

SECTION 1500 PORTLAND CEMENT CONCRETE PAVEMENT

1501 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.

1502 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 these Specifications.

- A. Concrete. The concrete for the use in construction of Portland Cement Concrete pavement shall conform to the requirements established in Section 2000, "Concrete" with the following modifications.
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| Cement | Portland Cement shall conform to ASTM C150, Type II. Type III cement may be used only upon written approval of the City Engineer. |
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- B. Reinforcing Steel. Refer to section 2000 for Bars, Welded Steel Wire and Supporting Elements.
- C. Expansion Joint Fillers. Expansion joint fillers shall conform to ASTM D994, D1751 or D1752.
- D. Joint Sealing Compounds. Joint sealing compounds shall conform to ASTM D6690-21.
- E. Curing Membrane. All material to be used or employed in curing Portland Cement Concrete must be approved by the Engineer prior to its use. It shall be of the liquid membrane type and shall conform to ASTM C309-19.

1503 CONSTRUCTION DETAILS.

The Portland Cement Concrete pavement shall be constructed to the configuration, and to the lines and grades shown on the plans.

- A. Grading and Subgrade Preparation. All excavation or embankment required shall be as defined in Sections 1100 and 1200 of these Technical Specifications entitled "Grading" and "Subgrade Preparation".
- B. Forms. All forms shall be in good condition, clean, and free from imperfections. Each form shall not vary more than 1/4 inch in horizontal and vertical alignment for each 10 feet in 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, and the impact and vibration of any equipment which they may support.
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.

1504 JOINTS.

Generally joints shall be formed at right angles to the true alignment of the pavement and to the depths and configuration specified by the standard drawings or as modified by the plans and specifications.

- A. Expansion Joints. Expansion joints shall be placed at all locations where shown on the plans and standard details or as directed by the 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 or the material will have a suitable tear strip provided to allow for the application of the joint sealer.

Under no circumstances shall any concrete be left across the expansion joint at any point.
 2. Material. Expansion joints shall be formed by a one piece, one inch thick preformed joint filler cut to the configuration of the correct pavement section.
 3. 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.
 4. 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 remain in place. One half of each dowel shall be pointed, greased or fitted with a dowel sleeve of the dimensions shown on the plans or standard drawings.

- B. Contraction Joints. Contraction joints shall be placed where indicated and to the depth indicated by the plans and specifications or standard drawings.
1. Templates. The templates shall be removed as soon as the concrete has attained its initial set and finished as outlined for tooling joints.
 2. Sawing. When transverse contraction joints are to be formed by sawing, care must be taken to saw the grooves soon after placing the concrete to prevent the formation of cracks due to contraction of the slab. All transverse joints shall be sawed at least 1/4 of the slab depth. Any procedures for sawing joints that result in premature and uncontrolled cracking shall be revised immediately by adjusting the time intervals between the placing of the concrete and the cutting of the joints.
 3. Tooling. Tooling or contraction joints will be permitted if completed to the width and depth specified on the construction plans or the standard drawings, and shall be true to line.
 4. Pre-molded Strip Joints. Pre-molded strip joints shall be of the proper dimensions as shown on the plans and standard drawings and shall be secured at the proper location so as not to be disturbed by the finishing of the concrete.
- C. Longitudinal and Construction Joints. Longitudinal joints or construction joints shall be placed as shown on the plans or where the Contractor's construction procedure may require them to be placed.
1. Center Joints. Longitudinal center joints shall be constructed using the methods specified in Section 1504(B) "Contraction Joints".
 2. Longitudinal Construction Joints. Longitudinal construction joints (joints between construction lanes) shall be keyed joints of the dimensions shown on the plans or standard drawings.
 3. Transverse Construction Joints. Transverse construction joints of the type shown on the plans or standard drawings shall be placed wherever concrete placement is suspended for more than 30 minutes.
 4. Tiebars. Tiebars shall be of deformed steel of the dimensions specified by the plans or standard drawings. Tiebars shall be installed at the specified spacing and firmly secured so as not to be disturbed by the construction procedure.

1505 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 Section 2000 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 preclude movement during placement of the concrete. The concrete shall be deposited on the prepared subgrade to the required depth and width of the construction lane in successive batches and in a continuous operation without the use of intermediate forms or bulkheads. The concrete shall be placed as uniformly possible in order to minimize the amount of additional spreading necessary. While being placed, the concrete shall be vibrated and compacted with suitable tools so that the formation of voids or honeycomb pockets is prevented. In no case shall Ajitterbug≡ vibrators be used.

The concrete shall be well vibrated and tamped against the forms and along all joints. 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 brought to the required grade, alignment, and cross slope. 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, the concrete shall be struck off at such a height that after consolidation and final finishing it shall be at the exact elevations as shown on the plans. A depth of at least 2 inches of concrete shall be carried in front of the strike-off screed for the full width of the slab, whenever the screed is being used to strike off the pavement. 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 the fewest possible number of passes of the machine. The edge of the screeds 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 for use in case the finishing machine breaks down.

When hand finishing is used, the pavement shall be struck off and consolidated by a vibrating screed to the exact elevation as shown on the plans. When the forward motion of the vibrating screed is stopped, the vibrator shall be shut off; it 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 by means of a mechanical longitudinal float or float finishers using 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 12 feet in length and 6 inches in width, and shall be properly stiffened and provided with handles at each end. This operation may be eliminated if specified tolerances can be attained by some other approved method.

In cases where the longitudinal floating operation has been eliminated, the pavement shall be scraped with a straight edge 10 feet long, equipped with a handle to permit it to be operated from the edge of the pavement. The longitudinal float and straight edge shall be operated so that any excess water and laitance are removed from the surface of the pavement. After the scraping operation, the surface of the pavement shall be within the specified tolerances.

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 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 5 foot intervals transversely. After each test the straight edge shall be moved forward one-half its length and the operation repeated. When irregularities are discovered, they shall be corrected by adding or removing concrete. All disturbed places shall be smoothed with a float not less than 3 feet long and not less than 6 inches wide, and again straight edged. The pavement surface shall have no depression 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 plans or standard details.
4. Final Surface Finish. A burlap drag or a broom finish shall be used as the final finishing method. When a drag is used it shall be at least 3 feet in width and long enough to cover the entire pavement width. It 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 laid. When broom finishing, a hard bristle broom shall be used. The broom shall be kept clean and used in such a manner as to provide a uniform texture surface. The curb shall have the same final finish as the pavement.

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 Engineer may require changes in the final finishing 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 Engineer.

As soon as practical after the concrete is finished it shall be cured with one of the acceptable methods. If a liquid curing membrane is used, it shall be according to the manufacturer's directions.

A nozzle producing a uniform mist pattern will be used on all spray equipment when applying the liquid curing membrane. Rate of application to the pavement shall be in accordance with the manufacturers recommendation for said type and application.

If the forms are removed from finished concrete pavement within a period of 72 hours or if a slip form paving machine has been used, these surfaces shall also be cured.

- D. Protection. The Contractor shall, at his own expense, protect the concrete work against damage or defacement of any kind until it has been accepted by the City.

All vehicular traffic shall be prohibited from using the new concrete pavement until it has attained 70 percent of the 28 day compressive design strength.

Concrete pavement which is not acceptable to the Engineer because of damage or defacement, shall be removed and replaced, or repaired to the satisfaction of the Engineer, at the expense of the Contractor.

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

1506 BACKFILL.

A minimum of 24 hours shall lapse before forms are removed and 5 days shall lapse before pavement shall be backfilled unless otherwise approved by the Engineer.

Backfill shall be accomplished in accordance with Section 1100 and 1200 entitled "Grading" and "Subgrade Preparation".

The Contractor shall be responsible for the repair of any existing street pavement disturbed by the construction to the satisfaction of the Engineer.

1507 JOINT SEALING AND CLEAN-UP.

All joints shall be sealed with an approved joint sealer applied in accordance with the manufacturer's directions within 7 days of the placement of the concrete and prior to the opening of the pavement to traffic.

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

1508 INTEGRAL CURB.

Integral curbs shall be required along the edges of all street pavement as indicated on the plans or standard drawings except at such locations as the Engineer may direct.

The integral curb shall be constructed immediately following the finishing operation unless otherwise shown on the plans. Special care shall be taken so that the curb construction does not lag the pavement construction and form a "cold joint".

Steel curb forms shall be required to form the backs of all curbs except where impractical because of small radii street returns or other special sections.

In placing curb concrete, sufficient spading shall be done to secure adequate bond with the paving slab and eliminate all voids in the curb.

Curbs shall be formed to the cross section as shown on the drawings with a mule or templates supported on the side forms and with a float not less than 4 feet in length.

The finished surface of the curb and gutter shall be checked by the use of a 10 foot straight edge and corrected if necessary. Where grades are flat and while the concrete is still plastic, the drainage of the gutter should be checked by pouring water at the gutter summit and observing its flow to the inlet.

1509 SURFACE TOLERANCES.

Concrete pavement shall have a surface tolerance in all directions of 1/4 inch in 10 feet when checked with a 10 foot straight edge.