

**KANSAS DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION TO THE
STANDARD SPECIFICATIONS, EDITION 2007**

Add a new SECTION to DIVISION 500:

SECTION 504

**PORTLAND CEMENT CONCRETE PAVEMENT BONDED INLAY OR OVERLAY
OVER HOT MIX ASPHALT (HMA)**

504.1 DESCRIPTION

Construct portland cement concrete bonded inlay or overlay on the existing HMA.

BID ITEMS

- Milling
- Concrete Placement
- Bonded Concrete Pavement (* Uniform)(AE)(**)
- *Thickness
- ** "Plain" denotes PCCP without mesh and dowel assemblies.

UNITS

- Square Yard
- Square Yard
- Cubic Yard

504.2 MATERIALS

Provide materials that comply with the applicable requirements.

Concrete and Grout	DIVISION 400
Reinforcing Steel.....	DIVISION 1600
Epoxy Coated Steel Bars for Concrete Reinforcement	DIVISION 1600
Joint Sealants.....	DIVISION 1500
Expansion Joint Filler.....	DIVISION 1500
Concrete Curing Materials	DIVISION 1400
Preformed Elastomeric Compression Joint Seals.....	DIVISION 1500
Cold Applied Chemically Cured Joint Sealant.....	DIVISION 1500
Hot Type Joint Sealing Compound	DIVISION 1500
Epoxy Resin-Base Bonding System for Concrete	DIVISION 1700

Use the appropriate Type, Grade and Class of Epoxy as shown in **SECTION 1705**.

504.3 CONSTRUCTION REQUIREMENTS

a. General. Prepare the areas for the inlay or overlay by milling the pavement to the limits designated in the Contract Documents. After milling the existing HMA pavement, fill any transverse or longitudinal cracking that is greater than 3/4 inch in width or potholes with cement or fly-ash grout meeting an unconfined compressive strength of 500 psi ± 50 psi in 4 hours or prior to placement of the overlay. If the PCCP inlay or overlay is placed on a new HMA pavement leveling course, no milling or crack filling is needed.

b. Surface Preparation. Broom and use high pressure air blast to remove loose millings. At cracks, use high pressure air blast to remove loose and deteriorated material. Fill resulting void with grout meeting an unconfined compressive strength of 500 psi ± 50 psi in 4 hours or prior to placement of the overlay.

Place the concrete inlay or overlay within 72 hours after surface preparation. If the concrete inlay or overlay is not placed within 72 hours after surface preparation, the Engineer will evaluate the surface, and if deemed necessary, may require the surface to be re-prepped according to **subsection 504.3b**. If at any time the surface has been contaminated, re-prep the contaminated area according to **subsection 504.3b**.

Before placing the concrete inlay or overlay, cool the existing HMA surface to a temperature below 120°F. If water is used to cool the surface remove pooled water and allow the surface to dry to a saturated surface condition before the concrete is placed.

c. Slip Form Paving. Except in irregular areas, pave with a slip form paving unit, using equipment as described in **subsection 154.5**.

Pave 24 feet wide mainline pavement in a single operation, unless shown on the Contract Documents. Do not exceed 24 feet paving width in a single operation except as follows:

- The Contractor may pave a maximum of 2 lanes plus a 6-foot shoulder (30 feet maximum) in a single operation.
- For pavements of 3 lanes or more, pave a minimum of 2 lanes mainline (with the option of including a single shoulder for a maximum of 30 feet) in a single operation.
- Approval will be based on satisfactory performance of the Contractor's operation.

Place ramps and auxiliary lanes/shoulders as shown in the Contract Documents.

Once the paving operation has started, provide adequate equipment and supply of materials to maintain continuous placement for any given working period. Keep all concrete conveying equipment clean.

Do not apply any tractive forces to the slip form paver, except that which is controlled from the machine.

Operate the paver continuously, stopping only when absolutely necessary. If the forward motion of the paver is stopped, immediately stop the vibrator and tamping elements.

Deposit the concrete on the grade in successive batches to minimize re-handling. Place concrete over and against any joint assemblies so the joint assembly is retained in its correct position. Spread the concrete to prevent segregation and separation of the materials.

After striking the concrete off with the spreader, leave sufficient concrete in place to allow the final shaping by the use of screeds, templates and pans, depending on make, model and type of machines approved for use in the paving train. Adjust the paving units to meet the required final cross-section, minimizing the need to carry back concrete to fill voids or depressions. Adjust each screed or template so a uniform roll of concrete extends the full length of the screed or template and allows just enough concrete to pass under the unit to properly feed the next machine. Do not shove large volumes of concrete with the screed or template. Adjust the screed or template to maintain a uniform cross-section.

Place concrete ahead of the initial spreader strikeoff no more than 30 minutes ahead of the final spreader strikeoff.

The use of any paving machine in the paving train is contingent on its ability to finish the pavement satisfactorily to the required grade, section and specified degree of consolidation. The Engineer may at any time require the adjustment, repair or replacement of the machine for unsatisfactory performance.

Correct any edge slump of the pavement in excess of $\frac{1}{4}$ inch, exclusive of edge rounding, before the concrete hardens. Excessive edge slumping will be sufficient reason to discontinue paving until machinery (or mix) is properly adjusted or removed from the project.

When the machine finishing has been completed, check the surface with a straightedge a minimum of 10 feet in length before texturing. Operate the straightedge parallel to the pavement centerline, starting at the center and progressing outward. Advance in successive stages of less than $\frac{1}{2}$ the length of the straightedge. At the Contractor's option, this requirement may be eliminated when smoothness is to be determined by the profilograph.

d. Placing Reinforcement. Place pavement reinforcement at the locations shown in the Contract Documents. Use a sufficient number of approved metal bar supports or pins to hold all tie bars or dowel bars in proper position as required by the Contract Documents.

Use reinforcing steel free from detrimental materials that could impair the bond between the steel and concrete.

e. Consolidation and Finishing. Perform hand spreading with shovels, not rakes. Do not allow workers to walk in the fresh concrete with boots or shoes coated with earth or foreign substance.

Do not apply moisture to the surface of the fresh concrete pavement unless the Engineer approves the use of additional water on the fresh concrete surface to lubricate the float of the longitudinal finisher. If unusual weather conditions require the addition of superficial water to the concrete surface, apply it only in the form of a fine, fog mist.

Consolidate and finish the concrete to the cross-section and elevation shown in the Contract Documents.

Use vibrators or other approved equipment to consolidate each layer of concrete, when placed in more than 1 lift, or full depth if placed in 1 lift. Uniformly vibrate the concrete across the full width and depth of the pavement so that the density of concrete pavement is a minimum of 98% of the vibrated unit weight. The 98% density requirement may be eliminated on miscellaneous areas such as entrance pavement, median pavement and gore areas.

Vibrators, either of the surface type (pan or screed) or the immersion type (tube or spud) may be attached to the spreader, paver or finishing machine, or may be mounted on a separate carriage. Only operate the vibrators when the machine they are mounted on is moving forward. Do not operate hand vibrators more than 15 seconds, or less than 5 seconds in any one location unless approved otherwise by the Engineer. Vertically insert and extract vibrators from the concrete in a slow, deliberate manner. Check vibrator frequencies with the vibrator under load to comply with the frequencies shown in **subsection 154.2e**.

Maintain a uniform, continuous roll of concrete over the vibrators ahead of the strike-off. The height of the roll shall be approximately the same height as the thickness of the pavement being vibrated.

In order to obtain concrete consolidation in the vicinity of joint assemblies, the Engineer may require that these areas be hand vibrated with an immersion spud vibrator.

On projects or areas within projects where the use of conventional equipment is impracticable, other consolidation and finishing equipment may be used with approval of the Engineer.

f. Texturing. Use texturing equipment and devices as described in **subsection 154.7**.

Use burlap drag as soon as all excess moisture has disappeared and while the concrete is still plastic enough to make a granular surface possible.

Following the dragging operation, use a mechanical device to make a final finish or texture by giving the surface of the plastic pavement a longitudinal tining as shown in the Contract Documents. Perform the operation at such time to minimize displacement of larger aggregate particles and before the surface permanently sets.

Small or irregular areas may be tined by hand methods.

On projects of less than 5,000 square yards, or projects with longitudinal tining, the tining and curing devices may be mounted on the same carriage when approved by the Engineer. Operations of this type will be based on satisfactory performance.

Before final texturing, finish the exposed edge of the pavement to a radius of $\frac{1}{4}$ inch with an edger. Edge the interior longitudinal joints on multiple-lane pavement to a radius of $\frac{1}{8}$ inch. Eliminate any tool marks appearing on the panel adjacent to the joints or edge of the panel. Do not disturb the rounding of the corner of the panel.

g. Joints.

(1) General. Construct joints according to the Contract Documents. Timely joint sawing is necessary to prevent random cracking. Sawing should begin as soon as the concrete is strong enough that joints can be cut without significant raveling or chipping.

(2) Transverse Joints. Locate the transverse joints as shown in the plans. Cut the full lane width $\frac{1}{8}$ inch wide and to the full joint depth as shown in the Contract Documents ($D/3 \pm 1/8$ inch).

(3) Longitudinal Joints. Locate the longitudinal joints as shown in the plans. Cut the longitudinal joint $\frac{1}{8}$ inch wide and to the full joint depth as shown in the Contract Documents ($D/3 \pm 1/8$ inch). Saw the longitudinal joints after sawing the transverse joints.

(4) Construction Joints. Make a tied butt construction joint perpendicular to the centerline of the pavement at the close of each day's work, or when the process of depositing concrete is stopped for a length of time sufficient for the concrete to take its initial set. Form this joint by using a clean header having a nominal thickness of 2 inches, and minimum cross-sectional area equal to pavement thickness by pavement width. Cut the header true to the crown of the finished pavement. Accurately set and hold the header in place in a plane at right angles to centerline and perpendicular to the surface of the pavement. Protect the top surface of the header with steel.

With approval of the Engineer, the Contractor may pave beyond the joint location a distance to maintain the line and grade. Saw the construction joint when the concrete has hardened. Drill holes for reinforcing tie bars and epoxy the bars in-place when shown on the Plans. Place fresh concrete against the previously placed concrete taking care to avoid injury to the edge. Vibrate the concrete to obtain an interlocking joint and prevent a honeycombed face of the joint. The additional concrete, removal of debris and other work created by this alternative is at the Contractor's expense.

Unless shown otherwise in the Contract Documents, do not place any construction joint within 5 feet of an expansion, contraction or other construction joint.

(5) Special Joint Construction. Construct special joints as shown in the Contract Documents or as ordered by the Engineer around drainage, utility and other structures located within the concrete pavement boundaries. Hold temporary forms securely in place during the concrete placement operation.

(6) Cleaning Joints. Immediately clean freshly cut sawed joints by flushing with a pressurized jet of water and other necessary tools to remove the resulting slurry from the joint and immediate area.

(7) Sealing Joints PCCP over HMA. If Contractor's sawing results in joints ¼ inch or wider, seal with hot type joint sealing compound at no additional cost to KDOT.

h. Hand Finishing. Keep hand finishing methods to a minimum. Generally, hand methods of placement and finishing will be permitted as follows:

- For pavement when a breakdown of some portion of the paving train occurs, making the hand finishing of that portion of the concrete already in place necessary.
- For pavement lanes that may be too narrow or a length too short to accommodate a full paving spread.
- For all irregular shaped areas.
- For special approach sections to bridges, widened portions at bridges, intersections and sections widened beyond traffic lanes.
- When the dimensions of the work make the use of a complete power operated paving impossible, or impracticable.

For uniform width areas or transition width areas using false forms, finish handwork with a mechanical finishing machine or approved vibrating screed, whenever possible.

Use spud hand vibrators on any area considered impracticable to vibrate with a vibrating screed. Approved metal or wood floats may be used if needed to help close an open or porous surface condition.

Continue the operation of consolidation and screeding or striking off the concrete until the concrete is uniformly consolidated and the surface is true to line, grade and cross-section.

After the pavement has been properly struck off, straightedge the pavement for trueness and finish it. Use a burlap drag to remove surface straightedge marks. The burlap drag may be pulled by hand, but the results shall be similar to that on the mainline pavement.

Manual methods may be used for texturing hand finished pavement areas. Where applicable, the tined texture applies. Use a metal comb with dimensions and spacing shown in **subsection 154.7c**. Obtain a finished textured surface similar to that produced mechanically.

On miscellaneous areas such as entrance pavement, median pavement and gore areas, texturing with the metal comb may be eliminated. Final finish may be attained by the use of a drag that consists of a seamless strip of damp burlap, cotton fabric or other suitable material capable of producing a uniform surface of gritty texture.

i. Protection and Curing of Concrete. Cure the pavement by using burlap, liquid membrane-forming compounds, white polyethylene sheeting, concrete curing blankets or reinforced white polyethylene sheeting. Failure to provide proper curing is cause for immediate suspension of the concreting operations.

(1) Burlap, Concrete Curing Blankets, White Polyethylene Sheeting and Reinforced White Polyethylene Sheeting.

Place the curing material on the pavement immediately after the pavement has been finished, and the concrete has hardened sufficiently to avoid harmful marring of the surface, yet early enough to prevent undue loss of moisture from the concrete. If the pavement becomes dry before the curing material is placed, moisten the concrete with a fine spray of water. Place burlap-polyethylene blankets with the dampened burlap side down. Dampen burlap and place on the surface. Keep burlap damp throughout the entire curing period.

Lap adjacent units of curing materials approximately 18 inches. Upon removal of the forms, extend the material to completely cover the full depth of the exposed pavement.

Weight the curing material down using continuous windrows of earth placed along the sides and edges of the pavement and transversely across the pavement on the laps to cause the material to remain in contact with the covered surface throughout the curing period. Other methods may be used with approval of the Engineer.

Walking on the pavement surface to place the curing material is prohibited. Walking on the curing material is prohibited until the pavement has cured sufficiently to prevent damage to the surface.

Leave the curing material in place for a minimum of 4 days, unless otherwise directed by the Engineer. Immediately repair any tears or holes appearing in the material during the curing period, or replace it with material in good condition.

The material may be reused, provided it is kept serviceable by proper repairs, and if in the judgment of Engineer it will provide water retention during the curing period.

(2) Liquid Membrane-Forming Compounds. After finishing operations have been completed and immediately after the free water has left the surface, completely coat and seal the surface of the panel with a uniform layer of white membrane curing compound. Apply the compound at a minimum rate of 1 gallon per 150 square feet of surface. After sawing, apply a second application at a minimum rate of 1 gallon per 150 square feet of surface. Thoroughly mix the curing compound at all times during usage. Do not thin the white membrane curing compound.

Protect the treated surface from injury a minimum of 4 days, unless otherwise directed by the Engineer. If the newly coated film is damaged in any way, apply a new coat of material to the affected areas equal in coverage to that specified for the original coat. A minimum of foot traffic will be permitted on the dried film as necessary to properly carry on the work, provided any damage to the film is immediately repaired by application of an additional coat of compound.

Immediately after the forms are removed (fixed form and slip form), coat the entire area of the sides of the panel with white membrane curing compound at the rate specified for the pavement surface, regardless of whether or not further concrete placement will be made against the pavement edge. Approved hand spray equipment will be permitted only for the application of curing compound on the sides of the panel, for repairing damaged areas and for hand finished areas. Repair any damaged areas caused by joint sawing.

(3) Opening to Traffic. No motorized traffic is allowed on the pavement until:

- The flexural strength of the pavement shall meet or exceed 450 psi. Determine the flexural strength of the pavement by testing flexural strength specimens utilizing the third point loading method, or by use of a calibrated maturity meter; or
- If testing is not done, observe a 4-day curing period before allowing motorized traffic on the pavement.

The Contractor may, at own expense, increase the cement content from the minimum shown in **DIVISION 400** to accelerate the strength gain of the PCCP.

(4) Cold Weather Curing. Maintain the concrete pavement at a minimum temperature of 40°F, as measured along the surface of the concrete, for a minimum of 4 days after placing. When the ambient air temperature is expected to drop below 35°F, anytime during the curing period, take precautions to maintain the concrete temperature. Keep a sufficient supply of approved moisture barrier material, other than liquid curing compound, and suitable blanketing material, such as straw, hay and burlap close by. Be prepared to cover the pavement with a moisture barrier and protect all pavement less than 4 days old with blanketing material. Remove, dispose of and replace concrete damaged by cold weather, as determined by the Engineer.

(5) Early Strength Concrete Curing. Provide a curing period that complies with the requirements specified for regular concrete pavement in **subsection 504.3i.(3)**.

j. Cold Weather Limitations. If concrete is placed in cold weather, comply with **DIVISION 400**.

k. Repair of Defective Pavement Panels. It is the responsibility of the Contractor to repair any spalled joints or cracked panels at no cost to KDOT.

Repair joint spalls that extend wider than ¼ inch but less than or equal to ½ inch from edge of initial saw cut plane with hot type joint sealing compound. Repair joint spalls that extend greater than ½ inch wide but less than or equal to 1" wide with epoxy patching material. Repair joint spalls that extend more than 1 inch" from edge of initial saw cut plane by making a saw cut a minimum of 1 inch outside the spalled area to a minimum depth of 2 inches. No individual patch of a spall is to be less than 1 square foot with no dimension less than 1 foot. Form interior angles by the intersection of adjacent sides of the patch with a minimum of 60°. When the spalled area abuts a joint, make the saw cut to a depth of 2 inches or 1/6 the panel thickness, whichever is greater. Chip out the concrete between the saw cut and the joint or primary crack to solid concrete. Do not use chipping hammers greater than 15 pounds. Thoroughly clean all loose material from the formed cavity. Apply a coat of an approved concrete bonding epoxy to the dry, cleaned surface of all sides of the cavity, except the joint. Apply the epoxy by scrubbing the material into the surface with a stiff bristle brush. Place portland cement concrete, epoxy resin concrete or mortar, immediately following application of the epoxy, according to the manufacturer's recommendations. If the spalled area to be patched abuts a working joint, use an insert or other bond breaking medium during the repair work to maintain working joints.

Replace any panel which is cracked from any edge to another adjacent or opposite edge. Saw the perimeter of the panel full depth through the original joint saw cuts. Remove the cracked panel without damaging the adjacent panels or the base pavement below. Remove saw slurry with jet of water and all loose material with high pressure air blast. Place paving concrete, consolidate, and finish the patched panel surface.

l. Protection of Pavement from Rain. Before placing PCCP, prepare and submit to the Engineer for approval, a Protection Plan to address the onset of rain during concrete placement. As a minimum, provide a plan that includes protective covering and side forms available at the project site at all times to protect the surfaces and edges of the newly placed concrete pavement. Polyethylene, burlap or other covering materials may be used. Side

forms may be of wood or steel and have a depth a minimum of the thickness of the pavement. Specify the location of the storage site in order that a review of the protective materials may be conducted by the Engineer.

Include the type and amount of protective materials as well as the methods proposed to protect the pavement.

When rain appears imminent, stop all paving operations and initiate the Protection Plan. Extend the covering back to the point where the rain will not indent the surface. Exercise care to prevent unnecessary damage to the surface with the covering.

m. Pavement Thickness and Tolerance. Make the required corrections for pavement smoothness before making the pavement thickness determinations. Thickness will be determined by average caliper measurements of cores taken by the Engineer. Random cores will be taken for each 1,000 square yard section paved per day. The 1,000 square yard sections will be calculated on a lane (9 to 15 feet width) basis for mainline paving, ramp driving areas, lane widenings, and acceleration or deceleration lanes. When sections would require taking cores with an area less than 250 square yards, include that area with the days full section. Sections with an area greater than 250 square yards will stand as individual sections. The Engineer will not include bridge deck wearing surfaces or bridge approach paving in the 1,000 square yard calculation. Cores will not be taken in gore areas, intersection curb returns, entrances, shoulders, median, widenings less than 5 feet in uniform width and irregular areas less than 500 square yards.

Cores will not be taken for projects with less than 2,500 square yards of concrete pavement.

Treat pavement less than the thickness specified in the Contract Documents as described in **TABLE 504-1**.

TABLE 504-1: PCCP THICKNESS (D) TOLERANCE	
Core Thickness in a Section (inch)	Action
Core measurement is 0.0 to 0.05D inches less than specified thickness.	Take no additional cores. Pay as per TABLE 504-2 .
Core measurement is >0.05D to 0.099D inches less than specified thickness.	Take 2 additional cores at random intervals a minimum of 200 feet apart and average. Note: If the measured thickness is greater than 0.05D + the specified thickness, the measured thickness value will be 0.05D + specified thickness, when calculating the average. Use the calculated average, and pay as per TABLE 504-2 .
Core measurement is a minimum of 0.10D inch less than the specified thickness.	Take exploratory cores on 10 foot intervals parallel to the centerline in each direction to define the length of deficient pavement. Deficient pavement for removal is any pavement less than the specified thickness minus 0.10D inch. Remove all deficient pavement identified in the exploratory cores and replace with pavement of satisfactory quality and thickness at own expense. When removing and replacing a length of pavement, and one end of the deficient pavement is less than the minimum plan joint dimension from an expansion, contraction or construction joint, remove and replace the entire pavement up to the joint. After the deficient area and removal and replacement area is defined, take an additional core at a random location within the section and apply subsection 504.3m . The replaced deficient pavement area will be included for pay in the section. For monetary deductions found in the measurement of the thickness cores, see subsection 504.4b .

n. Pavement Smoothness. Evaluate pavement smoothness for pay according to **SECTION 503**.

504.4 MEASUREMENT AND PAYMENT

a. Measured Quantities. The Engineer will measure milling and concrete placement by the square yard.

Provided the project is constructed essentially to the lines and grades shown in the Contract Documents, the theoretical quantities of bonded concrete pavement (cubic yard) shown in the Contract Documents will be the quantities for which payment is made. The Contractor can submit an alternate profile to the Engineer for approval. If the alternate profile is approved, the Engineer will use the theoretical quantities of bonded concrete pavement (cubic yard) shown in the alternate profile for payment.

b. Price Adjustments. When the average thickness of the pavement determined in **subsection 504.3m** is deficient by more than 0.05D inch based on the thickness required by the Contract Documents, a price adjustment for deficient concrete pavement thickness will be made according to **TABLE 504-2** for the entire section represented. Payment for "Concrete Pavement Thickness Deficiency" will be shown as an added item to the contract.

TABLE 504-2: PCCP DEFICIENCY PRICE ADJUSTMENT	
Deficiency in thickness as determined by cores (inches) D=PCCP Thickness	Percent of contract unit price for pay
0.00 to 0.05D	100
0.051D to 0.065D	75
0.066D to 0.080D	60
0.081D to 0.10D	40

c. General Payment. Payment for "Milling", "Concrete Placement" and "Bonded Concrete Pavement" with pay adjustments as specified above is full compensation for the work specified.

02-16-10 M&R (AJG)
Jun-10 Letting