



SECTION 506

CONCRETE OVERLAYS FOR PAVEMENTS

SECTION 506.10 BONDED CONCRETE OVERLAYS OF ASPHALT PAVEMENTS.

506.10.1 Description. This work shall consist of producing and placing a bonded concrete overlay on asphalt(BCOA) as shown on the plans or as directed by the engineer. The BCOA pavement shall be in accordance with [Sec 502](#), except as modified herein. The BCOA pavement shall consist of a fiber reinforced concrete pavement placed over a prepared asphalt surface. Unless otherwise specified on the plans, the minimum BCOA pavement thickness shall be 4 inches. The prepared base asphalt shall have a minimum thickness of 3 inches.

506.10.2 Material. All material shall be in accordance with Division 1000, Material Details, unless otherwise noted.

506.10.2.1 Fibers. Fibrillated polypropylene fibers shall be added at a rate of 3.0 pounds per cubic yard. All fibers shall be measurable by weight. Fibers may be measured in bags, boxes or like containers with approval from the engineer. The containers shall be sealed by the fiber manufacturer, and shall have the weight contained therein clearly marked by the manufacturer. No fraction of container delivered unsealed or left over from previous work shall be used unless weighed. Fibers shall be added to the concrete mix and mixed according to the fiber manufacturer's recommendations.

506.10.2.2 Water-Reducers. An approved high range water-reducer admixture may be used. No re-dosing of high range water-reducing admixture will be permitted.

506.10.3 Mix Design.

506.10.3.1 Mix Approval. The contractor shall submit a mix design to Construction and Materials for approval in accordance with [Sec 501](#). The mixture shall be designed to develop a minimum 28-day compressive strength of 4,600 psi. The maximum aggregate size shall be no more than one-third the thickness of the BCOA pavement.

506.10.3.2 Admixtures. Any admixtures used shall be certified by the fiber manufacturer for compatibility with the fibers used in the concrete.

506.10.3.3 Mix Adjustments. The contractor shall not make any mix design changes during placement of the BCOA pavement without prior approval from the engineer.

506.10.4 Construction Requirements. The QC/QA provisions of [Sec 502](#) will not apply.

506.10.4.1 Surface Preparation. The existing bituminous surface shall be coldmilled in accordance with [Sec 622.10](#) and as indicated elsewhere in the contract.

506.10.4.1.1 Prior to placing the BCOA pavement, the surface shall be thoroughly cleaned of all vegetation, dirt, mud and other objectionable material. All dust and loose particles shall be completely removed.

506.10.4.1.2 The asphalt surface temperature shall not exceed 90 F at the time of BCOA pavement placement. This may require night placement, water fogging or other suitable means of obtaining a cooler surface. At the time of placement of the BCOA pavement, there shall be no puddled water or other contamination to prevent bonding of the BCOA to the asphalt surface.

506.10.4.2 Placement.

506.10.4.2.1 Provided no loose, foreign material is tracked onto the surface, trucks used for transporting concrete may drive on the pavement being overlaid and concrete may be deposited directly in front of the concrete spreader.

506.10.4.2.2 The BCOA pavement shall be free of fiber balls when placed.

506.10.4.2.3 The concrete temperature shall not exceed 90 F when delivered to the site.

506.10.4.2.4 The BCOA pavement shall be placed in a uniform thickness on a final grade that has been established by other means, such as cold milling.

506.10.4.3 Surface Finish. The surface finish of the BCOA pavement shall be in accordance with [Sec 502](#).

506.10.4.4 Joints. Sawing of the joints shall not cause excessive raveling. The joints shall be spaced equidistant longitudinally and transversely and at a distance approximately equal to twelve times the specified BCOA pavement thickness, with the following exceptions. Slight adjustments may be made in the joint spacing to equalize the longitudinal joints between pavement cast edges. All sawed BCOA pavement units shall be square, except as necessary in pavement width transitions. In such cases, slight field adjustments may be made to maintain relatively square units. Joint spacing for any adjustments shall not exceed one foot more than 12 times the specified BCOA pavement thickness. Transverse joints on adjoining lanes shall match. The minimum depth of the joints shall be one-third the BCOA and the width of the joint shall be 1/8 inch maximum. The joints shall not be sealed but shall be cleaned of all deleterious material after sawing. The engineer may require the contractor to replace BCOA pavement where cracking occurs due to late sawing at the contractor's expense.

506.10.4.5 Curing. Curing compound shall be applied at 1.5 times the normal application rate. If blankets are used for fast tracking, the blankets shall be light in color and shall not take the place of a curing compound. The temperature under the blanket shall not exceed 160 F. Blankets shall not be removed until the temperature under the blanket is within 40 F of the ambient temperature.

506.10.4.6 Opening to Traffic. BCOA pavement shall not be opened to all types of traffic until the concrete has attained a minimum compressive strength of 3,500 psi. Compressive strength will be determined by tests conducted in accordance with MoDOT Test Methods.

506.10.5 Method of Measurement.

506.10.5.1 Material Furnished. Measurement for furnishing BCOA concrete will be made to the nearest 0.1 cubic yard for material incorporated into the BCOA pavement.

506.10.5.2 Material Placed. Measurement for placing BCOA pavement will be computed to the nearest 0.1 square yard.

506.10.5.3 Pavement Thickness Determination. The thickness of the BCOA pavement will be determined by the average caliper measurement of cores in accordance with AASHTO T 148.

506.10.5.3.1 For the purpose of determining the constructed thickness of the pavement, cores will be taken at random intervals in each traffic lane at the rate of one core per 1,000 feet, or increment thereof. In addition, cores will be taken at all locations where thickness measurements taken during construction indicate a thickness deficiency sufficient to justify a deduction from the contract unit price or at any other locations as may be determined by the engineer. If the measurement of any core is deficient in excess of 3/10 inch from the plan thickness, additional cores will be taken at 30-foot intervals parallel to the centerline ahead and behind the affected location until the extent of the deficiency has been determined.

506.10.5.3.2 Each core will represent the pavement thickness for a distance extending one-half the distance to the next core, measured along the centerline. In the case of a beginning or ending core, the distance shall extend to the end of the pavement section.

506.10.5.4 Pavement Strength Determination. The strength of the BCOA concrete will be determined by testing cylinders in accordance with AASHTO T 22. Cylinders will be tested at the rate of one per 500 cubic yards, or increment thereof. Any 28-day cylinder strength below 4,000 psi is unacceptable.

506.10.5.5 Final Measurement. Final measurement of the complete UTW pavement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity.

506.10.5.6 Quantity of Cold milling. Measurement for cold milling bituminous pavement for removal of surface will be made in accordance with [Sec 622.10.4](#).

506.10.6 Basis of Payment.

506.10.6.1 Material Furnished. The plan quantity for the furnishing of BCOA concrete will be paid for at the contract unit price for BCOA concrete, per cubic yard. Reimbursement for any additional concrete incorporated into the BCOA pavement will be in accordance with [Sec 109.5.3](#) and shall not exceed the unit contract price.

506.10.6.2 Material Placed. The plan quantity for the placement of BCOA pavement will be paid for at the contract unit price for BCOA pavement, per square yard. No direct payment will be made for surface preparation following cold milling of the bituminous surface, or furnishing labor, equipment, reinforcement and other materials to place, finish, texture cure, and saw the joints in the BCOA pavement.

506.10.6.3 Pavement Thickness. Pavement thickness determination will be made after all smoothness correction has been completed. If any core measurement of thickness is deficient, the contractor may remove and replace the pavement at the contractor's expense or leave the pavement in place, and receive the following deductions in payment:

Deficiency in Thickness	Deductions, Percent of Contract Unit Price
0 to 3/10 inch	None
Over 3/10 inch	100

506.10.6.3.1 The above deductions will be applied to a section of pavement 30 feet long and will include the entire paved width for a specific pass. Deductions for deficient thickness or damaged pavement may be entered on any estimate after the information becomes available.

506.10.6.3.2 Any pavement that is replaced shall be of a satisfactory quality and thickness that, when accepted by the engineer, will be included in the pay quantity. No payment will be made for any costs incurred in the removal of the deficient pavement.

506.10.6.3.3 Removal of pavement shall be from the edge to a longitudinal joint or between longitudinal joints and on each side of the deficient measurement until no portion of the exposed cross sections is more than 3/10 inch deficient, except that there shall be no less than 15 linear feet of pavement removed. If there remains less than 15 feet of acceptable pavement between the section that has been removed and a transverse contraction, expansion or construction joint, the contractor shall remove the pavement to the joint, at the contractor's expense.

506.10.6.4 Adjustments. Any adjustments in payment as a result of the profilograph index or pavement thickness deficiency of the BCOA pavement will be made to the unit contract prices for furnishing BCOA concrete, per cubic yard and placing BCOA pavement, per square yard. For this purpose, the volume of BCOA pavement placed per cubic yard price will be adjusted to a square yard price based on the plan BCOA pavement thickness.

506.10.6.5 Cold Milling. Payment for cold milling bituminous pavement for removal of surface will be made in accordance with [Sec 622.10.5](#).

SECTION 506.20 UNBONDED CONCRETE OVERLAYS OF CONCRETE PAVEMENTS.

506.20.1 Description. This work shall consist of placing an interlayer material on an existing concrete pavement and constructing an unbonded concrete overlay in accordance with the details and locations shown on the plans. The standard unbonded concrete overlay design thickness is either 8 or 5 inches. The eight-inch overlays are constructed similarly to new concrete pavement in terms of joint spacing and use of dowel bars and tie bars. The five-inch overlays are sawed into smaller panels and require no steel. The overlay shall be placed in accordance with [Sec 502](#), except as herein stated.

506.20.2 Material. All material shall be in accordance with Division 1000, Material Details, unless specified otherwise.

506.20.2.1 Patching Material. Patching material for use in repair of surface defects prior to the overlay shall consist of bituminous material, cementitious material, or other equivalent material meeting the approval of the engineer.

506.20.2.2 Interlayer. The interlayer material shall be a minimum one-inch thick new bituminous or a geotextile fabric in accordance with Section 1011.3.7.

506.20.2.3 Concrete. All procedures and material for the unbonded overlay shall be in accordance with [Sec 502](#), including QC/QA and PWL provisions for non-reinforced concrete pavement, except the strength pay factor will account for 100 percent of the total pay factor. The pay factor for thickness will not apply.

506.20.2.4 Dowel Bars. Dowel bars shall be in accordance with [Sec 1057.1](#) and of the size shown on the plans.

506.20.3 Construction Requirements.

506.20.3.1 Handling Traffic. Preliminary work, including joint sealing and patching, may be done under traffic as permitted elsewhere in the contract. Prior to placement of the debonding material, the traffic shall be diverted as shown on the plans, and the remaining operations shall commence.

506.20.3.2 Surface Preparation. All holes greater than 2 inches wide and one inch deep in the surface of the traffic lanes, excluding shoulders, shall be filled with patching material and shall be compacted to a flat, tight surface.

506.20.3.3 Expansion Joints. Any transverse expansion joints in the existing pavement shall be specifically marked and identified as such.

506.20.3.4 Interlayer Placement.

506.20.3.4.1 Bituminous Interlayer. The surface temperature of a bituminous interlayer shall not exceed 90 degrees F prior to the overlay placement. The temperature may be controlled with any means approved by the Engineer, including, but not limited to white curing compound and water misting.

506.20.3.4.2 Geotextile Interlayer. Geotextile interlayer placement shall comply with the following requirements:

506.20.3.4.2.1 Fabric shall be tight without excess wrinkles and folds.

506.20.3.4.2.2 Fabric shall be pinned to underlying layer with bolts/nails punched through galvanized washers/discs every 6 ft.

506.20.3.4.2.3 Where it occurs, fabric shall overlap by 8 ± 2 in.

506.20.3.4.2.4 Fabric shall be damp, but not saturated, prior to concrete placement.

506.20.3.4.2.5 Fabric shall extend throughout the travelway and overlap onto the shoulder by at least 18 inches.

506.20.3.5 Surface Cleaning. Before the unbonded concrete overlay is placed, the interlayer surface shall be free of loose material.

506.20.3.6 Dowel Bars. Dowel bars for eight-inch unbonded overlays shall be installed the full width of the unbonded overlay and the baskets, if used, shall be firmly anchored to the interlayer surface.

506.20.3.7 Tie Bars. Tie bars shall be installed between lanes in an eight-inch unbonded concrete overlay.

506.20.3.8 Concrete Temperature. The concrete temperature shall not exceed 90 F when delivered to the site.

506.20.3.9 Placing Concrete. Provided no loose foreign material is tracked onto the surface, trucks used for transporting concrete may drive on the pavement being overlaid and concrete may be deposited directly in front of the concrete spreader.

506.20.3.10 Joints.

506.20.3.10.1 Any expansion joints shall be precut in the plastic concrete to allow for slab movement prior to sawing. As soon as sawing is possible, the contractor shall saw two full-depth cuts on each side of the precut joint following the edges of the underlying expansion joint, as marked out, and the concrete between the saw joints shall be removed.

506.20.3.10.2 Sawing of the contraction joints shall not cause excessive raveling. Standard joint spacing for a five-inch unbounded concrete overlay is 6 feet transversely and longitudinally. Standard joint spacing for an eight-inch unbounded overlay is 15 ft transversely and 12 ft across the full lane width. New transverse joints will not be required to match existing transverse joints. The minimum depth of the sawed joints shall be one-third the pavement thickness and the width of the joint shall be 1/8-inch maximum. The joints shall not be sealed, unless open more than 1/4 inch, but shall be cleaned of all deleterious material after sawing. Concrete panels with cracking outside of the sawed joints shall be considered unacceptable.

506.20.3.11 Opening Strength. The unbounded concrete overlay may be opened for light-weight traffic when the concrete has attained a minimum compressive strength of 2,500 psi. The concrete pavement shall not be opened to all types of traffic until the concrete has attained a minimum compressive strength of 3,000 psi. Compressive strength for opening to traffic shall be determined either by compressive strength tests in accordance with AASHTO T 22 or the maturity method in accordance with [Sec 507](#).

506.20.3.12 Acceptance Testing Procedures and Reporting. All testing and reporting procedures for the unbonded concrete overlay shall be in accordance with [Sec 502.10](#), including QC/QA and PWL provisions for concrete pavement, except the following shall apply:

506.20.3.12.1 Minimum Thickness. Pavement thickness determination will be made after all smoothness correction has been completed. The minimum concrete overlay thickness shall be the design thickness less 10 percent. Any core less than the minimum thickness is unacceptable. Additional cores will be taken at 30-foot intervals parallel to the centerline ahead and behind the affected locations until the extent of the deficiency has been determined.

506.20.3.12.2 Compressive Strength. After the thickness is determined, the cores shall be tested for compressive strength in accordance with AASHTO T 22. The length-to-diameter (L/D) ratio of the core shall be measured and recorded to the nearest 0.01 inch, and the L/D ratio shall be between 1.00 and 2.00. If the L/D ratio of the drilled core is 1.75 or less, the compressive strength shall be corrected by multiplying the appropriate correction factor shown in the following table:

L/D	1.75	1.5	1.25	1.00
Correction Factor	0.98	0.96	0.93	0.87

Use interpolation to determine correction for L/D values between those given in the table.

506.20.3.12.3 Pay Factor. The Pay Factor for Compressive Strength (PF_{CS}) will account for 100 percent of the total pay factor. The total pay factor (PF_T) for each lot shall be determined as follows:

$$(PF_T) = (1.0) PF_{CS} ; \text{ where the pay factor for thickness does not apply.}$$

The PF for each pay factor item for each lot is based on the PWL of each pay factor item of each lot and is determined as follows:

When PWLt is greater than or equal to 70: $PF = 0.5 \text{ PWLt} + 55.0$
When PWLt is less than 70: $PF = 2 \text{ PWLt} - 50$.

506.20.4 Method of Measurement.

506.20.4.1 Furnishing Concrete. Measurement for furnishing unbonded overlay concrete will be to the nearest 0.1 cubic yard. The cubic yard quantity will be calculated in one of the two ways explained in Secs 506.20.4.1.1 and 506.20.4.1.2. Thickness, profile, and smoothness requirements shall not be waived for either method of measurement, unless stated so in the plans or agreed to by the engineer.

506.20.4.1.1 Field Established Profile. The contractor shall establish the roadway profile prior to the overlay. The profile shall be submitted to the engineer and include edge of pavement and centerline elevations at 50-foot intervals in tangent sections and 25-foot intervals in curve sections. The engineer will determine the final profile within 7 calendar days of receipt. The engineer will determine the required number of cubic yards of concrete from this profile. This quantity will be the field established plan quantity.

506.20.4.1.2 Existing Profile. The contractor shall use the plan quantity shown in the contract documents. The contractor shall construct the overlay to match the profile of the existing roadway. The contractor may utilize traveling grade control to place the overlay.

506.20.4.2 Placing Unbonded Concrete Overlay. Measurement for placing unbonded overlay concrete will be computed to the nearest 0.1 square yard. Final measurement of the completed pavement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity.

506.20.4.3 Interlayer. Measurement for the interlayer will be made to the nearest square yard.

506.20.5 Basis of Payment.

506.20.5.1 Furnishing Concrete. The accepted volume of concrete for the unbonded concrete overlay will be paid for at the contract unit price for furnishing concrete, per cubic yard.

506.20.5.2 Placing Unbonded Concrete Overlay. Placement of the unbonded concrete overlay will be paid for at the contract unit price for placing unbonded concrete overlay per square yard. No direct payment will be made for furnishing labor, equipment, dowels, tie bars and other materials to place, finish, texture and cure the overlay including sawing and sealing, if necessary, the joints, in accordance with the plans and specifications.

506.20.5.3 Payment Adjustments. Any adjustments in payment as a result of the profilograph index or pavement thickness deficiency of the unbonded concrete overlay will be made to the contract unit price for furnishing concrete and placing unbonded concrete overlay each, for the segments involved. Adjustment in payment for QC/QA concrete strength pay factors will be made to the contract unit price for furnishing concrete and placing unbonded concrete overlay, each, for the segments involved. For all adjustments, the furnishing concrete per cubic yard price will be adjusted to a square yard price based on the plan overlay thickness.

506.20.5.4 Interlayer. Payment for the interlayer will be paid for at the contract unit price per square yard.

506.20.5.5 Repairs. Payment for full depth and partial depth repairs shall be in accordance with [Sec 613](#).

506.20.5.6 Surveying and Staking. Payment for contractor surveying and staking will be in accordance with [Sec 105](#).

SECTION 506.30 UNBONDED CONCRETE OVERLAYS ON ASPHALT PAVEMENTS.

506.30.1 Description. This work shall consist of constructing an unbonded concrete overlay on an existing asphalt surface in accordance with the details and locations shown on the plans. All work shall be performed in accordance with Section 506.20, except that an interlayer shall not be used.