SECTION 32 16 00

CURBS, GUTTERS, SIDEWALKS, AND DRIVEWAYS

PART 1 - GENERAL

1.01 The work specified by this section shall consist of furnishing all plant, labor, equipment, appliances and materials and of performing all operations in connection with the construction of concrete paving, curbs and guttering, sidewalks, and ramps on previously prepared subgrades in accordance with the drawings and these specifications.

1.02 CONCRETE

A. All concrete shall be Ready-Mixed Concrete per ASTM C 94, with f'c=4,000 psi, at 28 days as defined by ACI standards, air entrained (4-7%), maximum water/cementitious materials ratio of 0.45. The applicable provisions of ACI 301, Specifications for Structural Concrete for Buildings, form a part of this specification.

1.03 QUALITY ASSURANCE

A. Comply with the provisions of the following codes, specifications and standards except where more stringent requirements are shown or specified:
   1. ACI 302, Guide for Concrete Floor and Slab Placement.
   2. ACI 304, Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
   3. ACI 305, Hot Weather Concreting.
   4. ACI 306, Cold Weather Concreting.
   5. ACI 315, Detailing Manual.
   6. ACI 318, Building Code Requirements for Reinforced Concrete.
   7. ACI 347, Recommended Practice for Concrete Formwork.
   8. CRSI Manual of Standard Practice.

B. The contractor is responsible for correcting concrete work that does not conform to the specified requirements, including requirements for strength, tolerances and finishes. Correct deficient concrete as directed by the A/E.

C. Contractor to provide and test two cylinders per pour.

D. Materials and installed work may require testing and retesting, as directed by the A/E, at any time during the progress of work. Allow free access to material stockpiles and facilities at all times. Tests not specifically indicated to be done at the owner's expense, including the retesting of rejected materials and installed work shall be done at the contractor's expense.

E. Test aggregates by the methods of sampling and testing outlined in ASTM C33.

F. For Portland cement, sample the cement and determine the properties by the methods outlined in ASTM C150.

PART 2 - PRODUCTS

A. Reinforcing Bars: ASTM A615, Grade 60.

B. Welded Wire Reinforcement: ASTM A1064, 65,000 psi yield strength.

C. Form Coatings: Provide commercial formulation form coating compounds that will not bond with, stain or adversely affect concrete surface and that will not impair subsequent treatments of concrete surfaces to be cured with water or curing compound.

D. Supports for Reinforcement: Provide supports for reinforcement, including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Unless otherwise indicated on the drawings, use wire type bar supports complying with CRSI recommendations. Wood, brick and other devices will not be acceptable. Comply with the following:
   1. For concrete surfaces exposed to view, where leg supports are in contact with forms, provide supports with legs that are hot dip galvanized or protected by either plastic or stainless steel.

E. Portland Cement: ASTM C150, Type I, Type IA, Type II, Type III or Type V. Use only one brand of cement throughout the project unless directed otherwise.

F. Normal Weight Aggregates: ASTM C33.

G. Fine aggregate is to be clean, sharp, river sand or crushed gravel when used for vehicle wearing surfaces. Manufactured sand may be used elsewhere provided the percentage passing a No. 200 sieve is less than 3 percent.

H. Coarse Aggregate: Coarse aggregate shall consist of crushed stone that is clean, uncoated and processed from natural rock or stone and that contains no clay, mud, loam or foreign matter. Its maximum size shall be no larger than 1/5 of the narrowest dimension between sides of forms, 1/3 of the depth of slabs or 3/4 of the minimum clear spacing between individual reinforcing bars or bundles of bars.

I. Moisture Barrier: Provide moisture barrier cover over prepared base material where shown on the drawings. This barrier shall consist of a plastic sheet, meeting the requirements of ASTM E 1745, Class C, that is not less than 6 mils thick, is resistant to decay when tested in accordance with ASTM E154, and has a certified water transmission rate of no more than 0.1 perms. Lap and tape all joints. Repair any tears.

PART 3 - EXECUTION

3.01 SUBGRADE AND FORMS

A. Provide and operate a template for checking the contour of the subgrade. The template shall rest on the side forms and shall be provided with adjustable rods that project downward to the subgrade at 1-foot intervals. Adjust these rods to the required cross sections of the bottom of the slab when the template is supported at its sides.

B. Forms shall be of metal or wood and subject to approval by the A/E.

C. The Owner reserves the right to approve the machine used, the contour and finish of the curb and gutter, the design mix and the right to designate the spacing for expansion and contraction joints.

D. Test the subgrade with respect to elevation and density prior to setting forms. Complete the subgrade to the plane of the typical sections shown on the drawings and to the lines and grades established by the drawings. Compact subgrades for all slabs on earth to at least 98% of maximum dry density as determined by ASTM D698 (Standard Proctor), or in accordance with the geotechnical investigation, whichever is more stringent.

E. After preparing the subgrade as described above, set the forms. The subgrade under the forms shall be firm and cut true to grade so that each form section will, when placed, be firmly in contact for its entire length and base width. Stake the form into position so that the top, when tested by a 10-foot straightedge, conforms to the requirements specified for the surface of the concrete and so that the longitudinal axis of the upstanding leg does not vary more than ¼ inch. Tightly lock form sections together.

F. Finish the subgrade to the exact section of the bottom of the pavement shown on the drawings. Wet the subgrade down far enough in advance of the placing of the concrete to ensure that it is firm and moist. In cold weather, the subgrade shall be entirely free from frost when the concrete is deposited.

G. Leave forms in place at least 24 hours after the concrete has been placed against them. Do not use crowbars or heavy tools against green concrete when removing the forms. Clean the forms well before re-oiling and reuse.

3.02 PLACING

A. Concrete shall be in place within 45 minutes from the time all ingredients are charged in the mixing drum and before the concrete has obtained it's initial set. Deposit concrete so that minimum handling will be necessary and distribute it so that, when consolidated and finished, the slab thickness and surface grade required by the drawings will be obtained at all points. Place concrete rapidly and continuously between expansion joints. Use shovels for any necessary hand spreading. Consolidate the concrete adjacent to forms and joints with forks and spades.

B. Do not place concrete when the ambient temperature is below 35 degrees F, or when concrete is, without special protections, likely to be subject to freezing temperatures before final setting has occurred. The temperature of the concrete when placed shall not be less than 50 degrees F, or more than 90 degrees F. Heating of the mixing water and / or aggregates will not be permitted until the temperature of the concrete has decreased to 55 degrees F. Heated materials shall be free from ice, snow and frozen lumps before entering the mixer. Methods and equipment for heating shall be subject to the A/E's approval. Provide suitable means for maintaining concrete at a temperature of at least 40 degrees F for not less than 72 hours after placement. Any concrete damaged by freezing shall be removed and replaced at the expense of the contractor.

3.03 FINISHING

A. Immediately after placement, properly finish the concrete. The sequence of operations shall be as follows:
   a. Hand finishing.
   b. Longitudinal floating.
   c. Straightedge finishing.
   d. Edging the joints.

B. Provide an approved hand strike template, approved tamping template and a longitudinal float for the hand finishing of pavement. The templates shall be at least 1.0 foot longer than the pavement width and at least 4 inches wide. The longitudinal float shall be 6 feet to 8 feet long. The float shall be rigid and substantially braced and provided with suitable handles to ensure smooth and effective manipulation. The bottom edges of the base of the float shall be rounded. Floats made of metal or a combination of wood and metal may be used.

C. As soon as concrete is placed, strike off and screed to the appropriate cross section and to an elevation above grade which, when the concrete is consolidated and finished, will ensure that the surface of the pavement is at the exact elevation indicated on the drawings. Tamp the entire surface, and continue tamping until the required compaction and reduction of internal and surface

voids are secured. Immediately after the final tamping of the surfaces, float the pavement longitudinally by hand. If contact with the pavement is not made at all points by the float, additional concrete shall be required and screeded, and the float operated until a satisfactory surface is obtained.

D. After the longitudinal floating is complete, eliminate minor irregularities and score marks remaining in the pavement surface by removing surplus material or if necessary, by adding and working in freshly mixed concrete with long handled floats and filling in open textured areas in the pavement surfaces. Make the final finish with straightedges 8 feet in length. A straightedge operated from the side of the pavement shall be equipped with a handle 3 feet longer than ½ of the pavement width. Place the straightedge at the centerline and pull uniformly to the edge. Do not advance the straightedge along the pavement in successive stages more than ½ its length. Immediately fill depressions with freshly mixed concrete, strike off, consolidate and refinish. Remove projections above the required elevation while the concrete is still plastic and workable, doing so in a time sequence that will ensure the removal of all water and laitance from the surface. Continue the straightedge testing and re-floating until the entire surface is free from observable departures from the straightedge, conforms to the required grade and contour and will, when the concrete has hardened, conform with the surface requirements specified herein.

E. After hand finishing has been completed but before the concrete has attained initial set, carefully finish the edges of slabs along forms and at joints with an edging tool of ½ inch radius to form a smooth, rounded surface. Clean corners or edges of slabs that have crumbled and areas that lack enough mortar for proper finishing by removing loose fragments and soupy mortar, and then fill solidly and finish with a mixture of the correct proportions and appropriate consistency. Eliminate unnecessary tool marks and leave edges smooth and true to line. After removing the forms, fill any damaged or honeycombed areas with mortar composed of one part cement and two parts sand.

F. Form transverse and contraction joints in the finished pavement prior to initial set, spacing them as shown on the drawings. Contraction joints shall be ¼ inch wide and ¾ inch deep and shall be finished with an edging tool of ¼ inch radius.

G. Place transverse and pre-molded expansion joints ¾ inch thick in such a way that the joint will be filled to within ½ inch of the surface of the walk. Place them to full depth and normal to the grade. Wherever concrete walks abut against transverse steps, other walks or adjacent structures, provide expansion joints. Clean all concrete from the top of the pre-molded joints and edge the concrete as specified above.

3.04 PROTECTION AND CURING

A. Protect and cure concrete with an approved curing compound applied according to the manufacturer’s directions.

3.05 SURFACE TEST

A. The finished surfaces shall conform to the lines and grades shown on the drawings. No deviations, variations or irregularities exceeding ¼ inch in any direction when tested with a 10-foot straightedge will be permitted in the finished work, nor will any depressions that will not drain. Correct all such defects. In Accessible access aisles, parking areas, crosswalks, or other areas subject to 2010 ADA Standards for Accessible Design (US DOJ September 15, 2010) contractor to ensure finished surfaces conform to lines and grades as shown and in accordance with the standards when tested with a calibrated, 24-inch digital level.

END OF SECTION