

CEMENT CONCRETE PAVEMENT.**(REV 4-3-13)**

SECTION 350 is deleted and the following substituted:

**SECTION 350
CEMENT CONCRETE PAVEMENT**

350-1 Description.

Construct Portland cement concrete pavement in one course, on a prepared subgrade or base. Use either the fixed-form or the slip-form method of construction. The Engineer may require a demonstration of equipment and paving operations to meet placement specifications.

If any uncontrolled cracks appear prior to final acceptance remove and replace the cracked concrete at no expense to the Department. Investigate and implement immediate effective solutions to eliminate further cracks, in consultation with, and subject to the approval of the Engineer.

Furnish the following information in the Quality Control Plan (QCP) as required in Section 105:

1. An anticipated detailed sequence and schedule of concrete placement operations including, but not limited to, width of pavement to be placed, proposed equipment, anticipated production rates of concrete plant(s) and paving operations, working hours, concrete hauling, and placement, curing, sawing, and sealing methods. Identify backup equipment and the procedures that will be followed in the case of a breakdown of equipment.
2. A method to ensure the proper placement of reinforcing steel, tie bars and dowel bars. Include details on method to locate dowel bar center line for joint sawing.
3. A traffic control plan.
4. Defined provisions for adequate lighting for all work done at night, including finishing, curing, and sawing joints.
5. A method for ensuring pavement thickness is met and a consolidation procedure is identified including verifying vibratory compliance with specifications and manufacturer's recommendations.
6. If forms are to be utilized define the material, dimensions, type, connections, and staking of the forms.
7. Define the procedure for the protection of the fresh concrete pavement from inclement weather.

350-2 Materials.**350-2.1 General:** Meet the following requirements:

Concrete	Section 346*
Grinding Concrete Pavement	Section 352
Curing Materials	Section 925
Embedded Items.....	Section 931
Joint Seal.....	Section 932

*with exceptions noted herein.

350-2.2 Mix Design Requirements: Provide a mix design with approved sources, a minimum strength of 4,000 psi and maximum water to cementitious materials ratio of 0.45 to the

Engineer for approval prior to use. The requirements of 346-2, 346-3, 346-4, and the overdensity requirements in Materials Manual Volume II, Section 9.2.7 do not apply. Notify the Engineer if any of the component quantities are adjusted. Submit enough component materials to the Engineer to prepare a 0.5 cubic yard batch for each mix. If any material sources change, resubmit the mix design and materials to the Engineer for approval prior to use.

350-3 Equipment.

350-3.1 General: Ensure the equipment and tools that are to be used have the capability of handling materials and performing all parts of the work. Ensure equipment and tools meet the following.

350-3.2 Slip-Form Paver: Use a self propelled slip-form paving system consisting of a slip-form paver and if needed, a concrete spreader to spread, strike off, consolidate, and screed the freshly placed concrete in one pass to produce a dense and homogeneous pavement requiring minimal hand finishing. The slip-form paving machine shall extrude concrete into a shape using attached molding components consisting of a profile pan and side forms. The slip-form paving machine shall be equipped with the following components:

1. Automatic controls to control line and grade from either or both sides of the machine.
2. Vibrators to consolidate the concrete for the full width and depth of the course placed in a single pass, and designed and constructed so no spreading or slumping of the concrete occurs.
3. A positive interlock system to stop all vibration and tamping elements when forward motion of the machine stops.
4. May include a mechanical device that accurately spaces and positions the required tie bar reinforcement and that allows satisfactory mechanical or manual tie bar insertion.

For finishing small amounts of concrete pavement, obtain approval from the Engineer for the use of any finishing equipment that does not conform to these requirements but is specifically designed for that purpose. This equipment must produce equivalent results including adequate consolidation by internal vibration and an acceptable finish.

350-3.3 Vibratory Equipment: Consolidate the full width and depth of concrete in a single pass of an approved internal vibrator system. Operate internal vibrators within a frequency range of 4,000 to 12,000 vibrations per minute (vpm). The Engineer may authorize the minimum vibration frequency to be lowered to 3,500 vibrations per minute for particular sections of paving such as super elevations. Do not operate vibrators in a manner to cause segregation, either a downward displacement of large aggregate particles or an accumulation of laitance on the surface of the concrete. Avoidance of segregation may require a reduction in vibrator frequency when forward motion of the paver is reduced.

If a vibrator fails to operate within the specifications, repair or change the vibrator before the paving begins the following day or begins the same day if the continuous paving that day is stopped at a header or at the end of a session. If two adjacent vibrators fail to operate within specifications, stop the paving operation and repair or replace the vibrators.

Stop vibrators whenever forward motion of the paver is stopped.

Set the depth of penetration into the concrete pavement slab of internal vibrators to mid slab or as deep as possible while passing above any reinforcing steel. Use an operating position locking device so that no part of the vibrating unit can be lowered to the extent that it will come in contact with reinforcing steel or tie bars while paving.

Meet the manufacturer's recommendations for the horizontal spacing of the vibrators or 16 inches from center to center of the vibrators, whichever is less.

Ensure that the longitudinal axis of the vibrator body is mounted approximately parallel to the direction of paving with the exception that the trailing end of each vibrator is tilted downward to an approximate slope of 15 degrees below horizontal.

Use vibrators that meet or exceed the following specifications at the manufacturer's design frequency of 10,000 vpm:

Amplitude (peak to peak) 0.070 inches

Centrifugal force 1,200 pounds

350-3.3.1 Vibratory Monitoring Equipment: Use an electronic vibrator monitoring device displaying the operating frequency of each individual internal vibrator on all contracts with mainline portland cement concrete paving quantities over 50,000 square yards in areas where mainline pavement exceeds 600 feet in length. When project staging necessitates small mainline sections to be paved separately from the majority of mainline paving, the Engineer may waive this requirement for those small sections.

Use a monitoring device with a readout display near the operator's controls visible to the paver operator and the Engineer that operates continuously while paving, and displays all vibrator frequencies with manual or automatic sequencing among all individual vibrators. At a minimum, use a monitoring system that records, the clock time, station location, paver track speed, and operating frequency of individual vibrators. Provide an electronic record of the data to the Engineer daily for the first 3 days of paving and weekly thereafter. The Engineer may determine that more frequent submission is necessary, particularly if equipment malfunctions occur.

If the electronic monitoring and recording devices fail to operate properly, immediately check the vibrators manually. If the vibrators are functioning properly, paving may continue. Correct the malfunction within 3 days. The Engineer may allow additional time if circumstances are beyond the Contractor's control.

350-3.4 Curing Compound Application Equipment: Use equipment for applying membrane curing compound that is self-propelled and capable of uniformly applying the curing compound at the specified rate. Use mechanical spray equipment that continuously stirs the curing compound, by effective mechanical means, and that thoroughly atomizes the curing compound during the spraying operation so that the finished surface of the fresh concrete will not be marred. Only use spray nozzles that are equipped with appropriate wind guards to ensure uniform application.

350-4 Subgrade Preparation.

Keep construction of the subgrade completed and accepted ahead of the paving operation. Maintain the finished subgrade in a smooth, compact condition, and restore to accepted condition any areas which are disturbed prior to placing the concrete. Do not place concrete on a frozen subgrade.

Uniformly moisten the surface ahead of paving operations without allowing standing water.

350-5 Setting Forms.

For straight forms, use only steel forms intended for concrete pavement. For radius work, use forms approved by the Engineer.

Accurately set the forms to line and grade and such that they rest firmly, throughout their entire length, upon the subgrade surface. Join forms neatly and tightly, and brace them to resist the pressure of the placed concrete and equipment operating on the forms. Obtain the Engineer's approval of the alignment and grade of all forms before and immediately prior to the placing of concrete.

Thoroughly clean the forms before use. Apply a release agent in accordance with the manufacturer's recommendations.

350-6 Protection from Weather.

350-6.1 General: Protect unhardened concrete from effects of inclement weather. Cease production and paving operations in rain. In lieu of the temperature requirements in Section 346, the following will apply:

350-6.2 Concrete Paving in Cold Weather: The Contractor may mix and place concrete when the air temperature in the shade and away from artificial heat is 35°F or above. The temperature of the mixed concrete shall not be less than 50°F at the time of placement. Protect the fresh concrete from freezing until the concrete reaches a minimum compressive strength of 1,500 psi.

350-6.3 Concrete Paving in Hot Weather: The temperature of the concrete when placed shall not exceed 100°F. Cool the aggregates and mixing water as necessary to maintain the concrete temperature at not more than 100°F at time of placement.

350-7 Placement of Reinforcement.

Place steel reinforcement in accordance with the details shown in the Plans. Securely wire together transverse and longitudinal bars at their intersections. Lap splices not less than 20 times the nominal diameter of the bar, and only in the longitudinal members. At the time of concrete placement, ensure that the reinforcing steel is free from any of the following which could impair bonding of the steel with the concrete: dirt, oil, paint, grease, mill scale, and any loose or thick rust.

350-8 Placing Concrete.

350-8.1 General: Place concrete to a depth to meet the slab thickness specified in the Plans after consolidation, finishing and grinding. Ensure freshly placed concrete is not contaminated with soil or other deleterious substances.

Thoroughly consolidate concrete against and along the faces of all forms, and along the full length on both sides of all joint assemblies, by means of hand-operated spud-type vibrators. Do not allow vibrators to come in contact with joint assemblies, reinforcement, the subgrade or side forms.

350-8.2 Placement Widths: The Contractor may construct the pavement either in full traffic lanes as determined by the longitudinal joints shown in the plans or for the full width of the pavement in one operation. Construct the pavement to the full width of the lane or slab in a single construction operation. When constructing pavement in separate lanes, do not deviate the junction line from the true line shown on the plans by more than 1/2 inch at any point except where restricted by phase limits shown in the plans.

350-8.3: Delivery Certification: Provide a delivery ticket in accordance with 346-6.3 except that the total gallons of water added at the jobsite and the water to cementitious materials ratio do not apply.

350-8.4 Adding Water to Concrete at the Placement Site: 346-7-7 does not apply.

350-9 Sampling and Testing Methods.

350-9.1 General: Meet the requirements of 346-8 and 346-9 with the following exceptions: Quality Control tests consist of temperature and preparing compressive strength cylinders for testing at later dates. Follow test methods: ASTM C 31 and ASTM C 39 (except for slump and air content); ASTM C 42; ASTM C 172; and ASTM C 1064, as appropriate.

350-9.2 Sampling Frequency for Quality Control Tests: As a minimum, sample and test concrete of each design mix for temperature, and compressive strength once per LOT. A LOT is defined as 2,000 square yards or one day's production of the same type placement method such as slip-form or form work, whichever is less. Partial LOTs of less than 500 square yards will be combined with the previous LOT for testing and acceptance purposes. Section 346 Table 8 does not apply.

350-9.2.1 Reduced Frequency for Quality Control Tests: Reduced frequency for testing may be requested in accordance with Section 346. The LOT may represent a maximum production quantity of 4,000 square yards as approved by the Engineer.

350-9.2.2 Sampling Frequency for Verification: The Engineer will verify one of every four consecutive LOTs, randomly selected, for each design mix based on Section 346 Table 7. The Engineer may perform additional Independent Verifications tests. All QC activities, calculations and inspections will be randomly confirmed by the Engineer. The Engineer will obtain additional samples for informational purposes.

350-10 Striking-off, Consolidating, and Finishing Concrete.

350-10.1 General Requirements: Immediately after placing the concrete, strike-off, consolidate, and finish it to produce a finished pavement in accordance with the cross-section, width, and surface finish required by the Contract Documents. As soon as possible after screeding while the concrete is plastic, correct all flaws such as cavities, blemishes, marks, or scratches that will not be removed by diamond grinding.

Provide a concrete surface true to grade, cross slope, superelevation, and free of irregularities.

If the Engineer permits adding water to assist the finishing operations, apply water as a fog spray by means of approved spray equipment.

350-10.2 Hand Methods - Conditions under which Allowed: Use hand methods in areas of narrow width or irregular dimensions, where operation of a slip-form paver is impractical.

350-10.2.1.1 Strike-off and Screeding: Use a portable screed of an approved design, constructed either of metal or of other suitable material, to strike-off and screed the concrete. Use a screed that is sufficiently rigid to retain its shape and is at least 2 feet longer than the maximum width of the strip to be screeded.

350-10.2.1.2 Consolidation: Use hand-operated spud-type vibrators to consolidate.

350-10.2.1.3 Finishing: Apply a broom finish to areas constructed using hand methods.

350-10.3. Cross Slope: Furnish a level with a minimum length of 4 feet or a digital measuring device approved by the Engineer for the control of cross slope. Make this level or measuring device available at the jobsite at all times during paving operations. Measure the cross slope at a minimum frequency of one measurement every 100 feet. Prior to next shift's paving operations verify the preceding 500 feet to ensure that the cross slope is uniform and in compliance with the design cross slope. When the difference between the measured cross slope

and the design cross slope exceeds plus or minus 0.2% for travel lanes (including turn lanes) or plus or minus 0.5% for shoulders, make all corrections immediately to bring the cross slope for subsequent paving into the acceptable range.

When the cross slope is consistently within the acceptable range, upon approval of the Engineer, the frequency of the cross slope measurements can be reduced to one measurement every 250 feet during paving operations.

350-11 Final Finish.

350-11.1 Finishing: Use a burlap drag that consists of two layers of medium weight burlap with the trailing edge of the lower layer extending approximately 2 inches behind the upper layer. Support the burlap drag in a manner so that a length of at least 3 feet of burlap is in contact with the pavement. Except in areas where using hand methods to construct the pavement, support the lead end of the burlap drag by a traveling bridge. Maintain the drag clean and free from encrusted mortar. Replace the burlap with new material as necessary.

350-11.2 Edging: After applying the final finish, but before the concrete has become nonplastic, carefully round the edges to a 1/4 inch radius on each side of transverse expansion joints and along any structure extending into the pavement. Produce a well-defined and continuous radius, and obtain a smooth, dense mortar finish. Completely remove all concrete from the top of the joint filler.

350-12 Curing.

350-12.1 General: After completing the finishing operations and as soon as the concrete has hardened sufficiently to not mar the surface, cover and cure the entire surface and, when the slip-form method is used, cover and cure the edges of the newly placed concrete. Do not leave freshly placed concrete exposed for a period in excess of 30 minutes without applying curing protection. If the Contractor fails to provide sufficient curing materials to adequately cure the concrete in place in a timely manner the concrete pavement section addressed in the QCP may be suspended.

Continuously cure the freshly placed concrete for a period of 72 hours, exclusive of any periods when the temperature of the surface of the concrete falls below 50°F.

350-12.2 White-Pigmented Curing Compound: Uniformly apply white-pigmented curing compound meeting the requirements of Section 925 to the surfaces to be cured, including the edges of slip-form produced paving, in a single coat of continuous film, at the minimum rate of 1 gallon per 200 square feet.

During application, thoroughly mix the compound in accordance with the manufacturer's recommendation.

Do not apply curing compound during periods of rainfall. Do not apply curing compound to the inside faces of joints to be sealed. Should the film become damaged from any cause within the required curing period, repair the damaged portions immediately with additional compound. If using forms, upon their removal, immediately coat the sides of the slabs exposed to provide a curing treatment equal to that provided for the surface.

350-12.3 Removal of Forms: Do not remove forms from freshly placed concrete for at least 12 hours after placement. Remove forms carefully so as to avoid damage to the pavement. After removing the forms, immediately cure the sides of the slab in the same manner as the surface of the pavement.

350-13 Joints.

350-13.1 Longitudinal Joints: Construct longitudinal construction joints in accordance with details shown in the Contract Documents when constructing the pavement in stages to construct the full width of the pavement. Construct longitudinal lane tie joints within the limits of the pavement placed in accordance with the details shown in the Plans by sawing a groove in the surface of the hardened concrete. Saw the groove perpendicular to the surface of the hardened concrete. Saw the groove perpendicular to the surface of the pavement, 1/4 inch wide, and at least 1/3 of the depth of the pavement thickness in the hardened concrete. Complete sawing as soon as possible to prevent uncontrolled cracking.

350-13.1.1 Tie Bars: Place deformed steel tie bars at the required depth, parallel to the finished surface, at right angles to the joint and at the uniform spacing specified or required in the plans. Place them in the plastic concrete using approved equipment, or rigidly support them on the subgrade by approved devices capable of preventing displacement prior to placing of the concrete. Do not paint or coat the bars with any material before placing them in the concrete.

If placing tie bars along a longitudinal construction joint using the method of inserting bars with a 90 degree bend in the edge of the plastic concrete, use Grade 40 reinforcing steel for such tie bars. When the concrete hardens, straighten the bar. Replace any bar broken while being straightened in an approved manner.

Do not insert steel tie-bars into the unsupported side of the freshly formed slab. The Contractor may place tie-bars into position prior to extrusion from the paver by insertion through the forms, by insertion through a temporary support form placed against the form slab, or by other means approved by the Engineer. Use a method that results in placement of the tie-bars at the specified locations with no edge slumping, damage or disruption of the plastic concrete.

350-13.2 Transverse Joints:

350-13.2.1 Load-Transfer Devices: Provide dowel load-transfer devices in all transverse joints. Firmly hold dowel bars in a position parallel to the surface and the centerline of the slab by approved supports and spacers. Allow the dowels to be free to move in one slab as the concrete contracts and expands. Use dowel bars with one coat of zinc rich primer or red oxide alkyd based primer meeting the requirements of SSPC Paint 25, Type I or Type II. To prevent the concrete from bonding to the dowel, wait a minimum of 7 days before coating one-half of the dowel with a lubricant approved by the Engineer. Ensure that the bars are straight, round, smooth, and free from burrs or other deformations detrimental to the free movement of the bar in the concrete.

Position each dowel such that:

1. its final deviation from parallel to the surface of the pavement does not exceed 1/2 inch;
2. its final deviation from parallel to the longitudinal centerline of the pavement does not exceed 1/2 inch;
3. its final deviation from being centered on the joint does not exceed 2 inches; or
4. at no point in its length does it deviate from the surface of the pavement as shown in the plans in excess of 1 inch.

Confirm the position of dowel bars by suitable means acceptable to the Engineer.

350-13.2.2 Transverse Construction Joints: Construct transverse construction joints at the end of all pours and at other locations where the paving operations are stopped for 30 minutes or longer. Do not place construction joints, however, within 7 1/2 feet of any other transverse joint or within 7 1/2 feet of either end of a section of pavement. If sufficient concrete has not been placed to form a slab at least 7 1/2 feet long, remove the excess concrete, back to the last preceding joint. Form the joints in a plane perpendicular to the profile and centerline of the pavement. Saw or form construction joints, in a manner similar to contraction joints, so that a groove will be formed for holding the joint sealing compound.

Check all joints with a straightedge before the concrete has become nonplastic, and, if one side of the joint is higher than the other or the entire joint is higher or lower than the adjacent slabs, make corrections as necessary.

350-13.2.3 Transverse Contraction Joints: Construct transverse contraction joints at the intervals indicated in the Plans consisting of planes of weakness created by sawing a groove in the surface of the hardened concrete. Place the groove perpendicular to the surface of the pavement. Ensure that the sawing equipment does not damage the pavement, and saw the transverse contraction joints as soon as the pavement has hardened to prevent uncontrolled cracking. Saw a 1/4 inch wide groove at least 1/3 of the depth of the pavement thickness.

350-13.3 Expansion Joints Around Structures at Manholes, Meter Boxes and other Projections: Form expansion joints by placing premolded expansion joint material about all structures and features projecting through, into or against the pavement. Ensure that such joints are 3/4 inch in width.

350-13.4 Cleaning Joints: Immediately after sawing the joints, completely remove the resulting slurry from the joint and the immediate area by flushing with a pressure washer with a minimum of 1,500 psi and by using other tools as necessary.

After flushing, blow out the joints with compressed air.

Patch all spalled edges with an epoxy compound.

Immediately prior to joint seal installation, clean the joints using compressed air to remove all traces of debris and dust within and on the joint surfaces.

350-13.5 Sealing Joints: Insert a temporary backer rod or material approved by the Engineer near the surface of the pavement to prohibit incompressible material from entering the joint, if traffic or construction equipment is going to be on the pavement prior to grinding or final sealing. Until final sealing, repair any temporary seal that is damaged or displaced. Prior to final sealing, remove any temporary seal and clean joints in accordance with 350-13.4.

Install joint seals that resist a minimum of 40 pounds of pullout force per inch of joint length. After cleaning, the Engineer may randomly test joints to determine the adhesion of the joint sealant beginning on the first day of joint sealing. The testing will be performed after the joint sealant has been placed and cured for a minimum of 3 weeks. The Engineer will prepare a portion of the selected joint for testing. After the Engineer has prepared the location for testing, seal the joint and the remaining joints that have been cleaned. Provide means to prohibit traffic over the joint for the 3 week test period.

Repair the test locations if the test requirement is satisfied. Suspend joint sealing if the test requirements are not satisfied and develop a means of determining the extent of the area with inadequate adhesion and submit to the Department for approval. Propose a revised means of cleaning and sealing the joint for the Engineer's approval. With the Engineer's approval clean and seal the joints for four LOTs and suspend operations until the testing by the Department is complete and adequate adhesion is provided.

Remove and replace the joints that have inadequate adhesion at no cost to the Department.

When using silicone and non-silicone sealants in the transverse and longitudinal joints, respectively, use the silicone sealants first to prevent contamination at the intersection of the joint faces. Remove non-silicone sealant 1 foot in each direction from the transverse joints, and replace it with silicone sealant.

350-13.5.1 Hot-Poured Type Sealant: When the plans require hot poured sealant for specific joints, fill the joint thoroughly, without trapping air, ensuring the sealant is recessed 1/4 inch below the pavement surface. Control the pouring rate to avoid spilling of sealant onto the adjacent pavement surface. If any spilling of sealant occurs, immediately remove and clean the entire surplus amount from the pavement surface. Place the poured material when the ambient air temperature is 50°F or greater.

Use an indirect heating or double boiler type heating kettle that uses oil as a heat transfer medium, for hot poured sealer. Use a heating kettle that has a thermostatically controlled heat source, a built-in automatic agitator, and thermometers installed to indicate both the temperature of the melted sealing material and that of the oil bath.

350-13.5.2 Low Modulus Silicone Sealant: Use low modulus silicone sealant of either Type A (non-self-leveling silicone sealant), or Type B and/or Type C (self-leveling silicone sealant). Because Type A will not flow into the proper shape under its own weight, install and tool it so that the sealant is in firm contact with the joint faces and is formed into the appropriate shape as specified. Types B and C will normally flow into the proper shape without tooling. Exercise care to provide the required depth of recess above the sealant surface and below the pavement surface. Install the silicone sealant at ambient air temperatures above 40°F.

350-14 Surface Requirements.

Produce, by grinding in accordance with Section 352, a pavement surface that is true to grade and uniform in appearance with a longitudinal line type texture.

350-15 Thickness Requirements.

350-15.1 General: After grinding the pavement in accordance with 350-14, determine the thickness for acceptance by core borings on the cross-section so that each test represents an area not exceeding one LOT. Provide traffic control, coring equipment, and an operator to obtain the samples.

350-15.1.1 Core Borings: To determine the actual thickness, drill cores from the pavement and measure thickness in accordance with ASTM C-174. Replace the portions of the pavement removed by the borings at no expense to the Department using material meeting the requirements of Section 930. Take two cores per LOT at randomly selected locations. Submit the cores to the Engineer once the thickness determinations have been made. Label the cores based on location and LOT number.

350-15.1.2 Probing: For informational purposes, take 12 randomly selected probe measurements per LOT in accordance with FM 5-596 from the first 15 LOTs of the initial concrete paving operation(s). Record the probe measurements and submit the LOT data to the Engineer. Allow the Engineer access to the work bridge in order to perform verification of the probe measurements. Verification probe measurements will be taken at 12 randomly selected locations per LOT from the same first 15 LOTs of initial concrete paving operations as the Contractor's measurements were taken, but shall be at different locations within the LOT than those used by the Contractor.

In addition to the cores taken for thickness, in the presence of the Engineer, obtain two cores prior to grinding, from each LOT within 15 days of placement and provide the cores to the Engineer. The Engineer will randomly select the core locations. Replace the portions of the pavement removed at no expense to the Department using material meeting the requirements of Section 930.

350-15.2 Method of Calculating Average Thickness: The Engineer will determine the average thickness of the LOT by using the following method of calculation:

a. When an individual thickness of a core is more than 1/2 inch greater than the specified design thickness, the Engineer will consider it in the calculation as the specified design thickness plus 1/2 inch.

b. The Engineer will calculate the average thickness on a LOT-by-LOT basis from the cores obtained in accordance with 350-15.1.1.

350-16 Deficient Thickness.

350-16.1 General: Any LOT which is more than 1/2 inch under the specified thickness as determined by 350-15 is defined as deficient in thickness. Revise the quality control plan to address the cause of the deficient thickness and submit for approval prior to placing additional pavement.

350-16.2 Deficient Pavement: By means of coring, define the limits of the pavement with deficient thickness. Remove such areas and replace them with concrete of the thickness shown in the Plans at no cost to the Department. When removing a section of pavement, remove the full length between transverse joints and the full lane width. Grind replaced sections in accordance with 350-14.

For any LOT requiring partial removal and replacement, the thickness of the entire LOT will be determined by the Engineer by averaging the thickness of two cores taken from each replaced section plus two additional cores from the original portion of the LOT. Take cores in accordance with 350-15.1.1 at locations randomly selected by the Engineer.

350-17 Pay Reductions for Low Strength Concrete and Plastic Properties.

When a concrete acceptance strength test result falls below 4,000 psi, meet the requirements of 346-10 and 346-11 except that the Engineer will adjust the price reduction per square yard and apply the adjusted price reduction accordingly to the LOT(s).

When concrete is placed outside the temperature requirements of 350-6, meet the requirements of 346-12.

350-18 Opening Pavement to Traffic.

Construct an earth berm along longitudinal free edges of the pavement that are constructed on a granular base of an erodible nature within 36 hours of finishing any newly placed concrete pavement. Build the berm to the full height of the pavement and at least 18 inches wide. Sufficiently compact the berm to prevent underwash of the pavement. Maintain the berm until the final shoulders are complete.

Keep the pavement closed to traffic, including construction operations until one of the following has been met:

1. 14 calendar days after placement of the concrete,
2. test cylinders made in accordance with ASTM C-31 and tested in accordance with ASTM C-39 indicate a compressive strength of at least 2,200 psi (cure these test cylinders in a manner identical to the corresponding section of pavement).

350-19 Method of Acceptance.

Acceptance will be based on compressive strength of cylinders and concrete temperature at placement in accordance with Section 346 and thickness per LOT.

350-20 Method of Measurement.

The quantity to be paid for will be the lump sum price of cement concrete pavement adjusted per LOT for average thickness as provided herein.

350-20.1 Concrete Pavement Adjustment: For purposes of payment, the average thickness of pavement will be used to determine the final pay for this pavement for each LOT as follows:

If the average thickness of pavement is less than the specified thickness, then the area of pavement represented by the difference between the calculated average thickness and the specified thickness will be converted into equivalent square yards of specified thickness pavement, and the quantity thereby obtained will be deducted from the quantity of pavement to be paid. The equivalent square yards adjustment is calculated per the following equation:

$$\text{Adjustment (SY)} = (\text{Average LOT Thickness} - \text{Specified Thickness}) / \text{Specified Thickness} * \text{Lot size (SY)}$$

The Engineer will apply a reduction in payment for the LOT based on a unit price of \$ per square yard. If the average thickness is greater than or equal to the specified thickness, no adjustment will be made.

350-20.2 Joints: Include the cost for Cleaning and Sealing Joints in the cost of the newly constructed pavement for:

1. transverse and longitudinal joint construction for new pavement; and
2. abutting joints between existing pavement and new pavement.

350-21 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section, including any preparation of the subgrade not included in the work to be paid for under another Contract item; all transverse and longitudinal joint construction, including tie-bars and dowel bars and joint seal testing; the furnishing of test specimens; repair of core holes; and all incidentals necessary to complete the work.