

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 7

**CONCRETE CURB, GUTTER, CROSS GUTTERS,
SIDEWALKS, AND DRIVEWAY TRANSITIONS**

A. GENERAL

This work shall consist of the construction of Portland Cement concrete curb, curb and gutter, sidewalk, steps, and driveway and alley approaches at the locations shown on the Drawings or where designated by the City Engineer. They shall be constructed in accordance with the Drawings and Specifications and shall be in reasonably close conformity to the lines, grades, and dimensions established by the City Engineer. When shown on the Drawings, concrete cross gutters shall be constructed to the same requirements as concrete curb and gutter and as detailed on the Drawings. Work shall conform with the general practices outlined in the American Concrete Institute publication "Slabs on Grade" and in accordance with applicable provisions of ACI Manual of Concrete Practices, Parts 1, 2, and 3.

B. MATERIALS

The Portland Cement concrete used for this work shall be a commercial transit mix. The exact proportions of all the materials entering into the concrete shall be as established by an approved laboratory mix design and shall be changed only as approved by the City Engineer or Laboratory when necessary to obtain the specified strength, desired density, uniformity, or workability. Previously prepared mix designs will be allowed provided adequate test data is available to document the suitability of the mix and the Contractor can document that the same materials are being used. The mix design shall be provided to the City Engineer for review.

The mix shall have a maximum water-cement ratio of 0.45, a **minimum 28-day compressive strength of 4,000 psi**, a minimum of 564 pounds of cement per cubic yards of mix, and an air content of 5 to 7 percent. The maximum allowable slump shall be 4 inches for all structures covered under this section of the specifications. In some localities, additional cement may be required to achieve the minimum 4,000 psi 28-day compressive strength. The use of approved additives will be allowed, when designed into the mix.

The materials to be used for this work shall conform to the following requirements.

1. Portland Cement. Portland cement shall conform to the requirements of ASTM C150, for Type I - II cement. All cement shall be stored in a suitable, weathertight building in such a manner as to protect the cement from dampness and to permit easy access for proper inspection. Storage bins for bulk cement shall be weathertight and constructed so that there will be no dead storage.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 7

**CONCRETE CURB, GUTTER, CROSS GUTTERS,
SIDEWALKS, AND DRIVEWAY TRANSITIONS**

2. Aggregates.

a. General. All aggregates for concrete shall conform to the requirements of ASTM C33. No aggregate shall be incorporated into the work until and unless the aggregates are approved by the City Engineer. The decision to perform any or all tests on aggregates shall be left to the City Engineer. Should testing of the aggregates be deemed necessary, samples shall be selected at random from the stockpile and tested for conformance with the specifications. When the aggregates have been approved by the City Engineer, the source shall not be changed without the written approval of the City Engineer.

Fine and coarse aggregates shall be stored and measured separately. Aggregates shall be protected from contamination with dust, dirt or other foreign materials.

b. Fine Aggregate. Fine aggregate shall consist of natural sand, having hard, strong, and durable particles and which does not contain more than 2 percent by weight of such deleterious substances as clay lumps, shale, schist, alkali, mica coated grains, or soft and flaky particles. The grading of fine aggregate shall range uniformly from coarse to fine within the limits indicated in ASTM C33.

c. Coarse Aggregate. Coarse aggregate shall consist of clean, hard, fine grained, sound crushed rock, or washed gravel which does not contain in excess of 5 percent by weight of flat, chip-like, thin, elongated, friable or laminated pieces, or more than 2 percent by weight of shale or cherty material. Any piece having a major dimension in excess of 2 1/2 times the average thickness shall be considered to be flat and/or elongated. The maximum size of coarse aggregate shall not exceed 1-1/2 inches nor 1/5th of the narrowest dimension between the forms nor 3/4th of the clear spacing between reinforcing bars. The minimum size of coarse aggregate shall be 3/4 inch unless approved otherwise. Coarse aggregate shall be uniformly graded from coarse to fine within the limits allowed in ASTM C33.

3. Water. Water for mixing shall be clean, fresh, and free from injurious amounts of oil, acid, chlorides, sulfates, alkali, organic matter, or other deleterious substances.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 7

**CONCRETE CURB, GUTTER, CROSS GUTTERS,
SIDEWALKS, AND DRIVEWAY TRANSITIONS**

4. Admixtures. The use of admixtures will be allowed only when included in the mix design or as specified. Admixtures used will be considered as a means of improving workability and/or placement of the concrete. Admixtures shall conform to the following:

Air-entraining	- ASTM C260
Water Reducer	- ASTM C494, Type A
Set Retarding	- ASTM C494, Type B
Water Reducing/Set Retarding	- ASTM C494, Type D
High Range Water Reducing(Superplasticizer)	- ASTM C494, Type F and G
Pozzolanic	- ASTM C618
Fly Ash	- AASHTO M295, Class C or F

5. Premolded Joint Filler. Premolded joint filler for use in expansion (through) joints shall be asphalt-impregnated cane fiber and shall conform to ASTM D1751. The thickness shall be 1/2-inch thick or match existing adjacent expansion joints.

6. Base Rock. Base rock shall be 1" - 0 base rock conforming to the requirements of the Technical Specifications - "Road Work."

C. EARTHWORK

Excavation shall be made to the required depths and to a width that will permit the installation and bracing of forms. All soft and unsuitable material shall be removed and replaced with suitable material. The top 6 inches of any cut section and the full depth of any embankment shall be compacted to a minimum of 95 percent of the maximum density as determined by ASTM D-698.

D. BASE ROCK

The base aggregate shall be placed as shown on the Drawings and shall be compacted to 90 percent of the maximum density as determined by ASTM D-698.

E. FORMS

Forms shall be wood or metal and shall extend for the full depth of the concrete. All forms shall be straight, free from ways, and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 7

**CONCRETE CURB, GUTTER, CROSS GUTTERS,
SIDEWALKS, AND DRIVEWAY TRANSITIONS**

F. GENERAL PLACEMENT AND FINISHING

The foundation and forms shall be well wetted prior to the placement of the concrete. Unless otherwise specified, all concrete shall be placed upon clean, damp surfaces free of running or standing water, and never upon soft mud, dry porous earth, or frozen subgrade. All concrete shall be placed before the initial set has occurred and unless otherwise authorized by the City Engineer. It shall be placed within 1-1/2 hours after water has been added to the mix. The temperature of the concrete at placement shall not be below 50°F or exceed 90°F unless approved otherwise by the City Engineer. The concrete shall be placed on a moist base and deposited as close as possible to its final location and to its required depth. Movement of the concrete horizontally with a vibrator will not be allowed. Once the concrete has been placed, it shall be struck off to the proper elevation using a straightedge and sawing motion. A smooth surface shall be provided after the concrete has been straightedged by the use of a bull float or Darbie. A wooden bull float shall be used unless the Contractor can show that a magnesium bull float does not seal in the bleed water.

Bull floating shall occur immediately after striking off and before bleed water accumulates on the surface. Bull floating shall be done in such a manner that the surface is not sealed, so bleed water is not trapped below the surface. Care shall be taken not to overwork the surface. The use of a jitterbug or tamper will not be allowed unless approved by the City Engineer. Initial edging shall be performed with a wide edger, again in a manner that will avoid sealing the surface. The concrete shall be allowed to sit until the bleeding has stopped and after the concrete is firm enough to permit a man to walk on the surface leaving footprints no more than 1/4 inch deep. After the waiting period, the concrete may be floated and finished as required.

G. CURING

As soon as the concrete has been placed and finished, as specified, it shall be cured: (1) by application of an approved Type 2, Class B white or gray pigmented or Type 1-D clear compound with fugitive dye liquid membrane-forming compound applied uniformly at a rate of at least 1 gallon per 200 sq. ft. to the damp concrete by pressure spray methods; or (2) by keeping the concrete continually damp for at least 120 hours. The actual curing method and materials shall meet the requirements of ACI 308 and ASTM C-309. The Contractor shall submit a proposed method of curing to the City Engineer prior to the placement of any concrete.

The Contractor shall protect the newly placed concrete from vandalism and any other damages. The exact method of protection shall be left up to the Contractor. Any

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 7

**CONCRETE CURB, GUTTER, CROSS GUTTERS,
SIDEWALKS, AND DRIVEWAY TRANSITIONS**

damages, regardless of the cause, shall be repaired or replaced to the satisfaction of the City Engineer at no cost to the City.

H. RESTRICTIONS DUE TO WEATHER

1. Cold Weather. Concrete placement in cold weather, i.e., 40°F or less, will be permitted only under conditions which shall meet the approval of the City Engineer. In general, cold weather placing shall conform to "Recommended Practice for Cold Weather Concreting" (ACI 306). Salts, chemicals, or other foreign materials shall not be mixed with the concrete to prevent freezing, unless such use is authorized by the City Engineer in writing. All concrete shall be effectively protected from frost action for a period of five days after placement. Upon written notice from the City Engineer, all concrete which may have become damaged by frost action shall be replaced by the Contractor at his own expense.

2. Hot Weather. For concrete placed during extremely hot weather (air temperature exceeding 95°F), the aggregate shall be cooled by frequent spraying in such a manner as to utilize the cooling effect of evaporation. During such periods, the placement schedule shall be arranged, as approved, in such a manner as to provide time for the temperature of the previously placed concrete to begin to recede. The mixing water shall be the coolest available at the site insofar as is practicable.

3. Low Humidity/Wind. Pouring of concrete during periods of low humidity (below 50 percent) and/or windy conditions should be avoided when feasible and economically possible, particularly when large surface areas need to be finished. No concrete shall be placed if the rate of evaporation approaches 0.2 lb/sq. ft./hr. unless approved by the City Engineer and precautions against plastic shrinkage cracking are taken. In any event, surfaces exposed to the drying wind shall be covered up immediately after finishing with polyethylene sheets and be water cured continuously as soon as the concrete has set up. Curing compounds, in lieu of water, may not be used.

I. BACKFILL

After the concrete has reached sufficient strength, the space in back of structures shall be backfilled to the required elevation with the proper material as shown on the Drawings, which shall be compacted until firm and solid. When the entire project has been finished, any damaged structure sections shall be repaired or replaced at no additional cost to the City.

J. CURB AND CURB AND GUTTER

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 7

**CONCRETE CURB, GUTTER, CROSS GUTTERS,
SIDEWALKS, AND DRIVEWAY TRANSITIONS**

1. General. Concrete curb and curb and gutter shall be constructed in accordance with these Technical Specifications and the lines, grades, and cross sections shown on the Drawings and as staked. They can be constructed with forms or with a curbing machine meeting the requirements of these Technical Specifications. Curbs located on vertical or horizontal curves shall be constructed to result in a smooth curve.

2. Curbing Machine. The machine for extruding Portland Cement concrete curb shall be of the self-propelled type equipped with a material hopper, distributing screw and adjustable curb forming devices capable of placing and compacting Portland Cement concrete to the lines, grades, and cross sections as shown in an even homogeneous manner. A grade line gauge or pointer shall be attached to the machine in such a manner that a continual comparison can be made between the curb being placed and the established curb grade as indicated by the offset guideline.

3. Placement and Finishing. The top and face of finished curb, and curb and gutter shall be true and straight and the top surface of curb shall be of uniform width free from humps, sags, honeycombs, or other irregularities. When a straightedge 6 feet long is laid on the top face of the curb or on the surface of the gutter, the surface shall not vary more than 0.02 foot from the edge of the straightedge, except at grade changes or vertical curves. The Contractor shall construct all curb and gutter within 0.02 foot of true line, within 0.02 foot of established surface grade, cross-section and slope and within 0.02 foot of specified thickness. When the curbing machine is used, the Contractor shall feed the concrete into the extruding machine at a uniform rate and operate the machine under sufficient restraint in a forward motion to produce a well compacted mass of concrete. All exposed surfaces of the curb or curb and gutter shall be floated, followed by a light brush finish. If forms are used, they shall be removed after the concrete has taken its initial set and while the concrete is still green enough to finish. Minor defects shall be repaired with mortar containing one part Portland Cement and two parts sand. Honeycombed, slumped, and other structurally defective concrete shall be removed and replaced at no expense to the City. All exposed formed surfaces shall receive a rubbed finish utilizing a Carborundum brick or other abrasive until a uniform color and texture is produced.

4. Joints. Expansion joints shall be provided opposite abutting expansion joints, at the end of curved sections, at connections to existing curbs, and adjacent to any structure. The width of joints and thicknesses of filler shall match those of the joints and abutting or underlying concrete; elsewhere the filler thickness shall be 1/2 inch. Each expansion joint shall be at right angles to the structure alignment, vertical to the structure surface, and shall provide complete separation of new cement concrete.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 7

**CONCRETE CURB, GUTTER, CROSS GUTTERS,
SIDEWALKS, AND DRIVEWAY TRANSITIONS**

Transverse contraction joints of the weakened plane or dummy type shall be formed in the exposed surfaces opposite contraction joints in abutting Portland Cement concrete and at other locations in the new curb as required to confine the contraction joint spacing to a maximum of 10 feet. The joints shall be formed by grooving, by insertion and removal of plates or other devices, by insertion and leaving in place of preformed bituminous filler, or by sawing. Contraction joint shall be 3/16 inch in width and a minimum depth of 1/4 of the thickness of the concrete. The edges of joints shall be tooled, unfilled grooves and shall be clean and neat, and joint filler shall be even and flush with the surface of the concrete. If the joints are constructed by sawing, the sawing shall be performed as soon as practical after pouring and prior to the occurrence of any shrinkage cracking.

K. SIDEWALK AND DRIVEWAY AND ALLEY APPROACHES

1. General. Concrete sidewalks shall be constructed in accordance with these Technical Specifications and the lines, grades, and cross sections shown on the Drawings and as staked.

2. Placement and Finishing. Before the concrete is given the final finishing, the surface of the sidewalk shall be checked with a 10-foot straightedge and any irregularities of more than 1/4-inch in 10 feet shall be eliminated. Edges including those of expansion joints shall be rounded with an approved finishing tool. The final surface of the concrete shall receive a medium to coarse cross brooming finish so as to provide a granular or matte texture which will not be slick when wet. Cross brooming shall be transverse to the length of the sidewalk and approaches.

3. Joints. Expansion joints shall be provided opposite abutting expansion joints, at the end of curved sections, at all corners other than those 90°, at connections to existing sidewalks, adjacent to any structure, and as shown on the Drawings. The width of the joints and thickness of the filler shall match those of the joints and abutting or underlying concrete; elsewhere, the thickness shall be 1/2 inch. Each expansion joint shall be at right angles to the structure alignment, vertical to the structure surface, and shall provide complete separation.

Transverse contraction joints are required every 5 feet along the length of sidewalks. The joints between sections shall be formed by steel templates 1/8 inch in thickness or sawn in with a concrete saw after initial set of the concrete to a minimum depth of 1/4 the thickness of the concrete. Joints shall be at right angles to the alignment.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 7

**CONCRETE CURB, GUTTER, CROSS GUTTERS,
SIDEWALKS, AND DRIVEWAY TRANSITIONS**

L. REINFORCING BARS

1. General. Mild steel reinforcing bars shall be furnished, cut, bent, and placed as indicated on the Drawings and to the latest methods of practice approved by the Concrete Reinforcing Steel Institute. At the time of placing concrete, all reinforcement shall be free from loose mill scale, rust, grease, or other coating which might destroy or reduce its bond with concrete. Steel reinforcement not placed in the work shall be stored under cover to prevent rusting, and shall be placed on blocking such that no steel touches any ground surfaces.

Reinforcing steel shall be in position before concrete placement is begun. All reinforcing steel shall be tied together and supported in such a manner that displacement during placing of concrete will not occur.

M. TESTING AND INSPECTION

1. General. All testing shall be performed as per the requirements of the Drawings and Specifications. Materials which fail to meet contract requirements shall not be incorporated in the work. The Contractor shall arrange for routine testing and inspection services on materials and work incorporated on the project for quality control purposes. These tests may include, but are not limited to, spot gradation checks, slump, air content, and compressive strength.

a. Slump. Concrete shall be tested for slump in accordance with ASTM C143.

b. Air Content. Air content shall be tested in accordance with ASTM C231.

c. Compressive Strength. At least three identical cylinders may be taken not less than once a day, nor less than once for each 50 cubic yards of concrete placed. When the frequency of testing will provide less than five tests for a given class of concrete, tests may be made from at least five randomly selected batches or from each batch if fewer than five are used, or as required by the City Engineer.

All cylinders shall be prepared and cured in accordance with ASTM C31 and tested in accordance with ASTM C39. One cylinder shall be tested at the age of 7 days and two at the age of 28 days. Each strength test result shall be the average of the two cylinders from the same sample tested at 28 days.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 7

**CONCRETE CURB, GUTTER, CROSS GUTTERS,
SIDEWALKS, AND DRIVEWAY TRANSITIONS**

2. Contractor's Responsibilities. The Contractor shall provide, at his expense, all testing needed to determine if materials and equipment are suitable for the project. In addition to the above tests, all other tests required by laws, ordinances, regulations, and orders of public authorities shall also be the responsibility of the Contractor. The results of all tests performed on materials to be used on the project by the Contractor shall be submitted to the City Engineer.

Contractor shall cooperate with testing and inspection personnel and shall provide access to the work area and to manufacturer's operations. The Contractor shall notify testing and inspection personnel at least 24 hours in advance of operations to allow for personnel assignments and test scheduling. All materials to be tested shall be provided by the Contractor at his expense. After tests are completed, the Contractor shall be responsible for repairing test areas to match original conditions. The Contractor shall remove all defective material from the site at his expense. The Contractor shall pay for reinspection and retesting required because of defective work or ill-timed notices.

N. GUARANTY

The Contractor shall provide a 3-year guaranty against defects in the concrete which become evident during the 3-year guaranty period. A 3-year warranty bond shall be purchased by the Contractor, properly executed and delivered to the City prior to project acceptance by the City. The Contractor shall repair or replace the concrete as requested by the City when defects, due to improper materials or workmanship occur. Specifically, defects such as scaling, spalling, plastic shrinkage, soft surface will be the responsibility of the Contractor to correct. The guaranty is not limited, however, to these defects alone.