

## 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.

A. Concrete. Concrete for pavement shall be Class II air-entrained as specified in Section 2000 *Concrete* unless otherwise specified or approved by the Engineer.

B. Reinforcing. As specified in Section 2000 *Concrete*.

C. Isolation Joint Fillers. Expansion joint fillers shall conform to ASTM D1751.

D. Joint Sealing Compound. Joint sealing compounds shall conform to the following.

<b>Joint Seals and Sealants</b>	<b>AASHTO</b>	<b>ASTM</b>
Hot-poured, Polymeric Asphalt Based	M 301	D 3405
Hot-poured, Elastomeric Type	M 282	D 3406
Preformed Polychloroprene Elastomeric	M 220	D 2628
Lubricant for Installation of Preformed Seal	--	D 2835

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 C1315, Type II, Class A – white pigmented cure.

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

A. Grading and Subgrade Preparation. All excavation or embankment required shall be completed in accordance with Sections 1100 *Grading* and 1200 *Subgrade Preparation*.

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

1. Material & Size. Forms shall have a height equal to or greater than the prescribed edge thickness of the pavement slab unless otherwise approved by the Engineer.

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 with a release agent 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. 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 project specifications.

A. Isolation Joints. Isolation joints shall extend from the subgrade 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 isolation joint at any point.

1. Location: Isolation joints shall be placed at all locations where shown on the plans and standard details or as directed by the Engineer.
2. Material. Isolation joints shall be formed by an one-piece, preformed joint filler cut to the configuration of the correct section. For pavement the filler shall be three fourths (3/4) inch thick.
3. Stability. Isolation 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 isolation 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. The basket 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 lightly painted or greased with an approved lubricant.

B. Contraction Joints. Contraction joints shall be of the type and dimensions and at the spacing shown on the plans or standard drawings or as directed by the Engineer. Contraction joints may be sawed or formed to produce a controlled crack in the proper location.

1. Configuration: The standard contraction joint is a one fourth (1/4) inch wide joint to a depth of one third (1/3) the thickness of the slab unless otherwise indicated or specified.
2. Templates. The templates shall be removed as soon as the concrete has attained its initial set and the joint edges tooled as indicated.
3. Sawing. Sawed contraction joints shall be cut as soon as the concrete has hardened sufficiently to prevent excessive tearing and raveling regardless of the time or weather. Joints shall be sawed along the saw cut and finished before conditions induce uncontrolled cracks, Material created by sawing shall be flushed from the pavement before it has had time to dry or set.
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.
5. Spacing: The spacing shall be as shown on the plans or as directed by the Engineer.
6. Pavement with uncontrolled or undesirable cracks that occur due to the Contractor's method shall be removed and replaced, or repaired in an acceptable manner as approved by the Engineer at the contractor's expense. All damaged sections to be removed shall be sawed a minimum of three (3) feet from a joint or removed to the nearest joint.

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 1404B "Contraction Joints" or as specified for longitudinal construction joints as required.

2. Longitudinal Construction Joints. Longitudinal construction joints (joints between construction lanes) shall be constructed with tiebars. Joint configuration shall conform to 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 thirty (30) minutes or for such a time that the concrete has begun to take its initial set.
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 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.

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 Section 2000--*Concrete* 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 shall be properly and firmly set into position to preclude movement during placement of the concrete.

The concrete shall be deposited over the entire width of the prepared subgrade between the forms in such a manner to prevent segregation and to require as little rehandling as possible. The pour shall be made 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. Concrete shall be thoroughly vibrated along the forms or sides and along expansion joints. Attachments on finishing machines to vibrate the concrete adjacent to forms and longitudinal joints will be permitted provided satisfactory results are attained. Care shall be taken that the vibrator does not penetrate the subgrade or dislodge or move the joints. The vibrating shall be sufficient to produce a smooth pavement edge. Under no circumstances shall the vibrator be used to move concrete. Honeycomb in the edge may be cause for rejection of the pavement.

No concrete shall be placed around manholes or other structures until they have been brought to the required grade, alignment, and cross slope. All utility appurtenances shall be boxed out or otherwise isolated using isolation joint material as indicated or as directed by the Engineer. 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.

Misting the concrete by means of a spray nozzle is acceptable. No brushes will be allowed.

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 two (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 least 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 machine 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 one half (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. 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 twelve (12) feet long, equipped with a handle to permit it to be operated from the edge of the pavement. The longitudinal float and straightedge 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. Straightedging. While the concrete is still plastic, the slab surface shall be tested for smoothness with a twelve (12) foot straightedge swung from handles three (3) feet longer than one-half (1/2) the width of the slab. The straightedge 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 straightedge shall be moved forward one-half its length and the operation repeated. When irregularities are discovered, adding or removing concrete shall correct them. All disturbed places shall be smoothed with a float not less than three (3) feet long and not less than six (6) inches wide, and again straightedged. 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 three (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 textured 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 - *Concrete* with the exception that waterproof 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.
- 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 strength in accordance with the following table.

Slab Thickness (inches)	Compressive Strength for Opening to Traffic (psi)
All UTW	2000
6.0	3600
7.0	2700
8.0	2150
9.0	2000
10.0+	2000

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-*Concrete*.
- 1406 BACKFILL. A minimum of twenty four (24) hours shall elapse before forms are removed and five (5) days shall elapse, or the concrete must have attained 75% of its 28-day strength, before pavement shall be backfilled unless otherwise approved by the Engineer.

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

- 1407 JOINT SEALING AND CLEANUP. All joints shall be sealed with an approved joint sealer applied in accordance with the manufacturer's recommendations. 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 Contractor shall be responsible for the removal of excess dirt, rock, broken concrete, concrete splatters and overspray from the area of the construction.

1408 SURFACE TOLERANCES. Concrete pavement shall have a surface tolerance in all directions of one fourth (1/4) inch in ten (10) feet when checked with a ten (10) foot straightedge.

1409 THICKNESS TOLERANCES. It is the intent of these specifications that pavement shall be constructed strictly in accordance with the thickness shown on the plans. The thickness of the pavement may be measured by coring. If any pavement is found deficient in thickness, it may be compensated for at an adjusted unit price or shall be removed and replaced. In removing pavement, it shall be removed from the outside edge of the curb and gutter (curb and gutter with tiebars may remain if in good condition) to a longitudinal joint, or between longitudinal joints, and on each side of the deficient measurement until no portion of the exposed cross sections are more than two tenths (2/10) inch deficient, except that there shall not be less than five (5) linear feet of pavement removed. If there remains less than ten (10) feet of acceptable pavement between the section that has been removed and a transverse contraction, expansion, or construction joint, the Contractor shall remove pavement to the joint.