

SECTION 03216

CONCRETE STRUCTURES, DRIVEWAY, SIDEWALK, CURB AND GUTTER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Materials, installation and tolerances for Portland cement concrete ramps, sidewalk, curbs, gutters, and driveway approaches.

1.02 SUBMITTALS

- A. Concrete mix design must be submitted 48 hours before placement and physical-chemical analysis of aggregates, in accordance with Section 03304.
- B. Test reports: Submit test reports as requested by Engineer verifying compliance with standards.

PART 2 PRODUCTS

2.01 BACKFILL MATERIALS

- A. Common fill, in accordance with Section 02205.
- B. Select fill, in accordance with Section 02206.

2.02 MATERIALS: Materials used in Portland cement concrete and reinforcing of Portland cement concrete shall meet the following requirements:

- A. In accordance with Section 03304.
- B. Reinforcing Steel: All bar material used for reinforcement of concrete shall be intermediate grade steel conforming to the requirements of ASTM Designation A-15 and shall be deformed in accordance with ASTM Designation A-305.
- C. Welded Wire Fabric: Welded wire fabric for concrete reinforcement shall conform to the requirements of AASHTO M-55.

2.03 FORMS

- A. Forms shall be substantially built and adequately braced so as to withstand the liquid weight of concrete. All linings, studding, walling and bracing shall be such as to prevent bulging, spreading, or loss of true alignment while pouring and displacement of concrete while setting.
- B. Metal forms shall be used for curb and gutter work except at curves and on winding roads, unless continuous lay down machine is used, or as directed by city engineer.
- C. Continuous curb lay down machine shall be used on all winding roads over 100 feet long, unless otherwise approved by City Engineer.
- D. All edge forms for sidewalk pavements, curbs and gutters shall be of sufficient rigidity and adequately braced to accurately maintain line and grade.

- E. Forms for curved sections shall be so constructed and placed that the finish surface of walls, edge of sidewalks, or curbs and gutters will not deviate appreciably from the arc of the curve.
- F. Exposed vertical and horizontal edges of the concrete in structures shall be chamfered by the placing of moldings in the forms.

2.04 PORTLAND CEMENT CONCRETE

- A. In accordance with Section 03304.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces scheduled to receive concrete form work for defects that will adversely affect the quality of the work and be out of compliance with tolerances for installation of concrete material.
- B. Do not start work until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. A minimum slope of 0.5 % shall be maintained on all concrete used for drainage purposes unless discussed with and approved by the City Engineer.
- B. Joining to Existing Concrete: Cut existing concrete to provide a straight line. Make all cuts at score lines or expansion joints. If existing adjacent concrete slabs not scheduled for replacement are damaged by Contractor's operation, replace concrete at no additional cost to City. When connecting to existing curb and gutter or waterways, the existing concrete shall be drilled and dowels inserted to make the connection.
- C. Subgrade: A soils classification, as determined by AASHTO T-27 shall be made on the proposed subgrade and the following preparation schedule shall be followed based on that classification:

Sidewalk, Curb and Gutter, and Driveway Subgrade Preparation Schedule

SOIL CLASSIFICATION	REQUIREMENT
A-1 or A-2	The subgrade shall be moistened and compacted in accordance with Section 02250.
A-3 or A-4	The subgrade shall be over excavated a minimum of 12 inches and replaced with select granular material and be moistened and compacted in accordance with Section 02250.
A-5, A-6, or A-7	The subgrade shall be over excavated a minimum of 18 inches, replaced with select granular material, and be moistened and compacted in accordance with Section 02250.

- 1. No organic material, soft clay, spongy material, or other deleterious material will be permitted in the scarified or imported subgrade layer.
- 2. Rough subgrade shall be shaped and graded at least 6 inches beyond the back of the sidewalk to within a tolerance of 0.10 feet of design grade and drainage shall be maintained at all times.
- D. Compaction: As indicated, in accordance with Section 02250.

- E. Select Backfill: Unless indicated otherwise, provide 6" minimum of select fill below curbs, gutter, driveway approaches, alley intersections, and sidewalks.
- F. Reinforcement and Embedded Items
 - 1. Reinforcing steel shall be clean and free from rust, scale, paint, grease, or other foreign matter which might impair the bond. It shall be accurately bent and shall be tied to prevent displacement when concrete is poured. Reinforcing steel shall be held in place by only metal or concrete ties, braces and supports. No steel shall extend from or be visible on any finished surface.
 - 2. The Contractor shall use concrete chairs for holding the steel away from the subgrade and spreader or other type bars for securing the steel in place. The spreader bars shall be not less than 3/8 inch in diameter.
- G. Site Preparation
 - 1. Before batching and placing concrete, all equipment for mixing and transporting the concrete shall be cleaned.
 - 2. All debris and ice shall be removed from the places occupied by the concrete.
 - 3. Forms shall be thoroughly wetted (except in freezing weather), or oiled.
 - 4. Masonry filler units that will be in contact with concrete shall be well drenched (except in freezing weather).
 - 5. Reinforcement shall be thoroughly cleaned of ice or other coatings.
 - 6. Water shall be removed from spaces to receive concrete.

3.03 CONCRETE PLACEMENT

- A. Place in accordance with Section 03310.
- B. No concrete shall be placed until the surfaces have been approved by the City Inspector.
- C. When placing concrete on earth surfaces, the surfaces shall be free from frost, ice, mud, and water.
- D. When the subgrade surface is dry soil or pervious material, it shall be sprayed with water immediately before placing of concrete or shall be covered with a plastic membrane.
- E. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to re-handling or flowing.
- F. The concrete placing shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the corners of forms and reinforcing bars.
- G. No concrete that is partially hardened or been contaminated by foreign material shall be deposited in the work, nor shall retempered concrete be used.
- H. All concrete in structures shall be vibrator compacted during the operation of placing and shall be thoroughly worked around reinforcement and embedded fixtures and into the corners of forms.

I. Placing concrete in cold weather:

1. No concrete shall be placed where the air temperature is lower than 40 degrees Fahrenheit, at a location where the concrete cannot be covered or protected from the surrounding air.
2. When concrete is placed below a temperature of 35 degrees Fahrenheit the ingredients of the concrete shall be heated so that the temperature of the mixture shall not be less than 50 degrees or more than 100 degrees Fahrenheit.
3. Before mixing, the heated aggregates shall not exceed 175 degrees Fahrenheit.
4. Cement shall not be added while the temperature of the mixed aggregates and water is greater than 100 degrees Fahrenheit.
5. When there is likelihood of freezing during the curing period, the concrete shall be protected by means of an insulated covering to prevent freezing of the concrete for a period of not less than 7 days after placing.
6. Equipment for protecting concrete from freezing shall be available at the job site prior to placing concrete. Particular care shall be exercised to protect edges and exposed corners from freezing.
7. In the event heating is employed, care shall be taken to insure that no part of the concrete becomes dried out or is heated to temperatures above 100 degrees Fahrenheit.
8. The housing, covering, or other protection used shall remain in place and intact at least 24 hours after the artificial heating is discontinued.
9. For a period of five days concrete shall be kept between 40 degrees and 100 degrees F.

3.04 CONCRETE MIXING

- A. Concrete mix design must be submitted 48 hours before placement.
- B. The concrete shall be mixed until there is a uniform distribution of the materials.
- C. Sufficient water shall be used in mixing concrete to produce a mixture which will flatten and quake when deposited in place, but not enough to cause it to flow or exceed the water - cement ratio.
- D. In no case shall the quantity of water used cause the collection of a surplus in the forms.
- E. Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in AASHTO M-157.
- F. Concrete shall be delivered and deposited in its final position within 90 minutes after adding the cement and water to the mixture.
- G. Washing out of mixer trucks shall not be permitted within City rights-of-way.

3.05 CONTRACTION JOINTS

- A. Sidewalks shall have contraction joints with the following requirements:
 1. Spacing shall match sidewalk width.

2. Approximately 3/16 inch wide.
 3. Approximately one-fourth of slab thickness.
- B. Curb and Gutter shall have contraction joints with the following requirements:
1. Ten (10) foot intervals.
 2. Approximately 3/16 inch wide.
 3. Approximately one-half of slab thickness.

3.06 EXPANSION JOINTS

- A. One-half (1/2) inch expansion joints, extending the full thickness of the slab shall be provided at minimum 60 foot intervals in all sidewalks in addition to locations where sidewalks adjoin existing sidewalks, or driveways. One-half (1/2) inch expansion joints shall be provided at minimum 100 ft intervals in curb and gutter.
- B. Material for one-half (1/2) inch expansion joints shall be as defined in AASHTO M-33.
- C. Expansion joints shall be installed with the top approximately one-quarter (1/4) inch below the concrete surface and extend to the bottom of the concrete.

3.07 SEALING OF EXPANSION AND CONTRACTION JOINTS

- A. The sealant shall be one of the following or approved equal:
1. Polysulfide polymer by Thiokol Chemical Corporation.
 2. Sonolastic one-part sealant by Sonneborn-Contech Corporation.
- B. As an alternative to the above sealant a continuous film of 4 mil thickness water-proof plastic may be placed under all concrete sidewalks, curbs and gutters on the low sides of streets.
- C. Other erosion prevention measures may be used as an alternate if the developer first obtains written approval from the City Engineer concerning material types and installation procedure.

3.08 FINISHING

- A. Refer to Section 03345 for finishing requirements.
- B. Slabs:
1. The concrete shall be brought to established grade and screened, and then worked with a magnesium float.
 2. The concrete shall be given a light broom finish.
 3. Dry cement or a mixture of dry cement and sand should in no case be sprinkled on the surface to absorb moisture or hasten hardening.
 4. Do not spray water on the surface of concrete to aid in finishing.

5. Surface edges of all slabs shall be rounded to a radius of one-half (1/2) inch.

C. Curb and Gutter:

1. Curb and gutter shall be slipped with a continuous curb machine where possible.
2. Where concrete must be poured in curb and gutter forms it shall be tamped and spaded to insure a thorough mixture, eliminate air pockets, and create uniform and smooth sides.
3. While the concrete is still green and not thoroughly set, the forms shall be removed and the front and top sides shall be finished with a float or steel trowel to make a uniform finished surface.
4. The top and face of the curb and also the top of the apron on combined curb and gutter must be finished true to line and grade and without any irregularities of surface noticeable to the eye.
5. The gutter shall not hold water to a depth of more than one-fourth (1/4) of an inch nor shall any portion of the surface or face of the curb or gutter depart more than one-fourth (1/4) of an inch from a straight edge ten (10) feet in length, placed on the curb parallel to the centerline of the street nor shall any part of the exposed surface present a wavy appearance.

D. Sidewalk:

1. The sidewalk shall not hold water to a depth of more than one-fourth (1/4) of an inch nor shall any portion of the surface or face depart more than one-fourth (1/4) of an inch from a straight edge ten (10) feet in length, placed on the side walk parallel to the centerline of the street nor shall any part of the exposed surface present a wavy appearance.

3.09 CURING

- A. Apply curing compound in accordance with Section 03310 unless water cure is indicated. Water cure is required if concrete surface sealing compound is to be applied.
- B. A chemical curing agent may be used, provided it is applied in accordance with the manufacturers specifications.
- C. As soon as the concrete has hardened sufficiently to prevent damage, the finished surface shall be sprinkled with water and kept wet for at least three (3) days.

3.10 PROTECTION AND REPAIRS

- A. See Section 03310 Concrete Work

END OF SECTION