

SECTION 613**CONCRETE CURB, WALK, GUTTERS, DRIVEWAYS AND ALLEY INTERSECTIONS**

DESCRIPTION

613.01.01 GENERAL

- A. Concrete curb, walk, gutters, cross gutters, driveways, and alley intersections shall be constructed of Portland cement concrete prepared as prescribed in **Section 501**, **"Portland Cement Concrete."**

MATERIALS

613.02.01 GENERAL

- A. Materials shall conform to the applicable requirements of **Section 501**, **"Portland Cement Concrete,"** **Section 502**, **"Concrete Structures,"** and **Section 505**, **"Reinforcing Steel."**

CONSTRUCTION

613.03.01 GENERAL

- A. The thickness of Type I or II aggregate base under concrete curbs, gutters, walks, driveways, and alley intersections shall be as shown on the plans or Standard Drawings or as specified in the Special Provisions.
- B. The subgrade shall be constructed true to grade and cross sections as shown on the Plans or as established by the Engineer.
- C. The subgrade shall be watered and compacted until the subgrade reaches the compaction required for the adjacent roadway or base course.

613.03.02 DIMENSIONS

- A. The dimensions of the concrete curbs, gutters, walks, driveways, and alley intersections shall be as shown on the Plans or Standards Drawings or as specified in the Special Provisions.

613.03.03 DRAINAGE OUTLETS THROUGH CURB

- A. The Contractor shall provide suitable outlets through new curb for all existing building drains along the line of the work. The Contractor shall place outlets opposite any low area on adjacent property, the drainage of which will be affected by the new work.
- B. Where sidewalk or curb will be higher than adjacent property, the Contractor shall provide at least one 4-inch diameter opening through the curb for each parcel when directed by the Engineer.

613.03.04 DRIVEWAY ENTRANCES AND ALLEY INTERSECTIONS

- A. Driveway entrances and alley intersections shall be provided in new curb at all existing driveways and alley intersections along the line of the work at locations shown on the plans or Standard Drawings, or as specified in the Special Provisions.

613.03.05 STANDARD FORMS

- A. Form material shall be free from warp, with smooth and straight upper edges and, if used for the face of curb, shall be surfaced on the side against which the concrete is to be placed.
- B. Wooden forms for straight work shall have a net thickness of at least 1-1/2 inches; metal forms for such work shall be of a gauge that will provide equivalent rigidity and strength.
- C. Curb face forms used on monolithic curb and gutter construction shall be of a single plank width when the curb face is 10 inches or less, except for those used on curb returns.
 - 1. Wooden forms used on curb returns shall be not less than 3/4 inch in thickness, cut in the length and radius as shown on the plans, and held rigidly in place by the use of metal stakes and clamps.
 - 2. The curb face shall be cut to conform exactly with the curb face batter as well as being cut in the required length and radius.
 - 3. Forms shall be of sufficient rigidity and strength, and shall be supported to adequately resist springing or deflection from placing and tamping the concrete.
 - 4. Metal forms shall not be used for curb returns or on curves of less than 250-foot radius.
- D. Form material shall be clean at the time it is used, and shall be given a coating of light oil or other equally suitable material, immediately prior to the placing of the concrete.
- E. All forms, except back planks of curb, shall be set with the upper edges flush with the specified grade of the finished surface of the improvement to be constructed, and all forms shall be not less than a depth equivalent to the full specified thickness of the concrete to be placed.
- F. Back forms shall be held securely in place by stakes driven in pairs at an interval not to exceed 4 feet, 1 at the front form and 1 at the back.
 - 1. Clamps, spreaders, and braces shall be used as necessary to ensure proper form rigidity.
 - 2. Forms for walk, gutter, and similar work shall be firmly secured by stakes driven flush with the upper edge of the form at intervals not to exceed 5 feet.
 - 3. Form stakes shall be of sufficient size and be driven to adequately resist lateral displacement.
- G. Commercial form clamps for the curb and gutter may be used, provided the clamps fulfill the requirements specified herein.

613.03.06 SLIP FORMS

- A. At the option of the Contractor and with the approval of the Engineer, slip form equipment may be used for the construction of concrete curb and gutter and concrete curb, gutter, and sidewalk except for commercial driveways and curb returns with cross gutters.
- B. If machines designed specifically for such work and approved by the Engineer are used, the results shall be equal to or better than that produced by the use of forms.
 - 1. If the results are not satisfactory to the Engineer, the use of the machines will be discontinued.

2. All applicable requirements of construction by use of forms shall apply to the use of machines.
- C. Slip form equipment shall be provided with traveling side and top forms of suitable dimensions, shapes, and strength to support the concrete for a sufficient length of time during placement to produce curb and gutter of the required cross section. The equipment shall spread, consolidate, and screed the freshly placed concrete in such a manner as to provide a dense and homogeneous product.
 - D. Any curb, except on structures, may be placed by using an extrusion machine provided the finished curb is true to line and grade and the concrete is dense and of the required surface texture and strength. The combined aggregate for the concrete placed by the extrusion method shall be of such size that the percentage composition by weight will conform to the grading limits of combined aggregates as specified in **Subsection 706.02.01, "General,"** for the 3/4-inch maximum grading.
 - E. The grading limits shall be further restricted, if necessary, to produce concrete that after extrusion has well defined web marks of water on the surface and is free from surface pits larger than 3/16 inch in diameter.
 - F. The concrete shall be of such consistency that after extrusion, the concrete will maintain the shape of the curb section without support. The concrete shall contain the maximum amount of water that will permit this result.
 - G. In lieu of placing dowels and bar reinforcing steel and in advance of placing curbs on existing pavement or base, the surface shall be thoroughly cleaned and the adhesive specified below shall be applied.
 1. Cleaning of the pavement or base shall be accomplished by wire brushing or by blast cleaning if the latter method is ordered by the Engineer.
 2. The cleaned surface shall be free from dust, loose material, and oil.
 - H. The adhesive shall consist of 2 components which shall be mixed together at the site of the work and shall conform to **Subsection 728.03.11, "Binder (Adhesive), Structural Epoxy."**
 - I. The grade for the top of the curb shall be indicated by an offset guide line set by the Contractor from survey marks established by the Engineer.
 1. The forming tube portion of the extrusion machine shall be readily adjustable vertically during the forward motion of the machine to provide, when necessary, a variable height of curb conforming to the predetermined curb grade.
 2. A grade line gauge or pointer shall be attached to the machine in such manner that a continual comparison can be made between the curb being placed and established curb grade as indicated by the offset guide line.
 - J. In lieu of the above method for maintaining the curb grade, the extrusion machine may be operated on rails or forms set at uniform depth below the predetermined finished top of the grade.
 - K. The top and face of the finished curb shall be true and straight, and the top surface of curbs shall be of uniform width, free from humps, sags, or other irregularities. When a straightedge 10 feet long is laid on the top or face of the curb or on the surface of gutters, the surface shall not vary more than 0.01 foot from the edge of the straightedge, except at grade changes or curves.

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L. Extrusion Machines:

1. Crawler track driven extrusion machines shall not be used on finished course plantmix surface.
2. Concrete shall be fed to the machine at a uniform rate.
3. The machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete free from surface pits larger than 3/16 inch in diameter and requiring no further finishing, other than light brushing with a brush filled with water only.
4. Finishing with a brush application of grout will not be permitted.

M. Expansion joints shall be required at EC and BC of curb returns, and also along the line of work at regular intervals not to exceed 300 feet.

N. Unless otherwise specified, transverse weakened plane joints on curb and gutter produced by an extrusion machine shall be constructed at 10-foot intervals along the line of the work.

O. Weakened plane joints shall be constructed as specified in ***Subsection 613.03.10, "Weakened Plane Joints."***

P. Expansion joints shall be constructed as specified in ***Subsection 613.03.09, "Expansion Joints."***

Q. Curing of slip form curb, gutter, and sidewalk shall be done as specified in ***Subsection 613.03.15, "Curing."***

613.03.07 PLACING CONCRETE

A. Concrete shall be placed on a subgrade sufficiently dampened to ensure that no moisture will be absorbed from the fresh concrete.

B. Concrete shall be placed in curb, gutter, and curb and gutter forms in horizontal layers not exceeding 6 inches in thickness, each layer being spaded along the forms and thoroughly tamped. Concrete may be placed in layers of more than 6 inches in thickness only when authorized by the Engineer and when the spading and tamping is sufficient to consolidate the concrete for its entire length.

C. After the concrete for walk has been placed, a strike-off shall be used to bring the surface to the proper elevation when compacted. The concrete shall be spaded along the form faces and tamped to ensure a dense and compact mass, and to force the larger aggregate down while bringing to the surface not less than 3/8 inch of free mortar for finishing purposes.

D. Concrete shall be placed in cross gutters in horizontal layers of not more than 4 inches in thickness, each layer being spaded along the form faces and thoroughly tamped into a dense and compact mass. If internal vibrators are used, the full specified thickness may be placed in 1 operation.

E. After the concrete has been placed and tamped, the upper surface shall be struck off to the specified grade.

613.03.08 JOINTS

A. Joints in concrete curb, gutter, and walk shall be designated as expansion joints and weakened plane joints.

613.03.09 EXPANSION JOINTS

- A. Expansion joints shall be constructed in curbs, walk, and gutter as shown on the plans, Standard Drawings, or as specified herein.
 - 1. The joints shall be filled with pre-molded joint filler conforming to **Section 707, "Joint Material."**
 - 2. No expansion joints shall be constructed in cross gutters, alley intersections, or driveways except as approved by the Engineer.
- B. One-half-inch joints shall be constructed in curb and gutter at the end of all returns except where cross gutter transitions extend beyond the curb return, in which case the joints shall be placed at the ends of the cross gutter transition.
 - 1. No joints shall be constructed in returns.
 - 2. Where monolithic curb and gutter is constructed adjacent to concrete pavement, no expansion joints will be required except at EC and BC of curb returns.
- C. Expansion joint filler 1/2-inch thick shall be placed in walk at the EC and BC of all walk returns, around all utility poles that project into the concrete along the line of the work, and in walk returns between the walk and the back of curb returns when required by the Engineer.
 - 1. At the EC and BC and around utility poles, the joint filler strips shall extend the full depth of the concrete placed.
 - 2. Joint filler strips between walk and curb shall be the depth of the walk plus 1 inch with the top set flush with the specified grade at the top of curb.
- D. All expansion joint filler strips shall be installed vertically, shall extend to the full depth and width of the work in which they are installed, and shall be constructed perpendicular to straight curb or radially to the line of the curb constructed on a curve.
 - 1. Expansion joint filler materials shall completely fill these joints to within 1/4 inch of any surface of the concrete.
 - 2. Excess filler material shall be trimmed off to the specified dimension in a neat and workmanlike manner.
 - 3. During the placing and tamping of the concrete, the filler strip shall be held rigidly and securely in proper position.

613.03.10 WEAKENED PLANE JOINTS

- A. Weakened plane joints shall be straight and constructed in accordance with paragraphs D or E below, unless otherwise shown on the plans.
- B. In walks, joints shall be transverse to the line of work and at regular intervals not exceeding 10 feet. At curves and walk returns, the joints shall be radial.
- C. In gutters, including gutters integral with curb, joints shall be at regular intervals not exceeding 10 feet. Where integral curb and gutter is adjacent to concrete pavement, the joints shall be aligned with the pavement joints where practical.
- D. **Control Joint.**
 - 1. After preliminary trowelling, the concrete shall be parted to a depth of 2 inches with a straightedge to create a division in the coarse aggregate.

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2. The concrete shall be refloated to fill the parted joint with mortar.
3. Headers shall be marked to locate the weakened plane for final joint finishing, which shall be accomplished with a jointer tool having a depth of 1/2 inch and a radius of 1/8 inch.
4. The finished joint opening shall not be wider than 1/8 inch.

E. Plastic Control Joint.

1. The joint material shall be a T-shaped plastic strip at least 1 inch deep, having suitable anchorage to prevent vertical movement, and having a removable stiffener with a width of at least 3/4 inch.
2. After preliminary trowelling, the concrete shall be parted to a depth of 2 inches with a straightedge.
3. The plastic strip shall be inserted in the impression so that the upper surface of the removable stiffener is flush with the concrete.
4. After floating the concrete to fill all adjacent voids, the removable stiffener shall be stripped.
5. During final trowelling, the edges shall be finished to a radius of 1/8 inch using a slit jointer tool.

613.03.11 FINISHING

- A. Finishing shall be completed as specified herein for the type of work being performed.

613.03.12 CURB

- A. The front forms may be stripped as soon as the concrete has set sufficiently.
- B. The face and top of the curb shall be carefully trowelled to a smooth and even finish; the top shall be finished to a transverse slope of 1/4 inch toward the gutter, with both edges rounded to a radius of 3/4 inch.
- C. The trowelled surface shall be finished with a fine hair broom applied parallel with the line of the work.
- D. The edge of the concrete at all expansion joints shall be rounded to a 1/4-inch radius.
- E. The surface of the work shall be finished as prescribed, after which the name of the Contractor, together with the year in which the improvement is constructed, shall be stamped therein to a depth of 1/4 inch in letters not less than 3/4 inch high, at BC and EC curb returns.

613.03.13 WALK

- A. The forms shall be set to place the finished surface in a plane sloping up from the top of curb at a rate of 1/4 inch to 1 foot when measured at right angles to the curb.
- B. Following placing, the concrete shall be screeded to the required grade, tamped to consolidate the concrete and to bring a thin layer of mortar to the surface, and floated to a smooth, flat, uniform surface. The concrete shall then be edged at all headers, given a preliminary trowelling, and provided with weakened plane joints.
- C. Walks shall be steel trowelled to a smooth and even finish.
 1. All formed edges shall be rounded to a radius of 1/2 inch.

2. Edges at expansion joints shall be rounded to a radius of 1/8 inch.
 3. Preliminary trowelling may be done with a long-handled trowel or "Fresno," but the finish trowelling shall be done with a hand trowel.
 4. After final trowelling, walks on grades of less than 6 percent shall be given a fine hair broom finish applied transverse to the centerline.
 5. On grades exceeding 6 percent, walks shall be finished by hand with a wood float.
 6. Walks shall be remarked as necessary after final finish, to ensure neat uniform edges, joints, and weakened plane lines.
- D. Weakened plane lines, where required, shall have a minimum depth of 1-1/2 inch and a radius of 1/8 inch.
1. When longitudinal weakened plane lines are required, the lines shall be parallel to, or concentric with, the lines of the work.
 2. Walks 20 feet or more in width shall have a longitudinal center weakened plane line.
 3. In walk returns, 1 weakened plane line shall be made radially midway between the BCR and ECR.
 4. When directed by the Engineer, longitudinal and transverse weakened plane lines shall match the adjacent walk.
 5. The Contractor shall have sufficient metal bars, straightedges, and joint tools on the project.
- E. Headers shall remain in place for at least 16 hours after completion of the walk but shall be removed before the work is accepted.
- F. The name of the Contractor, together with the year in which the improvement is constructed, shall be stamped therein to a depth of 1/4 inch in letters not less than 3/4 inch, at intervals of not less than 200 feet.
1. A metal identification plate with the exposed face set flush with the finished surface of the concrete, anchored to a depth of not less than 1-1/2 inches, may be substituted for the stamping in the concrete.
 2. At least 1 such stamping or identification plate shall be made on each cement concrete job at the project.

613.03.14 GUTTER

- A. After the concrete has been thoroughly tamped in such manner as to force the larger aggregate into the concrete and bring to the top sufficient free mortar for finishing, the surface shall be worked to a true and even grade by means of a float, trowelled with a long-handled trowel (or "Fresno") and wood float finished.
1. The flow line of the gutter shall be trowelled smooth for a width of approximately 4 inches for integral curb and gutter and 4 inches on either side of the flow line on cross and longitudinal gutters.
 2. The outer edges of the gutter shall be rounded to a radius of 1/2 inch.
- B. Side forms shall remain in place for at least 24 hours after completion of the gutter, but shall be removed before the work will be accepted.
- C. Median island paving shall be as shown on the Standard Drawings.

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613.03.15 CURING

- A. Immediately after finishing operations are completed, the exposed surfaces shall be cured in accordance with **Section 502, "Concrete Structures."**

613.03.16 REPAIRS AND REPLACEMENTS

- A. Any new work found to be defective or damaged prior to its acceptance shall be repaired or replaced by the Contractor at no additional cost to the Contracting Agency and in accordance with **Subsection 105.12, "Removal of Unacceptable and Unauthorized Work."**

613.03.17 BACKFILLING AND CLEANUP

- A. Backfilling to the finished surface of the newly constructed improvement shall be complete before acceptance of the work.
- B. Upon completion of the work, the surface of the concrete shall be thoroughly cleaned and the site left in a neat and orderly condition.

613.03.18 DETECTABLE WARNINGS

- A. In accordance with the Americans with Disabilities Act (ADA), detectable warnings shall be constructed on all sidewalk ramps.
- B. Detectable warnings shall provide a tactile surface which visually contrasts with ramp and street surfaces to assist visually impaired persons in the identification of street and driveway crossings.
- C. Detectable warnings shall be constructed at the bottom of sidewalk ramps to a minimum depth of 24 inches and extending the full width of the ramp in accordance with the Standard Drawings.
- D. The materials and method of constructing the warning strips shall be as directed by the Engineer of the entity having jurisdiction over the ramp.
- E. Additional information on detectable warning materials and applications is available from the U.S. Access Board.

METHOD OF MEASUREMENT

613.04.01 MEASUREMENT

- A. The quantity of curb, gutter, and combination curb and gutter measured for payment will be the number of linear feet along the base of the curb face or along the flow line of the gutter.
- B. The quantity of sidewalk, driveway, and alley intersections shall be measured for payment by area in square feet.
- C. In the case of integral curb and walk, the width of the walk shall extend to the back face of the curb.
- D. All quantities measured for payment herein will be complete and in place.
- E. All measurements will be made in accordance with **Subsection 109.01, "Measurement of Quantities."**

BASIS OF PAYMENT

613.05.01 PAYMENT

- A. The accepted quantities of concrete measured as provided in **Subsection 613.04.01, "Measurement,"** will be paid for at the contract unit price bid per linear feet for curb, gutter, curb and gutter and per square foot for sidewalks, driveways, cross gutters, and alley intersections.
- B. All excavation and base course work required for and performed during construction of the items of this section will be paid for as provided in the respective sections of the specifications; however, when the contract does not provide bid items for excavation or base course, such work required and performed will be considered subsidiary to the pay item contained herein and no further payment will be made therefor.
- C. Any excavation or backfill required other than roadway quantities will be considered subsidiary to the major items of work and no further payment will be made therefor.
- D. Reinforcing steel placed in curbs and gutters as shown on the plans or ordered by the Engineer will not be paid for directly but the cost thereof shall be considered as included in the contract bid prices for other items of work.
- E. All payments shall be made in accordance with **Subsection 109.02, "Scope of Payment."**
- F. Payment will be made under:

PAY ITEM	PAY UNIT
Type A Curb.....	Linear Foot
Type L Island Curb and Gutter	Linear Foot
Type L Curb and Gutter	Linear Foot
Concrete Sidewalk.....	Square Foot
Concrete Driveway	Square Foot
Concrete Sidewalk and Driveway.....	Square Foot
Concrete Alley Intersection.....	Square Foot
Concrete Cross Gutter.....	Square Foot
Concrete Commercial Driveway	Square Foot