

SECTION 32 16 21

CONCRETE CURBS, GUTTERS, AND WALKS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Materials and accessories.
- B. Preparation of sub grade.
- C. Types of construction.
- D. Joints.
- E. Form removal.
- F. Finishing.
- G. Curing and protection.
- H. Field quality control.

1.02 RELATED SECTIONS

- A. Preparation of sub grade to proper grade for concrete, including compaction, is specified in Section 31 00 00 - Earthwork.
- B. Portland cement concrete, concrete reinforcement, and various materials, services, and incidentals pertaining thereto shall conform with Section 03 15 00 - Concrete Accessories, Section 03 20 00 - Concrete Reinforcing, Section 03 30 00 - Cast-In-Place Concrete, Section 03 05 15 - Portland Cement Concrete, and Section 03 35 00 - Concrete Finishing.

1.03 MEASUREMENT AND PAYMENT

- A. General: Measurement and payment for concrete curbs, gutters and walks will be either by the lump sum method or by the unit price method as determined by the listing of the bid item for concrete curbs, gutters and walks indicated in the Bid Schedule of the Bid Form.
- B. Lump sum: If the Bid Schedule indicates a lump sum for concrete curbs, gutters and walks, the lump-sum method of measurement and payment will be in accordance with Section 01 20 00 - Price and Payment Procedures, Article 1.03.
- C. Unit price: If the Bid Schedule indicates a unit price for concrete curbs, gutters and walks, the unit price method of measurement and payment will be as follows:
 - 1. Measurement:
 - a. Concrete curb, gutter, and combination curb-and-gutter will be measured.

- b. Sidewalks, including island paving, driveways, and ramps, will be measured for payment by the square yard for each type and thickness of concrete placed.
 - c. Reinforcing steel, tie bars, and dowels, and expansion joints and contraction joints will not be measured separately for payment, and all costs in connection therewith will be considered included in the measurements of portland cement concrete curbs, gutters, and walks.
2. Payment: Concrete curbs, gutters, and walks will be paid for at the indicated Contract unit prices for the computed quantities as determined by the measurement method specified in Article 1.03.C.1.

1.04 REFERENCES

A. American Concrete Institute (ACI):

- 1. ACI 117 Standard Specification for Tolerances for Concrete Construction Materials
- 2. ACI 301 Standard Specifications for Structural Concrete
- 3. ACI 318 Building Code Requirements for Reinforced Concrete

B. American Society for Testing and Materials (ASTM):

- 1. ASTM A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- 2. ASTM A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- 3. ASTM A663 Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties
- 4. ASTM C260 Specification for Air-Entraining Admixtures for Concrete
- 5. ASTM C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- 6. ASTM C881 Specification for Epoxy-Resin-Base Bonding Systems for Concrete

1.05 SUBMITTALS

- A. General: Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.
- B. Product Data: Submit the respective manufacturer's product data for manufactured products.
- C. Shop Drawings:

1. Submit drawings that indicate the section profile of curb and gutter, and the locations of joints in concrete, including construction joints, expansion joints, isolation joints, and contraction joints.
2. Submit drawings of extruded curbs and gutters, if proposed, and any modification of the indicated section profile required by the extrusion process.
3. Submit drawings of reinforcing steel, tie bars, and connecting dowels. Comply with requirements specified in Section 03 20 00 - Concrete Reinforcing.

1.06 QUALITY ASSURANCE

A. Tolerances:

1. Construct concrete surfaces within 1/4 inch of the indicated elevation, and deviating not more than 1/8 inch from a 10-foot straightedge placed anywhere on the surface.
2. Slab tolerances shall be "straightedge tolerance" as specified in ACI 117.

B. Finishes: Slab finishes shall be as specified herein in accordance with the requirements of ACI 301.

C. Site Mock-Ups: Provide site mock-up, in accordance with Section 01 43 38 - Field Samples and Mockups, at least 3 feet by 4 feet in size, of slab finishes for walks, for the Engineer's review and approval. Site mock-ups require approval of the Engineer in writing before this work may proceed.

PART 2 - PRODUCTS

2.01 MATERIALS AND ACCESSORIES

- A. Concrete Reinforcement: Refer to Section 03 20 00 - Concrete Reinforcing, for requirements.
- B. Portland Cement Concrete: Refer to Section 03 05 15 - Portland Cement Concrete, for requirements. Provide Class of Concrete indicated on the Contract Drawings.
- C. Benches and Chairs: ACI 318.
- D. Tie Bars: ASTM A615, Grade 60, of type and size indicated.
- E. Dowels: Plain round bars meeting requirements of ASTM A615, Grade 60, or ASTM A663, Grade 80, epoxy-coated bars, furnished with a cardboard sleeve.
- F. Weep Holes: ASTM A53 galvanized pipe of size indicated.
- G. Expansion-Joint Filler and Joint Sealing Compound: Refer to Section 03 15 00 - Concrete Accessories, for requirements.
- H. Surfacing Material for Non-slip Finish: Refer to Section 03 35 00 - Concrete Finishing, for requirements.

- I. Concrete Curing Compound: ASTM C309, Type 1-D, Class A.
- J. Epoxy Adhesive: ASTM C881, Type V for load-bearing concrete, Grade and Class as determined by project conditions and requirements.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

- A. Excavate for and prepare the sub grade as specified in Section 31 00 00 - Earthwork, true to the indicated grade and cross section.
- B. Test completed sub grade for correct grade and cross section by means of template supported on side forms.
- C. Dampen sub grade and forms just before placing concrete.

3.02 TYPES OF CONSTRUCTION

- A. Provide cast-in-place concrete construction, plain or reinforced as indicated. Curbs and gutters shall be formed accurately to indicated section profile with template screed.
- B. Extruded curbs and gutter, placed by an extrusion machine, may be provided where site conditions are suitable and the extrusion process is appropriate for the purpose.

3.03 JOINTS

- A. Expansion Joints:
 - 1. Construct 3/8-inch to 1/2-inch thick expansion joints in the following locations:
 - a. In curb and combination curb and gutter at the locations of expansion joints in the concrete roadway.
 - b. In curb or combination curb and gutter, at points where curved and tangent sections join.
 - c. Between curb or combination curb and gutter, and any drain inlet, or similar structure occurring within the limits of the curb or combination curb and gutter.
 - d. At corners in sidewalks, following the projections of the building lines from the corner of the building to the curb.
 - e. Between sidewalks and any permanent structure.
 - f. Between sidewalk and curb.
 - g. Through sidewalks at intervals not greater than 20 feet.
 - h. In sidewalks, encircling fixtures more than 12 inches in diameter.

2. Construct expansion joints as specified in Section 32 13 13 - Concrete Paving, except that load transfer devices will not be required unless indicated. Shape preformed filler to cross section of curbs and combination curb and gutter.
- B. Contraction Joints: In sidewalks, provide contraction joints as indicated in uniform intervals not greater than 6 feet, with the edges rounded to a 1/4-inch to 3/8-inch radius.
- C. Tooling: Finish joints with an edging tool having 1/4-inch to 3/8-inch radius, leaving joints free of mortar and concrete. In preformed type joints, leave joint filler material exposed for full length of joint with clean and true edges.
- D. Joint Sealing:
1. Seal to within 1/8 inch of pavement surface joints in curbs and gutters, including gutter surfaces of combination curb and gutter sections; all joints between curbs and vehicular pavement; all joints between gutters and vehicular pavement; and all other expansion joints. Do not seal other joints unless so indicated.
 2. Do not seal joints until concrete curing is complete. Prior to installation of the joint sealing compound, clean the joints of dirt and other foreign material. Joints may be cleaned with compressed air jets provided that the air in such jets is free of oil or water. Do not fill joints when there is any free water in or adjacent to the joints. Joint walls and all surfaces to which the sealing material is to adhere shall be surface dry for at least three hours prior to sealing.
 3. Apply with approved pressurized equipment. Perform sealing of joints to make them impervious to water and to prevent the sealing compound from spreading over the surface of the pavement.

3.04 FORM REMOVAL

- A. Remove front curb forms not less than two nor more than six hours after placing concrete, but in no case while the concrete is still plastic enough to slump.
- B. Remove other forms not less than twelve hours after finishing is completed.

3.05 FINISHING

- A. Curb and Combination Curb and Gutter:
 1. Trowel the face of curb smooth to a depth of not less than 2 inches below the flow line, or to the flow line of integral curb and gutter, and finish with a steel trowel, all immediately after removal of front curb forms.
 2. Finish all curb edges with a radius of 1/2-inch.
 3. Provide a final fine brush finish to both top and face of curb with brush strokes parallel to the line of the curb, so that both top and front face present the same uniform appearance.
 4. Keep the curb face wet during above finishing operations.

5. Allow no coarse aggregate to show on the finished curb surface.

B. Sidewalk, Island Paving, and Ramps:

1. After the concrete has been placed, consolidated, struck off, leveled, grooved and edged as specified herein and in Section 03 30 00 - Cast-In-Place Concrete, and in Section 03 35 00 - Concrete Finishing, do not work the concrete further until ready for floating.
2. Provide "floated finish" or light "broom finish" as indicated in accordance with the requirements of ACI 301.
3. For pedestrian and wheelchair ramps, and all other surfaces where the Contract Drawings require a non-slip finish, provide a "nonslip finish" in combination with a "floated finish" or "broom finish" in accordance with the requirements of ACI 301.
4. Broom finish shall be applied perpendicular to the direction of traffic flow.

- C. Joints and Edges:** As soon as the condition of the work permits, perform joint work, edging, and marking. Finish all edges with a radius of 1/4 inch to 3/8 inch.

3.06 CURING AND PROTECTION

- A. Comply with the applicable requirements of Section 03 35 00 - Concrete Finishing, for curing concrete with liquid membrane-forming curing compound. Do not permit traffic on new concrete pavement until the concrete has cured a minimum period of ten days.
- B. Provide damp curing only, in accordance with Section 03 35 00 - Concrete Finishing, for concrete slab surfaces indicated to be treated with concrete hardener and dust proofers.

3.07 FIELD QUALITY CONTROL

- A. The Contractor shall perform inspections and tests as specified in Section 03 05 15 - Portland Cement Concrete. The Contractor shall provide such samples and services to facilitate testing as specified in Section 03 05 15 - Portland Cement Concrete.

END OF SECTION 32 16 21