

**DIVISION 500 – RIGID PAVEMENT****SECTION 501 - PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)****501.01 Description.**

Construct a Portland cement concrete pavement (PCCP) on a prepared subgrade or base course.

**501.02 Materials.**

Provide Materials as specified below:

Portland Cement	Section 1022
Ground Granulated Blast Furnace Slag (GGBFS)	Section 1020
Fly Ash	Section 1020
Fine Aggregate	Section 1003
Coarse Aggregate	Section 1004
Air-Entraining Admixtures	Section 1022
Chemical Admixtures	Section 1022
Water	Section 1021
Curing Materials	Section 1022
Reinforcing Steel	Section 611 & Section 1037
Embedded Hardware:	
Load-Transfer Devices	Section 1037
Tie Bars	Section 1037
Coated Dowel Bars	Section 1037
Tie Bolts (Hook Bolts and/or W-Bolts)	Section 1037
Insulation Materials	Section 610.03.D.3.d
<u>Joint/Crack Sealant Material</u>	<u>Section 1042</u>
<u>Joint Backup Material</u>	<u>Section 1043</u>

**501.03 Construction.**

Provide an American Concrete Institute (ACI) or National Ready Mix Concrete Association (NRMCA) certified concrete flatwork technician to supervise all finishing. Provide proof of the flatwork certification to the Engineer prior to concrete placement.

Slip-form or conventionally form the pavement unless otherwise specified. If slip-form is selected, small, irregular, or areas inaccessible to the paver may be constructed with fixed forms. These areas may be hand-finished, but must still meet all Performance Measures, Section 501.03.9. No portions of pavement shall be formed to produce a “point.” Unless otherwise approved, no formed dimension shall be less than 2 feet.

At least ten (10) Calendar Days prior to paving, schedule a “Pre-paving Meeting” with representatives from the Engineer, Contractor, and other interested parties in attendance.

Submit on or before the date of the “Pre-paving Meeting,” a “Means and Methods” plan. The plan shall include, but not be limited to, the Contractor’s proposed:

- A. Method of concrete placement and concrete delivery schedule

- B. Proposed width of paving pulls
- C. Installation methods for all embedded hardware
- D. Typical locations of longitudinal sawed and construction joints
- E. Method of transverse construction joint installation
- F. Joint locations if different than shown on the plans
- G. Procedure, including the finishing screed, for forming and constructing small or irregular shaped portions of pavement
- H. Safety edge construction method
- I. Method of installing and securing load transfer devices [Contractor to also provide a template for use by the Engineer]
- J. Procedure for final texturing the pavement surface
- K. Location of the concrete delivery trucks in relation to the paving area and the proposed haul route from the concrete plant
- L. Hand finishing procedures and tools, including a misting or fogging device
- M. Contingency plan and protective covering for rain events
- N. Proposed subcontractors
- O. Proposed Thermal Protection Plan for extreme hot and cold concrete placement

**501.03.1 Mix Design.** Prepare and submit for approval by the Engineer, prior to pre-paving meeting, a mix design as specified in Section 1022 Concrete Production; Class B/SF for slip form paving and Class B for fixed form paving.

**501.03.2 Slip-Form Paving.**

**501.03.2.1 Equipment** – Furnish and maintain all Equipment and tools for concrete batching, placement, finishing, curing, and texturing operations.

- A. Batch Plant and Central Plant Equipment – Section 1022.06.2
- B. Place concrete with a track operated, self-propelled, slip-form paver that can independently, or in conjunction with an advance concrete spreader:
  - 1. Strike-off
  - 2. Screed
  - 3. Adjust to produce the specified cross slope and pavement width
  - 4. ~~Place a minimum width pavement of 24 feet in one pull~~
  - 5. Operate using electronic grade controls for both horizontal and vertical alignment
  - 6. Provide a vertical pavement edge with slump off not exceeding 1/4 inch, exclusive of edge rounding, when checked under a 10 foot straightedge
  - 7. Vibrate and consolidate the concrete for the full width being placed. Vibrators are to be attached to the paving Equipment or mounted on a separate carriage. Vibrators shall not contact load transfer devices, embedded hardware, or forms. The Contractor is responsible for the number and frequency setting of the vibrators to achieve uniform consolidation of the concrete throughout the entire slab thickness and width. Vibration must automatically stop when forward movement of the unit is interrupted.
  - 8. Provide a smooth, uniform concrete surface finish requiring minimal or no floating or hand finishing
  - 9. A paver equipped with a Dowel Bar Inserter (DBI) may be utilized if approved in advance by the Engineer.

## PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)

## SECTION 501

- C. Concrete Saws – Provide mechanical saws capable of producing the specified joint details. The Contractor shall determine the number of saws needed based on weather, temperature, and amount of pavement placed. Backup Equipment and lighting (if necessary) must be on site prior to beginning concrete placement.
- D. Work Bridge(s) – Provide platforms spanning the full width of the paving pull so that workers can perform necessary finishing, texturing, and/or curing. The work bridge(s) shall not come in direct contact with the pavement surface.
- E. Texturing – Provide independently powered, self-propelled texturing Equipment capable of adjusting the depth of tine penetration to produce the specified pavement surface texture. For formed pavement, the texturing Equipment shall ride on the forms or rails.
- F. Curing – Provide mechanically powered Equipment to place curing compound at the specified rate to the pavement surface and all exposed edges. Use a fully atomized mechanical sprayer equipped with a tank agitator and wind guard.
- G. Diamond Grinding – Provide self-propelled machines equipped with gang mounted diamond blades having a minimum cutting head width of 3 feet, capable of producing a “corduroy type” pavement surface texture consisting of parallel grooves between 3/32 inch and 5/32 inch wide and 1/16 inch deep. Fifty (50) to sixty (60) diamond blades per foot of cutting head are required.

**501.03.2.2. Construction Methods.**

- A. Place and grade base course to the tolerance specified under the applicable Specification. No hardware may be placed on the grade until the Engineer has given approval.
- B. Furnish and install load transfer devices. Clearly mark, on both sides of the pavement, the center of each assembly using paint, stakes, or other agreed upon method so that the transverse sawed joints can be properly located. Construct load transfer assemblies in accordance with the Contract Documents. Apply a graphite coating to each dowel just prior to concrete placement if they are AASHTO M254, Type B (fusion bonded epoxy). No additional coating is required, if the approved dowels are AASHTO M254, Type A. Locate dowels at a pavement depth of  $T/2$ , ( $T$  = pavement thickness). Securely stake or otherwise fasten, in accordance with the [Standard Construction Details](#), the load transfer device to the subgrade to prevent movement during concrete placement. Cut the tie wires on the dowel bar basket assembly. Do not use load transfer assemblies that are damaged in any way. Verify horizontal and vertical alignment of the devices not to exceed the tolerances as defined in the [Standard Construction Details](#). Check initial dowel placement on grade with a template or other approved tool supplied by the Contractor for use by the Engineer.
- C. Furnish Hook Bolts (or W-Bolts) for use when lanes will longitudinally abut the pavement being placed, and #5 standard rebars for tie bars used under longitudinal sawed joints or for tying into concrete lanes placed under previous contracts. Install these items during or prior to concrete placement. The method of installation must be approved prior to beginning concrete placement.
- D. Install lines, wires, or other devices as needed for electronic grade control.
- E. Placing Concrete
  - 1. Minimize or eliminate stopping the forward movement of the paver. Sufficient number and proper scheduling of concrete delivery trucks is required in this regard.
  - 2. Maintain a vertical pavement edge. If necessary, use extra finishers, temporary forms, or trailing forms as part of the paver.
  - 3. Maintain a uniform level of concrete feeding the paver screed, allowing sufficient concrete to completely fill the void under the screed for the entire width of pavement placed. A roll of concrete covering approximately half of the distributing augers is desirable. Spreaders in advance of the paver may be used to control the concrete supplied to the paver.
  - 4. Wet the base course just prior to contact by the concrete using a hose or other spray device for uniform water application. The application rate should not cause any pooling of water on the grade.

## PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)

## SECTION 501

5. As the concrete is being placed, install tie bars under longitudinal sawed joints and Hook or W-Bolts along longitudinal pavement edges requiring abutting pavement to be placed in the future.
6. Build a transverse construction joint at the end of the day's paving run in accordance with the previously approved details.
7. Prior to placing adjoining concrete paving lanes or shoulders, seal the previously sawed joint opening along the edges of the existing concrete using duct tape, caulk, or other approved material to prevent stones or grout from entering the saw cut.
8. When placing concrete in lanes adjoining previously constructed pavement, locate the full width of the paver tracks over the pavement with no overhang across the edge, in order to prevent breaking. Use rubber facing, wood, or other approved protection if the paver tracks will be in contact with the existing pavement surface. Concrete in the completed lane must have achieved a compressive strength of at least 2,000 pounds per square inch prior to placing any adjoining pavement.
9. For small, irregular sections, or areas of pavement inaccessible to the paver:
  - a. Use wooden or steel forms. Depth of the forms must be at least that of the required pavement thickness. Form faces shall not deviate from a true plane by any more than 1/8 inch in 10 feet. Provide pins or other bracing to prevent movement of the forms under the weight of the concrete.
  - b. Place concrete directly onto a previously approved, moistened grade. Consolidate with hand vibrators paying particular attention to not dislodge the load transfer devices or have the vibrator come in contact with the forms.
  - c. Finish with a pre-approved screed. Hand float or otherwise finish any areas as necessary. Pull a damp burlap drag longitudinally along the placement area. Texture and cure in accordance with Sections 501.03.4 and 501.03.5.
  - d. If forms are stripped prior to five (5) Calendar Days following concrete placement, apply curing compound or extend other curing methods immediately, after patching any "honey-combed" areas, to completely cure the exposed edge. Forms must remain in place at least 12 hours following initial concrete placement, except for areas immediately adjacent to saw cut transverse joints. Forms at these joints must be removed when required in order to complete the saw cut through the entire pavement surface. Maintain curing methods in place until the full five (5) Days has elapsed or the compressive strength of the concrete has reached 2,000 pounds per square inch.
10. Safety Edge – Construct a safety edge as specified in the Contract Documents. The safety edge is required longitudinally along the ~~outermost~~ pavement edges (generally an interior and exterior shoulder) on all mainline and ramp paving unless otherwise approved by the Engineer. In P.C.C. pavement sections, the paver screed shall be modified to provide a chamfer at the end of the P.C.C. pavement that results in a compacted wedge shape pavement edge of 32 degrees (construction tolerance range of 26 to 40 degrees).

## F. Finishing

1. Produce a smooth, uniform, concrete surface with the paver screed conforming to the specified pavement cross slope and width.
2. Hand finishing is limited to sealing any surface tears, supporting any non-vertical pavement edges, and to assist in the surface finish of small, irregular, or other areas inaccessible to the paver. No steel trowels will be allowed for finishing surfaces.
3. Finish all longitudinal pavement edges with a 1/4 inch, rounded edging tool where safety edge is not required.
4. Do not add surface water as an aid to finishing. If absolutely necessary, an evaporation retardant may be added through the use of a misting or fogging device approved prior to beginning paving operations. Water shaken from brushes or applied through a hose is not permitted.

5. Finish the final pavement surface prior to texturing by pulling a wet burlap drag in the longitudinal direction. Keep the burlap in a moist condition throughout the paving operation in order to prevent surface tearing.
6. Texture and cure the pavement per Sections 501.03.4 and 501.03.5.

### 501.03.3 Fixed Form Paving.

#### 501.03.3.1 Forms.

- A. Use straight, metal forms having adequate strength to support the Equipment. Each section shall be a minimum of 10 feet in length. Use forms with a depth equal to or greater than the prescribed edge thickness of the concrete, a base width at least equal to the depth of the forms, but not required to exceed 8 inches for deeper forms, and without a horizontal joint. Use flexible or curved forms of proper radius for curves of 150 foot radius or less, except approved straight forms of 5 foot lengths may be used for curves of a radius from 75 to 150 feet. Flexible or curved forms must be approved by the Engineer. The Engineer may approve the use of wood forms in areas requiring hand finishing [see Section 501.03.2.2.e.9)]. Secure the forms in place to withstand the impact and vibration of the consolidating and finishing Equipment without visible spring or settlement. Extend flange braces outward on the base a minimum of  $\frac{2}{3}$  the height of the form. Remove forms with battered top surfaces or bent, twisted, or broken forms. Do not use repaired forms until they have been inspected and approved by the Engineer. Do not use buildup forms, except where the total area of pavement of any specified thickness on the project is less than 2,000 square yards. Do not vary the top face of the form from a true plane more than  $\frac{1}{8}$  inch in 10 feet, and do not vary the vertical face of the form by more than  $\frac{1}{4}$  inch. Make provisions for locking the ends of abutting form sections together tightly, and for secure setting.
- B. Supplementary Rails
  1. Provide suitable metal rails capable of being securely attached to the top of the side forms to provide a track that will allow spreading, finishing, and curing Equipment to back over the end of the previous day's run.
  2. Ensure metal rail length is sufficient to accommodate all Equipment that must be backed out of the way. Also, ensure the rails are of such a height that all wheels and flanges of wheels will clear the previously placed concrete by at least 1/2 inch.
- C. Base Support - Provide a foundation under the forms so that the whole length of the form will be set firmly in contact with the grade.
- D. Form Setting - Set forms sufficiently in advance of the point where concrete is being placed so that line and grade may be checked. Stake forms into place with a minimum of 3 pins for each 10 foot section. Place a pin at each side of every joint. Tightly lock form sections to be free from play or movement in any direction. Do not deviate the form from true line by more than  $\frac{1}{4}$  inch at any point. No excessive settlement or springing of forms is permitted from the weight of the finishing machine. Clean and oil forms before the placing of concrete.
- E. Grade and Alignment - Check the alignment and grade elevations of the forms immediately before placing the concrete and make any necessary corrections. When any form has been disturbed or any grade has become unstable, reset and recheck the form.
- F. Removing Forms - Do not remove forms from freshly placed concrete until it has set for a minimum of 12 hours, except for auxiliary forms used temporarily in widened areas and forms against transverse saw cut joint locations. Remove forms carefully to avoid damage to the pavement.

**501.03.3.2. Equipment** - Furnish and maintain all Equipment and tools for concrete batching, placement, finishing, curing, and texturing operations.

- A. In addition to the Equipment included in this Section, all Equipment listed under Section 501.03.2.1 is required except that Section 501.03.2.1.b is replaced with the following for fixed form paving:
- B. Place concrete with a finishing machine designed for fixed form paving that can ride on previously set forms and can independently, or in conjunction with an advance concrete spreader:

## PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)

## SECTION 501

1. Strike-off
2. Screed
3. Adjust to produce the specified cross slope and pavement width
- ~~4. Place a minimum width pavement of 12 feet in one pull~~
- ~~5.4.~~ Provide a smooth, uniform concrete surface finish requiring minimal or no floating or hand finishing

## C. Vibration

Vibrate and consolidate the concrete for the full placement width. Vibrators are to be attached to the paving Equipment or mounted on a separate carriage. Only operate the vibrators when the machine on which they are mounted is moving forward. Do not operate hand vibrators more than 10 seconds, or less than 5 seconds in any one location unless approved otherwise by the Engineer. Place vibrators in and withdraw from concrete vertically in a slow deliberate manner. 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. Vibrators shall not contact load transfer devices, embedded hardware, or forms. The Contractor is responsible for the number and frequency setting of the vibrators to achieve uniform consolidation of the concrete throughout the entire slab thickness and width.

## D. Form Line Excavating Machine

Excavate form lines for all forms supporting mechanical finishing Equipment to line and grade by a machine designed for this purpose and approved by the Engineer, or an approved machine that concurrently trims the subgrade or subbase to grade.

- E. If, during the operation of paving Equipment, it is necessary to operate one or both sets of wheels or tracks on previously placed concrete, adjust or alter the wheels or tracks so that the bearing on the concrete will not be closer than 3 inches from the pavement edge. When operating with one side of the machine on pavement and the other side on forms, the wheels operating on the forms may be double flanged. Use flangeless, rubber faced wheels on the pavement. When operating over the edge of concrete less than 2 months old, support the ends of the finishing machine screeds with an approved device to provide from 1/16 to 1/8 inch clearance between the screed and previously placed pavement.

**501.03.3.3. Construction Methods.**

- A. Place and grade base course to the tolerance specified under the applicable Specification. No hardware may be placed on the grade until the Engineer has given approval.
- ~~A. No hardware may be placed on the grade in contact with the concrete pavement until the Engineer has given approval to do so. Place and grade the base course to the tolerance specified under the applicable Specification.~~
- B. Furnish and install load transfer devices. Clearly mark, on both sides, the center of each assembly using paint, stakes or other agreed upon method so that the transverse sawed joints can be properly located. Unless otherwise specified in the Contract Documents, construct load transfer assemblies in accordance with the Standard Construction Details. Apply a graphite coating to each dowel just prior to concrete placement if they are AASHTO M254, Type B (fusion bonded epoxy). No additional coating is required, if the approved dowels are AASHTO M254, Type A. Locate dowels at a pavement depth of T/2, (T = pavement thickness). Securely stake or otherwise fasten, in accordance with the [Standard Construction Details](#), the load transfer device to the subgrade to prevent movement during concrete placement. Do not use load transfer assemblies that are damaged in any way. Verify horizontal and vertical alignment of the devices not to exceed the tolerances as defined in the [Standard Construction Details](#). Check initial dowel placement on grade with a template or other approved tool supplied by the Contractor for use by the Engineer.
- C. Furnish Hook Bolts (or W-Bolts) for use when lanes will longitudinally abut the pavement being placed, and #5 standard rebar for tie bars used under longitudinal sawed joints or for tying into concrete lanes placed under previous contracts. Install these items prior to or during concrete placement. The method of installation must be approved prior to beginning concrete placement.



D. Placing Concrete

1. Minimize or eliminate stopping the forward movement of the paver. Sufficient number and proper scheduling of concrete delivery trucks is required in this regard.
2. Maintain a uniform level of concrete feeding the paver screed, allowing sufficient concrete to completely fill the void under the screed for the entire width of pavement placed. Spreaders in advance of the paver may be used to control the concrete supplied to the paver.
3. Wet the base course just prior to contact by the concrete using a hose or other spray device for uniform water application. The application rate should not cause any pooling of water on the grade.
4. As the concrete is being placed, install tie bars under longitudinal sawed joints and Hook or W-Bolts along longitudinal pavement edges requiring abutting pavement to be placed in the future.
5. Build a transverse construction joint at the end of the day's paving run in accordance with the previously approved details.
6. Prior to placing adjoining concrete paving lanes or shoulders, seal the previously sawed joint opening along the edges of the existing concrete using duct tape, caulk, or other approved Material to prevent stones or grout from entering the saw cut.
7. When placing concrete in lanes adjoining previously constructed pavement, the paver tracks must be fully in contact with the completed pavement surface to prevent breaking of the edge. Use rubber facing, wood, or other approved protection if the paver tracks will be in contact with the existing pavement surface. Concrete in the completed lane must have achieved a compressive strength of at least 2,000 pounds per square inch prior to placing any adjoining pavement.
8. For small, irregular sections, or areas of pavement inaccessible to the paver:
  - a. Use wooden or steel forms. Depth of the forms must be at least that of the required pavement thickness. Form faces shall not deviate from a true plane by more than 1/8 inch in 10 feet. Provide pins or other bracing to prevent movement of the forms under the weight of the concrete.
  - b. Place concrete directly onto a previously approved, moistened grade. Consolidate with hand vibrators, paying particular attention not to dislodge the load transfer devices or come in contact with the forms.
  - c. Finish with a pre-approved screed. Hand float or otherwise finish any areas as necessary. Pull a damp burlap drag longitudinally along the placement area. Texture and cure in accordance with Sections 501.03.4 and 501.03.5.
  - d. When forms are stripped following concrete placement prior to five (5) Calendar Days following placement, apply curing compound or extend other curing methods immediately after patching any "honey-combed" areas to completely cure the exposed edge. Forms must remain in place at least 12 hours following initial concrete placement, except for areas immediately adjacent to saw cut transverse joints. Forms at these joints must be removed when required in order to complete the saw cut through the entire pavement surface. Maintain the curing in place until a full five (5) Days has elapsed or the compressive strength of the concrete has reached 2,000 pounds per square inch.
9. Safety Edge – Construct a safety edge as specified in the Contract Documents. The safety edge is required longitudinally along the outermost pavement edge (generally an inside and outside shoulder) on all mainline and ramp paving unless otherwise approved by the Safety Program Manager or Designee.

E. Finishing

1. The paver screed shall produce a smooth, uniform concrete surface conforming to the specified pavement cross slope and width.
2. Limit hand finishing to sealing any surface tears, supporting any non-vertical pavement edges, and to assist in the surface finish of small, irregular, or other areas inaccessible to the paver. No steel trowels will be allowed for finishing surfaces.

3. Finish all longitudinal pavement edges with a 1/4 inch, rounded edging tool where safety edge is not required.
4. Do not add surface water as an aid to finishing. If absolutely necessary, add an evaporation retardant through the use of a misting or fogging device approved prior to beginning paving operations. Water shaken from brushes or applied through a hose is not permitted.
5. Create a final pavement surface prior to texturing by pulling a wet burlap drag in the longitudinal direction. Keep the burlap in a moist condition throughout the paving operation in order to prevent surface tearing.
6. Texture and cure the pavement per Sections 501.03.4 and 501.03.5.

**501.03.4 Texturing.**

- A. Texture the finished pavement for the entire placement width with an approved tining device. Flat steel wire tines are required and shall be 3/32 inches wide and 5 to 6 inches in length unless otherwise approved, having a 3/4 inch spacing between the tines. The tines shall form rectangular shaped grooves 1/16 inch to 3/16 inches in depth. Do not texture portions of the pavement that will receive permanent pavement markings. In these areas, maintain a 10 inch wide flat surface to accommodate the striping and/or raised pavement markers. The burlap drag finish is acceptable for these areas
- B. The Contractor may elect to diamond grind all surfaces of concrete pavement to create a final texture. If so, do not perform the grinding until the concrete has obtained a compressive strength of at least 3,500 pounds per square inch.
- C. Pull the tining in the longitudinal direction, parallel to the centerline of the pavement, in one pass without dragging or tearing the mortar.
- D. The Contractor is responsible to determine the proper time to install the tining. The tining should not pull excessive mortar or aggregate from the pavement (too early) or fail to penetrate the surface by the minimum 1/16 inch (too late).
- E. Make available hand tining devices at least 4 feet in width, equipped with tines identical to those specified above, for use in areas inaccessible to the mechanical device.
- F. Immediately follow the tining operation with approved curing.

**501.03.5 Curing** – Use one of the methods listed below.

- A. White Membrane Curing Compound
  1. Spray the curing Material on the pavement surface and all exposed edges immediately following the texturing operation.
  2. Continuously agitate the curing Material during application to keep it thoroughly mixed.
  3. Uniformly apply 2 applications of spray to the entire surface at a rate covering no more than 200 square feet (22.2 square yards) per gallon per each of the 2 applications. Apply the first coat immediately following the tining operation and the second coat no more than 30 minutes after the first.
  4. If necessary, use hand sprayers for pavement edges or small and irregular areas inaccessible to the larger mechanical applicator. The rate of application remains no more than 200 square feet per gallon per each of the 2 applications.
  5. No Equipment or traffic (other than joint saws and foot traffic) is permitted on the pavement until the compressive strength has reached at least 2,000 pounds per square inch.
- B. Polyethylene Film
  1. Extend the polyethylene beyond the slab edges by at least twice the pavement thickness and add weight to secure the material against wind and weather.



2. Maintain the polyethylene in place for at least 5 Calendar Days or until the concrete compressive strength has reached at least 2,000 pounds per square inch. At sawed joint locations, remove as little polyethylene as possible just prior to the sawing operation. Re-cover the area over the sawed joint immediately upon completion of the sawing operation and maintain for the remainder of the curing period.

#### 501.03.6 Quality Control Plan.

Develop and submit a Quality Control Plan in accordance with Section 610.03.A, except as modified herein.

##### 501.03.6.1 Temperature Limitations.

###### A. Cold Weather –

1. Do not place concrete when the ambient air temperature in the shade, and away from artificial heat, is less than 35 degrees Fahrenheit. Resume placement when the ambient air temperature is 35 degrees Fahrenheit and rising.
2. Do not place concrete on frozen grade.
3. Maintain temperatures of not less than 50 degrees Fahrenheit surrounding the concrete pavement for a curing period of five (5) Calendar Days following placement of the concrete. Provide all necessary monitoring devices (High-Low thermometers or other tools) and a plan for monitoring the temperature during the five (5) Day period ensuring placed concrete is not damaged by the temperatures. Use of insulating blankets, straw, polyethylene, or other protection subject to the approval of the Engineer, must be addressed in the plan.

###### B. Hot Weather

1. If plastic concrete temperatures reach 80 degrees Fahrenheit, give additional attention to dampening the subgrade immediately in advance of the concrete placement. Perform finishing, texturing, and curing operations as soon as possible. Should the pavement surface dry out to the extent that it cannot be sealed without the application of surface water, paving shall be suspended.
2. No concrete may be placed when the temperature of the plastic concrete exceeds 90 degrees Fahrenheit at the production facility.
3. Regardless of the protection methods selected, the Contractor is responsible to protect the concrete from freezing or other thermal damage. Any removal, replacement, and/or repairs resulting from thermal damage will be made at the Contractor's expense.

##### 501.03.7 Joints.

###### A. Transverse Sawed Joints

1. Saw the joints at the specified spacing to a depth of  $T/3 + 1/4$  inch (T = Pavement Thickness) and a width of ~~1/8~~ 3/8" inch.
2. Begin joint sawing as soon as the concrete can support the saw and operator with no damage to the pavement surface.
3. Time the sawing so that the concrete does not ravel behind the blade and so that random cracking does not occur.
4. Determine the timing of the saw cutting based on weather, temperature, and his/her judgment. Center the saw cuts over the load transfer dowels. Following transverse saw cutting, provide crack-free pavement except for the cracks under the designed saw cut joints.
5. All Transverse joints in the finished concrete pavement shall be sealed with hot-poured joint sealant conforming to Section 1042 and as shown in the plans. All sawed joints to be sealed with hot-poured joint sealant shall utilize a backup material that conforms to Section 1043, is sufficiently heat resistant to develop the required sealant shape and depth.
6. Construction joints shall be tooled and sealed as shown on the Plans. Immediately prior to installation of the backer road and joint sealant, each joint shall be air blown, clean and dry. Hot-poured joint sealant

PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)

SECTION 501

shall be placed in conformance with the manufacturers recommendations concerning joint cleaning, application, and safe heating temperature. For rounded or beveled joints, the sealant shall be installed to a depth as shown in the Detail.

- 4.7. The sealing material shall be applied to each joint opening in accordance with the details shown on the Plans or as directed. Application shall be done in such a manner that the material will not be spilled on the exposed surfaces of the concrete. All excess material on the surface of the concrete pavement shall be removed immediately, and the pavement surface cleaned. Hot-poured joint sealing material shall not be placed when the air temperature in the shade is less than 50° F, unless approved by the Engineer.

B. Longitudinal Sawed Joints

1. Following the transverse joint saw cutting, perform longitudinal saw cutting on pavement placed in multi-lane (or lane and shoulder) pulls. Saw the joints to a depth of T/3 + 1/4 inch and to a width of 1/8<sup>4</sup> inch.
2. Determine the timing of the saw cutting based on weather, temperature, and his/her judgment. Center the saw cuts over the tie-bars. Following longitudinal saw cutting, provide crack-free pavement except for the cracks under the designed saw cut joints.
3. All Longitudinal joints in the finished concrete pavement shall be sealed with hot-poured joint sealant conforming to Section 1042 and as shown in the plans. All sawed joints to be sealed with hot-poured joint sealant shall utilize a backup material that conforms to Section 1043, is sufficiently heat resistant to develop the required sealant shape and depth.
4. Construction joints shall be tooled and sealed as shown on the Plans. Immediately prior to installation of the backer road and joint sealant, each joint shall be air blown, clean and dry. Hot-poured joint sealant shall be placed in conformance with the manufacturers recommendations concerning joint cleaning, application, and safe heating temperature. For rounded or beveled joints, the sealant shall be installed to a depth as shown in the Detail.
- 2.5. The sealing material shall be applied to each joint opening in accordance with the details shown on the Plans or as directed. Application shall be done in such a manner that the material will not be spilled on the exposed surfaces of the concrete. All excess material on the surface of the concrete pavement shall be removed immediately, and the pavement surface cleaned. Hot-poured joint sealing material shall not be placed when the air temperature in the shade is less than 50° F, unless approved by the Engineer.

C. Transverse Construction Joints

1. Construct this joint at the end of a day's paving run.
2. Prior to beginning paving operations, provide a formed bulkhead for use in an emergency necessitating a non-planned paving stoppage exceeding 30 minutes.
3. Submit for approval the proposed method of building the transverse construction joint. The resulting joint must create a vertical face perpendicular to the pavement conforming to the designed cross slope having load transfer dowels spaced the same as the load transfer devices. Finish the top edge with a 1/4 inch rounded edging tool. If the proposed construction method involves drilling and grouting load transfer dowels, they must be of the same Material and dimensions as those provided as part of the load transfer devices. Drilling and grouting procedures and related Materials must accompany the submission, if applicable. Provide a grout retainer ring if dowels will be installed by drilling and grouting.
4. When placing concrete pavement abutting the transverse construction joint, use a 1/4 inch rounded edging tool to finish the top edge of the concrete in contact with the previously constructed joint. If tying into a non-rounded edge of existing pavement, saw cut a 1/4 inch bevel on the existing pavement edge prior to placing the new adjoining concrete pavement.

D. Longitudinal Construction Joints

**PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)**

**SECTION 501**

1. Construct these joints directly over Hook Bolts or W-Bolts installed in a previously placed run of pavement. If tying into concrete placed under a previous contract, drill and grout tie-bars (#5 rebars) into the existing concrete pavement if so noted in the Contract Documents.
2. Form the joint by finishing the concrete abutting the existing concrete with a 1/4 inch rounded edging tool. If tying into a non-rounded edge of existing pavement, saw cut a 1/4 inch bevel on the existing pavement edge prior to placing the new adjoining concrete pavement.

~~E. Unless detailed otherwise in the Contract Documents, no joint sealant Material is required in any of the joints covered in this Section.~~

**501.03.8 Opening the Road to Traffic.**

When the compressive concrete strength has reached at least 3,500 pounds per square inch.

**501.03.9 Performance Measures.**

Acceptance and final payment for this Item will be based on the Contractor's ability to acceptably construct a concrete pavement meeting the following criteria:

- A. Alignment and cross-slope
  1. Maintain a pavement edge within 0.15 feet of the specified horizontal alignment. Pavement width provided must be no less than that specified.
  2. Provide the cross-slope at the specified percent plus or minus 0.5%.
- B. Consolidation as verified by visual observation of pavement edges, pavement cores, and/or other non-destructive testing as determined by the Engineer.
- C. Thickness as verified by cores. Payment to be adjusted in accordance with Section 501.05.
- D. Ride quality as specified in Section 501.05 with payment adjustments as specified therein.
- E. Pavement free of random cracks – Any uncontrolled random cracks must be repaired or removed and replaced prior to Final Acceptance and payment. Submit repair or replacement procedure and details for approval by the Engineer.
- F. Provide a vertical pavement edge having no more than 1/4 inch edge slump, exclusive of rounding of the finishing tool, when measured under a 10 foot straight edge.
- G. Provide load transfer dowels located as specified in Section 501.03.2.2.b. Verify specification compliance of load transfer dowel bar locations and alignment using non-destructive testing devices.
- H. Provide concrete meeting the required compressive strength requirements subject to payment Adjustment as outlined in Section 501.05.

**501.03.10 Tolerance in Pavement Thickness.**

For the purpose of establishing an adjusted Unit Price for pavement lanes, the following is considered:

- A. The Engineer will divide the PCC Pavement for the entire Contract into 1,000 square yard lots, determine the random core locations, drill the cores, determine pavement thickness according to AASHTO T 148, and patch the resulting holes in the PCC Pavement.
- B. Uneven lots less than 1,000 square yards may occur due to the pavement geometry. If this is the case, these irregular lots will be considered a complete lot when evaluating the pavement thickness, regardless of their actual size.
- C. If a random core measurement is deficient by more than 0.20 inch when compared to the Plan pavement thickness, 2 additional randomly selected cores will be taken within the same lot. Cores measuring 0.20 inch or more in excess of the Plan pavement thickness will be considered to measure exactly 0.20 inch greater than the planned thickness when computing the average of the 3 cores. The average thickness of the 3 cores will be considered the pavement thickness for the lot being evaluated. This lot thickness will be used to determine payment for the entire lot in accordance with Table 501.05.1.

**PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)**

**SECTION 501**

Remove and replace the entire lot represented by the short cores when any average lot thickness is deficient by more than 1 inch when compared to the Plan pavement thickness. The Engineer will provide the limits of the lot in question.

**501.03.11 Pavement Smoothness Testing.**

**501.03.11.1 General Description.** Test finished surfaces of concrete pavements, Bridge decks, approach slabs, and transition slabs in accordance with the Contract Documents ~~using an Inertial Profiler unless otherwise stated.~~

**501.03.11.2 Straight Edge Surface Testing.** ~~In the absence of the requirement for Inertial Profiler smoothness testing,~~ surface testing will be performed with a rolling straight edge or a conventional straight edge furnished by the Contractor. Finished concrete pavement and/or Bridge surfaces will be tested by the Contractor and witnessed by the Engineer for trueness in each wheel lane at the completion of the required curing or protection period. Test the surface with a rolling 10 foot straight edge, or a 10 foot straight edge placed parallel to the center line of the pavement, parallel to the grade line and touching the surface. Surface variations of the pavement measured by the 10 foot rolling straight edge, or measured from the base of the straight edge to the surface of the pavement, shall not exceed 0.25 inch. An approved 10 foot long straight edge shall be available at all times during concrete paving operations.

**501.03.11.3 Surface Corrections.** Use diamond grinding to remove deviations exceeding 0.25 inch in 10 feet and/or to improve ride quality. Submit, for review by the Engineer, similar types of work performed with the proposed Equipment, including references if requested.

**501.04 Method of Measurement.**

The quantity will be measured as the actual square yards placed and accepted. Pavement width measurement not to exceed that shown on the Plans unless otherwise approved. Longitudinal dimension measured along the centerline of pavement.

Areas requiring repairs due to random cracking or failure to meet other performance measures will not be measured for payment until the repairs have been successfully completed. In these cases, the actual repair area (dimensions of the patch or other repair) will be the quantity withheld from payment.

**501.05 Basis of Payment.**

Payment includes furnishing all Equipment, Materials, and incidentals; placing, finishing, texturing, and curing concrete pavement meeting the performance measures outlined in Section 501.03.9. Incidental to the Item are the following, but not limited to:

- A. Repairs to random crack areas.
- B. Repairs required to meet performance measures.
- C. Furnishing a "Thermal Plan" and any accompanying testing Equipment.
- D. Furnishing inertial profiling system, operator, and straight edge for smoothness testing; providing specified results for same.
- E. Performing diamond grinding for Specification compliance and/or ride quality improvement.
- F. Sawing, drilling, grouting, and constructing all pavement joints.
- G. Sealing sawed joints along the completed pavement edge prior to placing adjoining pavement.
- H. Constructing safety edge.
- I. Cold weather curing Materials if necessary.
- J. Lighting in order to perform Work, if needed.
- K. Template or other approved device for checking dowel bar assembly installation prior to concrete placement. This to be supplied to the Engineer for use during paving operations and returned to the Contractor at the conclusion of paving.
- L. Maintenance of traffic, if required for smoothness testing.

**PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)**

**SECTION 501**

M. Polyethylene covering and transverse bulkhead for protecting concrete during a rain event or other emergency.

N. Verifying load transfer dowel bar location and alignment using non-destructive testing devices.

O. Wire Reinforcement

P. Dowels

Q. Tie Bars

R. Hook Bolts

S. Load Transfer Devices

T. Cleaning

U. Sawing

~~N.V.~~ Tooling and Sealing of Joints

~~W.~~ Any other incidental Items mentioned in the body of this Specification.

**501.05.1 Pavement Thickness Adjustments.**

A. For thickness deficiencies, the Department will adjust the Contract Unit Price according to the schedule provided in Table 501.05-A.

*Table 501.05-A  
Price Adjustments for Concrete Pavement Thickness Deficiency*

<i>Deficiency in Average Pavement Thickness Determined by Cores</i>	<i>Proportional Part of Contract Unit Bid Price (%)</i>
0.00 to 0.20 inches	100
0.21 to 0.30 inches	80
0.31 to 0.40 inches	72
0.41 to 0.50 inches	68
0.51 to 0.75 inches	57
0.76 to 1.00 inches	50
Greater than 1.00 inch	Remove and Replace

B. No additional payment over the Contract Unit Price will be made for any pavement with an average thickness in excess of that shown on the Plans. The maximum pavement thickness value used in this chart for a 1,000 square yard lot will be the Plan pavement thickness.

**501.05.2 Pavement Smoothness Acceptance and Payment.**

Apply any incentive/disincentive pay Adjustments as established by this Specification and in accordance with the Contract Documents.

**501.05.3 Price Adjustment for Low Strength Concrete.**

Concrete which fails to reach full 28-day design strength ( $f_c$ ) shall be subject to remedial action and prorated payment as specified in Categories A and B of Section 610.03.M of the Standard Specifications. Make prorated payment in accordance with Section 610.03.M. Concrete having compressive strength of 500 pounds per square inch or more below the designed  $f_c$  of the pavement shall be removed and replaced at no cost to the Department.

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
501001	PORTLAND CEMENT CONCRETE PAVEMENT, 8"	SY
501002	PORTLAND CEMENT CONCRETE PAVEMENT, 9"	SY

**PORTLAND CEMENT CONCRETE PAVEMENT (PCCP)**

**SECTION 501**

---

501004	PORTLAND CEMENT CONCRETE PAVEMENT, 10"	SY
501005	PORTLAND CEMENT CONCRETE PAVEMENT, 11"	SY
501006	PORTLAND CEMENT CONCRETE PAVEMENT, 12"	SY
501012	PORTLAND CEMENT CONCRETE PAVEMENT, 14"	SY