

Section 03002

CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SUMMARY

This section includes construction of concrete pavement for roadways, driveways, turnouts, concrete medians, directional islands, sidewalks and curbing when Harris County rules, regulations and requirements relating to the approval and acceptance of improvements are a requirement.

1.02 MEASUREMENT AND PAYMENT

A. Measurement

Concrete Pavement to be measured by the square yard of surface area of completed and accepted pavement of thickness designated. Measurement to be made from back to back of curb.

B. Payment

1. Adjustment of payment for acceptable pavement and replacement of faulty pavement to be in accordance with the following:
  - a. Thickness of pavement to be determined by measurement of cores taken prior to final acceptance at such points as Project Manager or Engineer may select. Four-inch diameter cores to be taken at rate of at least one core per each 1,000 square yards of pavement. These initial cores to be paid for by Owner.
  - b. The thickness of individual cores shall be determined in accordance with ASTM C174 by averaging no less than three (3) such measurements. Any core, the thickness of which is equal to or greater than one-quarter-inch ( $\frac{1}{4}$ " ) less than the thickness shown on the approved Plans, shall be considered one of deficient thickness.

If a core is determined to be deficient in thickness, additional cores shall be taken at ten-foot (10') intervals on either side of the deficient core to establish the length of the deficient section. The length of the deficient section shall be the distance between the nearest cores of satisfactory thickness, and the width shall be the entire width of the pavement. Additional 4-inch diameter cores required to determine areas of deficient thickness to be paid for by Contractor.

- c. Deficient pavement shall be removed and replaced with concrete that meets or exceeds requirements. Contractor to bear expense of removal of deficient pavement.
2. No additional payment over Contract unit price to be made for pavement of thickness exceeding that required by Plans.
3. No separate payment to be made for “Concrete Paving Headers.” Include cost of same in Contract price for items of which this Work is a component.

#### 1.03 REFERENCES

- A. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete
- B. ASTM C174/C174M - Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
- C. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- D. ASTM D994/D994M – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- E. ASTM D6690 – Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
- F. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- G. TXDOT SP433-003 – Joint Sealants and Fillers
- H. Portland Cement Association (PCA) - Design and Control of Concrete Mixtures Thirteenth Edition (Revised) 1992

#### 1.04 SUBMITTALS

- A. Samples, mix designs, tests, and reports, as specified within Section 03001 – “Concrete (Pavement and Structures)”
- B. Standard Beam Test in accordance with Section 03001 – “Concrete (Pavement and Structures)”
- C. Core Samples to consist of one core taken for each 1,000 square yards of finished pavement (minimum one core per street). Each core to be tested for thickness and compressive strength.

1.05 RELATED REQUIREMENTS

- A. Section 02315 – “Roadway Excavation”
- B. Section 02330 – “Embankment”
- C. Section 2754 – “Concrete Driveways”
- D. Section 2761 – “Colored Concrete for Medians and Sidewalks”
- E. Section 2771 – “Curb, Curb and Gutter, and Headers”
- F. Section 2772 – “Concrete Medians and Directional Islands”
- G. Section 2775 – “Concrete Sidewalks”
- H. Section 2951 – “Pavement Repair and Resurfacing”
- I. Section 03001 – “Concrete (Pavement and Structures)”
- J. Section 03210 – “Reinforcing Steel”

1.06 QUALITY ASSURANCE (NOT USED)

1.07 – 1.08 NOT USED

1.09 PROJECT/SITE CONDITIONS

Concrete placement weather limitations are as specified under Paragraph 3.03.

1.10 – 1.13 NOT USED

PART 2 PRODUCTS

2.01 MANUFACTURER(S) (NOT USED)

2.02 MATERIALS AND/OR EQUIPMENT

A. Concrete

In accordance with Section 03001 – “Concrete (Pavement and Structures)”. Thickness as shown on Plans.

B. Reinforcing Steel

In accordance with Section 03210 – “Reinforcing Steel”. Bar size and type as shown on Plans.

C. Expansion Joint Material shall be in accordance with section and location shown on Plans.

1. Fillers

a. Premolded

- 1) Asphalt filler board per ASTM D994.
- 2) Premolded joint material per ASTM D1751

b. Wood

Clear heart Redwood; maximum weight per cubic foot when oven dried to constant weight to be 30 pounds. Other materials may be used with prior approval of the Project Manager.

c. Hot Poured

Per ASTM D6690.

2. Load Transmission Devices

To be of type and size as shown on Plans.

D. Forms

1. Pavement

a. Wood Forms (Used only in residential construction)

To be 2X material, free from warps, bends and kinks, and sufficiently true to provide a straight edge on concrete. Use precautionary methods to prevent leakage of mortar through or under side forms. Top of each form section, when tested with a straight edge, to conform to the requirements specified for the surface of completed pavement.

b. Metal Forms

Use metal forms of approved shape and section. Preferred depth of form to be equal to required edge thickness of pavement. Forms with depths greater or less than 1 inch of pavement thickness may be used. Forms with less depth than pavement thickness to be brought to required depth by securely attaching wooden planks of approved section and size to bottom of form. Use form section at least 10 feet in length, and provide for staking in position with not less than 3 pins. Use forms of adequate strength to withstand machine loads without

visible springing or settlement. Use forms free from warps, bends and kinks, and sufficiently true to provide a straight edge on concrete. Top of each form section, when tested with a straight edge, to conform to the requirements specified for the surface of the completed pavement. Use flexible or curved forms of wood or metal of proper radius for curves of 200-foot radius or less.

c. Slip Forms

Slip form equipment to be equipped with a longitudinal transangular finishing float adjustable to crown and grade. Float to extend across pavement to the side forms and/or edge of slab.

2. Curbs

a. Wood or Metal

Wood or metal curb forms to be of approved section, straight and free of warp. Outside curb forms to have a depth at least ½-inch greater than height of curb. Rigidly attach inside curb forms (if required) to outside forms.

b. Machine Laid

Equipment to conform to the requirements as specified under Paragraph 3.03. Use flexible or curved forms of wood or metal of proper radius for curves but not to exceed radius recommended by curb machine manufacturer.

E. Positioning and Support Devices for Reinforcement and Joint Assemblies

The devices to be of sufficient structural quality to prevent movement of the dowels or steel reinforcement during concrete placement and finishing. Devices to be of a type approved by the Engineer.

Positioning and supporting devices (chairs) for steel reinforcement bars to be either plastic or metal and of sufficient number to maintain the position of the bars within the allowable tolerances.

F. Materials for Curing

1. Burlap

Mats to be in good condition, clean, and free of any substance which would have deleterious effect on concrete.

2. Cotton Mats

Mats to be in good condition, clean, and free of any substance which would have deleterious effect on concrete.

3. Waterproof Paper

Per ASTM C171.

4. Membrane Curing Compounds

Conform to ASTM C309

5. White Polyethylene Sheeting

Sheet having thickness not less than 4 mils (.004 inch).

G. Grouting

1. Material and mixtures for grouting curb dowels.

a. Proportion by weight.

b. One part Portland cement, Type I or Type II.

c. One part clean, sharp sand.

d. Seven-tenths part nonshrinking grout aggregate.

e. No more than 5-1/2 gals. water per sack cement.

2. Other

Use mixture by weight of one part portland cement and two parts sand for general purposes. If space to be grouted is less than 1 inch and is impossible to tamp grout, use one-to-one mix. Where space to be filled with grout is large, use original concrete mixture. Use stiff mixture for grout to be tamped, produced by prolonged mixing. To obtain stiff grout, mix mortar using amount of water required to thoroughly mix ingredients, then continue mixing without additional water until grout is stiff enough to be compacted by tamping when placed. For grouting blockouts for embedded pipes and similar items, use grout to which 5 pounds of nonshrinking grout aggregate per sack of cement has been added.

H. Joint Sealing Compound

Polyurethane joint seal conforming to Texas Department of Highways Specification SP433-003.

2.03 – 2.04 NOT USED

PART 3 EXECUTION

3.01 GENERAL/MANUFACTURER(S) (NOT USED)

3.02 PREPARATION

Excavate, shape, and compact subgrade to grades, sections, and densities shown on Plans. Maintain drainage of subgrade at all times. Test subgrade section with an approved template, operated and maintained by Contractor. Wet down subgrade sufficiently in advance of placing of pavement. No pavers, batch trucks, or other equipment to be permitted between forms during paving operations.

3.03 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Wood and Steel Forms

1. Setting

Set forms on compacted subgrade, cut true to grade so that entire form section is supported by subgrade. Stake metal form sections with at least 3 pins per section, with a pin on each side of every joint. Adequately stake wood form sections to prevent bows in form and to keep form sections to grade. Join form sections to prevent displacement. Clean and oil forms with form oil each time they are used. Set forms to line and grade for at least 200 feet ahead of mixer. Check conformity of alignment and grade immediately prior to placing concrete.

2. Removal

Leave forms in place for at least 12 hours. Remove forms without injury to concrete. Immediately repair damage resulting from form removal. Point up all exposed honeycombed areas with approved mortar. As soon as curb forms are removed, backfill behind curbs with approved material and compact to 90 percent standard Proctor density.

B. Slip Forms

Equipment to be provided with traveling side forms of sufficient dimensions, shape, and strength to support concrete laterally for sufficient length of time during placement to produce pavement of required cross-section. Concrete to be distributed uniformly into final position by slip form paver, and horizontal deviation in alignment of edges not to exceed 1-¼ inches from established alignment. When slip form paving equipment is designed by manufacturer to place the curb monolithically with the pavement, curb reinforcing steel is optional.

C. Concrete Placing and Handling

1. Wood and Steel Forms

- a. Deposit concrete on subgrade in such manner as to require as little rehandling as possible. Use shovels for hand spreading of concrete. Use of rakes will not be permitted. Place concrete in a rapid, continuous operation.
- b. Consolidate all concrete placed for pavement by an approved mechanical vibratory unit designed to vibrate the concrete internally. Use vibratory member equipped with synchronized vibratory units to extend across pavement practically to, but not to come in contact with, side forms. Space separate vibratory units at sufficiently close intervals to provide uniform vibration and consolidation to entire width of pavement. Mount mechanically operated vibrators in such manner as not to come in contact with forms or reinforcement and not to interfere with transverse or longitudinal joints.
- c. Furnish hand-manipulated mechanical vibrators in number required for proper consolidation of concrete along forms, at joints, and in areas not covered by mechanically controlled vibrators.

2. Slip Forms

- a. Concrete, for full paving width, to be effectively consolidated by internal vibration, with transverse vibrating units, or with a series of longitudinal vibrating units. Internal vibration to mean vibration by means of vibrating units loaded within the specified thickness of pavements section and at a minimum distance ahead of screed equal to pavement thickness.
- b. When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement to be equipped with protective pads on crawler tracks or rubber-tired wheels, offset to run a sufficient distance from edge of pavement to avoid breaking or cracking pavement edge.
- c. After concrete has been given a preliminary finish by finishing devices incorporated in the slip-form paving equipment, surface of the fresh concrete to be checked with a straightedge to tolerances and finish required.

3. Wood or Metal Formed Curb



Curbing may be poured monolithic with pavement or may be added to pavement surface at a later time. Place curb dowel bars while pavement is plastic. Provide expansion joint or contraction joint in curb opposite each expansion joint or contraction joint in pavement and at each curb inlet. Use same expansion joint material as used in pavement. Cut weakened plane joints with an approved grooving tool opposite each joint in pavement, as required. Apply finish coat of mortar on exposed surfaces of curb. Mortar composed of one part Portland cement and two parts sand. Apply mortar with a template or "mule" conforming to plan curb dimensions. Steel trowel finish all exposed surfaces of curb and brush to a smooth, uniform surface.

4. Machine-Laid Curb

- a. Lay curbs by an extrusion-type machine. Immediately prior to placing of the curb, thoroughly clean the previously approved foundation.
- b. Grade and alignment for top of curb to be as shown on Plans. The forming tube of the extrusion machine to be readily adjustable vertically during the forward motion of the machine, to provide required variable height of curb necessary to conform to the established grade line.
- c. Feed concrete into machine in such a manner and at such consistency that the finished curb shall present a well-compacted mass with a surface free from voids and honeycomb and true to established shape, line, and grade.
- d. Perform any additional surface finishing specified and/or required immediately after extrusion. Construct joints as specified or as shown on Plans.

5. Placing Concrete in Cold Weather

Minimum temperature of all concrete at time of placement to be not less than 50°F.

- a. Maintain temperature of concrete placed on or in the ground above 40°F for period of 72 hours from time of placement.
- b. Protect concrete against freezing during curing period in accordance with Portland Cement Association "Design and Control of Concrete Mixtures."
- c. Protect concrete from temperatures below 40°F until it has cured for a minimum of 3 days at 70°F or 5 days at 50°F. Remove and replace, at Contractor's expense, all concrete not meeting this requirement.

- d. Protection may consist of additional covering, insulated forms, artificial heatings, or other means approved by Engineer.

6. Placing Concrete in Hot Weather

When air temperature is above 90°F, use approved retarding agent in all exposed concrete.

- a. Reinforcing steel and other surfaces in contact with concrete, to be cooled to below 90°F by means of water spray or other approved methods.
- b. Concrete temperature prior to placement not to exceed 90°F, plus a maximum tolerance of 5°F. Concrete above this maximum will be rejected.
- c. Reduce concrete temperature at time of placement to satisfy maximum allowable temperature by one or more of the following:
  - 1) Addition of cold water with a subsequent addition of cement to maintain proper water-cement ratio. Tanks or trucks used for storing or transporting water to be insulated or painted white. Mechanical refrigeration may be used to reduce water temperatures.
  - 2) Addition of crushed, shaved, or chipped ice directly into the mixer with a subsequent addition of cement to maintain proper water-cement ratio. Continue mixing until ice is completely melted.
  - 3) Other approved methods.

D. Finishing

1. Nonresidential Pavements

Finish concrete pavement by power-driven transverse finishing machines and longitudinal finishing machines. Provide transverse finishing machine with two screeds accurately adjusted to crown of pavement. Ride transverse finishing machine on forms, so designed and operated as to strike off and consolidate concrete. Make at least two trips over each area, or more if necessary. Provide longitudinal finishing machine with a longitudinal float not less than 10 feet in length, adjusted to a true plane. Ride longitudinal finishing machine on forms, so designed and operated as to finish pavement to required grade. Equip finishing machines with rubber tires to roll on concrete pavement. Just before concrete becomes nonplastic, belt pavement surface

with a canvas or canvas-rubber composition belt of two- or four-ply construction, not less than 6 inches nor more than 10 inches wide, and at least 2 feet longer than width of pavement. Use short transverse strokes and rapid advance longitudinally to produce uniform surface of gritty texture. In lieu of canvas or canvas-rubber composition belt finish, Contractor may furnish a seamless burlap drag and finish the pavement by one or more passes of the burlap drag over the pavement. The burlap drag to consist of four or more piles of 10-ounce burlap fastened to a bridge to form a continuous strip of burlap the full width of the pavement and with approximately 3 feet of its width in contact with the pavement surface.

2. Residential Pavements

Concrete pavement may be finished by machine or by hand. If by machine, finish in accordance with paragraph D.1 above. If finished by hand, thoroughly vibrate concrete around reinforcement and embedded fixtures. Tamp concrete with a tamping template made of 4-inch by 10-inch lumber, or equivalent metal section, at least 2 feet longer than width of pavement, to conform to crown section of pavement. If wood tamping template is used, it is to have a steel face not less than 3/8 inch in thickness. Strike off concrete with a strike-off screed made of 4-inch by 10-inch lumber or equivalent metal section at least 2 feet longer than width of pavement and conforming to crown section of pavement. Move strike-off screed forward with combined transverse and longitudinal motion in direction Work is progressing, maintaining screed in contact with forms, and maintaining slight excess of materials in front of cutting edge. Use a longitudinal float not less than 10 feet in length to level surface. Prior to concrete becoming nonplastic, belt pavement surface with a canvas or canvas-rubber composition belt of two- to four-ply construction not less than 6 inches nor more than 10 inches wide, and at least 2 feet longer than width of pavement. Use short transverse strokes and rapid advance longitudinally to produce uniform surface of gritty texture. In lieu of canvas or canvas-rubber composition belt finish, Contractor may furnish a seamless burlap drag and finish the pavement by one or more passes of the burlap drag over the pavement. The burlap drag to consist of four or more piles of 10-ounce burlap fastened to a bridge to form a continuous strip of burlap the full width of the pavement and with approximately 3 feet of its width in contact with the pavement surface.

3. Slip Form

If this method of construction is used, all requirements of this Specification Section in regards to subgrade and pavement tolerances, pavement depth, alignment, consolidation, finishing, workmanship, etc. to be met. Equip "slip form paver" with longitudinal transangular finishing float adjustable to crown

and grade. Extend float across the pavement almost to the side form and/or the edge of slab.

E. Surface Tests

1. Test entire surface before initial set and correct irregularities or undulations to bring surface within requirements of following test, then finish.
2. Place approved 10-foot straight edge parallel to center of roadway so as to bridge any depressions and touch all high spots. Ordinates measured from face of straight edge to surface of pavement not to exceed 1/16 inch per foot from nearest point of contact, and in any case maximum ordinate to 10-foot straight edge to be no greater than 1/8 inch.

F. Joints

Place joints of types shown on Plans at required locations and at spacing shown.

1. Construction Joints

Place transverse construction joint when necessary to stop concrete placement for period of more than 30 minutes. Length of slab to be not less than 10 feet from nearest joint of complete slab. If closer than 10 feet, Contractor to remove concrete from between forms back to nearest normal joint and place construction joint bulkhead. Use longitudinal keyed construction joints at pavement edges where required.

2. Expansion Joints

Place expansion joint at radius points of curb returns for cross-street intersections, or as shown on Plans. Do not use boards less than 6 feet in length. When pavement is 24 feet or less in width, use not more than two lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross-section of concrete slab. Use premolded joint filler, accurately shaped, in curb section. Load transmission devices to be of type and size shown on Plans. Use joint sealing compound as required.

3. Contraction Joints

Make straight and place at spacings as shown on Plans. Place asphalt-coated smooth dowels accurately and normal to joint. Tool edges of groove and seal with joint sealing compound.

4. Longitudinal Weakened Plane Joints

Form longitudinal weakened plane joint by an approved continuous metal shield or an asphalt impregnated felt strip placed continuously behind longitudinal float by a machine of the flex plane type.

3.04 – 3.08 NOT USED

3.09 PROTECTION

If alternate methods of curing are used, cover concrete with burlap or cotton mats, when concrete has hardened sufficiently to prevent marring of surfaces, and keep wet continuously for 72 hours. Apply curing compound immediately after free water has disappeared and at rate specified. Keep polyethylene sheets or membrane curing film in place and intact for 5 days, in lieu of 72 hours wet curing. Cure concrete curbs and gutters to prevent checking while setting. After each day's run, barricade street. No wheeling will be allowed on concrete during curing period. Do not open pavement to traffic until concrete is at least 10 days old. Clean off pavement and seal joints before opening pavement to any traffic.

Polyethylene sheeting shall be kept on the jobsite at all times to cover and protect a minimum of 400 linear feet of pavement during adverse weather conditions. Concrete surface which is still in a plastic state shall be protected from adverse rainfall conditions so as not to impair the quality of the pavement surface.

3.10 SCHEDULES (NOT USED)

END OF SECTION