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ITEM 502.91000004 - Constructing Transverse Joints
ITEM 502.91100004 - Constructing Longitudinal Joints
ITEM 502.92100004 - Sealing Transverse Joints – Highway Joint Sealant
ITEM 502.93100004 - Sealing Longitudinal Joints – Highway Joint Sealant

DESCRIPTION

Construct a portland cement concrete (PCC) pavement and shoulders, if required, as detailed in the contract documents.

MATERIALS AND EQUIPMENT

Portland Cement Concrete 501
Anchoring Materials - Chemically Curing 701-07
Highway Joint Sealants (ASTM D6690, Type IV) 705-02
Premoulded Resilient Joint Filler 705-07
Preformed Elastic Longitudinal Joint Seal 705-10
Preformed Elastic Transverse Contraction and Expansion Joint Seal 705-12
Lubricant for Preformed Elastic Joint Sealer 705-13
Longitudinal Joint Ties 705-14
Transverse Joint Supports 705-15
Wire Fabric for Concrete Reinforcement 709-02
Epoxy Coated Bar Reinforcement, Grade 60 709-04
Quilted Covers (for curing) 711-02
Plastic Coated Fiber Blankets (for curing) 711-03
Polyethylene Curing Covers (white opaque) 711-04
Membrane Curing Compound 711-05
Form Insulating Materials for Cold Weather Concreting 711-07
Water 712-01

In addition to meeting the requirements of §701-07, Anchoring Materials - Chemically Curing, the material used to anchor longitudinal joint ties, dowels, or other miscellaneous items into hardened concrete must be a pourable, two-component, 100% solids structural epoxy dispensed:
- From side-by-side cartridges by manual or pneumatically powered injection guns.
- Through a static mixing nozzle that homogeneously mixes the material without any hand mixing.

The Department may perform supplementary sampling and testing of the joint sealants. Deliver sealant in the manufacturer’s original sealed container legibly marked with the:
- Manufacturer’s name.
- Trade name of the sealant.
- Manufacturer’s lot or batch number.
- Pouring temperature.
- Safe heating temperature.

502-2.01 Concrete. Use Class C concrete furnished in accordance with Section 501, Portland Cement Concrete – General, when specified. High-Early-Strength (HES) concrete, meeting the requirements of §502-2.02, may be substituted for closure or short placements, subject to the Engineer’s approval.
502-2.02 High-Early-Strength (HES) Concrete. Use HES concrete where required in the contract documents or where the Contractor’s request to use HES concrete is approved by the Department. Whether required or requested, design the HES mix to satisfy the opening to traffic time requirements of the project and Table 502-1, High-Early-Strength Concrete Mix Requirements. Submit the HES concrete mix design to the Engineer. Include admixture brands and dosages as well as mixing, transporting, placing, paving, curing, and anticipated strength gain details.

Produce and place a 4.0 cy (minimum) trial batch at an off-contract location selected by the Contractor and agreed upon by the Engineer. Produce the trial batch using the same materials and processes as those to be used to produce concrete for the contract. Provide the Engineer a 7-day minimum advance notification of trial batch production. Produce and place the trial batch in the presence of the Engineer, the Regional Materials Engineer, and Materials Bureau personnel.

Provide an American Concrete Institute (ACI) Certified Concrete Field Testing Technician, Grade I, or higher, to:

• Measure slump, air content, and unit weight of the trial batch.
• Cast cylinders from the trial batch for compressive strength and freeze-thaw resistance testing.

Determine the compressive strength of the concrete at the desired time as discussed in §502-3.18C, Project Strength Determination.

The Materials Bureau will render a decision on mix acceptability, curing, and opening to traffic requirements within 45 calendar days of trial batch production. Changes other than minor fluctuations in admixture dosage rates require a new mix design and trial batch. The Engineer will reject the concrete if the specified plastic air content is not achieved. The Engineer may halt paving and order additional trial batches whenever the specified compressive strength requirements are not achieved.

<table>
<thead>
<tr>
<th>TABLE 502-1 HIGH-EARLY-STRENGTH CONCRETE MIX REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
</tr>
<tr>
<td>28 Day Compressive Strength</td>
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<tr>
<td>Opening Compressive Strength</td>
</tr>
<tr>
<td>Freeze-Thaw Loss (Test 502-3P, 3% NaCl)</td>
</tr>
<tr>
<td>Plastic Air Content</td>
</tr>
<tr>
<td>Water – Cement Ratio (w/c)</td>
</tr>
</tbody>
</table>

NOTES:
1. See §502-3.18, Opening to Traffic.
2. Minimum slump provided the mix consolidates and finishes properly. Maximum slump provided the mix is nonsegregating.

502-2.03 This subsection is intentionally blank.

502-2.04 Equipment. Provide the Engineer with an equipment list and specifications a minimum of 14 days prior to the planned start of PCC paving. Bring all equipment needed to place, consolidate, finish, texture, cure, saw cut, seal, and test the PCC pavement and permeable base to the job site a minimum of 1 full work day before its use to allow examination by the Engineer. Repair or replace any equipment found to be defective before or during its use. Discontinue any operation if unsatisfactory results are being obtained. Use of equipment other than described below is subject to the approval of the Director, Materials Bureau.
A. Slipform Paving. Slipform paving consists of a single paver, or a placer/spreader followed by a separate paver, capable of placing, spreading, consolidating, screeding, and finishing the concrete such that hand finishing is kept to a minimum. Use a self-propelled slipform paver equipped with:
- Rigid side forms that laterally support the concrete and minimize edge slumping.
- A full-width finishing pan.
- Attached internal vibrators capable of consolidating the entire concrete placement.
- Use equipment guided by a reference system that ensures the pavement is placed to the specified line, grade, and cross section.

B. Fixed Form Paving

1. Forms. Use straight forms without horizontal joints meeting Table 502-2, Form Requirements, and equipped with:
- At least 3 stake pockets spaced 3 feet apart (maximum), each having a positive, nondetachable wedge.
- Positive, interlocking devices capable of holding abutting sections together to form neat, tight joints.

<table>
<thead>
<tr>
<th>TABLE 502-2 FORM REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Characteristic</strong></td>
</tr>
<tr>
<td>Material</td>
</tr>
<tr>
<td>Length</td>
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<tr>
<td>Depth</td>
</tr>
<tr>
<td>Base Width</td>
</tr>
<tr>
<td>Horizontal Top Face</td>
</tr>
<tr>
<td>Vertical Face</td>
</tr>
<tr>
<td>Flange Bracing</td>
</tr>
</tbody>
</table>

Flexible, curved, or wooden forms may be used in irregular areas or curved sections having horizontal radii of 100 feet or less.

2. Paving Equipment. Use fixed form paving equipment specifically made for placing concrete. The equipment must be capable of placing, spreading, consolidating, screeding, and finishing the concrete to the specified line, grade, and cross section such that hand finishing is kept to a minimum. Use equipment with either attached internal vibrators or in conjunction with hand-held internal vibrators.
C. Vibrators. Use paver-mounted internal vibrators capable of consolidating the entire concrete placement that are:
- Capable of being shut off without shutting off the paver.
- Equipped with frequency controls readily accessible to the paver operator.
- Capable of simultaneously operating at the same frequency as the other paver-mounted vibrators.
- Capable of operating through a frequency range of 6,000 - 10,000 vibrations per minute.

Check vibrator operating frequencies daily when paving begins. Check frequencies under load with the Engineer present. If the paver is not equipped with direct-read frequency gauges for each vibrator, supply the Engineer with a calibrated, hand-held tachometer, including instructions, to monitor vibrator frequencies. The tachometer will remain the Contractor’s property after paving is complete.

Use hand-held vibrators capable of operating through a frequency range of 6,000 - 10,000 vibrations per minute in any location that is not consolidated by internal vibrators attached to the paving equipment.

D. This subsection is intentionally blank.

E. Saw Cutting Equipment. Use diamond blade saws capable of making straight cuts to the dimensions depicted in the Standard Sheets that are equipped with cutting guides, blade guards, water cooling systems, dust controls, and cut depth control.

Maintain equipment and supplies to ensure uninterrupted saw cutting. Early entry saws require approval from the Director, Materials Bureau. Submit requests to use early entry saws at least 7 calendar days before paving.

F. Curing Compound Applicators. Use atomizing mechanical sprayers capable of exerting consistent pressure without hand pumping that are equipped with tank agitators to continuously mix the curing compound. Use nozzles with spray shields to prevent drift. Flush nozzles daily before use.

Maintain equipment and supplies, including extra nozzles, to ensure uninterrupted curing compound application. In a slip form paving operation, use self-propelled applicators guided by the same reference system as the slip form paver. In a fixed form operation, applicators need not be self-propelled.

G. The subsection is intentionally blank.

H. Diamond Grinding. Use equipment having gang-mounted diamond saw blades on a multiblade arbor specifically designed for pavement bump cutting or production grinding. When production grinding, use equipment capable of producing a 4 foot (minimum) grinding pass width that is equipped with a vacuum system capable of removing slurry from the pavement surface. Use blade spacers having a minimum thickness of 0.105 inches. Inform the Engineer of the spacer thickness selected.
I. Drills. Use gang drills with a minimum of 2 independently powered and driven drills. Use tungsten carbide drill bits. Rest and reference the drill rig frame on and to the pavement surface such that the drilled holes are cylindrical, perpendicular to the surface being drilled, and repeatable in terms of position and alignment. Hand-held drills are permitted for drilling holes in longitudinal joints if there is not enough room to use gang drills resting on the pavement surface.

J. The subsection is intentionally blank.

K. Joint Sealing - Highway Joint Sealant. Heat the sealant in a melter constructed either:
   - As a double boiler with the space between inner and outer shells filled with oil or other heat-transfer medium.
   - With internal tubes or coils carrying the sealant through a heated oil bath and into a heated double-wall hopper.

   Do not use direct heating. Use a melter capable of maintaining the sealant’s pouring temperature and providing homogeneous sealant equipped with:
   - Positive temperature control.
   - Continuous full sweep mechanical agitation.
   - Separate thermometers indicating the temperatures of the heat transfer medium and the sealant in the hopper. Do not place any sealant if the thermometers are defective or missing.

   Provide 2 thermometers having stems 18 inches long and temperature ranges sufficient to meet the requirements of this specification. Use a discharge hose equipped with a controlled heating apparatus or sufficiently insulated to maintain the proper sealant pouring temperature. Use nozzles that apply the joint sealant within the joint confines for the full width and depth of the joint.

L. Air Blasting Equipment. Use equipment with traps or other installed devices that prevent moisture and oil from contaminating the concrete surface. Use a compressor that delivers air at a minimum of 120 cfm and develops a minimum nozzle pressure of 90 psi. Check the compressed air stream purity daily with a clean white cloth.

CONSTRUCTION DETAILS

Convene a prepave meeting 7 to 14 days before the planned start of paving with the Engineer and any PCC paving and saw cutting subcontractors to coordinate all aspects of paving and inspection, including equipment review, construction methods, and time and personnel requirements.

Construct a smooth, well consolidated, properly finished, textured, and cured pavement to the line and grade depicted in the contract documents, ± 1/4 inch vertically at any location.

502-3.01 Weather Limitations

A. Rain. Do not pave in the rain. Supply sufficient quilted covers, plastic coated fiber blankets, or polyethylene curing covers near the paving operation when rain may be expected. Securely cover any concrete exposed to rain that has not reached initial set or will be visibly affected by the rain.
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B. Cold Weather. Place concrete when the air temperature is 40°F and rising, or warmer, and when
the surface temperature of the area to be paved is 40°F, or warmer. Stop paving when the air
temperature falls below 40°F. Measure temperatures in the shade to an accuracy of 1°F. Refer to
§502-3.11C, Cold Weather Curing.

502-3.02 Subbase Course. Furnish in accordance with Section 304, Subbase Course, before placing any
PCC. If the area is available, extend the prepared subbase course at the same line, grade, and cross slope
as the area being paved such that it is at least:
• 3 feet beyond the longitudinal edges of a slipform pavement.
• 1 foot beyond the outside longitudinal edges of the fixed forms.

Additional subbase course that is not included in the finished work will be paid for under Section
304 items included in the contract.

502-3.03 This subsection is intentionally blank.

502-3.04 Slipform Paving. Use equipment meeting §502-2.04A, Slip Form Paving. Establish a
reference system to achieve the specified smoothness level. If string lines are used, set them by survey
and use dual lines whenever possible.

Maintain uniform concrete quality and head in front of the paver. Coordinate concrete delivery to
maintain continuous forward movement of the paver and avoid excessive delivery truck queues. Keep
paver tracks clear of concrete and debris before and during paving.

Wet the entire subbase surface without forming puddles or mud immediately before placing
cement.

Consolidate the entire concrete placement using internal vibrators attached to the machine.
Combine paver forward speed, vibrator frequency, and vibrator depth to consolidate the concrete without
segregation, vibrator trails, or contacting the joint assemblies. Discontinue vibration and tamping if the
paver stops.

Determine edge slump by extending a 2 foot (minimum) long straightedge over the longitudinal
pavement edges. Immediately correct edge slumps greater than 1/4 inch that are between concrete
placements and greater than 3/8 inch at free edges and HMA shoulders.

502-3.05 Fixed Form Paving.

A. Setting Forms. Use forms meeting §502-2.04B1, Forms. Compact the supporting layer at the
form line such that the forms are supported for their full length. Set forms to string lines placed at the
pavement elevation, line, and grade and to achieve the specified smoothness. If a form sits above
the string line, remove the form and trim the form line to the proper grade. If a form sits below string
line, remove the form and fill and compact the low area with granular material at least 6 inches on
both sides of the form. Frequently check form grade and alignment while paving. Reset forms as
necessary.

Set forms to accommodate a full days paving before placing concrete. Extend forms beyond
construction bulkheads to provide a working platform at the end of a placement. Secure each form
with a minimum of 3 pins each of sufficient length to hold the forms in place without movement
during any operation. Lock the forms together such that the form ends are aligned and the joints are
tight and smooth. Run the paving equipment atop the forms before placing any concrete and recheck form alignment. Reset forms as necessary.

Align keyway strips in a smooth, horizontal plane, parallel to the top of the form. Match keyway strips on abutting forms such that a nearly seamless keyway results.

B. Paving. Use equipment meeting §502-2.04B2, Paving Equipment. Apply oil to forms before placing concrete. Immediately before placing concrete, wet the entire subbase surface without forming puddles or mud. Uniformly distribute the concrete in front of the paver by maneuvering the delivery truck chute. If concrete is spread by hand, use come-alongs or shovels. Do not use rakes or hand-held vibrators to spread concrete.

Maintain uniform concrete quality and head in front of the paving machine and without running over the screeds. Coordinate concrete delivery to maintain continuous forward movement of the paver and avoid excessive delivery truck queues. Keep form tops clean before and during paving. Consolidate the entire concrete placement using internal vibrators attached to the paver. Combine paver forward speed, vibrator frequency, and vibrator depth to consolidate the concrete without segregation, vibrator trails, or contacting the joint assemblies. Discontinue vibration and tamping if the paver stops.

Use hand-held vibrators ahead of the paving equipment to consolidate all concrete not consolidated by machine-mounted internal vibrators. Keep hand-held vibrators perpendicular to the pavement surface. Vibrate between 2 and 4 seconds in each location, overlapping adjacent locations. Do not drag vibrators through the concrete. Do not walk through consolidated concrete.

Mark the midpoint (± ½ inch) of each transverse contraction joint such that the saw cut operator can accurately locate the first-stage saw cut locations.

C. This subsection is intentionally blank.

D. Form Removal. Remove forms after the concrete has developed sufficient strength to allow removal without damaging the pavement. Repair pavement damaged during form removal. Remove forms before making second-stage saw cuts.

502-3.06 Joint Construction. Provide the Engineer approved Materials Details for longitudinal joint ties and transverse joint supports before placing any joint hardware. Construct joints in accordance with the Standard Sheets and approved Materials Details. Do not stand on joint hardware.

Base final joint layout on construction staging and the actual location of utilities, drainage structures, intersections, tapers, and other irregular areas. Submit a proposed joint layout to the Engineer at least 10 calendar days prior to PCC paving. Obtain the Engineer’s joint layout approval before paving. Inserting dowels and/or longitudinal joint ties into plastic concrete will be considered in accordance with the written procedures of the Materials Bureau. Submit a plan to verify dowel and tie locations, depth, and alignment. Do not insert dowels or ties until the plan is approved by the Engineer.

Make second-stage saw cuts and bevels, clean, and seal joints in accordance with §502-3.12, Sealing Joints.
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A. Transverse Joints. Transverse joints include contraction, expansion, hinge, and construction joints. Secure joint supports to the subbase as depicted in the Materials Details. Maintain joint supports in their proper position and alignment during paving.

Construct transverse joints perpendicular to both the pavement surface and longitudinal joints in the area being paved. Use a 15 foot typical transverse joint spacing for pavements having standard slab widths of 12 and 14 feet. For pavements having other slab widths, determine typical maximum and minimum transverse joint spacings in accordance with the following:

\[
\begin{align*}
L_{\text{max}} &= W_{\text{min}} \times 1.33 \\
L_{\text{min}} &= W_{\text{max}} \div 1.33
\end{align*}
\]

where:

\begin{align*}
L_{\text{max}} &= \text{maximum transverse joint spacing (slab length)} \\
L_{\text{min}} &= \text{minimum transverse joint spacing (slab length)} \\
W_{\text{max}} &= \text{maximum slab width across the pavement (load carrying slabs only)} \\
W_{\text{max}} &\leq 15 \text{ feet} \\
W_{\text{min}} &= \text{minimum slab width across the pavement (load carrying slabs only)}
\end{align*}

1. Transverse Contraction Joints. All transverse joints are contraction joints unless otherwise shown in the contract documents. Contraction joints are constructed in a straight line across the full width of the PCC pavement and shoulders. Contraction joints may be slightly angled (rather than straight across a pavement) at tied longitudinal joints between lanes placed separately if the placements do not have the same centerline, e.g., where a ramp centerline diverges from parallel to the pavement centerline. Contraction joints may terminate at, or be misaligned at, untied longitudinal joints as discussed in §502-3.06B3, Untied Longitudinal Joints with Keyway.

Store transverse contraction joint support assemblies in inverted stacks at the project site. Cover epoxy coated steel such that it is protected from direct sunlight. Handle joint supports such that no twisting or bending occurs during storage and positioning. Supports with bent, twisted, or deformed wires will be rejected.

Before placing concrete, position transverse joint supports such that the:

- Entire longitudinal axis of each dowel is located at the mid-depth of the pavement slab or up to 1 inch below the mid-depth of the slab.
- Longitudinal axes of the dowels are aligned parallel with the pavement centerline and pavement surface such that the maximum misalignment of one dowel end relative to the other is ¼ inch.
- Midpoint of the longitudinal axis of each dowel is at the center of the joint (±1 inch).
- Longitudinal axes of the two end dowels are 4 to 8 inches from the longitudinal joints.
- Longitudinal axes of the dowels are spaced 4 to 12 inches apart.

Mark the location of each transverse joint on the subbase before placing concrete such that the assembly is properly positioned. Also mark the longitudinal midpoints of the dowels such that the saw cut operator can accurately locate first-stage saw cuts. In a slipform paving operation, mark the joint support midpoint on the subbase immediately adjacent to the pavement. In a fixed form paving operation, mark the joint support midpoint on the form or such that the saw cut operator can easily locate the joint midpoint. Do not cut the shipping wires.
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Use saws meeting §502-2.04E, Saw Cutting Equipment. Make first-stage saw cuts as soon as the concrete has hardened sufficiently to permit sawing without causing raveling wider than 1/8 inch. Replace blades if raveling persists. Center first-stage saw cuts within 1 inch of the longitudinal midpoints of the dowels.

Complete first-stage saw cuts before any uncontrolled cracking occurs. Be prepared to make first-stage saw cuts 24 hours a day to prevent uncontrolled cracking. Provide lighting required to make first-stage saw cuts at night at no additional cost to the State.

Sweep or wash first-stage saw cut debris from the pavement before profiling, before it rains, or before opening the pavement to any traffic, such that debris does not enter the joint.

2. Transverse Expansion Joints. Construct transverse expansion joints as part of the utility and drainage structure isolation systems depicted in the Standard Sheets or where indicated in the contract documents. Handle and position expansion joint supports in accordance with §502-3.06A1, Transverse Contraction Joints.

Construct expansion joints using 3/8 to 5/8 inches thick premoulded resilient joint filler placed in 1 piece between longitudinal joints. Tightly place and support abutting sections of joint filler such that no concrete infiltrates the joint. Place expansion caps on the dowels as depicted in the Materials Details. Do not tap or hammer the caps onto the dowels.

No saw cuts are required in expansion joint construction. Remove the finishing cap, if supplied, after the concrete has developed sufficient strength to prevent damage.

3. Transverse Construction Joints. Construct transverse construction joints wherever there is an interruption of more than 30 minutes in concrete paving operations. Construct these joints as wide as the concrete placement, typically 1 or 2 lanes, but not necessarily the full pavement width. Align construction joints with transverse contraction or construction joints in adjacent lanes.

<table>
<thead>
<tr>
<th>Planned or Unplanned</th>
<th>Paving Method</th>
<th>Adjacent Pavement</th>
<th>Joint Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned</td>
<td>Slip Form</td>
<td>No</td>
<td>Saw Cut or Bulkhead</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>Bulkhead</td>
</tr>
<tr>
<td>Fixed Form</td>
<td></td>
<td>No</td>
<td>Saw Cut or Bulkhead</td>
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<td></td>
<td></td>
<td>Yes</td>
<td>Bulkhead</td>
</tr>
<tr>
<td>Unplanned</td>
<td>Slip Form</td>
<td>No</td>
<td>Saw Cut</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>Removal</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>Removal</td>
</tr>
</tbody>
</table>

a. Bulkheads. Bulkheads may be slotted or solid. Place a slotted bulkhead over the dowels of an exposed joint assembly such that half of the dowel lengths are embedded within newly placed concrete. Immediately remove plastic concrete in front of the bulkhead and from the exposed joint support.

The transverse joint assembly may be omitted and a solid bulkhead may be used. In this case, drill and anchor dowels, if required, into the transverse joint in accordance with §502-
3.06D, Drill and Anchor Dowels or Ties, such that they meet the positioning requirements of §502-3.06A1, Transverse Contraction Joints. In either case, ensure the bulkhead is capable of supporting the weight of the plastic concrete.

b. *Saw Cut.* Saw cut full depth construction joints at locations that satisfy the minimum and maximum slab length requirements of §502-3.06A, Transverse Joints. Saw cut when the concrete has obtained sufficient strength to be saw cut without damage to concrete to remain in place. Do not cut within 12 inches of a longitudinal joint tie. Remove the hardened concrete ahead of the saw cut. Drill and anchor dowels, if required, into the saw cut face in accordance with §502-3.06D, Drill and Anchor Dowels or Ties, such that they meet the positioning requirements of §502-3.06A1, Transverse Contraction Joints. Do not drill into longitudinal joint ties.

In lieu of drilling holes, the contractor may use transverse joint supports fabricated with closed-end, hollow plastic cylinders instead of dowels. Use hollow cylinders with outer diameters equal to the drilled hole diameters described in §502-3.06D, Drill and Anchor Dowels or Ties. Position cylinders as required in §502-3.06A1, Transverse Contraction Joints. Saw cut the newly placed concrete full depth and full width through the midpoint of the longitudinal axis of each cylinder (± 1 inch). Remove hardened concrete and the joint assembly ahead of the saw cut. Remove the hollow cylinder embedded in the concrete that remains and anchor the dowels in accordance with §502-3.06D, Drill and Anchor Dowels or Ties, to the required alignment in §502-3.06A1, Transverse Contraction Joints.

c. *Removal.* Remove all concrete to the midpoint of the preceding transverse joint without damaging the dowels, dowel coatings, or the pavement to remain in place.

4. *Transverse Hinge Joints.* Do not place hinge joints without the Engineer’s approval. Construct transverse hinge joints when a slab length exceeds the geometric requirements of §502-3.06, Transverse Joints. (This situation typically occurs near structures that are skewed from perpendicular to the pavement centerline.)

Locate hinge joints such that they are equally spaced between other types of transverse joints. Construct hinge joints in accordance with 502-3.06A1, Transverse Contraction Joints, except the positioning requirements do not apply. Instead, position transverse hinge joint supports such that the:
- Entire longitudinal axis of each deformed bar is located at the mid-depth of the pavement slab or up to 1 inch below the mid-depth of the slab.
- Longitudinal axes of the bars are aligned parallel with the pavement centerline and pavement surface such that the maximum misalignment of one bar end relative to the other is 1 inch.
- Midpoint of the longitudinal axis of each bar is at the center of the joint (±1 inch).
- Longitudinal axes of the two end bars are 4 to 10 inches from the longitudinal joints.
- Longitudinal axes of adjacent bars are spaced 4 to 18 inches apart.
B. Longitudinal Joints. When required, select tie type, size, spacing, and positioning in accordance with the contract documents. Provide a minimum clearance of 3 inches between the end ties in a slab and any part of the transverse joint support. Keep ties free of materials that inhibit bonding to concrete or anchoring material. Maintain ties in their proper position during paving.

Eliminating a longitudinal joint (and subsequent sawing and sealing) between a shoulder and adjacent lane is optional provided (1) the lane and shoulder are paved simultaneously and (2) the resulting slabs meet the geometric requirements detailed in §502-3.06A, Transverse Joints.

It is highly desirable to align longitudinal joints with the permanent pavement markings. Tied longitudinal joints located in the wheelpaths of the completed pavement will require additional ties.

1. Longitudinal Joints Between Lanes Paved Simultaneously. Use one-piece ties fabricated into assemblies capable of securely holding 2 or more ties. Secure the assemblies to subbase prior to paving in accordance with the Materials Details.

Make first-stage saw cuts parallel to the pavement centerline and perpendicular to the pavement surface before uncontrolled cracking occurs. Use equipment specified in §502-2.04E, Saw Cutting Equipment. Replace saw blades if raveling wider than 1/8 inch occurs. Center first-stage saw cuts within 1 inch of the longitudinal midpoint of the ties.

Sweep or wash first-stage saw cut debris from the pavement before profiling, before it rains, or before opening the pavement to any traffic, such that debris does not enter the joint.

2. Tied Longitudinal Joints Between Lanes Paved Separately. In a slip form operation, construct a butt joint and drill and anchor one-piece ties into the hardened concrete in accordance with §502-3.06D, Drill and Anchor Dowels and Ties.

Use #6 ties, 28 inches long between travel lanes and 18 inches long between a travel lane and a PCC shoulder. Anchor ties between travel lanes 12 inches into the previously placed concrete, leaving 16 inches projecting from the joint face. Anchor ties between a travel lane and a PCC shoulder 8 inches into the previously placed concrete, leaving 10 inches projecting from the joint face.

Place end ties in a slab 12 to 14 inches from the transverse joint. Typically, space ties between the end ties 24 inches apart, maximum. Pavements having 4 or more tied lanes, or 3 lane pavements 12 inches (or more) thick, may require a decreased spacing in accordance with the contract documents.

In a fixed form operation, construct either a butt or a keyed joint. If a butt joint is constructed, drill and anchor longitudinal joint ties as described above. If a keyed joint is constructed, use multiple-piece ties. Apply a corrosion inhibiting coating to the threads of all components before assembly. Bolt the female portion of the tie to the form prior to paving as depicted in the Standard Sheets. Insert and tighten the male ends before paving the adjacent lane. Ensure all threaded connections are tight.

First-stage saw cuts are not required between lanes paved separately.

3. Untied Longitudinal Joints with Keyway. Construct untied longitudinal joints with keyways at utilities and/or drainage structures, at intersections, between adjacent lanes having non-parallel center lines (such as ramps), or where indicated in the contract documents. Form as depicted in the Standard Sheets. Transverse joint type, location, and alignment may be changed when a transverse joint intersects an untied longitudinal joint.
Patch honeycombing along the untied longitudinal joint face to achieve a smooth surface prior to applying the bond breaker and placing the adjacent concrete. First-stage saw cuts are not required.

C. Utility and Drainage Structures and Telescoping Manholes.

Detail jointing around each utility and drainage structure in the proposed joint layout submitted to the Engineer for approval. When possible, do not isolate, or “box out,” utilities and drainage structures from the pavement. Instead, set and center utilities and drainage structures between transverse joints. Use a minimum slab length, $L_{\text{min}}$, as defined in §502-3.06A, Transverse Joints. Reinforce the slab that contains the structure. Select reinforcement size and spacing such that:

$$A_s \geq 0.0018(s)(t)$$

where:

- $A_s$ = Area of a steel bar (in²)
- $s$ = Spacing of steel bars (in). Minimum 3” clearance between bars.
- $t$ = Slab thickness (in)

Use mat reinforcement with steel in both directions. Use top and bottom double mat reinforcement for slabs thicker than 10”. Refer to the Standard Sheet for mat reinforcement placement locations. Pave the slab with the structures at the same time as the surrounding pavement. When using telescoping manholes, remove temporary support bolts from the telescoping manhole casting as soon as the concrete hardens.

D. Drill and Anchor Dowels or Ties. Use drills meeting §502-2.04I and chemically curing anchoring material meeting §701-07. Do not drill holes until the concrete has developed sufficient strength to withstand drilling without damage. Damage from drilling will be treated in accordance with §502-3.14, Damaged or Defective Concrete.

Drill such that the hole diameters are in accordance with the anchoring material manufacturer’s written recommendations. Give those recommendations to the Engineer before drilling any holes. Replace worn bits when necessary to ensure the proper hole diameter is drilled.

Follow the anchoring material manufacturer’s written recommendations for cleaning the holes. Give those recommendations to the Engineer. As a minimum, clean the drilled holes with compressed air using equipment meeting 502-2.04L, Air Blasting Equipment. Insert the nozzle to the back of the hole to force out all dust and debris.

When using new cartridges of anchoring material, ensure the initial material exiting the nozzle appears uniformly mixed. If it is not uniformly mixed, waste the material until uniformly mixed material extrudes.

Place the anchoring material in the back of the hole using a nozzle of sufficient length. Push the dowel or tie into the hole while twisting such that the air pocket within the hole is heard to burst and the anchoring material is evenly distributed around the bar. Use sufficient amounts of anchoring material such that it slightly extrudes out the hole as the bar is inserted.
502-3.07 Paving Adjacent To Existing Concrete. Wherever paving equipment operates on existing PCC pavement that is to remain, install bolt-on track covers or rubber tired, flangeless wheels. Remove all debris on the existing PCC pavement in the equipment track. Immediately remove any concrete that spills onto the existing concrete.

When paving from (or to) a transverse construction joint or intersecting pavement, use hand-held vibrators to thoroughly consolidate any concrete inaccessible to the paving equipment vibrators. Hand finish these areas with the minimum effort required to produce an acceptable surface. Do not dump the grout box head into the pavement concrete when approaching a construction joint.

502-3.08 Plastic Thickness Determination. Provide the Engineer with a round, rigid, nonaluminum probe, having a 1/8 inch ± 0 diameter. The Engineer will determine the plastic concrete thickness by inserting the probe and measuring the insertion depth. The Engineer will check thickness at least every 150 feet of paving and at least 2 feet from the placement edge. Keep several probes at the project.

The minimum measured plastic thickness must be equal to (-1/4 inch) or greater than the thickness required in the contract documents. Areas not meeting minimum thickness will be treated in accordance with §502-3.14, Damaged or Defective Concrete. If 2 consecutive measurements do not meet minimum thickness, stop paving and reestablish the paving operation to achieve acceptable thickness.

502-3.09 Finishing. Mechanically finish the pavement after consolidation and strike off. Use machine mounted finishers such as full-width finishing pans, transverse oscillating screeds, longitudinal floats, pan floats or separate pieces of equipment such as tube floats. Correct bumps with a 16 foot straight edge or bump cutter specifically made for finishing concrete.

After mechanical finishing, hand finish the pavement to correct and seal minor imperfections. Provide an ACI certified concrete flatwork finisher to supervise all hand finishing. Provide proof of ACI flatwork certification to the Engineer. Hand finish with magnesium floats, lutes, and/or trowels. Keep hand finishing to a minimum. Do not use excess mortar or discarded concrete to fill low areas. Use work bridges to hand finish concrete inaccessible from the pavement edge. Do not add water to the concrete surface to close imperfections. Stop paving or reformulate the concrete mix if surface imperfections that require additional water to close routinely occur.

502-3.10 Texturing. Immediately after finishing and prior to applying the curing compound, texture the concrete surface using one of the following procedures in accordance with the contract documents. Apply longitudinal tining if no texturing method is designated in the contract documents. If the contract has a closed drainage system, provide a 8 - 12 inch blank in the texture along the pavement edges to enhance drainage to catch basins.

A. Longitudinal Tining. Texture the concrete parallel to the pavement centerline with a set of evenly spaced spring steel tines. Use rectangular tines 1/8 inch wide, 1/32 inch thick, and approximately 5 inches long at a center-to-center spacing of 3/4 inches.

Operate the tine head manually or mechanically. In either case, hold the tines as near an angle of 45° to the concrete surface as possible to minimize mortar dragging. Produce tine texture 1/16 - 1/8 inch deep with minimal dislodging of aggregate. Do not make multiple tine passes in the same area. Keep tines 2 - 4 inches from the placement edges. Keep the tines free of hardened concrete.
B. Artificial Turf Drag. Use a seamless strip of artificial turf drag appearing on the Department's Approved List entitled “Turf Drag” under “Equipment, Concrete Related.” Produce a consistent texture, free of ridges or gouges, parallel to the pavement centerline either by hand or by attaching a weighted strip to the paver, texture/cure machine, or work bridge. Periodically replace or clean the drag to remove hardened concrete paste that compromises texture.

502-3.11 Curing. Keep the curing operation close to the texturing operation such that concrete is cured immediately after it is textured. The Engineer may stop paving if curing lags. Cure Class C concrete placed between June 1 and September 15 for 4 days, minimum. Cure Class C concrete placed between September 16 and May 31 for 6 days, minimum. Cure HES or other alternate mixes concrete in accordance with Materials Bureau requirements based on the Contractor-submitted mix design and the trial batch evaluation.

A. White Pigmented Membrane Curing Compound. Typically, cure concrete with white pigmented membrane curing compound. Use equipment meeting §502-2.04F, Curing Compound Applicators. Mix the curing compound before each use and continuously agitate during use. Thoroughly and uniformly coat all exposed surfaces (including slipformed edges and formed edges immediately after form removal) at a minimum rate of 150 sf/gal such that the coated surfaces are completely white. Check the application rate after every paving day, including exposed vertical slab faces in the calculations. Apply the curing compound in 2 opposite direction passes with no longer than 15 minutes between passes.

Immediately reapply curing compound to any damaged coating areas during the curing period. During curing equipment breakdown, cure the pavement in accordance with §502-3.11B, Curing Covers. Do not apply curing compound in the rain. If rain damages the curing compound before it sets, reapply curing compound after the pavement surface dries.

B. Curing Covers. Use of curing covers is subject to the approval of the Engineer. Use quilted covers, plastic coated fiber blankets, or polyethylene curing covers. Do not use covers with tears or holes. Cover all exposed surfaces and extend the covers a minimum of 12 inches beyond the pavement edges or beyond the forms, when used. Overlap successive covers 12 inches, minimum. Secure the covers to keep them in contact with the entire surface and maintain the overlap. Wet the entire surface of quilted covers and maintain them in a wetted condition throughout the curing period.

C. Cold Weather Curing. Supply form insulating materials for winter concreting when the air temperature is expected to fall below 40°F at any time during the curing period. Use material capable of maintaining a surface temperature of 55°F and being easily removed and replaced to accommodate first-stage saw cuts. Apply the insulating material to prevent newly placed concrete from being exposed to air temperatures below 35°F for the curing period. Secure the insulation tight to the concrete surface to prevent air intrusion beneath the insulation. Extend the insulation 12 inches beyond the newly placed concrete. Insulate the pavement vertical edge and/or forms as well.

Place recording surface thermometers between the pavement surface and insulating material 12 inches from one of the placement edges wherever insulation is used. Use 4 equally spaced thermometers for each day’s paving. Do not subject the concrete to a temperature drop in excess of 50°F during the first 24 hours after removing the insulation.

First-stage sawcuts may be temporarily left unfilled if a placement is only subjected to occasional construction traffic, such as pickup trucks or cars. In this case, sweep the pavement to ensure debris does not enter the joints.

Temporarily fill unsealed first-stage cuts with jute or backer rod if a placement is:

- Subjected to consistent construction traffic.
- Used as a haul road for subsequent concrete placements.
- Temporarily opened to general traffic while final sealing has been delayed for convenience, such as to maximize sealing production.

Before cleaning, remove any temporary fillers and repair damaged joints in accordance with §502-3.14, Defective or Damaged Concrete, including chipped joints resulting from debris accumulation in an unfilled or unsealed joint.

A. Sealing Transverse and Longitudinal Joints - Highway Joint Sealant. Widen joints to 1/4 - 3/8 inch for a depth of 1 inch if the first-stage saw cuts are less than 1/4 inch wide to allow full-depth sealing. Immediately wash the widening cut slurry from the pavement such that it does not reenter the joint.

Clean the joints by abrasive blasting immediately before sealing. Keep the nozzle within 2 inches of the joint surfaces. The Engineer may allow pressure washing in lieu of abrasive blast cleaning if it is not allowed in the contract. When pressure washing, use (1) a 900 psi minimum pressure and (2) a maximum pressure such that no damage occurs to the concrete. Manually dislodge debris remaining in the joint after cleaning, and reclean the joint. Immediately after pressure washing, air blast the joint to remove any debris from the cut and dry the exposed faces.

Do not allow any traffic on the pavement between cleaning and sealing. Reclean the joint if it rains between cleaning and sealing or if any traffic is on the placement between cleaning and sealing. Provide the Engineer a copy of the sealant Manufacturer's written recommendations for heating and application at least 1 work day before sealing. Follow those recommendations. Unless stated otherwise, the recommended pouring temperature is 40°F below the manufacturer's designated safe heating temperature, with an allowable variation of 40°F.

Prior to sealing, discharger sealant from the applicator wand into a vessel and measure the sealant temperature. The temperature must be equal to or above the Manufacturer's recommended minimum pouring temperature and equal to or below the Manufacturer's recommended safe heating temperature.

Do not use sealant heated above the safe heating temperature. Sealant may be reheated or heated in excess of 6 hours if allowed by the Manufacturer’s heating and application recommendations. In these cases, recharge the melter with fresh sealant amounting to at least 20% of the sealant volume remaining in the melter.

Seal joints immediately after cleaning. Use equipment meeting the requirements of §502-2.04K, Joint Sealing, Highway Joint Sealant. Seal the joint from the bottom of the cut to within 1/2 inch of the pavement surface. Seal when the:

- Air and surface temperatures are 40°F or warmer.
- Air temperature is above the dew point.
- Pavement surface and all joint surfaces are dry.

Open to traffic after the sealant has cured to prevent tracking. Do not blot with fine aggregate.
B. The subsection is intentionally blank.

C. Sealing Joints - Preformed Joint Sealers. Make second-stage saw cuts and/or bevels in accordance with the Standard Sheets and (1) no sooner than 72 hours after concrete placement and (2) after the curing period has ended if curing covers are used. Extend the second-stage saw cut vertically down the free concrete edges. Wash the resulting slurry from the pavement and joint immediately after making second-stage saw cuts and/or bevels.

Second-stage saw cuts may be delayed for convenience, but do not leave second-stage saw cuts unsealed or unfilled while open to any traffic. Temporarily fill second-stage saw cuts with jute or backer rod if (1) they are exposed to any traffic before cleaning and sealing or (2) weather conditions are not favorable for timely (within 2 calendar days) cleaning and sealing, whether or not they are exposed to any traffic.

Clean the joints by pressure washing before sealing. Use (1) a 900 psi minimum pressure and (2) a maximum pressure such that no damage occurs to the concrete. Manually dislodge debris remaining in the joint after cleaning, and reclean the joint. Within 24 hours of pressure washing, air blast the joint to remove any debris from the cut and dry the exposed faces. Reclean the joint if it rains between cleaning and sealing. Do not allow any traffic on the pavement between cleaning and sealing.

Install the sealant in accordance with the Manufacturer's written instructions. Give those instructions to the Engineer before any second-stage saw cutting begins. Lubricate the concrete, the sealer, or both before installation such that the lubricant fully covers the sealer/concrete interface, but not the top of the sealer.

Install one piece of transverse joint sealer in a compressed condition across the full pavement width, including concrete shoulders, and down the vertical saw cut at the free edge. Cut the longitudinal sealer where it crosses a transverse joint. Do not splice the longitudinal sealer between transverse joints. Seal the intersection between longitudinal and transverse sealers with lubricant.

Install the sealer such that it is not stretched more than 5%, nor compressed more than 2%, of the minimum theoretical length. Check the installation for stretch and compression by installing sealers in 5 transverse joints and removing the sealer immediately after installation and checking the length. An alternate method for checking stretch and compression, where applicable, may be performed by premarking or precutting the sealer to length prior to installation. If the measurement of any of these 5 sealers exhibits stretching in excess of 5% or compression in excess of 2%, modify the installation method to meet the requirements or discontinue installation.

Once sealing operations begin, remove 1 joint per 100 in the presence of the Engineer to check stretch and compression. If the sealer is found to be stretched in excess of 5% or compressed in excess of 2%, remove the sealer material from successive joints in both directions until sealers are found that meet the stretch and compression requirements. Replace all joints sealers found with excessive stretch or compression. Replace joint sealers removed and found to meet the stretch and compression requirements.

502-3.13 Pavement Protection. Protect the pavement and appurtenances from traffic and construction operations. Protect the work and provide for traffic as indicated in the contract documents.
502-3.14 **Damaged or Defective Concrete.** The Engineer will identify all areas of damaged and defective concrete. Submit a repair plan for these areas. The repair plan is subject to the Engineer’s approval. Repair or replace all damaged or defective concrete in accordance with the approved repair plan prior to final acceptance at no cost to the State. Damage and defects include, but are not limited to, cracking, spalling, honeycombing, or imperfections caused by inadequate pavement protection, traffic, and/or construction practices. Slipformed concrete with inadequate plastic thickness as described in §502-3.08, Plastic Thickness Determination, will be rejected in 150 foot segment lengths.

502-3.15 **Hardened Surface Tolerance (Nonprofilographed Concrete).** After the concrete has hardened sufficiently, test the entire longitudinal center of each travel lane, including ramps, with a 10 foot, minimum, long straight edge laid both longitudinally and transversely. The Engineer will mark longitudinal deviations in the pavement surface exceeding 1/4 inch in 15 feet and transverse deviations exceeding ¼ inch in 10 feet. Corrective action must be taken to repair surfaces out of tolerance. Shoulders and other areas not routinely exposed to traffic must meet ¼ inch in 10 feet both longitudinally and transversely.

502-3.16 *The subsection is intentionally blank.*

502-3.17 *The subsection is intentionally blank.*

502-3.18 **Opening to Traffic**

_A. Construction Traffic._ Class C concrete may be opened to construction traffic and paving equipment 7 days after placement. With the Engineer’s approval, this time frame may be shortened to 3 days if cylinders achieve a compressive strength of 2500 psi in accordance with §502-3.18C, Project Strength Determination. Any pavement damaged from opening to construction traffic in a reduced time frame will be treated in accordance with §502-3.14, Damaged or Defective Concrete.

_B. General Traffic._ Class C concrete placed between June 1 and September 15 may be opened to general traffic 10 days after placement. Class C concrete placed outside this interval may be opened to general traffic 15 days after placement. With the Engineer’s approval, these time frames may be shortened to 4 days if cylinders achieve a compressive strength of 3000 psi in accordance with §502-3.18C, Project Strength Determination, and the joints are addressed in accordance with §502-3.12, Sealing Joints.

If Project Strength Determination testing for construction traffic opening indicates the concrete has achieved a compressive strength in excess of 3000 psi, the concrete may be opened to general traffic after 4 days. Any pavement damaged from opening to general traffic in a reduced time frame will be treated in accordance with §502-3.14, Damaged or Defective Concrete.

_C. Project Strength Determination._ Provide an ACI Certified Concrete Field Testing Technician, Grade I, or higher, to cast all cylinders. Unless otherwise noted in the contract documents, use an agency accredited by the AASHTO Accreditation Program (AAP) in the field of construction materials testing of portland cement concrete to perform compressive strength testing. Cast and test in the presence of the Engineer, or the Engineer’s representative. Provide acceptable proof of ACI Certification and AASHTO Accreditation to the Engineer before placing any concrete.
The Engineer, or the Engineer’s representative, will complete the Concrete Cylinder Report as cylinders are cast and tested.

Cast a minimum of 3 cylinder pairs (6 total) from each 1000 feet of paving length, or fraction thereof, in accordance with Materials Method 9.2, Field Inspection of Portland Cement Concrete. Cast each pair from different delivery trucks. Develop an Engineer-approved marking system that allows a cylinder to be readily associated with the corresponding placement location and placement time. Mark the cylinders and place them adjacent to the pavement under similar curing conditions. Determine the concrete compressive strength at the desired time in accordance with ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens. The pavement may be opened to construction (or general) traffic if all the following apply:

- Average compressive strength of all cylinder pairs exceed 2500 psi (or 3000 psi).
- Average compressive strength of each cylinder pair exceeds 2000 psi (or 2500 psi).
- Appropriate time frame has elapsed for the entire area to be opened.
- Automobile only areas may be opened at 1500 psi.

If these conditions are not met, test 3 additional cylinder pairs at a later time, provided the appropriate numbers of additional cylinders were cast. If the above conditions are not met after additional testing, or, if the required number of additional cylinders were not cast, open the pavement in accordance with the nonreduced time frames of §502-3.18A, Construction Traffic, and §502-3.18B, General Traffic.

**D. HES Concrete.** HES concrete may be opened to construction traffic when it has achieved a compressive strength of 2500 psi and to general traffic when it has achieved compressive strength of 3000 psi, in accordance with §502-3.18C, Project Strength Determination, and the joints are addressed in accordance with §502-3.12, Sealing or Filling Joints.

**METHOD OF MEASUREMENT**
The Engineer will measure the following quantities for items incorporated into the finished pavement:

**502-4.01 This subsection is intentionally left blank.**

**502-4.02 PCC Pavement, Unreinforced.** The work will be measured for payment as the number of cubic yards of unreinforced PCC pavement satisfactorily placed based on the payment lines shown in the contract documents. Deductions in 150 feet segment lengths will be made for areas that do not meet minimum plastic thickness requirements. Deductions (and separate payment) will be made for catch basins, manholes, or other similar pavement obstructions requiring either mesh reinforced or heavily reinforced placements.

**502-4.03 PCC Pavement, Mesh or Heavily Reinforced.** The work will be measured for payment as the number of cubic yards of reinforced concrete satisfactorily placed. No deductions will be made for drainage and utility structures or other similar pavement obstructions within the placement.

**502-4.04 This subsection is intentionally blank.**

**502-4.05 Constructing Transverse Joints.** The work will be measured for payment as the number of feet of transverse joints satisfactorily constructed.
502-4.06 Constructing Longitudinal Joints. The work will be measured for payment as the number of feet of longitudinal joints satisfactorily constructed.

502-4.07 Sealing Transverse Joints. The work will be measured for payment as the number of feet of transverse joints satisfactorily sealed, excluding preformed sealers turned down at the pavement edges.

502-4.08 Sealing Longitudinal Joints. The work will be measured for payment as the number of feet of longitudinal joints satisfactorily sealed.

BASIS OF PAYMENT

502-5.01 This subsection is intentionally blank.

502-5.02 PCC Pavement, Unreinforced. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work, up to and including first-stage saw cuts, in the unit price bid for PCC Pavement, Unreinforced. No payment will be made for areas that do not meet minimum plastic thickness requirements. No additional payment will be made for Contractor-requested HES concrete mixes.

PCC Pavement, Unreinforced will be eligible for progress payments in accordance with the following:
- 90% upon satisfactory completion of all work up to and including, first-stage saw cutting.
- The remaining 10% upon satisfactory completion of the work.

502-5.03 This subsection is intentionally blank.

502-5.04 This subsection is intentionally blank.

502-5.05 PCC Pavement, Mesh or Heavily Reinforced. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work, up to and including first-stage saw cuts, in the unit price bid for PCC Pavement, Mesh or Heavily Reinforced. No payment will be made for areas that do not meet minimum plastic thickness requirements. No additional payment will be made for Contractor-requested HES concrete mixes.

502-5.06 Constructing Transverse Joints. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Constructing Transverse Joints.

502-5.07 Constructing Longitudinal Joints. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Constructing Longitudinal Joints. Placing the inside shoulder and inside lane simultaneously, at the Contractor’s option, will not generate a Significant Change in the Character of Work. No additional payment will be provided for the additional number of longitudinal joint ties associated with:
- Constructing butt joints between lanes placed separately in a slipform paving operation.
- Constructing longitudinal joints in wheelpaths.
502-5.08 Sealing Transverse Joints. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Sealing Transverse Joints.

502-5.09 Sealing Longitudinal Joints. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Sealing Longitudinal Joints. Placing the inside shoulder and inside lane simultaneously, at the Contractor’s option, will not generate a Significant Change in the Character of Work.

Payment will be made under:

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<tr>
<th>Item No.</th>
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<td>502.RLCF0004</td>
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<td>Cubic Yard</td>
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| 502.91000004 | Constructing Transverse Joints | Foot |
| 502.91100004 | Constructing Longitudinal Joints | Foot |
| 502.92010004 | Sealing Transverse Joints – Preformed Elastic Joint Sealer | Foot |
| 502.92100004 | Sealing Transverse Joints – Highway Joint Sealant | Foot |
| 502.93010004 | Sealing Longitudinal Joints – Preformed Elastic Joint Sealer | Foot |
| 502.93100004 | Sealing Longitudinal Joints – Highway Joint Sealant | Foot |