

## SECTION 40

### PORTLAND CEMENT CONCRETE PAVEMENT

#### 40.1 DESCRIPTION

**A. General:** This work consists of constructing Portland Cement Concrete (PCC) Pavement with or without reinforcement on a prepared surface.

**B. Related Work:**

Section 100	Portland Cement
Section 101	Air-Entraining Admixtures
Section 102	Chemical Admixtures for Concrete
Section 103	Fly Ash
Section 104	Water for Use in Portland Cement Concrete
Section 105	Fine Aggregate for Use in Portland Cement Concrete
Section 107	Coarse Aggregate for Use in Portland Cement Concrete
Section 108	Concrete Curing Materials
Section 113	Preformed Expansion Joint Filler for Concrete
Section 114	Concrete Joint Sealer
Section 123	Concrete Reinforcement
Section 203	Submittals

#### 40.2 MATERIALS

**A. Cement:** Shall conform to the requirements of Section 100. Type II cement shall be used for all concrete pavement.

**B. Admixtures:** Shall conform to the requirements of Sections 101 and 102.

**C. Water:** Shall conform to the requirements of Section 104.

**D. Fine Aggregate:** Shall conform to the requirements of Section 105.

**E. Coarse Aggregate:** Shall conform to the requirements of Section 107.

**F. Reinforcing Steel:** Shall conform to the requirements of Section 123.

**G. Preformed Expansion Joint Filler:** Shall conform to the requirements of Section 113.

**H. Joint Sealer:** Shall conform to the requirements of Section 114.

**I. Curing Materials:** Section 108.

**J. Dowel Bar Assemblies:** Section 123.

**K. Fly Ash:** Section 103.

**L. Epoxy Resin Adhesive:** Epoxy resin adhesive shall be of the type intended for horizontal applications, and shall conform to the requirements of ASTM C881, Type IV, Grade 3 (equivalent to AASHTO M 235, Type IV, Grade 3) Class A, B, or C. The minimum gel time shall be 5 minutes.

### 40.3 CONSTRUCTION REQUIREMENTS

**A. Quality of Concrete, Proportioning and Mix Design:** When the Contractor proposes to use materials for PCC Pavement from sources not previously accepted by the City, the Contractor shall obtain independent, certified laboratory tests that verify that the materials meet the requirements of the applicable sections listed in Section 40.2. Minimum number of tests is once each year per source unless otherwise ordered by the Engineer.

When the Contractor proposes to use a mix design not previously accepted by the City, the Contractor shall obtain independent, certified laboratory tests that verify that the mix design meets the following minimums:

1. Minimum cementitious material content of 600 pounds with a fly ash content of 20 to 25%.
2. Minimum coarse aggregate content of 55% by weight of total aggregates.
3. Minimum 28 day compressive strength of 4,000 psi.

Minimum number of tests is once each year unless otherwise ordered by the Engineer. Test results shall include three each of: seven (7), fourteen (14), & twenty-eight (28) day compressive strength; water-cement ratios; slump (to be consistent with proposed placement method); and air content. These results shall be obtained from separate batches of the same mix design.

These mix design results will be used to monitor and adjust, if necessary, the PCC Pavement placed on the project.

In case satisfactory plasticity, workability, or strength is not secured using the design mix designated, the Engineer may alter proportions as necessary. Adjustment will not be made to compensation due the Contractor because of design mix alterations.

For the Stationary Side Form Method, the slump of the concrete at the time of placement shall be maintained between one (1) and three (3) inches.

For the Slip-Form Method, the concrete shall be held at a uniform consistency, having a slump of not more than two (2) inches.

The concrete shall contain 6.5% entrained air with an allowable tolerance of +1% to -1.5%. Air shall be entrained by an approved air-entraining admixture.

**B. Equipment:** Vehicles tracking foreign substances, including but not limited to; soil, rock, vegetation, hardened concrete, partially hydrated concrete, fuel, and oil will not be allowed to drive through or back into fresh mixed concrete. Equipment dropping foreign substances, including but not limited to; soil, rock, vegetation, hardened concrete, partially hydrated concrete, fuel, and oil from the unit shall not be allowed over or in contact with the fresh mixed concrete.

**1. Batching Equipment:** Batching equipment shall be computerized and automatic. Manual operation will be permitted when automatic controls fail, provided concrete meeting specified results is produced. However, the automatic operation shall be restored before work may commence the day following the failure.

The Contractor shall provide safe and satisfactory means for obtaining necessary material samples from the batching plant.

Batching plant structures shall be leveled so the accuracy of the weighing mechanism is maintained.

Hoppers shall fully discharge without jarring the scales.

Clearances between scale parts, hoppers, and bin structure shall be maintained to avoid displacement of, or friction between, parts due to material accumulations, vibration, or other cause. Pivot mountings shall be designed so the parts will not jar loose, and constructed to assure unchanging spacing of knife edges under all circumstances. Exposed fulcrums, clevises, and similar working parts shall be kept clean.

To maintain accuracy, weighing hoppers and other parts which are affected by wind action shall be protected by shelters or wind breaks.

The equipment for weighing aggregates, cement, water, and admixtures shall be an integral part of the batching equipment. The scales/load cells shall be accurate within 0.5% at any point throughout the range of the scale/load cell. Graduations shall be not greater than 0.1% of the capacity of the scale/load cell. The scales/load cells shall be sensitive to the weight indicated by one graduation.

The following controls shall apply to the aggregate batching equipment:

- a) The batching equipment shall operate within a delivery tolerance of 1.5% of the net weight for each aggregate weighed.
- b) The hopper inlet mechanism shall be interlocked against opening when the discharge gate is open.

- c) The hopper discharge mechanism shall be interlocked against opening while the hopper is being charged.

The hopper discharge mechanism shall be interlocked against opening if any material in the hopper is either overweight or underweight by more than 1.5% of the specified weight.

The cement batching equipment shall operate within a delivery tolerance of 1% of the net weight of the cement per batch. The cementitious material (cement and fly ash) batching equipment shall also operate within a delivery tolerance of 1% of the net weight of the total cementitious material per batch.

Water may be measured by volume or weight. The measuring equipment shall operate within a delivery tolerance of 1% of the net weight or volume of water.

When water is measured by volume, means for determining the accuracy of the measuring device shall be provided.

Air-entraining or other admixtures may be measured by volume or by weight. The measuring equipment shall operate within a delivery tolerance of 3% of the net weight or volume per batch.

- 2. Ticket Requirements:** A printed, computer generated, ticket shall be automatically produced for each load of concrete batched. The printed computer ticket shall accompany each load of concrete to the project and shall be presented to the Engineer prior to discharging the load at the project site unless an alternate procedure is approved.

The printed ticket must contain the following minimum information:

- Truck Number
- Date and Time batched
- Total volume of the load, in cubic yards
- Mix Design Number or Mix Type
- Actual weight (mass) or volume of each component of the mix:
  - Coarse Aggregate
  - Fine Aggregate Cement
  - Fly ash
  - Water (batch water) Admixtures
  - Air Entraining
  - Admixtures
    - Water Reducers
    - Retarders
    - Accelerators
    - Others
- % Moisture in Aggregate (either % free moisture or % total moisture)
- Maximum Water Allowed

- (maximum water allowed = weight of mix design water - weight of free water)
- W/C ratio (as-batched)

The final W/C ratio, for acceptance, shall be calculated using the following formula and rounded to the nearest 0.01:

$$\text{W/C ratio} = \left( \frac{\text{weight of free water} + \text{weight of batch water} + \text{weight of added water}}{\text{weight of cement} + \text{weight of supplementary cementitious material}} \right)$$

% free moisture = % total moisture in aggregate - % absorption of aggregate  
 weight of free water = % free moisture x weight of aggregate  
 weight of batch water = total weight of water added to the batch either at the plant or in the truck  
 weight of added water = total weight of water added after batching process (typically added at point of delivery)

The weight of free water shall be calculated for both the fine aggregate and the coarse aggregate.

The above information must be automatically printed in such a manner that the Engineer may verify the mix adheres to the proportions specified by the design mix.

- 3. Mixing and Hauling Equipment:** Mixers and agitators shall have attached in a prominent place, the manufacturer's plate showing the various uses for which the equipment is designed and the capacity of the drum in terms of volume of mixed concrete.

The pick-up and throw-over blades in the drum shall be restored or replaced when any part or section is worn  $\frac{3}{4}$ -inch or more below the original height of the manufacturer's design. The Contractor shall maintain a copy of the manufacturer's design, showing dimensions and arrangement of blades in reference to the original height and depth. Mixers that have an accumulation of hard concrete or mortar shall not be used.

Mixers, except truck mixers, shall be equipped with a timing device to track the total mixing time of the concrete batch.

Truck mixers shall be equipped with counters to record the number of revolutions of the drum or blades.

Mixers shall be capable of combining the concrete ingredients into a thoroughly mixed and uniform mass and shall uniformly discharge the concrete.

The hauling bodies of non-agitating equipment shall be smooth, mortar-tight metal containers equipped with gates and vibrators that will permit uniform control of the discharge of the concrete.

- 4. Spreading and Finishing Equipment:** Shall consist of a mechanized device to place and provide a rough strike off of the concrete. The concrete shall be unloaded into an approved mechanical concrete spreader and deposited uniformly across the subgrade or subbase as close as possible to its final position. The use of a mechanical spreader may be waived provided the concrete hauling equipment is equipped with a discharge system capable of distributing the concrete uniformly without segregation across the width of paving and meets the approval of the Engineer. The spreader shall run on forms when forms are used or on wheels or tracks when slip forming. The mechanical concrete spreader shall be self-propelled and shall be capable of spreading the concrete mix to the desired cross sections. The spreader shall be easily adjustable to spread different elevations of concrete.

Slipform paving equipment shall have the direction of forward motion and grade (vertical elevation) controlled by an electronic sensing device. The electronic sensing device shall either follow a taut string line or shall be controlled by a GPS/Total Station system capable of meeting the alignment, grade, surface test, and cross slope requirements.

The paving equipment shall spread, consolidate, screed, and finish the freshly placed concrete to provide a dense and homogenous pavement with a minimum amount of hand finishing.

The paving equipment shall not cause flotation of aggregate particles or show evidence of an accumulation of laitance on the surface of the concrete either during or after placement.

- 5. Vibrators:** Shall be either the surface pan type or the internal type. They may be attached to the spreader, the finishing machine, or mounted on a separate carriage. Vibrators shall be interlocked with the machine's travel mechanism so vibration is stopped when the forward motion stops. Vibrators shall not come in contact with the joints, load transfer devices, reinforcement, subgrade, subbase, or side forms.

The frequency of the surface vibrators shall not be less than 3,500 impulses per minute. The frequency of the internal vibrators shall not be less than 7,000 impulses per minute. When spud type internal vibrators are used adjacent to forms they shall have a frequency of not less than 3,500 impulses per minute.

Vibrators shall not be operated in excess of this frequency to such a degree that flotation of aggregate particles is caused and is evident or visible either during or after placement or that it causes an accumulation of laitance on the surface of the concrete.

A vibrating reed tachometer, hand type, shall be provided with each paver. The vibrating reed tachometer shall have a range from at least 4,000 to 10,000 vibrations per minute.

Vibrators shall not be used to level or spread the concrete, but shall be used only

for purposes of consolidation.

- 6. Concrete Saw:** The Contractor shall provide sawing equipment, adequate to complete the sawing to the required dimensions and at the required rate. The Contractor shall also provide at least one standby saw in good working order.

If an early entry saw is used, the early entry saw shall use a dry cutting operation with up cutting blade rotation and a skid plate straddling the blades to minimize raveling and tearing of the concrete at the joint.

- 7. Forms:** Shall have a depth not less than the prescribed edge thickness of the pavement. Built up forms with horizontal joints shall not be used.

When staked in place, forms shall withstand the pressure of the concrete and the impact, vibration and loading of any equipment they are required to support, without significant springing, settlement, or lateral displacement meeting the following requirements:

- a) The top face of any form shall not vary from a true plane by more than 1/8 inch in 10 feet, nor shall the contact face of a straight form vary from a true plane by more than 1/4 inch in 10 feet.
- b) Bent, twisted, or broken forms and those with battered top surfaces shall be removed from the work. Repaired forms shall not be used until inspected and approved.
- c) Flexible or curved forms of proper radius shall be used for curves of 100 foot radius or less. Flexible or curved forms shall be of an acceptable design.

**C. Preparation:**

- 1. Insert Steel Bar in PCC Pavement:** When specified in the plans and at the locations specified in the plans, the Contractor shall insert steel bars into drilled holes in the existing concrete pavement. An epoxy resin adhesive must be used to anchor the steel bar in the drilled hole.

Epoxy resin adhesive shall conform to Section 40.2 L.

The diameter of the drilled holes in the existing concrete pavement for the steel bars shall not be less than 1/8 inch nor more than 3/8 inch greater than the overall diameter of the steel bar. Holes drilled into the existing concrete pavement shall be located at mid-depth of the slab and true and normal. The drilled holes shall be blown out with compressed air using a device that will reach to the back of the hole to ensure that all debris or loose material has been removed prior to epoxy injection.

The Contractor shall mix the epoxy resin as recommended by the manufacturer and apply by an injection method approved by the Engineer. If an epoxy pump is

utilized, the pump shall be capable of metering the components at the manufacturer's designated rate and be equipped with an automatic shut-off. The pump shall shut off when any of the components are not being metered at the designated rate.

The Contractor shall fill the drilled holes 1/3 to 1/2 full of epoxy, or as recommended by the manufacturer, prior to insertion of the steel bar. Care shall be taken to prevent epoxy from running out of the horizontal holes prior to steel bar insertion. Rotate the steel bar during insertion to eliminate voids and ensure complete bonding of the bar. Insertion of the bars by the dipping method will not be allowed.

- 2. Stationary Side Form Method:** Forms shall be set to line and grade. The granular surface shall be final graded and dowel assemblies, if required, accurately placed in advance of concrete placement.

The foundation under the forms shall be compacted and true to grade. The form shall be firmly in contact with the granular surface for the entire length of the form. Forms shall be staked into place with not less than three pins for each 10 foot section. A pin shall be placed at each side of every joint.

Form sections shall be tightly locked and free from play or movement. Forms shall be cleaned and oiled prior to placing concrete.

Alignment and grade elevations of the forms shall be checked and corrections shall be made before placing concrete. When forms have been disturbed or the grade has become unstable, the forms shall be reset and rechecked.

After side forms have been set to line and grade and securely fastened, the surface on which the concrete paving is to be placed shall be brought to final grade by an approved method. High areas shall be trimmed to proper elevation. Low areas shall be filled and compacted to a condition similar to that of surrounding grade, or filled with concrete integral with the pavement.

An automatic subgrader operating from a preset grade line or automatic grade control may be used prior to setting of the side forms. After grading has been completed by the automatic subgrader, the forms shall be set, the surface checked, and high and low areas corrected.

The finished subgrade surface shall be maintained in a smooth and compacted condition until the pavement is placed.

- 3. Slip Form Method:** The surface, on which the concrete is to be placed, shall be brought to final grade by an approved method, which may include automatic subgrader operating from a preset grade line or automatic grade control, or motor grader/blade.

The finished subgrade surface shall be maintained in a smooth and compacted condition until the pavement is placed.



- D. Handling, Measuring, and Batching Materials:** The separate aggregate components shall not become intermixed prior to being weighed.

Aggregates shall be transported from stockpiles or other sources to the batching plant in a manner that maintains a uniform grading of the material. The use of track-type dozing equipment will not be permitted in handling coarse aggregates from stockpiles.

Aggregates that have become segregated or mixed with earth or foreign material shall not be used. If the aggregates contain non-uniform moisture, storage or stockpile periods will be required to equalize the moisture content.

The separate aggregate components for each batch may be weighed cumulatively in a single hopper or weighed separately in individual hoppers. A separate scale and hopper shall be used for weighing cementitious materials.

- E. Mixing Concrete:** Concrete shall be mixed at a central stationary plant. Truck mixing will be permitted only when approved by the Engineer.

Mixing and agitating speeds shall be as designated by the manufacturer of the equipment. Mixers may not be charged in excess of their rated capacity.

Manual operation of the central plant will be permitted only in case of failure of the automatic control. Automatic operation must be restored before work may commence the day following the failure.

Mixing water shall not be heated above 160°F. Aggregates shall not be heated above 100°F and shall be free of frozen lumps, ice, and snow.

A portion of the mixing water shall be charged into the drum in advance of the cement and aggregates. The flow of water shall be uniform and all water shall be in the drum by the end of the first 15 seconds of the mixing period. Concrete mixed less than the specified time shall be disposed of at the Contractor's expense.

When a concrete batch is transported in a truck mixer or agitator and the batch is smaller than 60% of the rated capacity of the truck mixer or agitator, the following percentage of additional cementitious material at the same proportions as listed on the mix design shall be added to the batch:

Percent of Rated Capacity	Additional Cementitious Material Required
40% to 60%	5%
20% to 39%	10%
10% to 19%	15%
0% to 9%	20%

The above provisions regarding additional cementitious material shall also apply

to the mixing of small batches in central plants. Additional cementitious material will not be required when the small batch is mixed in a drum that is sufficiently coated with mortar to withstand the loss of cementitious material. Sufficient mortar coating, as determined by the Engineer, may include mortar coating the drum from a previously mixed batch during continuous mixing operations. Additional cementitious material will be required if more than 30 minutes has passed from the mixing of the previous batch, if the drum has been cleaned following the previous batch, or if the mortar coating the drum has been disturbed following the previous batch.

1. **Central Plant Mixing:** Concrete shall be mixed for a period of not less than one (1) minute after all materials, excluding water, are in the mixer.
2. **Truck Mixing:** Original mixing time for truck mixed concrete shall not be less than 70 or more than 100 revolutions of the drum at mixing speed after all ingredients, including water, are in the drum. Additional revolutions beyond 100 shall be done at agitating speed.

The mixing water shall be added at the time of batching. When approved by the Engineer, additional water, admixtures, and cement may be added to the batch after completion of the original mixing, in which case the batch shall be mixed an additional 30 revolutions at mixing speed. The Contractor shall provide means to accurately measure the amount of additional materials added.

**F. Delivery Requirements:** The rate of delivery of concrete shall be uniform.

When concrete is continuously agitated in the hauling unit, it shall be discharged within 90 minutes after the cement has been placed in contact with the aggregates and discharged and screeded within 105 minutes. When the concrete temperature is 85°F or above, the time limitation shall be reduced to discharged within 45 minutes and discharged and screeded within 60 minutes.

When concrete is not continuously agitated in the hauling unit, the concrete shall be discharged within 45 minutes after the cement has been placed in contact with the aggregates and discharged and screeded within 60 minutes. When the concrete temperature is 80°F or above, the time limitation shall be reduced to discharged within 30 minutes and discharged and screeded within 45 minutes.

The hauling unit shall be thoroughly cleaned and flushed with water as necessary to insure hardened concrete will not accumulate in the concrete hauling compartment. All wash water shall be completely discharged before recharging the hauling unit with fresh concrete.

**G. Placing Concrete:** Placement of concrete on a frozen surface will not be permitted. The surface temperature of forms, steel, and adjacent concrete which will come in contact with the concrete shall be raised to a temperature above freezing prior to placement.

Concrete temperature at time of placement shall not be less than 50°F or more than 90°F.

The subgrade surface shall be uniformly moist when the concrete is placed. Moisture shall be applied without forming pools of water.

The concrete shall be deposited on the grade so as to require as little rehandling as possible. Free fall of concrete shall not exceed 5 feet.

Necessary hand spreading shall be done with shovels. Rakes or vibrators shall not be used for spreading concrete. Workmen shall not be allowed in the freshly mixed concrete with boots or shoes coated with foreign substances.

The concrete shall be consolidated against and along the faces of all forms by vibrators. Vibrators shall not come in contact with a joint assembly, the grade, or a side form. The vibrator shall not be operated longer than 10 seconds in any one location.

All concrete material which falls on or is worked into the surface of a completed slab shall be removed immediately.

- H. Test Specimens:** The Contractor shall furnish concrete from the mixture for making test specimens.
- I. Placement of Reinforcement and Dowel Bar Assemblies:** The reinforcement shall be free from dried concrete, dirt, oil, paint, grease, mill scale, and rust which could impair bond with the concrete. Epoxy coated dowel bars and tie bars shall meet the requirements of Section 123.

The reinforcement shall be positioned on approved supports in advance of the concrete placement. No hand placement will be allowed. Automatic dowel bar inserters will not be allowed. The use of an automatic tie bar inserter will not be allowed for any longitudinal joint. The Concrete shall be consolidated around the tie bar.

Tie bars shall be held in the specified position parallel to the slab surface and perpendicular to the centerline by a supporting device. Tie bars or tie bar baskets shall be securely staked to the roadbed and shall hold the bar at the correct spacing, alignment, and elevation.

Tie bars will not require supports if inserted into the side of the pavement during slip form paving of the longitudinal construction joint operation. Failure to acquire the correct tie bar locations or position in the construction joint shall require the bars to be corrected and a change made to the operation which may include drilling and epoxying bars or other methods as approved by the Engineer.

The final position of each tie bar shall be within the following tolerances:

- a) Vertical Placement:**  $\pm T/6$  for any part of the tie bar (T = slab thickness)

- b) Transverse Placement (side shift):  $\pm 3$  inches when measured perpendicular to the longitudinal joint line

If the tie bar does not meet the requirements and tolerances specified, corrective action shall be performed at the Contractor's expense to the satisfaction of the Engineer.

Dowel bar assemblies shall be installed where specified. Anchor pins for the dowel bar assemblies shall be installed as detailed in the plans. Dowel bar assemblies shall be fabricated in single units for the appropriate lane prior to being placed on the subgrade. After the dowel bar assemble is staked and prior to concrete installation, it is the Contractor's option to cut and bend spacer wires that pass through the contraction joint.

The free ends of the epoxy coated dowel bars [minimum of 1/2 of the dowel length plus two (2) inches] shall be given a thin uniform coating of form oil or multipurpose grease. This coating shall be applied within two (2) hours of being covered by concrete.

In lieu of this manual coating, dowel bar assemblies may be pre-coated by dipping the complete assembly in a bond breaker meeting the requirements of Section 123. Pre-coated dowel bar assemblies must be free of foreign materials at the time of placement.

Dowel bars shall be placed parallel to the subgrade and parallel to the centerline of the pavement as specified in the plans. The final position of each dowel bar shall be within the following tolerances:

- a) Vertical Placement:  $\pm 1/8$  inch for any part of the dowel bar
- b) Transverse Placement (side shift):  $\pm 1/2$  inch when measured perpendicular to the longitudinal joint line

If the dowel bar does not meet the requirements and tolerances specified, corrective action shall be performed at the Contractor's expense to the satisfaction of the Engineer.

The Contractor shall accurately mark the location of doweled contraction joints to assure accurate placement of the weakened plane of the joint during subsequent operations. The marks must be within one (1) inch of the center of the dowel bars as placed.

#### **J. Final Strike-Off, Consolidation, and Finishing:**

1. **Sequence:** The sequence of operations shall be; the strike-off and consolidation, floating and removal of laitance, straight edging, and final surface finish.

The addition of water to the surface of the concrete to assist in finishing operations

will not be permitted. In isolated areas where extreme conditions exist, the Engineer may determine the addition of water would be beneficial if applied with an approved fog sprayer.

Concrete shall be finished before initial set has occurred. Concrete not finished before initial set has begun shall be wasted. Re-tempering of concrete will not be allowed. Concrete shall not be mixed and placed unless natural light is sufficient for finishing operations. The Contractor shall remove and replace concrete placed that is not workable or able to be finished properly.

The concrete shall be struck-off, consolidated, and finished, so the surface of the pavement conforms to the cross section and elevation specified. The Contractor shall consolidate the concrete in a manner that results in a dense homogenous mass without segregation, holes, voids, or layers.

Concrete shall not be constructed above or more than 1/8 inch lower than adjacent placed concrete pavement.

2. **Finishing at Joints:** The concrete adjacent to joints shall be placed without voids or segregation against the joint material, under and around all load transfer devices, joint assembly units, and other features designed to extend into the pavement. Concrete adjacent to joints shall be mechanically vibrated as per this section.
3. **Machine Finishing:** Vibrators meeting the requirements of this section shall be used for full width vibration of concrete paving slabs.

Immediately after placement, the concrete shall be struck off and screeded by an approved finishing machine. The machine shall go over each area of pavement as many times and at the intervals necessary to produce a surface of uniform texture, to provide proper consolidation, and to provide a dense homogenous mixture free of segregation, holes, voids, and layers. The Contractor will be responsible to remove and replace pavement that is not properly consolidated or contains segregation, holes, voids, and layers.

Excessive finishing over a given area shall be avoided. The top of the forms shall be kept clean by an effective cleaning device attached to the machine. The travel of the machine on the forms shall be maintained true without lift, wobbling, or other variation affecting the precision finish.

During the first pass of the finishing machine, a ridge of concrete shall be maintained ahead of the front screed for its entire length.

The finishing machine shall be operated with a continuous forward movement. All operations of mixing, delivering, spreading, and vibrating concrete shall be coordinated to provide uniform progress and minimize the stopping and starting of the paver.

Except in an emergency, no tractive force shall be applied to the machine, except that which is controlled from the machine.

- 4. **Hand Finishing:** Hand finishing methods will not be permitted except when narrow widths or irregular areas that cannot be finished with mechanical equipment are encountered.

In the event of mechanical equipment breakdown, the concrete already deposited on the grade shall be hand finished and additional concrete placement shall be terminated. Hand finishing shall be done in a manner that produces an acceptable finished surface.

- 5. **Floating:** Long handled floats shall be used to smooth and fill open-textured areas in the pavement. The use of long-handled floats shall be kept to a minimum and shall not be used to float the entire surface of the pavement. Care shall be taken so the crown is not worked out of the pavement during the operation.
- 6. **Final Finish:** Before the concrete has attained its initial set, the surface shall be given a final finish with a carpet drag drawn over the surface in a longitudinal direction. The drag shall be mounted on a bridge and shall be sized so that a strip of the carpet at approximately two (2) feet wide is in contact with the pavement surface while the drag is operated.

The condition of the drag shall be maintained so the resultant surface is of uniform appearance with corrugations approximately 1/16 inch in depth. Drags shall be maintained clean and free of encrusted mortar. Drags that cannot be cleaned shall be discarded and replaced.

The carpet shall meet the following requirements:

Facing Material .....	Molded polyethylene pile face	Blade
Length .....	7/8 inch, ±1/8 inch	
Total Fabric Weight .....	70 ounces per square yard	minimum

The backing shall be of a strong, durable material, not subject to rot, which is adequately bonded to the facing.

Plain Jointed concrete pavement shall be either longitudinally or transversely tined if called for in detailed plans and specifications. Tining shall be per SDDOT Standard Specifications for Roads and Bridges, Current Edition, section 380, or as approved by the Engineer.

Tining depth and spacing shall be determined according to SDDOT test SD 418.

Brooming may be used on irregular areas in lieu of the carpet drag and tine finish. The broom shall be drawn transversely across the pavement with adjacent strokes slightly overlapping. Brooming shall be uniform in appearance and shall produce grooves approximately 1/16 inch deep. Texturing shall be completed while the

concrete surface can be broomed without being torn or unduly roughened by the operation.

The finished surface shall be free from rough and porous areas, irregularities, and depressions resulting from improper handling of the broom.

- 7. Edging at Forms and Joints:** After the final finish, and while the concrete is still plastic, the edges of the pavement along each side of the slab, and on each side of transverse construction joints, shall be worked with an approved tool and rounded to the specified radius. Edging will be permitted along longitudinal construction joints provided the radius does not exceed 1/4 inch. A well-defined and continuous radius shall be produced and a smooth, dense mortar finish obtained. The surface of the slab shall not be unduly disturbed by tilting of the tool during use.

Any tool marks appearing on the slab adjacent to the joints shall be eliminated by brooming, belting, or burlap dragging the surface without disturbing the rounding of the corner of the slab. Where preformed expansion joint filler is used, the Contractor shall remove all concrete on top of the preformed expansion joint filler.

All joints shall be tested with a 10 foot straightedge before the concrete has set and correction made if one side of the joint is higher than the other or if they are higher or lower than the adjacent slabs.

- K. Protection of Concrete:** For the protection of the pavement surface, the Contractor shall have available covering materials, including but not limited to, insulating blankets, curing blankets, and plastic sheeting. The Contractor shall maintain the concrete surface temperature above 35°F until the concrete has attained a compressive strength of at least 1,500 psi. In addition, when the air temperature is forecasted to be below 32°F for more than four (4) hours, the Contractor shall cover the concrete surface with the covering material. This protection shall be in addition to one of the curing methods specified in this section. The Contractor shall remove and replace concrete damaged by cold weather at the expense of the Contractor.

The pavement shall not be opened to traffic until meeting the requirements of this section.

When rain appears imminent, paving operations shall stop and the unhardened concrete shall be covered with the protective covering. Pavement not properly protected from weather shall be subject to corrective action as determined by the Engineer.

The Contractor shall protect the concrete pavement and its appurtenances against all traffic. This shall include watchmen to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, cross-overs, etc. Cross-overs will not be permitted until the concrete is at least 24 hours old.

Any damaged or defective pavement shall be repaired or removed and replaced as

directed. When pavement must be removed and replaced, the Engineer will determine the dimensions of the pavement to be removed.

- L. **Joints:** Curing membrane damaged or protective cover removed during the sawing operation shall be repaired or replaced by the Contractor as directed by the Engineer at no cost to the City.

- 1. **Longitudinal Sawed Joints:** Deformed steel tie bars shall be placed perpendicular to the longitudinal joints by approved methods. Tie bars shall not be painted or coated with asphalt or other material, or enclosed in tubes or sleeves.

Longitudinal sawed joints shall be cut to the dimensions specified. Suitable guidelines or devices shall be used to assure cutting the joint to a true line. The sawed joint will not require reapplication of curing compound. The joint shall be sealed as required in this section.

Sawing of the longitudinal joint shall commence as soon as the concrete has hardened sufficiently to permit sawing without raveling. All joints shall be sawed to the specified depth as shown on the plans before uncontrolled shrinkage cracking occurs.

Repair or correction of uncontrolled cracks shall be as directed by the Engineer and at the expense of the Contractor.

- 2. **Longitudinal Construction Joints:** When adjacent lanes of pavement are constructed separately, a keyway shall be formed along the construction joint. The keyway may be omitted at the Contractor's option if the longitudinal joint is tied with deformed steel tie bars.

When adjacent lanes of pavement are constructed separately, epoxy-coated deformed steel tie bars of specified length, size, spacing, and material shall be placed across the longitudinal construction joint to tie the lanes together. The epoxy-coated tie bars installed in drilled holes along the vertical edge of the first lane placed, shall be installed with an approved epoxy resin adhesive to provide a minimum pull requirement of 8,200 pounds. Holes shall be blown clean and dry prior to placing the adhesive. The installation shall be with methods and tools conforming to the adhesive manufacturer's recommendations.

The drilled holes shall be filled from the back to the front 1/3 to 1/2 full of epoxy or as recommended by the manufacturer, prior to insertion of the steel bar. Care shall be taken to prevent epoxy from running out of the horizontal hole prior to steel bar insertion. Rotate the steel bar during installation to eliminate voids and ensure complete bonding of the bar. Insertion of the bars by the dipping method will not be allowed.

If an epoxy pump is utilized, it shall be capable of metering the components at the manufacturer's designated rate and be equipped with an automatic shut-off. The pump shall shut off when any of the components are not being metered at the



designated rate.

The Contractor shall load test tie bars at the direction of the Engineer. The Engineer has the authority to halt construction until the load test has been performed to the satisfaction of the Engineer.

For each bar that fails to pass the minimum requirements, two more bars selected by the Engineer shall be tested. Each bar that fails to meet the minimum load requirement shall be reinstalled and retested. The equipment and method used for testing shall meet the requirements of ASTM E488. All tests shall be performed within 72 hours of installation. The tie bars shall be installed and approved before concrete is placed in the adjacent lane.

3. **Transverse Contraction Joints:** Shall be created by sawing. The initial saw cut shall commence when the concrete has hardened sufficiently to permit sawing without raveling. If required, the widening cut shall not commence until completion of the concrete cure period. Joints shall be sawed before uncontrolled shrinkage cracking takes place. If necessary, the initial sawing operations shall be performed both day and night, regardless of weather conditions. The initial sawed joint will not require reapplication of curing compound.

If an early entry saw is used, the cut may remain approximately one (1) inch from the edges of the concrete slab to control spalling at the edge. Unless specified otherwise, the early entry saw cut shall be to a minimum depth of one (1) inch. If an early entry saw is used, the Contractor shall complete the initial saw cut on all joints where a crack has not developed for the entire width and to the required depth before the end of the 72 hour curing period. The Engineer will not require the Contractor to complete the saw cut to the final required depth at joint locations where the early entry saw cut resulted in the concrete pavement cracking, as determined by the Engineer. The early entry saw shall not induce micro cracking along the saw cut. The Contractor shall repair damaged areas resulting from incorrect early entry sawing practices.

When PCC pavement is installed adjacent to existing curb and gutter, the transverse contraction joints shall match the joint spacing in the curb and gutter.

4. **Random Cracks:** The sawing of a joint shall be omitted if a crack occurs within three (3) inches of either side of the joint location prior to the time of sawing. Sawing shall be discontinued when a crack develops ahead of the saw. Any procedure which results in premature and uncontrolled cracking shall be revised immediately by adjusting the sequence of cutting the joints or the time interval involved between the placing of the concrete or removal of curing media and the cutting of joints.

Longitudinal random cracks penetrating the full depth of the pavement shall be repaired to the satisfaction of the Engineer. The method of repair shall be approved by the Engineer. The methods will include, but are not limited to, cross-stitching, epoxy injection, routed and sealed, or removal and replacement. Cross stitching

and epoxy injection repair methods will not be allowed for pavement panels cracked into more than two pieces or pavement panels where the random crack is diagonal in orientation (approximately 45° from the centerline or transverse joint).

Repair or correction of uncontrolled or random cracks shall be as directed by the Engineer and at the expense of the Contractor.

If an uncontrolled crack develops within 6 feet of the contraction joint, a minimum of six (6) feet of pavement removal and replacement will be required. Removal and replacement of the pavement shall be done at the Contractor's expense. If cracking occurs on both sides of the joint, the dowel bar assembly and a minimum of three (3) feet of pavement each side of the joint shall be removed and replaced. Removal and replacement of the pavement shall be done at the Contractor's expense.

If an uncontrolled crack develops on one side of the contraction joint in the mid panel area between 6 feet from the joint and the midpoint of the panel, the entire panel shall be replaced on that side of the joint within the lane containing the cracking. Removal and replacement of the pavement shall be done at the Contractor's expense.

No section of pavement less than six (6) feet in length will be allowed to remain in place.

The City will provide guidance for repair procedures to the Contractor. If extreme conditions exist which make it impractical to prevent erratic cracking by early sawing, the contraction joint groove shall be formed in a manner approved by the Engineer prior to initial set of the concrete.

- 5. Transverse Construction Joints:** Shall be made at the end of each day's run and where an interruption is of duration long enough that the concrete is no longer plastic and cannot be vibrated.

The transverse construction joint shall be located at a contraction joint location. Supplemental hand vibrators shall be immediately available to provide satisfactory consolidation at joints.

Paving in the area of a transverse construction joint will not be permitted for 12 hours after installation.

- M. Curing:** Immediately after the finishing operations have been completed and marring of the concrete will not occur, the entire surface, and exposed edges of the pavement, shall be properly cured. The concrete shall not be left exposed for more than 1/2 hour between stages of curing or during the curing period. Curing shall be maintained for at least 72 hours after concrete placement. One of the following curing methods shall be used:

- 1. Curing Blankets and White Polyethylene Sheeting Method:** The surface of the concrete pavement and both pavement edges shall be covered with curing

blankets. The mats shall be thoroughly saturated with water and placed with the wettest side down.

Immediately after placement, the curing blankets shall be covered with white polyethylene sheeting placed in accordance with this section.

Combination burlap-polyethylene sheeting may be substituted for the layer of curing blanket and the polyethylene sheeting with the Engineer's approval.

The curing blankets shall be kept moist by periodic applications of water.

2. **White Opaque Polyethylene Sheeting Method:** The top surface and sides of the pavement shall be entirely covered with polyethylene sheeting. The units used shall be lapped at least 18 inches. The sheeting shall be placed and weighted down to maintain intimate contact with the surface covered. The sheeting shall be sized so each unit as laid will extend beyond the edges of the slab at least twice the thickness of the pavement. In cold weather the substitution of dark sheeting for white sheeting will be permitted.
3. **Liquid Membrane Curing Compound Method (Linseed Oil Cure):** The entire surface of the pavement shall be sprayed uniformly with white pigmented linseed oil-based curing compound immediately after the finishing of the surface. If the pavement is cured initially with curing blankets, the impervious membrane shall be applied immediately upon removal of the curing blankets. The curing compound shall not be applied during or immediately after rainfall.

Curing compound shall be applied under pressure by approved self-propelled mechanical sprayers. The curing compound may be applied in one or two applications. If applied in two applications, the second shall be applied within 30 minutes after the first.

The Contractor shall apply curing compound at the minimum application rate of one (1) gallon per 150 square feet for carpet drag or broom finished surfaces and one (1) gallon per 125 square feet for metal tined finished surfaces.

The sprayer equipment shall be equipped with a tank agitator and shall be fully atomizing. The spray fog shall be protected from the wind by a shield. During application the compound shall be thoroughly mixed and continuously agitated by mechanical means. Hand spraying of odd width or shapes and concrete surfaces exposed by form removal will be permitted.

Curing compound shall not be applied to the inside faces of joints to be sealed, unless the compound is completely removed by subsequent sawing operations. Curing membrane damaged or protective cover removed on the surface of the pavement during the sawing operation shall be repaired or replaced by the Contractor as directed by the Engineer at no cost to the City.

Should the film become damaged within the curing period, the damaged portions

shall be repaired immediately with additional compound.

The sides of the exposed slab shall be protected with a curing treatment equal to that provided for the surface.

**N. Removing Forms:** Forms shall not be removed until concrete has set for at least 12 hours, except for auxiliary forms used temporarily in widened areas. Forms shall be removed without damaging the pavement. After the forms have been removed, the exposed sides of the slab shall be cured by one of the methods indicated above, unless the forms are left in place for more than 72 hours.

**O. Surface Test (10 Foot Straightedge):** The pavement surface shall be tested with a 10 foot straightedge. The permissible longitudinal and transverse surface deviation shall be 1/4 inch in 10 feet.

Areas where the maximum deviation exceeds the permissible deviation by not more than three-eighths (3/8) inch will be subject to the following at the discretion of the Engineer:

- a) Grind down to an elevation where the area or spot will be within the permissible deviation and receive 100% pay.
- b) Accept affected area without corrective action with price reduction at a rate noted below.

Areas where the maximum deviation exceeds the permissible by more than three-eighths (3/8) inch will be subject to the following at the discretion of the Engineer:

- a) Grind down to an elevation where the area or spot will be within the permissible deviation.
- b) Remove and replace deficient area to the satisfaction of the Engineer.

The Contractor shall accomplish corrective grinding with specially prepared circular diamond blades mounted on a horizontal shaft. The Contractor shall day light corrective grinding to the outside edge of the pavement. The Contractor shall repair and replace joint sealant damaged by corrective grinding as directed by the Engineer and at no additional cost to the City. The Contractor shall not leave ground areas smooth or polished. The Contractor shall ensure ground areas have a uniform texture equal in roughness to the surrounding unground concrete. The Contractor shall reestablish the tining with a mechanical tining machine in areas where directed by the Engineer. The Contractor shall remove and replace all joint sealant within the area where tining is replaced. The Contractor will replace all permanent pavement markings damaged, destroyed, or removed during corrective grinding at no additional cost to the City.

If the Engineer accepts the deficient area without correction, a price reduction at the following rates will be deducted from the contract:

- a) Twenty Percent (20%) reduction of payment for contract unit price per square yard for those areas where the maximum deviation exceeds the permissible deviation by not more than one-eighth (1/8) inch.
- b) Thirty Percent (30%) reduction of payment for contract unit price per square yard for those areas where the maximum deviation exceeds the permissible deviation by more than one-eighth (1/8) inch but not more than three-eighths (3/8) inch.

Measurements for determining the limits and degree of deficient areas shall be per SD DOT test SD417, and shall be conducted by the Engineer.

Where the transverse surface test is out of specification, the maximum length and maximum width at a particular site shall be used in computation of the area.

- P. **Sealing Joints:** Joints shall be sealed with hot-poured elastic joint sealer or low modulus silicone sealant as specified. Joints shall be sealed immediately after completion of the curing period, before the pavement is opened to traffic. If joint sealing material is not specified in plans, hot-poured elastic joint sealer shall be used, or material as directed by the Engineer.

Joint grooves with spalls greater than 1/2 inch in depth shall be patched with an approved epoxy resin mortar in accordance with SDDOT Standard Specifications for Roads and Bridges, Current Edition. All loose concrete shall be removed from the spalled area and the spalled surface shall be thoroughly cleaned. After cleaning, the spalled surface shall be primed and an epoxy resin mortar of troweling consistency shall be placed in the spalled area and finished as the original pavement surface. The epoxy binder components shall be proportioned and mixed as recommended by the manufacturer. After the epoxy binder is thoroughly mixed, dry silica sand shall be blended into the mixture to give an epoxy resin mortar of trowelable consistency.

After the epoxy resin mortar has cured, the forming material shall be carefully removed.

The finished joint shall have vertical faces and the joint width shall be maintained.

Patching of spalls shall be done only within the temperature range recommended in AASHTO M 235, for the class of epoxy used.

Joints to be sealed shall be thoroughly clean and dry. All materials such as old sealant, oil, asphalt, curing compound, paint, rust, and other foreign materials shall be completely removed. Cleaning shall be accomplished by sand blasting and other tools as necessary. Joints to be sealed with silicone sealant shall be sand blasted utilizing a mechanical device that holds the sand blaster at the appropriate angle and distance from the joint to ensure proper cleaning. The device shall have a mechanism attached that will correctly guide the device in the joint.

Just prior to sealing, each joint shall be blown out using a jet of compressed air, at a

working pressure of not less than 90 psi, to remove all traces of dust. Air compressors used for cleaning joints shall be equipped with traps capable of removing all free water and oil from the compressed air.

Joint sealer application will not be permitted when the air or pavement temperature near the joint is less than 40°F or is 40°F and falling, or per manufacturer's recommendations.

The sealant shall be applied without spilling on the exposed surface. Sealant on the surface of the concrete pavement shall be removed immediately and the pavement surface cleaned.

Failure of the joint material in either adhesion or cohesion will be cause for rejection. Repair shall be at the expense of the Contractor.

1. **Hot-Poured Elastic Joint Sealer:** Shall be stirred during heating so that localized overheating does not occur. All joints shall be sealed with an approved pressure sealing device, equipped with a nozzle inserted into the joint, so sealing material will be forced from the bottom of the joint to the top.
2. **Silicone Sealant:** Shall be applied with a mechanical device equipped with a nozzle or spout shaped to fit into the joint. The joint sealant shall be applied under pressure from the inside of the joint to remove entrapped air and ensure good joint contact.

Backer rod shall be installed to the proper depth to produce the width and depth of sealant specified.

The sealant surface shall be tooled to produce a slightly concave surface below the pavement surface. Tooling shall be accomplished before a skin forms on the sealant surface. The use of water, soap, or oil as a tooling aid will not be permitted.

Seasonal Limitations: Silicone sealing operations will only be permitted between May 1 and October 15, inclusive, unless the Contractor has received written permission from the Engineer to continue sealing later than October 15. Silicone sealing operations will only be permitted when the air and pavement surface temperatures are 40°F or greater and rising. Without approval from the Engineer to continue silicone sealing operations after the October 15 seasonal limitation, the Contractor shall only perform the initial cut at all joints. Beginning no sooner than May 1 of the following year the Contractor shall widen the joints, install the backer rod, and seal joint with silicone according to this section. All costs related to the sealing seasonal limitations including additional labor, materials, equipment, traffic control, mobilization, and incidentals shall be at the expense of the Contractor.

- Q. Application of Live Load:** The pavement shall not be opened to traffic until the concrete has attained a compressive strength of 4,000 psi. The pavement shall be cleaned prior to opening to traffic.

When concrete is placed adjoining a previously constructed pavement, the paving machines, mechanical spreaders, and other heavy equipment shall not be operated on the existing pavement until the existing concrete has attained a compressive strength of 3000 psi. Equipment operated on a previously constructed pavement that has attained a compressive strength of at least 3000 psi but less than 4000 psi shall be tracked type equipment. Hauling units shall not be allowed on the concrete until it has attained a compressive strength of 4000 psi. Working platforms and tining, curing, and other lightweight finishing equipment may be operated on the edge of the existing concrete 72 hours after the concrete was placed. With the approval of the Engineer, lightweight sealing equipment, including but not limited to, pickup and trailer, hot kettle, and air compressor may be operated on the slab more than 72 hours after the concrete was placed if the concrete has reached 80% of design strength.

When operating on previously constructed lanes, measures shall be taken to protect the previously constructed lane from becoming marred by the equipment.

- R. Tolerance in Pavement Thickness:** The pavement thickness will be determined by average caliper measurement of cores tested in accordance with AASHTO T 148. Cores shall be sampled in accordance with AASHTO T 24.

One initial core shall be taken at random per unit by the Engineer. A unit shall be minimum one (1) lane of paving for one block (or 500 linear feet maximum unit). Parking shall be considered a lane for the intent of pavement cores.

- 1. Measurements:** When the measurement of the core from the unit is not more than 0.20 inch from the plan thickness, the core measurement shall represent the unit.

When the measurement of the core from a unit is deficient by more than 0.20 inch and not more than one (1) inch from the plan thickness, two additional cores, at an interval of 50 feet ahead and behind the deficient core, will be taken by the Engineer. Random offsets will be used for the additional cores. The average thickness of the three (3) cores will be used as the average thickness for that unit.

When the measurement of any core is deficient by more than one (1) inch, the following will apply:

- a)** Additional cores will be taken by the Engineer at not less than 25 foot intervals parallel to the centerline in each direction from the affected location until, in each direction, a core is found which is not deficient by more than 0.20 inches.

The point at which the pavement is deficient by exactly 0.20 inches will be found by assuming a straight line relationship between the cores. The deficient area will be defined by the point that is deficient by more than one (1) inch to the points on each side within 0.20 inches of the specified depth. The deficient area shall be removed and replaced at no cost to the City.

- b)** After the deficient area has been isolated, additional core(s) must be taken by the Engineer to represent the remaining portion of the unit.

- c) After removal and replacement, a final core per unit or repaired area shall be taken by the Contractor at a location determined by the Engineer to represent the repaired area.
2. **Averaging:** Measurements of cores will be averaged for a unit and the thickness will be reported to the nearest 0.01 inch.

Measurements of cores that are in excess of the specified pavement thickness by more than 0.20 inch will be considered as the specified thickness plus 0.20 inch.

Location of cores will not be a factor in determining average thickness of a unit.

3. **Payment:** Payment for units will be in accordance with Table 2.

**Table 2**

<b>Portland Cement Concrete Pavement</b>		
<b>Deficiency in Thickness Determined by Cores</b>		<b>Proportional Part of Contract Price allowed</b>
<b>From</b>	<b>Through</b>	
0.00 inch	0.20 inch	100%
0.21 inch	0.30 inch	80%
0.31 inch	0.40 inch	72%
0.41 inch	0.50 inch	68%
0.51 inch	0.70 inch	57%
0.71 inch	1.00 inch	50%

- S. **Concrete Patching:** Concrete replacement for utilities, storm sewer, or similar work shall comply with the requirements of Section 40 standard details.

Replacement of less than one full panel shall meet the following criteria:

1. Less than one full panel replacement with a new transverse joint shall be minimum of 6 feet from the next transverse joint.
2. Replacement of a portion of a concrete panel creating a new longitudinal joint requires approval from the Engineer, and in no case shall be less than one half of the panel.

- T. **Strength and Thickness Tests:** The Contractor shall submit the following test data. All sampling and testing shall be done by American Concrete Institute (ACI) certified testing laboratory personnel.

1. Slump, air content, seven (7) and twenty-eight (28) day compressive strength.
2. One test per 250 lineal feet of main line paving.
3. One test per 250 square yards of patching.



4. Thickness cores per Section 40.3R. Some cores provided by Engineer.
5. Results from concrete testing shall be provided to the Engineer within 3 days of the test being performed.

Failing strength tests shall be pro-rated as follows:

$$D = [(A - B) / A] * C$$

A = Specified strength

B = Average of all tests below specified strength

C = Number of failing tests divided by total number of tests times one hundred (100)

D = Percent reduction in unit price bid

If C is twenty percent (20%) or greater, the Contractor shall extend the pavement warranty period an additional two years. The City reserves the right to order additional tests. The Contractor shall pay for those additional tests that fail to meet specified strength and the City will pay for those additional tests that do meet the specified strength.

The Engineer or their representative shall be present for all field sampling and lab testing performed by/for the Contractor. Failure to notify the City of pending sampling or testing could result in rejection of submitted data and re-testing by in-place methods.

All required data shall be received by the Engineer before payment for pavement exceeds seventy-five percent (75%) of the total quantity.

#### 40.4 METHOD OF MEASUREMENT

- A. **PCC Pavement:** Will be made to the nearest 0.1 square yard.
- B. **Dowel Bar Assemblies:** Will be measured by the actual number of bars furnished and installed.
- C. **Insert Steel Bar in PCC Pavement:** Will be measured by the actual number and type of steel bars furnished and installed.

#### 40.5 BASIS OF PAYMENT

- A. **PCC Pavement:** Shall be paid for at the contract unit price per square yard or adjusted unit price as set forth in this section.

Payment will be full compensation for furnishing all materials (including reinforcing steel), concrete, labor, equipment, and all incidentals necessary. Payment will also be full compensation for trimming and water used to moisten the subgrade ahead of the paver, curing the concrete, sawing, and sealing joints.

- B. **Dowel Bar Assemblies:** Will be paid for at the contract unit price per each dowel bar.

Payment will be full compensation for labor, materials, equipment, and all incidentals necessary to furnish and install the assemblies.

- C. Insert Steel Bar in PCC Pavement:** Will be paid for at the contract unit price per each steel bar. Payment will be full compensation for labor, materials, equipment, and all incidentals necessary to furnish and install the steel bar.

**END OF SECTION**