STANDARD CONSTRUCTION SPECIFICATIONS FOR

PORTLAND CEMENT CONCRETE

DIVISION 300

INDEX

SECTION 301 GENERAL

301.1 General

The work covered by these specifications consists of providing all plant, labor, equipment, supplies, material, transportation, handling, and storage, and performing all operations in connection with the placement of Portland Cement Concrete in accordance with the specifications and the drawings.

301.2 Applicable Standards

The latest revision of the following standards of the American Society for Testing and Materials (ASTM), the American Society of State Highway and Transportation officials (AASHTO), and the State of Alaska Department of Transportation and Public Facilities are hereby made a part of these specifications.

ASTM A-185	AASHTO M-55	Specification for Welded Steel Wire Fabric for Concrete
ASTM A-615	AASHTO M-31	Specification for Billet-Steel Bars for Concrete Reinforcement
ASTM C-31	AASHTO T-23	Method of Making and Curing Concrete Compression and Flexture Test Specimens in the Field
ASTM C-33		Specification for Concrete Aggregates
ASTM C-330		Specification for Lightweight Aggregates For Structural Concrete
ASTM C-39	AASHTO T-22	Test for Compressive Strength of Molded Concrete Cylinders
ASTM C-40	AASHTO T-21	Test for Organic Impurities in Sands for Concrete
ASTM C-42	AASHTO T-24	Method of Securing, Preparing, and Testing Specimens from Hardened Concrete for Compression and Flexture Strengths.

ASTM C-90		Hollow Load-Bearing Concrete Masonry
ASTM C-94	AASHTO M-157	Specification for Ready-Mix Concrete
ASTM C-150	AASHTO T-119	Specifications for Portland Cement
ASTM C-156	AASHTO T-155	Test for Water Retention Efficiency of Liquid Membrane-Forming Compounds And Impermeable Sheet Materials for Curing Concrete
ASTM C-171	AASHTO M-171	Specification for Waterproof Paper for Curing Concrete
ASTM C-172	AASHTO T-141	Sampling Fresh Concrete
ASTM C-172	AASHTO M-226	Viscosity Graded Asphalt Cement, Table (3)
ASTM C-192	AASHTO T-126	Method of Making and Curing Concrete Compression and Flexture Test Specimens in the Laboratory.
ASTM C-226	AASHTO M-134	Specifications for Air-Entraining Additions For use in the Manufacture of Air-Entrain-ing Portland Cement
ASTM C-231	AASHTO T-152	Test for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C-260	AASHTO T-154	Specifications for Air-Entraining Admixture For Concrete
ASTM C-270		Mortar for Unit Masonry (Including Tentative Revision)
ASTM C-309	AASHTO M-148	Specification for Liquid Membrane Forming Compounds for Curing Concrete
ASTM C-494	AASHTO M-194	Specifications for Chemical Admixtures for Concrete
ASTM D-994	AASHTO M-33	Specifications for Preformed Expansion Joint Filler for Concrete (Bituminous Type)

AASHTO M-6	Specification for Fine Aggregate for Portland Cement Concrete
AASHTO M-32	Specification for Cold Drawn Steel Wire For Concrete Reinforcement Cement
AASHTO M-80	Specification for Coarse Aggregate for Portland Concrete

301.3 Materials

a. Reinforcing Steel

Concrete reinforcing shall be deformed steel bars conforming to the requirements of ASTM A-615, Grade 60 (AASHTO M-31). It shall be free from loose scales and excessive rust coatings of any character that will reduce the bond between steel and concrete.

If reinforcing bars are to be welded, these specifications shall be supplemented by requirements assuring satisfactory weldability in conformity with AWS D12.1, "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction." Reinforcing steel shall not be welded without the permission of the Engineer.

b. Welded Steel Wire Fabric

The welded steel wire fabric shall be cold-drawn steel wires or galvanized, fabricated into mesh formed by the process of electric welding. The grade of wire shall conform to AASHTO M-32. Welded Steel Wire Fabric shall conform to ASTM Specification A-185 (AASHTO M-55).

c. Cement

The cement shall be of a recognized standard brand of Portland Cement conforming to the specification requirements listed below and of a type listed below:

SPECIFICATION	TYPE PORTLAND CEMENT
ASTM C-150	TYPE I, III*
AASHTO M-85	TYPE I, III*

*Type III cement may be used upon authorization of the Engineer, subject to the following modification:

> Minimum design strength shall be achieved in seven (7) days in lieu of the twenty-eight (28) days required for Type I cement.

For architectural concrete, only one brand of cement shall be used unless otherwise approved by the Engineer. When no type cement is specified, the requirements of Type I shall govern.

Cement reclaimed from cleaning bags or leaking containers shall not be used.

d. Water

Water used for the mixing of concrete shall be clean and free of oil or acid and shall not contain salt, alkali or organic matter. Mixing water shall be potable.

e. Aggregates

Aggregates for Portland Cement Concrete shall be graded as required by the ASTMC 33 Specification: clean, hard gravel and coarse sand, non-frost susceptible material, and free of deleterious (organic) matter, and coatings of silt or clay. The gradations shall be determined by standard laboratory sieves with square openings. Material retained on a No. 4 screen shall be classified as coarse aggregate, which shall conform to the requirements of AASHTO M-80 and have the following limits of gradation:

COARSE AGGREGATE FOR PCC

Designated Sizes (AASHTO Gradation)		Percent by Weight Passing Laboratory Sieve Having Square Openings in Inches						
		2	1 ½	1	¾	½	3/8	No.4
#67	¾" to #4	---	---	100	90-100	---	20-55	0-10*
#4	1 ½ to ¾"	100	90-100	20-55	0-15	---	0-5	---

* Not more than five percent (5%) shall pass a sieve #8

All material passing a No. 4 sieve shall be classified as fine aggregate and shall conform to the requirements of AASHTO M-6 and having the following gradation:

FINE AGGREGATE FOR PCC

SIEVE SIZE	% PASSING SIEVE
Passing a 3/8 inch sieve	100
Passing a #64 inch sieve	95-100
Passing a #8 inch sieve	80-100
Passing a #16 inch sieve	45-80
Passing a #30 inch sieve	25-60
Passing a #50 inch sieve	10-30
Passing a #100 inch sieve	2-10

Aggregates shall consist of washed sand and gravel; fine and coarse aggregates shall be regarded as separate ingredients. Aggregates for normal weight concrete shall conform to the requirements of ASTM C-33 and aggregates for light weight concrete shall conform to the requirements of ASTM C-330.

The maximum size of coarse aggregates shall not exceed one and one-half inches (1-1/2"), nor one-fifth (1/5) of the narrowest dimension between the forms, nor three-fourths (3/4) of the clear spacing between reinforcing bars, nor one-third (1/3) the depth of slabs. The combined aggregates, coarse and fine, shall be of such composition of sizes that when separated on the No. 4 sieve, the weight passing shall not be less than thirty percent (30%) nor greater than fifty percent (50%) of the total weight.

The volume removed by sedimentation shall not exceed three percent (3%). Proportioning of the coarse and fine aggregate shall be obtained by weight. The weighing equipment shall be accurate within one percent (1%) of the net weight of the batch and shall permit adjustment for variations in the water content in the aggregate. Batching for fractional sacks of cement will not be permitted unless the cement is weighed for each batch. The water added shall be measured by an approved, calibrated device capable of metering within one percent (1%) of the total amount of water to be used for each batch.

f. Air-Entrainment

Air-entrainment agents shall be used in all concrete. Entrainment shall be achieved by the addition of an approved air-entraining mixture to the concrete mix. Air-entrainment shall conform to the requirements of ASTM C-231 (AASHTO T-152). Refer to *301.6 Mix Requirements for Classes of Concrete* of this section for air-entrainment percentages for each class of concrete.

g. Curing Materials

Curing materials shall be one (1) of the following types as approved by the Engineer

1. Kraft paper conforming to the requirements of ASTM C-171 (AASHTO M-171).

2. Mats of commercial quality and of a type used for curing concrete.

3. Burlap of commercial quality weighing not less than fourteen ounces (14oz.) per square yard.

4. Membrane curing compound conforming to the requirements of ASTM C-309 (AASHTO M-148.)

h. Expansion Joints

Pre-molded joint filler for use in expansion joints shall conform to the requirements of ASTM D-994 (AASHTO M-33.)

301.4 Mix

Portland Cement concrete may be mixed at a central mixing plant or in transit mixers. All mixing equipment and operations shall conform to the requirements of C-94 (AASHTO M-157.) All concrete shall be delivered to the work site thoroughly mixed to a uniform color and show uniform distribution of aggregates throughout the mixture. The minimum temperature of the fresh concrete after placement, and for the first 72 hours, shall be 50 degrees Fahrenheit.

Concrete shall be delivered to the project site, discharged from the truck completely, and be in the forms ready for vibration within one and one-half (1-1/2) hours after introduction of the cement to the aggregates. At the discretion of the Engineer, the above period may be extended one (1) minute for every degree of temperature at which the concrete is delivered below seventy degrees (70°) Fahrenheit to a maximum total time of two (2) hours.

In hot weather, or under conditions contributing to quick setting of the concrete, a discharge time less than one and one-half (1-1/2) hours may be required by the Engineer.

The use of non-agitating equipment for transporting concrete will not be permitted. The mixing drums of transit-mix trucks shall be thoroughly washed after discharging each load to prevent the accumulation of an adherent layer of concrete. The discharge of particles of hardened concrete with any batch will be sufficient grounds for the rejection of the entire batch. On curb, gutter, and sidewalk work, transit mix trucks shall be operated parallel to the forms while discharging.

The addition of water to the mix at the job site will not be permitted except with the approval of the Engineer.

301.5 Sub-base

Prior to placement of forms, the Engineer shall inspect the sub-base to insure that it is smooth, compacted, and free of soft or yielding spots and that compaction at optimum moisture is at least ninety-five percent (95%) of maximum density. Back-filling within the forms will be permitted if the sub-base is brought to the above specification and care is taken to maintain the forms to line and shape elevations.

301.6 Mix Requirements for Classes of Concrete

The minimum mix requirements for classes of concrete shall be as set forth below, unless otherwise specified in the contract documents.

	CLASS OF CONCRETE						
	C – 6	B – 3	B – 6	A – 3	A – 6	AA – 3	AA – 6
Minimum Cement Contents In Sacks/Cy	4.5	5.0	5.0	5.5	5.5	6.0	6.0
Maximum Water Content Ration in Gal/Sack	6.5	6.5	6.5	6.5	6.5	5.75	5.5
Slump Range in Inches	1-5	2-4	1-3.5	2-4	1-3.5	2-4	1-2
Entrained Air Range in Percentage	3-6	4-7	3-6	4-7	3-6	4-7	3-6
Coarse Aggregate (AASHTO Gradation)	#4 & #67	#67	#4* & #67	#67	#4* & #67	#67	#4* & #67
Fine Aggregate	Shall conform to AASHTO M-6 gradation						
Minimum Design Strength (f's), psi	2000	2500	2500	3000	3000	3500	3500

Minimum design compressive strength specification shall be achieved in twenty-eight (28) days.

*****The coarse aggregate for Class B-6, A-6 and AA-6 concrete shall be furnished in two separate sizes.

301.7 Ready-Mixed Concrete

Ready-mixed concrete shall conform to the requirements of ASTM C-94 (AASHTO M-157). It is the responsibility of the Contractor to furnish to the Engineer, for each batch of concrete and before unloading at the site, a delivery ticket from the manufacturer on which is printed, stamped or written, information concerning said concrete as follows:

a. Name of Ready-Mix batch plant.

b. Serial number of ticket.

c. Date and truck number.

d. Name of Contractor.

e. Specific designation of Project (name and location).

f. Specific class of concrete in conformance with that employed in specifications.

g. Amount of concrete (cubic yards).

h. Time loaded or first mixing of cement and aggregate.

i. Type of cement.

j. Admixtures and amount of same.

k. Slump requested by the Contractor and recorded in inches.

l. Percentage of entrained air requested by the Contractor.

301.8 Sampling and Testing

The Engineer shall take concrete samples for concrete cylinders in accordance with AASHTO T-141. Samples shall not be taken at the beginning or end of discharge. Making and curing the specimens shall be done in accordance with AASHTO T-23. Testing and sampling shall be done by the Engineer.

Slump tests shall be taken in accordance with AASHTO T-119 or ASTM C-150. Slump tests shall be taken by the Engineer.

Should the analysis of any test cylinder not meet the requirements of these specifications, its representative concrete shall be removed and replaced at the Contractor's expense.

301.9 Weather Limitations

Placement of concrete shall be prohibited at an ambient air temperature of less than forty degrees (40°) Fahrenheit or where the foundation material is frozen, except in special situations where authorized by the Engineer.

Exemption from the temperature clause of these specifications shall be considered under the following conditions:

a. A written proposal shall be submitted by the Contractor to the Engineer outlining a procedure for maintaining the temperature of the concrete placed of at least fifty degrees (50°) Fahrenheit for seventy-two (72) hours where Type III cement has been used. When the temperature is reduced, the drop in temperature must be gradual and not exceed thirty degrees (30°) Fahrenheit in the first twenty-four (24) hours.

b. Salt, chemicals or other material shall not be mixed with the concrete to prevent freezing.

c. Placement of concrete shall be prohibited whenever there is standing water in the forms, the sub-grade is yielding due to saturation, or rain is threatening.

301.10 Cleanup

When all concrete work has been completed and cured, the Contractor shall remove the forms, stakes, blocking, and concrete spoil from the site. The area adjoining the concrete that was excavated to permit the construction and placement of forms shall be filled with select material, and the slopes and parking areas, if any, shall be filled, shaped and smoothed to the level as shown on the typical sections.

SECTION 302 CONCRETE CURB AND GUTTER

302.1 General

This work shall consist of the construction of curb, gutter, or combination curb and gutter in conformance with the plans.

302.2 Materials

Material shall conform to *Section 301* of this division. Concrete shall conform to the requirements of *Section 301.6 Concrete, Class AA-3*.

302.3 Construction

Cast in Place Concrete Curbing

a. Excavation: Excavation shall be made to the required grade, and the base upon which the curb is to be placed shall be graded and compacted to ninety-five percent (95%) of ASTM D-1557 maximum density.

b. Erecting Forms: Forms shall be of wood or metal, straight, free from warp and of such construction that there will be no interference to the inspection of grade or alignment**.** All forms shall extend to the full depth of the curb and shall be braced and secured sufficiently so that no deflection from the plan alignment occurs during the placement of concrete.

All forms shall be set to the lines, grade, and dimensions shown on the drawings. The forms shall be thoroughly braced and secured to resist deformation or displacement under load, and shall be installed to permit easy removal without hammering or prying against the fresh concrete. The top of the forms shall not deviate more than one-eighth inch (1/8") in ten (10) feet, and the alignment of forms shall be within one-fourth inch (1/4"' in ten (10) feet.

Before placement of concrete, steel forms shall be lightly oiled with a good grade form oil. Excess oil shall be removed by wiping with clean rags, dampened in diesel or fuel oil. Wooden forms may be oiled in the same manner as metal forms, or they may be watered immediately in advance of the placement of concrete. Watering of the form shall be done with clean water of the same quality as that specified for mixing water, and only when the atmospheric temperature is not less than forty (40) degrees Fahrenheit. Concrete shall not be placed until all forms have been inspected and approved by the Engineer. Wherever form work is exposed to pedestrian traffic, bridges (not attached to the forms) shall be provided at all regular pedestrian crossings where it is required to maintain safety standards. Barricades and other safety features shall be installed as necessary.

c. Placing: The subgrade shall be properly compacted and brought to specified grade before placing concrete. The subgrade shall be thoroughly dampened immediately prior to the placement of the concrete. Forms shall not be splashed with concrete in advance of placing.

Concrete shall be handled from the transport vehicle to the point of final placement in a continuous manner and as rapidly as is practicable. The rate of placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these specifications. Concrete shall not be allowed to free-fall more than three (3) feet.

Compaction of concrete placed in the forms shall be by vibration. Forms shall be left in place until the concrete has set sufficiently so that they can be removed without damaging the concrete. Immediately upon removal of the forms the exposed concrete face shall be rubbed to a uniform surface. **No Plastering will be permitted**.

If approved by the Engineer, concrete curbing may be constructed by the use of a curb forming machine. The roadway grade upon which the curb machine will travel must be graded to a smooth condition and accepted by the Engineer.

1. Pumping Concrete – Concrete may be placed by pumping provided the Contractor demonstrates that the pumping equipment to be used will effectively handle the particular class of concrete with the slump and air content specified and that it is so arranged that no vibrations result that might damage freshly placed concrete. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned. Slump tests shall be taken at the discharge end of the pipe.

2. Concrete Deposited Under Water – If conditions render it impossible or inadvisable in the opinion of the Engineer to de-water excavations before placing concrete, the Contractor shall deposit under water, by means of a tremie or pump, a seal course of concrete of sufficient thickness to thoroughly seal the cofferdam. The concrete shall be carefully placed in a compact mass and shall not be disturbed after being deposited. Still water shall be maintained at the point of deposit.

A tremie shall consist of a watertight tube having a diameter of not less than ten (10) inches with a hopper at the top.

3. Placing Anchor Bolts - Anchor bolt assemblies conforming to the details shown shall be accurately secured in the forms in the positions shown on the plans, before any concrete is placed in the forms. The positions shall be checked and any adjustments made as soon as the concrete has been placed.

When pipe sleeves or pre-cast holes are provided, no water shall be allowed to freeze in the cavity. When anchor bolts are installed in pipe sleeves or pre-cast holes, the cavity shall be completely filled with grout at the time the grout pads are constructed or at the time the bearing assemblies or masonry plates are placed.

d. Stripping Forms and Finishing: The face form of the curb shall be stripped at such time in the early curing as will enable inspection and correction of all irregularities that appear thereon.

Forms shall not be removed until the concrete has set sufficiently to retain its true shape. The face of the curb shall be troweled with a tool cut to the exact section of the curb and at the same time maintain the shape, grade, and alignment of the curb. Both front and back edges shall be troweled to a radius of one half inch (1/2".) Final finish shall be obtained by brooming the surface, including the troweled edge, to a gritty finish after all free moisture has disappeared from the surface. Sprinkling of the cement or sand for blotting will not be permitted.

It is the intent of this specification to insure the highest quality of workmanship in the construction and finishing of PCC curb and gutter.

Unsightly or poorly finished surfaces will be considered grounds for rejection of the work involved.

All defective areas shall be removed and replaced at the Contractor's expense, unless permission to patch is granted by the Engineer. Such permission shall not be construed as an acceptance of the work, or as a waiver of the Engineer's right to require the complete removal of the work, if in his opinion, the patch does not satisfactorily restore the quality or appearance of the surface.

Should patching be permitted, the area shall be chipped clean to a depth of one inch (1") perpendicular to the surface and saturated with clean water prior to being patched. The patch shall be made with a mortar extracted from fresh concrete by passing it through a three-eighth inch (3/8") screen. The mortar shall be thoroughly compacted and screeded off slightly higher than the surrounding surface to allow for contracting or setting after the maximum shrinkage has taken place. After one (1) to two (2) hours, the patch shall be troweled to the same finish as the surrounding area and shall be cured as specified herein. The use of special patching material will be permitted if approved by the Engineer.

e. Curing: Concrete shall be cured for at least seventy-two (72) hours. Curing shall be by means of moist burlap or other approved methods. During the curing period all traffic and pedestrians shall be excluded.

Curing compounds shall be applied to all exposed surfaces immediately after finishing. Transparent curing compounds shall contain a dye of sufficient strength to render the film distinctly visible on the concrete for a minimum period of four (4) hours after application.

If, at any time during the curing period, any of the forms are removed, a coat of curing compound shall be applied immediately to the exposed surface. The curing compound shall be applied in sufficient quantity to obscure the natural color of the concrete. Additional coats shall be applied if the Engineer determines that the coverage is not adequate. The concrete shall be cured for the minimum period of time set forth below.

Type I Portland Cement Concrete----------5 days
Type III Portland High-Early-Strength Cement Concrete----------3 days

When forms are removed before the expiration of the curing period, the edges of the concrete shall be protected with moist earth, or sprayed with curing compound.

Other standard methods of curing the curb and gutter may be used upon approval of the Engineer. Concrete shall not be placed unless curing compounds and necessary equipment for applying such is on the project site.

f. Expansion and Contraction Joints:

1. Expansion Joints: Expansion joints shall be placed along all structures and about all features that project into, through, or against the concrete. An expansion joint shall be constructed at the intersection of sidewalks; between sidewalk crossings and sidewalks; between curbs and sidewalks (except parallel curb); and at the beginning and end of curb returns. Expansion joint material shall conform to the requirements of ASTM D-994 (AASHTO M-33.) This material shall extend the full width of the structure and shall be cut to such dimensions that the base of the expansions joint shall extend to the subgrade and the top shall be depressed not less than one-quarter (1/4) inch nor more than one-half (1/2) inch below the finished surface of the concrete. The material shall be of one (1) piece in the vertical dimension and shall be securely fastened in a vertical position to the existing concrete face against which fresh concrete is to be placed. After the concrete has set, the expansion joints shall be filled flush to the finish concrete surface with asphalt cement, two hundred (200) to three hundred (300) penetration.

Application temperature of the sealing asphalt shall be between 250 degrees and 350 degrees Fahrenheit. Sealing asphalt shall be applied by pouring from a bucket with a V-shaped spout, equipped with a positive shutoff to prevent spilling or dripping of asphalt. Before sealing, the joint shall be cleaned of all dirt, gravel, concrete mortar, and other extraneous material. Sealing shall be done in a neat workmanlike manner.

2. Contraction Joints: Transverse contraction joints, cut to a depth of one (1) inch, prior to the final set of the concrete, shall be tooled in the sidewalks at intervals of five (5) feet, and at ten (10) foot intervals in the curb and gutter. Where the sidewalk adjoins the curb (parallel to it), contraction joints in the sidewalk and curb shall be made to match where practicable.

g. Acceptance: The Engineer may check the hydraulic performance of the gutter flow line by placing a flow of water into the gutter. Any lengths of gutter which do not transmit water as designed shall be removed and the correct flow line established with fresh concrete at no additional cost to the Owner.

302.4 Method of Measurement

Curbing will be measured by the linear foot along the face of the curb. No deduction will be made for catch basin inlet grates.

Curb bedding material will be measured by the ton or cubic yard.

302.5 Basis of Payment

The accepted quantity of curb and gutter shall be paid at the contract unit price, complete and in place.

Payment will be made under:

PAY ITEM	DESCRIPTION	UNIT
302	Curb and Gutter, Type	Linear Foot

SECTION 303 PORTLAND CEMENT CONCRETE SIDEWALKS

303.1 General

The work covered under this section consists of all work necessary for the provision of Portland Cement Concrete sidewalks.

303.2 Materials

The Portland Cements Concrete, joint filler, reinforcing steel, and curing materials shall conform to *Division 300 – Standard Construction Specifications for Portland Cement Concrete – Section 301.3 Materials*. Concrete mix for sidewalks shall conform to the requirements for Class AA-3.

303.3 Construction

a. Excavation and Embankment

Excavation and embankment for sidewalks shall be as described in *Division 200 – Standard Construction Specifications for Earthwork*. Where directed by the Engineer, unsuitable material in the subgrade shall be removed to a specific depth and then backfilled with classified fill. Payment will not be allowed for excavation below grade and for backfill materials required when such excavation is caused by negligence of the Contractor.

Embankment shall be compacted to 95% maximum density in accordance with *Division 200, Article 1.5 Compaction Standards.* In areas that are inaccessible to normal compaction equipment, approved tampers shall be used.

Before the forms are set, the subgrade shall be graded to within one (1) inch of established grade and the area between the sidewalk and the adjacent private property line shall be shaped to line, grade, and section shown on the plans.

b. Forms and Grading

Forms shall conform to requirements outlined in *Section 302 Concrete Curb and Gutter*. Wood forms against unexposed concrete surfaces shall be No. 2 common lumber or better. Those against surfaces to be exposed shall be dressed and matched boards of uniform thickness, and widths not exceeding ten (10) inches. A rigid nonporous and waterproof sheet material may be used provided the end result will be a smooth unmarked concrete surface without waves, fins, or other noticeable markings.

Plywood conforming to the requirements for form work, as set forth by the American Plywood Association, may be used against both exposed and unexposed concrete surfaces. This plywood shall be not less than five (5) ply and at least nine-sixteenth (9/16) inches thick. Low areas in the subgrade shall be backfilled with classified fill or with suitable native material as directed by the Engineer. The backfill shall then be compacted to 95% maximum density and any fry areas in the subgrade shall be thoroughly

dampened prior to the time the concrete is placed. No payment will be made for water and the work of placing, and costs thereof shall be considered incidental to the construction of the concrete sidewalk.

c. Placing and Finishing Portland Cement Concrete Sidewalk

The subgrade shall be properly compacted and brought to specified grade before placing concrete. The subgrade shall be thoroughly dampened immediately prior to the placement of the concrete. Forms shall not be splashed with concrete in advance of placing.

Concrete shall be handled from the transport vehicle to the point of final placement in a continuous manner and as rapidly as is practicable. The rate of placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these specifications. Concrete shall not be allowed to free-fall more than three (3) feet.

The concrete shall be spread uniformly between the forms and thoroughly compacted with a steel shod strike-board. After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a steel float. Joints shall be edged with a one-quarter (1/4) inch radius edger and the sidewalk edges shall be tooled with a one-half (1/2) inch radius edger. The surface shall be brushed with a fiber hair brush of an approved type in a transverse direction except that at a driveway and alley crossing it shall be brushed longitudinally.

The sidewalk shall be divided into panels by scoring one (1) inch deep every five (5) feet. Refer to *Section 302.3 f. Expansion and Contraction Joints* for requirements for contraction and expansion joints. The expansion joints shall be placed at all structures such as catch basins and manholes, at driveways, and at all points of tangency and points of curvature.

Forms shall be left in place until the concrete has set sufficiently so that they can be removed without damaging the concrete. Immediately upon removal of the forms the exposed concrete face shall be rubbed to a uniform surface. **No Plastering will be permitted**.

Pumping Concrete: Concrete may be placed by pumping provided the Contractor demonstrates that the pumping equipment to be used will effectively handle the particular class of concrete with the slump and air content specified and that it is so arranged that no vibrations result that might damage freshly placed concrete. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned. Slump tests shall be taken at the discharge end of the pipe.

Concrete Deposited Under Water: If conditions render it impossible or inadvisable in the opinion of the Engineer to de-water excavations before placing concrete, the Contractor shall deposit under water, by means of a tremie or pump, a seal course of concrete of sufficient thickness to thoroughly seal the cofferdam. The concrete shall be carefully placed in a compact mass and shall not be disturbed after being deposited. Still water shall be maintained at the point of deposit.

A tremie shall consist of a watertight tube having a diameter of not less than ten (10) inches with a hopper at the top.

Placing Anchor Bolts: Anchor bolt assemblies conforming to the details shown shall be accurately secured in the forms in the positions shown on the plans, before any concrete is placed in the forms. The positions shall be checked and any adjustments made as soon as the concrete has been placed.

When pipe sleeves or pre-cast holes are provided, no water shall be allowed to freeze in the cavity. When anchor bolts are installed in pipe sleeves or pre-cast holes, the cavity shall be completely filled with grout at the time the grout pads are constructed or at the time the bearing assemblies or masonry plates are placed.

Additional requirements for placing and finishing concrete in cold weather shall be as outlined in *Section 301.9 Weather Limitations*.

d. Curing and Protection

The curing materials and procedures outlined in *Section 302.3* shall prevail. The curing agent shall be applied immediately after brushing and be maintained for a period of five (5) days.

The Contractor shall have, readily available, sufficient protective covering such as waterproof paper or plastic membrane to cover the pour of an entire day in event of rain or other unsuitable weather.

The sidewalk shall be protected against damage or defacement of any kind until it has been accepted by the City. Sidewalk which is not acceptable to the Engineer because of damage or defacement shall be removed and replaced at the expense of the Contractor.

Additional requirements for curing in cold weather shall be as outlined in *Section 301.9 Weather Limitations.*

303.4 Measurement

Sidewalks shall be measured per square yard, complete in place, for both four (4) and six (6) inch thickness.

303.5 Basis of Payment

Pay Item	Description	Unit
303	Concrete Sidewalk, thickness	Square Yard