SECTION 1400 - PORTLAND CEMENT CONCRETE PAVEMENT

1401 SCOPE. This section governs the furnishing of all labor, equipment, tools, and materials and the performance of all work necessary to construct Portland Cement Concrete Pavement.

1402 MATERIALS. Except as modified herein, all materials used for construction of Portland Cement Concrete Pavement shall conform to the requirements stipulated in applicable sections of this Technical Specification for Public Improvement Projects of the City of Gardner.

a. Concrete. The concrete for the use in Portland cement concrete pavement shall be classified as KCMMB-4K and mix designs shall be approved by the Kansas City Metro Materials Board prior to use.

b. Reinforcing Steel.

Bars: Bars shall be Grade 60 conforming to ASTM A615 and A996.

Welded Steel Wire Fabric: Fabric shall conform to ASTM A185.

Supporting Elements: Representative samples of supporting elements shall be approved by the City Engineer prior to their use in the project.

c. Epoxy Coating. All reinforcing shall be epoxy coated unless specifically waived by the approved plans. Epoxy coating for bars and dowel bars shall conform to ASTM A775 or ASTM A934. Epoxy coating for welded steel wire fabric shall conform to ASTM A884, Type 1, with Class A coating thickness.

d. Expansion Joint Fillers. Expansion joints shall be formed with pre-formed non-extruding, resilient expansion joint filler which shall include the following: cork, self-expanding cork, sponge rubber, cork rubber and bituminous fiber. These materials shall meet the requirements of ASTM D994, D1751 or D1752.

e. Joint Sealing Compound. Joint sealing compounds shall conform to ASTM D3405

f. Curing Membrane. Portland cement concrete curing material must be approved by the City Engineer prior to application. The cure shall be Type 2, white-pigmented liquid membrane type and shall conform to AASHTO M 148.

1403 CONSTRUCTION DETAILS. Portland cement concrete pavement shall be constructed to the configuration, and to the lines and grades shown on the approved plans and Standard Details.

A. Grading and Subgrade Preparation. All excavation or embankment required shall be as defined in these Technical Specifications.

B. Forms. All forms shall be in good condition, clean, and free from defects. Each form shall not vary more than 1/4 inch in horizontal and vertical alignment for each ten (10) feet length.

1. Material & Size. Forms shall be made of metal and shall have a height equal to or greater than the prescribed edge thickness of the pavement slab.

2. Strength. Forms shall be of such cross-section and strength, and so secured as to resist the pressure of the concrete when struck off, vibrated, and finished.

3. Installation. Forms shall be set true to line and grade, supported through their length and, joined neatly in such a manner that the joints are free from movement in any direction.

4. Preparation. Forms shall be cleaned and lubricated prior to each use and shall be so designed to permit their removal without damage to the new concrete.

5. Paving Machine. A slip-form paving machine may be used in lieu of forms. The machine must be equipped with mechanical internal vibrators, and be capable of placing the Portland cement concrete pavement to the correct cross-section, thickness, line and grade within the allowable tolerances.

1404 JOINTS. Joints shall be formed at right angles to the alignment of the pavement and to the depths and configuration specified by the Standard Details or as modified by the approved plans, unless otherwise approved by the City Engineer.

A. Expansion Joints. Expansion joints shall be placed at all locations where shown on the approved plans and Standard Details or as directed by the City Engineer.

1. General. Expansion joints shall extend the entire width of the pavement and from the sub-grade to one inch below the surface of the pavement. Expansion joints shall be formed by one (1) piece of one (1) inch thick preformed joint filler.

Under no circumstances shall any concrete be left across the expansion joint at any point.

2. Stability. Expansion joints shall be secured in such a manner that they will not be disturbed during the placement, consolidation and finishing of the concrete.

3. Dowels. If expansion joints are to be equipped with dowels they shall be of the size and type specified, and shall be firmly supported in place by means of a dowel basket which shall be installed in such a position that the center line of the joint assembly is perpendicular to the center line of the slab and the dowels lie parallel to the slab surface and parallel the center line of the slab. One half of each dowel shall be painted in accordance with the directions shown on the Plans, and then thoroughly coated with hard grease, or an approved bond breaker, to prevent the concrete from bonding to that portion of the dowel. As an option, a dowel sleeve of the dimensions shown on the plans or standard drawings may be used in lieu of grease.

B. Contraction Joints. Longitudinal and transverse contraction joints shall be of the type, dimensions, and spacing shown on the approved plans or Standard Details. Contraction joints shall be cut by means of wet sawing with an approved concrete saw.

All joints shall be sawed during the initial curing period. The Contractor shall appropriately schedule sawing operations to prevent both joint raveling and uncontrolled cracking of the pavement. Material created by sawing shall be removed from the pavement before it has had time to dry or set.

The Contractor shall remove and replace any concrete that has uncontrolled cracking at his expense.

C. Longitudinal and Construction Joints. Longitudinal and transverse construction joints shall be placed as shown on the approved plans or as required by the Contractor's construction procedure. Joint configuration shall conform to the dimensions shown on the approved plans or Standard Details.

1. Longitudinal Construction Joints. Longitudinal construction joints of the type shown on the approved plans and Standard Details shall be placed between adjacent paving lanes or where the curb and gutter is not poured monolithically with the pavement slab.

2. Transverse Construction Joints. Transverse construction joints of the type shown on the approved plans and Standard Details shall be located where concrete placement operations are suspended for more than thirty (30) minutes or until the concrete has begun set. No construction joint shall be placed within ten (10) feet of an expansion, contraction, or other construction joint.

3. Tiebars. Tiebars shall be of deformed steel of the dimensions specified by the approved plans and Standard Details. Tiebars shall be supported in the proper position and at the specified spacing and be firmly secured so as not to be disturbed by the construction procedure. They shall be free from dirt, oil, paint, grease, loose mill scale, and thick rust which could impair bond of the steel with the concrete. Tiebars shall be epoxy coated.

1405 PLACING, FINISHING, CURING, AND PROTECTION. Concrete shall be furnished in quantities required for immediate use and shall be placed in accordance with the requirements of these Technical Specifications and as specified herein.

A. Concrete Placement. Prior to placement of the concrete pavement, all debris and foreign material shall be removed from the inner surfaces of the forms, and all forms and subgrade properly moistened. All required reinforcement and other special metal parts shall be properly and firmly set into position to restrict movement during placement operations. No concrete shall be placed without the approval of the City Engineer.

The concrete shall be placed between the forms in such a manner that segregation will not occur. Lateral displacement of the concrete will not be permitted. The concrete shall be poured to the required depth and width in successive batches and in a continuous operation without the use of intermediate forms or bulkheads.

The concrete shall be thoroughly vibrated along the forms, expansion joints and longitudinal joints. The vibrator shall not be allowed to contact the subgrade or dislodge the joints. Attachments on finishing machines to vibrate the concrete adjacent to forms and

longitudinal joints will be permitted, provided satisfactory results are attained. The vibrating shall be sufficient to produce a smooth pavement edge but shall not cause segregation. Honeycomb in the pavement may be cause for rejection of the pavement.

Care shall be taken in the distribution of the concrete to deposit a sufficient volume along the outside form lines so that the curb section can be consolidated and finished simultaneously with the slab.

No concrete shall be placed around manholes or other structures until they have been adjusted to the required grade, alignment, and cross slope. All utility appurtenances shall be boxed out and isolated using expansion joint material. The minimum size of a boxed-out section shall be two (2) feet by two (2) feet.

Concrete shall not be allowed to extrude below the forms.

B. Concrete Finishing. The pavement shall be struck off and consolidated with a mechanical finishing machine or by hand-finishing methods.

When a mechanical finishing machine is used, a depth of at least two (2) inches of concrete shall be carried in front of the strike-off screed for the full width of the slab. The finishing machine shall be provided with a screed which will consolidate the concrete by pressure. The concrete shall, through the use of this machine, be brought to a true and even surface, free from rock pockets, with minimal passes of the machine. The edge of the screed along the curb line may be notched out to allow for sufficient concrete to form the integral curb. Hand- finishing tools shall be kept available in the event the finishing machine becomes inoperable.

When hand finishing is used, the pavement shall be struck off and consolidated by a vibrating screed to the lines and grades shown on the plans. When the forward motion of the vibrating screed is stopped, the vibrator shall be shut off and shall not be allowed to idle on the concrete. Internal mechanical vibration shall be used along all formed surfaces.

1. Longitudinal Floating. After the concrete has been struck off and consolidated, it shall be further smoothed smoothed by means of a mechanical longitudinal float or by a longitudinal hand float. If a longitudinal hand float is used, it shall be operated from foot bridges spanning the pavement and shall be worked with a wiping motion parallel to the centerline, and passing from one side of the pavement to the other. Movement ahead along the centerline of the pavement shall be in successive advances of not more than 1/2 of the length of the float. The float shall not be less than twelve (12) feet in length and six (6) inches in width, and shall be properly stiffened and provided with handles at each end. Excess water and laitance shall be removed from the surface of the pavement. This operation may be eliminated if specified tolerances can be attained by other approved methods.

   Additional water shall not be used to aid in the floating operation, unless otherwise approved by the City Engineer.

2. Straight edging. While the concrete is still plastic, the slab surface shall be tested for smoothness with a 10-foot straight edge swung from handles three (3) feet longer than one-half the width of the slab. The straight edge shall be placed on the surface

parallel to the centerline of the pavement and at not more than five (5) foot intervals transversely. After each test, the straight edge shall be moved forward one-half its length and the operation repeated. Irregularities shall be corrected by adding or removing concrete. All disturbed places shall be smoothed with a float not less than three (3) feet long and not less than six (6) inches wide. The smoothness of the repaired surface shall be verified with a ten-foot straight edge. The final pavement surface shall be free of depressions in which water will stand.

3. Edging. Before final finishing is completed and before the concrete has taken its initial set, the edges of the slab and curb shall be carefully finished with an edger of the radius shown on the approved plans or Standard Details.

4. Final Surface Finish. The final surface finish shall be either grooved or broomed as directed by the City Engineer. A burlap drag shall be utilized ahead of the grooving operation. The drag shall be at least three (3) feet in length and wide enough to cover the entire lane of pavement, and shall be kept clean and saturated while in use. It shall be laid on the surface of the pavement and dragged in the direction in which the pavement is being poured. The grooving operation shall be done in a neat and uniform manner. A hard bristle broom shall be used for broom finishing. The broom shall be kept clean and shall provide a uniformly textured surface. The direction of the grooving or brooming operation, either transverse or longitudinal, shall be determined by the City Engineer. The curb shall have a broomed finish.

   The final surface of the concrete pavement and curb shall have a uniform gritty texture free from excessive harshness and true to the grades and cross section shown on the plans. The City Engineer may require changes in the final finished procedure as required to produce the desired final surface texture,

C. Curing. Curing shall conform to the requirements set forth in Section 2000 with the exception that water proof paper, or polyethylene sheeting, shall not be acceptable as curing methods for concrete pavement. The use of straw or burlap for curing shall be as approved by the City Engineer.

   The concrete shall be cured prior to taking set. If a liquid curing membrane is used, it shall be applied according to the manufacturer's directions, except the rate of application will be at least one (1) gallon per one hundred and fifty (150) square feet. A nozzle producing a uniform mist pattern shall be used on all spray equipment when applying the liquid curing membrane.

   All exposed surfaces shall be cured if a slip form paving machine is used or if the forms are removed from hand poured concrete pavement within a period of seventy-two (72) hours.

D. Protection. The Contractor shall, at his own expense, protect the concrete work against damage or defacement until the project has been accepted by the City Engineer. Concrete pavement which is not acceptable to the City Engineer because of damage or defacement, shall be removed and replaced, or repaired to the satisfaction of the City Engineer, at the expense of the Contractor.

All vehicular traffic shall be prohibited from using the new concrete pavement until the proper strength has been achieved. The concrete pavement shall not be opened for light traffic for

a period of not less than seventy-two (72) hours after placement, and the after concrete has attained a minimum compressive strength of 3,000 psi and 75% of the mix design strength. The pavement shall not be fully opened to traffic for a period of not less than one hundred and twenty (120) hours, and after the concrete has attained a minimum compressive strength of 3,500 psi and 80% of the mix design strength. If high early strength concrete is used, the pavement may be opened to all types of traffic when the concrete has attained a compressive strength of 3,500 psi and 80% of the mix design strength.

E. Temperature Limitation. Concrete work shall proceed in accordance with the requirements established in Section 2000-*Concrete*.

1406 BACKFILL. A minimum of twenty-four (24) hours shall lapse before forms are removed and five (5) days shall lapse before pavement is backfilled, unless otherwise approved by the City Engineer.

Backfill shall be placed and compacted in accordance with these Technical Specifications.

The Contractor shall be responsible for repairing any damage to the existing pavement to the satisfaction of the City Engineer.

1407 JOINT SEALING AND CLEANUP. All joints shall be sealed with an approved joint sealer applied in accordance with the manufacturer's directions and the City of Gardner Technical Specifications and Design Criteria for Public Improvement Projects. The joints shall be sealed within seven (7) days of the placement of the concrete and prior to the opening of the pavement to traffic.

The joints shall be thoroughly cleaned by sand-blasting the dry joint in two (2) passes, one for each face prior to the placing of the joint material. Any residual sand, as well as dust and dirt deposited by wind and traffic, shall be blown out of the joint and away from the adjacent pavement using a high-pressure air blast prior to placing the joint material.

1408 CONCRETE CURB. Concrete curb will be constructed in accordance with these Technical Specifications and as shown on the approved plans, unless otherwise approved by the City Engineer. The options available for concrete curb are as listed below and detailed in Standard Details.

A. Integral curb Integral curb shall be constructed immediately following the finishing operation unless otherwise shown on the approved plans. The curb construction shall not lag the pavement construction and form a "cold joint."

Steel curb forms shall be required to form the backs of all curbs, unless otherwise approved by the City Engineer.

The concrete shall be sufficiently spaded to secure adequate bond with the paving slab and eliminate all voids in the curb.

Curbs shall be constructed to the specified cross section as shown on the Standard Details.

The finished surface of the curb and gutter shall be checked by the use of a 10-foot

straightedge and corrected if necessary. Where proposed grades are less than one (1) percent, and while the concrete is still plastic, the slope of the gutter should be checked with a 4-foot level.

B. Separate Curb and Gutter with Tiebars. Separate curb and gutter may be poured prior to pouring the remaining pavement. Tiebars 5/8 inches (5/8") in diameter and 24 inches (24") long shall be cast in the curb and gutter at 30-inch centers as shown on the Standard Details. Tiebars shall be epoxy coated.

C. Separate Curb and Gutter with Keyway. Separate curb and gutter may be placed prior to placing the remaining pavement using a keyway. A keyway of the configuration and dimensions shown on the Standard Details shall be cast in the curb and gutter section.

1409 CLEANUP. The Contractor shall be responsible for the removal of excess dirt, rock, broken concrete, concrete splatters, and overspray from the construction area.

1410 SURFACE TOLERANCES. Concrete pavement shall have a surface tolerance in all directions of 1/8 inch in twelve (12) feet when checked with a 12-foot straightedge. The Contractor shall be required to perform profilograph measuring of the pavement smoothness, at his expense, if so directed by the City Engineer.

1411 THICKNESS TOLERANCES. The thickness of the pavement section shall conform to the pavement thickness specified. The thickness of the pavement shall be measured by coring. Where pavement thickness is deficient, compensation may be made at an adjusted unit price approved by the City Engineer, or the pavement shall be removed and replaced at the expense of the Contractor.

Unless specified otherwise, thickness coring shall be performed by an approved materials testing service at the expense of the Contractor. The cores shall be a minimum of two (2) inches in diameter and shall be taken at random locations within each lane of pavement as approved by the City Engineer. A minimum of one (1) core per every 1,000 feet of lane width shall be taken. The stagger spacing between initial cores in adjacent lanes shall be a minimum of 100 feet.

The transverse limits of pavement removal shall be from the outside edge of the curb and gutter (curb and gutter with tie bars or keyway may remain if in good condition) to a longitudinal joint. The longitudinal pavement removal limits shall extend beyond each side of the deficient core sample to a point where no portion of the exposed pavement is more than 0.2 inch deficient. In no case shall less than five (5) linear feet of pavement be removed, and if less than ten (10) feet of acceptable pavement remains between the section that has been removed and a transverse contraction, expansion, or construction joint, the Contractor shall remove the pavement to the joint.