling using the steel wheel rollers specified herein, crossing the lines of the first rolling while the mixture is hot and in a compactible condition. The speed of the rollers shall not exceed three miles per hour and shall at all times be slow enough to avoid displacement of the hot mixture. Any displacement of the mixture occurring as the result of reversing the direction of the roller, or from any other cause, shall be corrected at once by the use of rakes and fresh mixture applied or mixture removed as required. Rolling of the surface

and base courses shall be continued with the steel wheel roller until all roller marks are eliminated and a density of at least 98 percent of the density of a laboratory specimen of the same mixture subject to 50 blows of a standard Marshall hammer on each side of the specimen has been obtained. During rolling, the wheels of the rollers shall be moistened to prevent adhesion of the mixture to the wheels, but an excess of water will not be permitted. The minimum number of rollers to be furnished by the Contractor shall consist of one pneumatic-tired roller and one steel wheel roller, conforming to the requirements specified herein before, for each spreading machine in operation on the job. The Contractor shall furnish additional ten-ton rollers if it is found that the pavement density specified is not obtained by the operation of the minimum number of rollers specified. In all places not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers. Hand tampers shall weigh not less than 25 pounds and shall have a tamping face of not more than 50 square inches. Skin patching of an area that has been rolled will not be permitted. Any mixture that becomes mixed with foreign material or in any way defective shall be removed, replaced with fresh mixtures, and compacted to the density of the surrounding area. The roller shall pass over the unprotected edge of the course only when the laying of the course is to be discontinued for such length of time as to permit the mixture to become cold. The surface course shall be rolled with a pneumatic-tired roller, conforming to requirements specified herein before, while the course is still warm. The pneumatic-tired roller shall follow immediately the steel wheel roller, the rolling shall be continued until all of the surface course has been subjected to at least three coverages. The use of pneumatic-tired rollers is at the option of the City.

16. PATCHING DEFICIENT AREAS: Mixtures that become contaminated with foreign material or that are defective shall be removed. Skin patching of an area that has been rolled will not be permitted. Holes the full thickness of the course shall be so cut that the sides are perpendicular and parallel to the direction of traffic and the edges are vertical. Edges shall be sprayed with hot bituminous materials. Sufficient fresh paving mixture shall be placed in the holes to obtain the grade and smoothness required for the finished surface. The mixture shall be compacted to the density specified herein. Competent workmen shall be provided who are capable of performing all work incidental to correction of deficiencies and defects.

17. JOINTS:

17.1 General: The joints between old and new courses or between successive days work, or joints that have become cold because of delay, shall be carefully made in such manner as to insure a continuous bond between old and new sections of the course. Contact surfaces that have become coated with dust, sand, or other objectionable material shall be cleaned by brushing or shall be cut back with an approved power saw, as directed. The surface against which the new material is to be placed shall be sprayed with a thin, uniform coat of hot bituminous material. The material shall be applied far enough in advance of placement of the fresh mixture to insure adequate curing. Care shall be taken to prevent damage or contamination of the sprayed surface.

17.2 Transverse: The roller shall pass over the unprotected end of the freshly laid mixture only when the laying of the course is to be discontinued or when delivery of mixture is interrupted to the extent that the unrolled material may become cold. In all cases, the edge of the previously laid course shall be cut back to expose an uneven, vertical surface the full thickness of the course. When required, the fresh mixture shall be raked against the joints, thoroughly tamped with hot tampers, smoothed with hot smoothers, and rolled.

17.3 Longitudinal: When the edges of the previously placed strip have become cool or cold or are irregular, honeycombed, poorly compacted, damaged, or otherwise defective, unsatisfactory sections of the joint shall be cut back to expose a clean, sound surface for the full thickness of the course as directed.

18. PROTECTION OF PAVEMENT: After final rolling of the pavement, vehicular traffic of any kind shall not be permitted until the pavement has cooled and hardened for at least six hours, unless otherwise approved by the City.

19. SURFACE REQUIREMENTS:

19.1 Bituminous Base Course: The surface shall not show any deviations in excess of 3/8 inch when tested with a ten-foot straightedge applied parallel with and at right angles to the centerline of the paved area. Any deviation in excess of this amount shall be corrected by the Contractor by loosening, adding, or removing material, watering, and reshaping and compacting. When the bituminous base course is to be constructed in more than one layer, the smoothness requirements specified above shall apply only to the top layer. The underlying layers shall be finished to a reasonably smooth surface.

19.2 Bituminous Surface Course: The surface course, upon completion of final rolling, shall be smooth and true to grade and cross section. When a ten-foot straightedge is laid on the surface parallel with the centerline, the surface shall not vary more than 1/8 inch from the straightedge. When the ten-foot straightedge is laid on the surface transverse to the centerline between the crown and edge of pavement, the surface shall not vary more than 1/4 inch from the straightedge. Low or defective areas shall be corrected in accordance with paragraph: "Patching Deficient Areas".

19.3 Equipment: The Contractor shall furnish and maintain in good condition at the site, one straightedge for each bituminous paver, for the use of the City in testing the finished surface. The straightedge shall be aluminium or other approved lightweight metal and shall have blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on the pavement. Where devices other than straightedges are approved for surface smoothness determinations, the Contractor shall furnish and maintain in good working condition at the site, one such device for each bituminous paver, for the use of the City.

20. COLD MILLING ASPHALT CONCRETE PAVEMENT

20.1 General: The Contractor shall cold mill existing asphalt concrete pavement, as dimensioned and as otherwise designated on the Plans. Cold milling shall remove variable depths of asphalt concrete to provide an overlay key at joints and over the width of the cold milled area. Additional widths of cold milling may be required at various locations as determined by the City. The surface of pavement after milling shall be uniformly rough grooved or ridged as required by the City. The grade shall not deviate from a suitable straight edge by more than 3/8 inch at any point. The Contractor shall remove existing asphalt concrete overlay from gutters adjacent to any area specified to be cold milled, as required by the City.

20.2 Equipment: The machine used for milling shall meet the following requirements:

20.2.1 The milling machine shall be specially designed and built for milling of bituminous pavements without the addition of heat, with the ability to plane

portland cement concrete patches in the bituminous pavement. The cutting drum shall be a minimum of 60 inches wide and shall be equipped with carbide-tipped cutting teeth placed in a variable lacing pattern to produce the desired finish.

20.2.2 The machine shall be capable of being operated at speeds from 0 to 40 feet per minute; it shall be self-propelled and have the capability of spraying water at the cutting drum to minimize dust. The machine shall be capable of removing the material next to the gutter of the pavement being reconditioned and be designed so that the operator can at all times observe the milling operation without leaving the controls. The machine shall be adjustable as to slope and depth and shall deep cut in one pass a maximum of 3 inches without producing fumes or smoke.

20.2.3 The Contractor shall provide a smaller machine if required to trim areas inaccessible to the larger machine at manholes, gate valve covers, curb returns, and intersections. The smaller machine shall be equipped with a 12-inch-minimum-width cutting drum mounted on a chassis allowing it to be positioned without interrupting traffic or pedestrian flow.

20.2.4 The cutting drum shall be totally enclosed to prevent discharge of any loosened material on adjacent work areas.

20.2.5 The planing machine shall be equipped with a flashing warning light visible from 360 degrees. The light shall be mounted near the rear of the machine, at least 2 feet (61 cm) above the highest part of the planing machine, and shall be used whenever the machine is being used or moved upon the City streets.

20.2.6 The equipment shall be capable of accurately and automatically establishing profile grades (within +/- 1/8 inch) along each edge of the machine by referencing from the existing pavement by means of a ski or matching shoe or from an independent grade control and shall be controlled by an automatic system for controlling grade elevation and cross slope at a given rate.

20.3 Execution: The pavement surface shall be removed to the depth, width, and grade as required by the City. This operation shall only commence when the contractor is ready to immediately follow-up with the resurfacing operation.

20.3.1 Depth transitions at the beginning and end of this project, side roads, bridge ends, and/or as shown on the plans shall be accomplished by cold milling using a machine and process as approved by the City.

20.3.2 The pavement planing operations shall be regulated by an automatically controlled grade leveling and slope control device. The device shall provide control for producing an uniform surface to the established grade and a cross slope conforming to the requirement of the typical section. The device shall also be equipped with the necessary controls to permit the operator to adjust or vary the slope as required by the City.

20.3.3 Existing shoulder material shall be removed as necessary to insure no ponding of water on the driving surface after the cold milling operation.

20.3.4 The pavement surface shall be removed and planed around and over manholes, utility valves, and drainage appurtenances within the limits of the work as required by the City. Any damage to manholes, valves, or drainage appurtenances by the removal and planing operation shall be the responsibility of the contractor to correct. After removal of existing material around manholes, utility valves and other appurtenances in the driving surface, the contractor shall place a temporary wedge of bituminous material at a slope no steeper than one inch in 4 feet around the appurtenance. Bituminous wedges shall be removed prior to resurfacing.

20.3.5 The cold milled surface shall not be exposed to traffic for an extended period of time before being resurfaced. In event the cold milled surface begins to ravel under the traffic, restrictions on the amount of time that a cold mill area may be left opened to traffic will be determined by the City.

20.3.6 During the milling operation, the Contractor shall sweep the street with mechanical equipment and remove all loosened material from the Project site until completion of the removal work. The removal crew shall follow within 50 feet of the milling machine unless otherwise required by the City. The Contractor shall take all necessary measures to avoid dispersion of dust.

20.3.7 Prior to placing asphaltic concrete on the cold milled concrete pavement the contractor shall seal the concrete pavement joints with an approved sealant.

20.3.8 All cold-milled material from the project shall become the property of the City and shall be disposed of by the Contractor at a disposal area designated or as required by the City. Disposal sites will be approximately two (2) miles from any project. Trucking of cold-milled material will be the responsibility of the contractor.

20.3.9 Before cold milling pavement within 300 feet of a traffic signal, the Contractor shall notify the Agency at least 3 working days prior to commencing work within said area. Upon notification, the Agency will mark the location of all existing loop detectors. The Contractor shall not cold mill within 12 inches of these loop detector conductors.

20.3.9.1 Damage to the existing loops caused by the Contractor operation will require replacement of the loops in their entirety at the Contractor's expense.

20.3.10 Areas where cold milling is specified, shall be overlaid with a 2-foot minimum width of asphalt concrete pavement transition adjacent to gutters, cross gutters, and structures and at existing transverse joint lines.

END OF SECTION