SECTION 02770

**CONCRETE CURB, CURB AND GUTTER,
VALLEY GUTTERS, SIDEWALK, AND DRIVEWAYS**

PART 1 - Description

The work covered by this section consists of furnishing all equipment, labor, and materials necessary for constructing concrete curb, curb and gutter, valley gutters, sidewalks, and driveways on natural or prepared subgrades and bases, completed in accordance with the following specifications and dimensions shown on the plans.

PART 2 – Materials

2.01 Materials

A. Portland Cement Concrete

1. Portland Cement Concrete shall conform to the requirements specified under Section 03050 Portland Cement Concrete

B. Reinforcing Steel and Fibers

1. Reinforcing steel for concrete reinforcement shall meet the requirements of ASTM A615, Grade 60.

2. Welded wire fabric for concrete reinforcement shall meet the requirement as ASTM A185. Mesh shall be welded plain cold-drawn steel wire fabric.

3. Reinforcing Fibers

    a. Concrete reinforcing fibers shall be polypropylene collated, fibrillated fibers designed and engineered specifically for use as secondary reinforcement for concrete, shall be three-quarter inch (3/4") (20mm) to one inch (1")(25mm) in length and be manufactured by Fibermesh Company, Forta Corporation, or approved equal.

C. Preformed Expansion Joint Material

1. Preformed joint material shall comply with the requirement of ASTM D994, ASTM D1751, or ASTM D1752.

D. Leveling Base Course

1. Base course materials, if specified, shall conform to the requirements of sand with less than 10% passing No. 200 sieve.

E. Forms

1. Concrete forms shall be wood, steel, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal.

2. Forms shall be coated with a non-staining agent that will not discolor or deface surface of concrete.

F. Curing Compound

1. Curing compound shall be poly-alpha-methyl-styrene (PAMS) meeting AASHTO 148 Class B, or engineer approved equivalent.

G. Foundation Material

1. Refer to Section 02632 for Foundation Material

H. Aggregates

1. Course and fine Aggregates shall meet the requirements of ASTM C33 Article 2. Concrete mix under this Section shall meet one and one half inch (1½") (37.5 mm) sieve size, as specified in Division 300, Section 301.

2.03 Subgrade and Base

A. Natural Subgrades.

1. Subgrade shall be cut to the grade to accommodate concrete improvement being specified. The upper eight inches (8") (200mm) of the subgrade shall be compacted to a dry density of at least 95% of maximum dry density as determined by ASTM D698 at a moisture content of ± 2% oF optimum. The finished surface of the subgrade shall be smooth, free from surface irregularities, and true to line and grade as established by grade hubs or pins.

2. Compaction tests shall be performed a minimum of every one hundred fifty feet (150') (45m) of curb walk or side walk, once for each valley gutter, and once for each driveway not part of a section of curb walk being tested. This testing requirement is only applicable for new subdivision construction.

B. Trenches crossing curbwalk, valley gutters, or other concrete paving within the City right-of- way shall be compacted the full depth of the trench and shall be compacted to a dry density of at least 95% of maximum dry density as determined by ASTM D698 at a moisture content of ± 2% oF optimum. This applies to all trenches installed for any purpose. Prepared Subgrades with

Foundation Material

1. Where spongy, organic, or otherwise unsuitable material is encountered, which, in the opinion of the Engineer is unsuitable for subgrade, such unsuitable material shall be removed to a minimum of twelve inches (12") (300mm) below the four inch (4") (100mm) thick leveling base course, and replaced with foundation material. The Engineer may direct the Contractor to excavate deeper than the specified twelve inches (12") (300mm).

2. All foundation material shall be compacted to 95% of maximum dry density, as determined by ASTM D698 at a moisture content of $\pm$ 2% of optimum. Tree roots shall be removed at least one foot (1') (300mm) laterally and twelve inches (12") (300mm) vertically below all prepared subgrades.

C. Proof Rolling

1. Subgrades shall be proof rolled after compaction testing requirements have been passed and prior to placement of the leveling base course.

2. Proof rolling shall be performed in the presence of the Engineer and a representative of the City Engineer's office.

D. Leveling Base Course.

1. Just prior to placement of concrete, the four inch (4") (100mm) thick leveling base course shall be accurately graded to conform to the grade of the forms, and sprinkled if necessary until the moisture content is at or near optimum moisture content. Optimum moisture content shall be determined by the Engineer in accordance with ASTM D698. In no case shall concrete be placed on a saturated base or if free water is standing on the base. This paragraph applies in areas where spot concrete improvements are scheduled such as short runs of new curb and gutter and in areas where valley gutters are removed and replaced and or where concrete is placed manually in lieu of machine placement.

2.04 Forms

A. When using forms, they shall be of wood or metal, straight, free from warp, and of sufficient strength when staked to resist the pressure of the concrete without springing, and the upper edge shall form a true line. Outside forms for the curbwalk shall be of a depth equal to the full depth of the sidewalk, and the inside forms shall be of the depth of the gutter and shall be so designed as to permit secure fastening to the outside form. All forms shall be cleaned thoroughly and greased or oiled before concrete is placed against them. Forms that have become worn, bent, or broken shall not be used. Forms shall be securely set true to line and grade.

B. On short radii curves, steel plates, which can be readily formed to the desired radii, shall be used. Face forms, if used, shall be preshaped to the proper radii. Care shall be exercised to insure the maintenance of the required cross-section around the entire radius.

C. The Contractor shall provide an approved metal straight edge, ten feet (10') (3m) in length for use in checking the alignment of the forms prior to placing the concrete and also to check the concrete surface during the finishing operation. Forms and the final product shall not deviate more than one-quarter inch (1/4") (6.25mm) from a straight edge ten feet (10') (250mm) in length and shall be sloped to achieve complete drainage without "bird baths."

D. Forms shall remain in place at least twelve (12) hours after concrete has been placed against them or for a longer period if so directed by the Engineer. Crowbars or other heavy tools shall not be used against green concrete in removing the forms. Forms shall be well cleaned before reoiling and reuse.

E. Screed guide templates shall be pulled prior to the concrete taking initial set. In those cases where initial set takes place prior to pulling of the templates, the joint shall be sealed with an asphaltic sealing compound approved by the Engineer.

2.05 Protection

A. Protect fresh concrete from deleterious effects of weather and from traffic until adequately cured.

B. Concrete shall not be placed on frozen subgrade or when weather is stormy, dusty, or otherwise inclement to the point that it precludes good workmanship. Air temperature shall be a minimum of 40° F (4^0C) and rising when the pour is started. Adequate measures shall be employed to protect the concrete from freezing for a period of at least seventy-two (72) hours after it is poured.

2.06 Joint Construction

A. Expansion Joints

1. All expansion joints shall be constructed straight, plumb, and shall extend through the full width and depth of the section. Expansion joint material shall be flush with the finished surface to three-quarters inch (3/4") (20 mm) below the finished surface. Edges adjacent to expansion joint material shall be tooled.

2. Expansion joints shall be constructed at the intersection with any existing curbwalk or curb and gutter, at the tangent point of curb radii, at alley returns, adjacent to inlet structures and at intermediate intervals of not more than sixty feet (60') (18m) or at such lesser spacing as may be determined by the Engineer.

B. Contraction Joints

1. Transverse weakened-plane contraction joints shall be constructed at right angles to the curb line at intervals of ten feet (10') (3.1m). Joint depth shall average at least one-fourth (1/4) of the cross- section of the concrete.

2. Contraction joints may be sawed, hand formed, or made by one-eighth inch (1/8") (3mm) thick

division plates in the formwork. Sawing shall be done early after the concrete has set to prevent the formation of uncontrolled cracking. The joints may be hand formed either by 1) using a narrow or triangular jointing tool or a thin metal blade to impress a plane of weakness into the plastic concrete; or, 2) inserting one-eighth inch (1/8") (3mm) thick steel strips into the plastic concrete temporarily. Steel strips shall be withdrawn before final finishing of the concrete.

3. After removal of templates and finishing, contraction joints shall be reopened with a mason's trowel to a depth of one-fourth (1/4) the thickness of the section, the line of cut coinciding with and extending into the joint formed by the template. The joints shall be finished with a jointer.

C. Construction Joints

1. At end of day's run, or in case of an interruption which would result in cold joint, construction joints shall be made at right angles to the longitudinal axis of the curbwalk and shall be located at the regular five foot (5') (1.5m) spacing designated for contraction joints unless otherwise specifically permitted by the Engineer. In no case shall any length of curbwalk be less than five feet (5') (1.5m) between joints.

2. Construction joints shall be formed by use of a bulkhead or divider which shall be removed before continuing with the next run. Edges of construction joints shall be edge tooled to form a recess for sealing compound.

2.07 Concrete Placement

A. Concrete shall be placed either by an approved slipform/extrusion machine, by the formed method, or by a combination of these methods. Concrete shall not be placed until base courses and forms have been checked for depth and alignment. The method used shall adequately vibrate and compact the concrete to achieve a homogeneous dense concrete free from honeycomb and pockets of segregated aggregate.

B. Machine Placement

1. The slipform/extrusion machine approved shall be so designed as to place, spread, consolidate, screed, and finish the concrete in one complete pass in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogeneous concrete section.

2. The machine shall shape, vibrate, and/or extrude the concrete for the full width and depth of the concrete section being placed. It shall be operated with as nearly a continuous forward movement as possible.

3. All operations of mixing, delivery, and spreading concrete shall be so coordinated as to provide uniform progress, with stopping and starting of the machine held to a minimum.

C. Formed Method

1. Construct forms to the shape, lines, grades, and dimensions called for in the Drawings. Set wood or steel forms securely in place, true to line and grade. Forms shall be braced to prevent change of shape or movement in any direction resulting from the weight of the concrete during placement. Tops of forms shall not depart from grade line more than one-fourth inch (1/4") (6.25mm) when checked with a ten-foot (10') (3m) straightedge. Alignment of straight sections shall not vary more than one-fourth inch (1/4") (6.25mm) in ten feet (10') (3m).

2.08 Finishing

A. Finishing shall be done with a metal screed or mule designed to give proper shape to the section as detailed. Particular care shall be used to finish the gutter flow line to a true, uniform grade that will drain completely without "bird baths". The back of the curbwalk and toe of the gutter shall be edge tooled. Traffic surfaces shall be broom finished at 90^{o} to the direction of traffic. All honeycombed areas or small defects shall be patched with 1:2 mix mortar.

B. After stripping forms, exposed concrete surfaces shall be finished smooth and even by means of a moist wood float or a moist brick.

C. Sides of concrete exposed by the removal of forms shall be protected immediately to provide continuance of curing and preventing injury to the edge and the underlying subgrade. After the forms have been removed, suitable fill material shall be placed along the edge of the walk and tamped by either hand or mechanical tampers to a density at least equal to that of the adjacent ground. The finish grade and section shall be as indicated on the drawings and to the satisfaction of the Engineer.

D. Protection And Repairs

1. Protection: Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

2. Maintain concrete with minimum moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3. Random Cracks in Pavement Slabs on Grade: When cracks occur within 2 feet (0.61 meters) of expansion or construction joints, remove and repair,otherwise grout with epoxy adhesive grout. Use saw cuts and dowels in all cut planes.

4. Random Cracks in Curb and Gutter: When concrete cracks larger than hairline cracks appear in curb and gutter and are the width of a penny standing on edge, Engineer shall direct Contractor to remove and replace concrete curb and gutter sections. Sections to be replaced shall be a minimum of five feet in length. When cracks are hairline in width, repair with epoxy adhesive grout.

2.09 Curing

A. Concrete shall be sprayed uniformly with curing compound immediately after finishing of the surface and before the set of the concrete has taken place. Curing compound shall be applied at the manufacturer's recommended rate.

B. Curing compound shall also be applied immediately to the exposed concrete once forms have been removed.

C. See section **2.02 F** for approved curing compounds.

2.05 Jointing New and Existing Curb Sections

Where the new concrete sections will join existing concrete sections with a different cross-section, five foot (5') (1.5m) long minimum transition section shall be constructed.

2.11 Fiber Reinforced Concrete

A. Where specified or approved by the Engineer, provide polypropylene fibers added to the concrete mix to control shrinkage cracks.

B. Polyproplyene fibers shall be added at the rate of three pounds (3#) (1.4 kg) of fiber per cubic yard of concrete. Fibers shall be added to the concrete in accordance with the manufacturer's recommendations.

2.13 Cutting and Patching of Asphalt Paving.

A. When curb cuts, or other concrete structures are installed adjacent to existing asphaltic concrete paving, the asphalt paving shall be saw cut parallel to and a minimum of eighteen inches (18") (450mm) away from the edge of the concrete.

B. The excavation between the concrete and the asphalt paving shall be backfilled with a minimum of two and one-half inches (2.5 inches) of asphalt over a specified base course. Base course and asphaltic concrete paving shall comply with City of Lakeland standard specification.

C. Where the existing pavement and base course sections exceed the minimums specified above, the replacement thickness shall match the existing.

END OF SECTION