

STANDARD SPECIFICATION  
SECTION 03000 GENERAL CONCRETE CONSTRUCTION

PART 1 - GENERAL

1.01 DESCRIPTION

This section includes materials, installation, and testing of formwork, reinforcing steel, joints, concrete, and finishing and curing for general concrete construction.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Standard Drawings.
- B. Record Drawings and Submittals: STD SPEC 01300.
- C. Painting and Coating: STD SPEC 09900.

1.03 SUBMITTALS

- A. Submit submittal packages in accordance with Standard Specification Section 01300.
- B. Submit manufacturer's catalog data and descriptive literature for form ties, spreaders, corner formers, form coatings and curing compound, bond breakers, joint sealant, backing rod, joint filler, control joints, expansion joint dowels, epoxy bonding compound, floor hardener, color additive, and rapid set cement.
- C. Submit mill test certificates identifying chemical and physical analyses of each load of reinforcing steel delivered. If mill test reports are unavailable and the quantity of steel for a structure exceeds 5 tons, provide a laboratory test to prove conformance with the specified ASTM standard.
- D. Submit reinforcing bending lists and placing drawings for all reinforcing. Placing drawings shall indicate all openings (mechanical, electrical, equipment, and architectural) including additional reinforcing at openings and corner bar arrangements at intersecting beams, walls, and footings indicated in the typical detail and structural drawings. Placing drawings shall be coordinated with the concrete placing schedule. Each bending list and placing drawing submitted shall be complete for each major element of a structure (grade slabs, footings, walls, deck, floor, or roof slabs) including dowels and corner bars. Furnishing such lists shall not be construed that the lists will be reviewed for accuracy. The Contractor shall be wholly and completely responsible for the accuracy of the lists and for furnishing and placing reinforcing steel in accordance with the details shown on the plans and as specified.
- E. Submit concrete mix design at least 15 days before placing concrete.
- F. Submit six copies of a report from a testing laboratory verifying that aggregate material contains less than 1% asbestos by weight or volume and conforms to the specified gradations or characteristics.

## PART 2 - MATERIALS

### 2.01 FORMWORK

- A. Design forms according to ACI 347.
- B. Class I Forms: Use steel forms, ply form, or smooth-surface plywood 3/4-inch minimum thickness for straight surfaces and 1/2-inch minimum thickness for curved surfaces.
- C. Class II Forms: Use plywood in good condition, metal, or smooth-planed boards free from large or loose knots with tongue and groove or ship lap joints. Forms shall be oiled.
- D. Class II forms may be used for exterior concrete surfaces which are 1 foot or more below finished grade. Use Class I forms for all other surfaces.

### 2.02 BOND BREAKER

Bond breaker shall be a nonstaining type which will provide a positive bond prevention, such as Williams Tilt-Up Compound, as manufactured by Williams Distributors, Inc., Seattle, Washington; Silcoseal 77, as manufactured by SCA Construction Supply Division, Superior Concrete Accessories, Franklin Park, Illinois; or District approved equal.

### 2.03 FORM RELEASE AGENT

- A. Form release agent shall effectively prevent absorption of moisture and prevent bond with the concrete. Agent shall be nonstaining and nontoxic after 30 days.
- B. For steel forms, release agent shall prevent discoloration of the concrete due to rust.

### 2.04 REINFORCING STEEL

- A. Reinforcement shall conform to ASTM A 615, Grade 60.
- B. Fabricate reinforcing in accordance with the current edition of the Manual of Standard Practice, published by the Concrete Reinforcing Steel Institute. Bend reinforcing steel cold.
- C. Deliver reinforcing steel to the site bundled and tagged with identifying tags.

### 2.05 WELDED WIRE FABRIC

Welded wire fabric shall conform to ASTM A 185.

### 2.06 TIE WIRE

Tie wire shall be 16 gauge minimum, black, soft annealed.

### 2.07 BAR SUPPORTS

Bar supports in beams and slabs exposed to view after form stripping shall be galvanized and plastic coated. Use concrete supports for reinforcing in concrete placed on grade.

## 2.08 BAR COUPLERS

Reinforcing steel bar splicing couplers shall be a mechanical type as manufactured by Dayton Barsplice Inc. or District approved equal. Use couplers which do not reduce tensile or ultimate strength of bars.

## 2.09 JOINT SEALANT

Joint sealant shall be a multipart, gray, nonstaining, nonsagging, polyurethane sealant, which cures at ambient temperature to a firm, flexible, resilient, tear-resistant rubber. Sealant shall be RC 270 of Products Research and Chemical Corporation, Mameco International Vulkem 227, Multi-Chem MC287, or District approved equal.

### Technical Requirements

---

Consistency	Gun grade
Tack free time	24 hours at 75°F and 50% R.H.
Pot life	1 to 3 hours
Hardness	35 Shore A, $\pm 5$
Elongation	700%
Tensile strength, ASTM D 412	300 psi
Peel strength on concrete	No loss of bond after 24 hours at 150% elongation
Temperature service range	-40°F to +175°F
Immersion in water	Continuous

## 2.10 BACKING ROD FOR EXPANSION JOINTS

Backing rod shall be an extruded closed-cell polyethylene foam rod, such as Minicel backer rod, manufactured by Industrial Systems Department, Plastic Products Group of Hercules, Inc., Middletown, Delaware; Ethafoam SB, as manufactured by Dow Chemical Company, Midland, Michigan; or District approved equal. The rod shall be 1/4-inch larger in diameter than the joint width. Where possible, provide full length sections for the joint; minimize splices. Apply backup rod and bond breaker tape in expansion joints.

## 2.11 BOND BREAKER TAPE

Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will adhere to the premolded joint material or concrete surface. The tape shall be the same width as the joint. The tape shall be compatible with the sealant.

## 2.12 PREFORMED CONTROL JOINT

Prefomed control joint shall be a one-piece, flexible, PVC joint former, such as Kold-Seal Zip-Per Strip KSF-150-50-50, manufactured by Vinylex Corp., Knoxville, Tennessee, or a one-piece steel strip with preformed groove, such as Keyed Kold Retained Kap, manufactured by Burke Concrete Accessories, Inc., San Mateo, California, or District approved equal. Provide the preformed control joint material in full length unspliced pieces.

## 2.13 PREMOLDED JOINT FILLER

Joint filler shall be preformed, nonextruded type constructed of closed-cell neoprene conforming to ASTM D 1752, Type I, as manufactured by W. R. Grace Company of Cambridge, Massachusetts; W. R. Meadows, Inc., Elgin, Illinois; or District approved equal.

## 2.14 STEEL EXPANSION JOINT DOWELS

- A. Steel expansion joint dowels shall conform to one of the following:
- B. Epoxy coated steel bar dowels with a 12-mil coating thickness. Steel bar dowels shall conform to ASTM A 36 or ASTM 615, plain rounds, Grade 40. Epoxy coating shall be in conformance with ASTM A 775; or
- C. Stainless steel bar dowels conforming to ASTM A 276, Type 302.
- D. Exposed portion of expansion joint dowels shall be thoroughly greased prior to casting of adjoining wall or slab.

## 2.15 CEMENT

Cement shall conform to ASTM C 150, Type II, with maximum tricalcium aluminate not to exceed 8%. The maximum percent alkalis shall not exceed 0.6%.

## 2.16 RAPID SET CEMENT

Rapid set cement is a unique dry blend of hydraulic cement and other ingredients that provide fast sets and high strengths within an hour. Cement shall be free of calcium chloride. Use 400 pounds of rapid set cement per cubic yard of mix and combine with the sand and aggregate as specified for Class A concrete. Rapid set cement shall be as manufactured by CTS Cement Manufacturing Company or District approved equal. Deliver the rapid set cement, sand, and aggregate to the job site in a dry and uncombined condition. Use a mobile mixer truck to combine the components with water at the point of use.

## 2.17 AGGREGATES

Aggregates shall comply with ASTM C 33 and shall contain less than 1% asbestos by weight or volume and be free from any substances that will react with the cement alkalis.

2.18 COLOR ADDITIVE FOR EXTERIOR ELECTRICAL DUCT ENCASEMENT

For exterior electrical duct concrete encasements, use a color additive for identification purposes: brick red "Colorfull," as manufactured by Owl Manufacturing Company, Arcadia, California; coral red "Chromix C-22," as manufactured by L. M. Scofield Company, Los Angeles, California; or District approved equal. Add the color additive while the concrete is being mixed using the quantity per cubic yard of concrete recommended by the manufacturer for the class of concrete indicated.

2.19 CONCRETE ADMIXTURES

- A. Concrete shall contain an air-entraining admixture. Admixture shall conform to ASTM C 260, except it shall be nontoxic after 30 days and shall contain no chlorides. Admixtures shall be Master Builders MB-AE 10, Sika AER (Sikamix 104), or District approved equal.
- B. Concrete shall contain a water-reducing admixture. The admixture shall conform to ASTM C 494, Type A or D, except it shall contain no chlorides, shall be nontoxic after 30 days, and shall be compatible with the air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations. Admixtures shall be Master Builders Pozzolith polymer-type normal setting; Plastocrete (Sikamix 160) Normal Set, Sika Chemical Corporation; or District approved equal.
- C. Do not use any admixture that contains chlorides or other corrosive elements in any concrete.

2.20 GROUT

- A. Nonshrink grout shall conform to the Corps of Engineers Specification for Nonshrink Grout, CRD-C621-83, and to these Standard Specifications. Use a nongas-liberating type, cement base, premixed product requiring only the addition of water for the required consistency. Grout shall be UPCON High Flow, Master Flow 713, or District approved equal. Components shall be inorganic.
- B. Ordinary type grout (dry pack) shall consist of one part portland cement to two parts sand (100% passing a No. 8 sieve). Add sufficient water to form a damp formable consistency.
- C. Expansive Grout: Premixed, cementitious mixture with a minimum 28-day strength of 3,500 psi. Provide air-entraining content as recommended by the manufacturer.
- D. Epoxy Grout:
  - 1. Mix the two components of epoxy bonding compound in compliance with the manufacturer's instructions.
  - 2. Use sand that is oven dry and meets the following gradation requirements for epoxy grout:

Sieve Size:	No. 8	No. 50	No. 100
% Passing:	100	30 ±15	5 ±5

2.21 MORTAR

- A. Mortar or grout placed on horizontal construction joints shall be a mixture of cement, sand, and water in the same proportions used in the concrete but with coarse aggregate omitted.
- B. Mortar used for repair of concrete shall be made of the same materials as used for concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than one part cement to two and one-half parts sand by damp loose volume. The quantity of mixing water shall be no more than necessary for handling and placing.

2.22 BONDING COMPOUND

- A. Epoxy bonding compound shall be Concessive 1001 LPL, Adhesive Engineering Company, San Carlos, California; Sikadur Hi-Mod (Sikastix 370), Sika Chemical Corporation, Lyndhurst, New Jersey; Epoxtile 2391 by W. R. Grace and Company; Euco Epoxy 463 by Euclid Chemical Company; or District approved equal.
- B. Nonepoxy bonding compound shall be Weldcrete by Larsen Products Corp., Link by Sta-Dry Manufacturing Corp., Euco Weld by Euclid Chemical Co., or District approved equal. The compound shall be rewettable for up to two weeks.

2.23 CONCRETE MIX DESIGN

- A. Conform to ASTM C 94, except as modified by these Standard Specifications.
- B. Air content as determined by ASTM C 231 shall be 4% ±1%.
- C. Maximum water-cement ratio for Class A concrete = 0.45 by weight.
- D. Use classes of concrete as described in the following table:

Class	Type of Work	28-Day Compressive Strength (in psi)	Minimum Cement Content (in lbs per C.Y.)
A	Concrete for all structures and concrete not otherwise specified. Concrete fill at structure foundations, cradle, supports across pipe trenches.	4,000	564
B	Pavement.	3,000	500
C	Floor grout, miscellaneous unreinforced concrete.	2,000	376

E. Measure slump in accordance with ASTM C 143. Slump shall be as follows:

Slab on grade or heavy sections wider (in plan view) than 3 feet	3 inches max.
Footings, walls, suspended slabs, beams, and columns	4 inches max.
Pavement	2 inches max.
Floor grout, miscellaneous unreinforced concrete	4 inches max.

Proportion and produce the concrete to have a maximum slump as shown. A tolerance of up to 1-inch above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used provided it is properly placed and consolidated.

F. Aggregate size shall be 3/4-inch maximum for slabs and sections 8 inches thick and less. Aggregate size shall be 1-inch maximum for slabs and sections greater than 8 inches and smaller than 17 inches. Aggregate size shall be 1-1/2 inches maximum for all larger slabs and sections. Aggregate size for floor grout shall be maximum 3/8-inch.

G. Combined aggregate grading shall be as shown in the following table:

	Maximum Aggregate Size			
	1-1/2-inch	1-inch	3/4-inch	3/8-inch
Aggregate Grade per ASTM C 33	467	57	67	8

H. Mix design for pumped concrete shall produce a plastic and workable mix. The percentage of sand in the mix shall be based on the void content of the coarse aggregate.

## 2.24 CONCRETE TESTS

A. The District will require the Contractor to test for concrete quality as described below.

1. Frequency of Sampling: Cast four concrete test cylinders from each 50 cubic yards, or fraction thereof, of each class of concrete placed in any one day. Sampling and curing of cylinders shall conform to ASTM C 31.
2. Strength Testing: Test cylinders in accordance with ASTM C 39. Test one cylinder at 7 days for information; test two cylinders at 28 days for acceptance; and hold one cylinder for verification. Strength acceptance will be based on the average of the strengths of the two cylinders tested at 28 days. If one cylinder of a 28-day test manifests evidence of improper sampling, molding, or testing, other than low strength, discard it and use the fourth cylinder for the test result.
3. Determine concrete slump by ASTM C 143 with each strength test sampling and as required to establish consistency.

4. Determine air content of the concrete using ASTM C 231 to verify the percentage of air in the concrete immediately prior to depositing in forms.
5. The average value of concrete strength tests shall be equal to or greater than the specified 28-day strength. No test shall be less than 90% of the specified 28-day strength.
6. If the 28-day strength tests fail to meet the specified minimum compressive strength, the concrete will be assumed to be defective and one set of three cores from each area may be taken as selected by the District's Representative and in accordance with ASTM C 42. If the average compressive strength of the set of three concrete cores fails to equal 90% of the specified minimum compressive strength or if any single core is less than 75% of the minimum compressive strength, the concrete will be considered defective. The District may require additional coring, nondestructive load testing, or repair of defective concrete. Costs of coring, testing of cores, load testing, and required repairing pertaining thereto shall be paid by the Contractor at no extra cost to the District.

B. To facilitate concrete sampling and testing, the Contractor shall:

1. Furnish labor, equipment, and materials to assist the District's Representative in obtaining and handling samples at the project site.
2. Advise the District's Representative in advance of concrete placing operations to allow for scheduling and completion of quality testing.
3. Provide and maintain facilities for safe storage and proper curing of concrete test specimens on the project site, as required by ASTM C 31.

#### 2.25 CURING COMPOUND

- A. Curing compound shall conform to ASTM C 309.
- B. Curing compound shall be compatible with required finishes and coatings and shall meet the State of California Clean Air Quality Standards which limit the quantity of volatile organic compounds to 250 grams per liter.

#### 2.26 CLEAR FLOOR HARDENER (SURFACE APPLIED)

Floor hardener shall be a colorless, aqueous solution of zinc and/or magnesium fluosilicate. Each gallon of the fluosilicate solution shall contain not less than 2 pounds of crystals. Hardener shall be Saniseal, a product of Master Builders Company, Cleveland, Ohio; Hornolith, a product of Grace Construction Materials, Cambridge, Massachusetts; Lapidolith, a product of Sonneborn, Minneapolis, Minnesota; or District approved equal. The solution shall be delivered ready for use in the manufacturer's original sealed containers.



2.27 MATS, PAPER, AND SHEETING FOR CURING

- A. Burlap mats shall conform to AASHTO Specification M182.
- B. Sisal-kraft paper and polyethylene sheets shall conform to ASTM C 171.

PART 3 - EXECUTION

3.01 FORM TOLERANCES

- A. Failure of the forms to produce the specified concrete surface and surface tolerance shall be grounds for rejection of the concrete work. Rejected work shall be repaired or replaced at no additional cost to the District.
- B. The following table indicates tolerances or allowable variations from dimensions or positions of structural concrete work:

	<u>Maximum Tolerance</u>
Sleeves and inserts	+1/4" - 1/4"
Projected ends of anchors	+1/4" -0.0"
Anchor bolt setting	+1/4" -1/4"
Finished concrete, all locations	+1/4" -1/4" in 10 feet
	Max ±1" in total length

- C. The planes or axes from which the above tolerances are to be measured shall be as follows:
  - Sleeves and inserts: Centerline of sleeve or insert.
  - Projected ends of anchors: Plane perpendicular to the end of the anchor as located on the Drawings.
  - Anchor bolt setting: Centerline of anchor bolt.
  - Finish concrete: The concrete surface as located on the Drawings.
- D. Where equipment is to be installed, comply with manufacturer's tolerances if more restrictive than above.

### 3.02 FORM SURFACE PREPARATION

- A. Clean form surfaces to be in contact with concrete or foreign material prior to installation.
- B. Coat form surfaces in contact with concrete with a release agent prior to form installation.

### 3.03 FORM REUSE

Reuse only forms which provide a uniform surface texture on exposed concrete surfaces. Apply light sanding or other surface treatment between uses for uniform texture. Plug unused tie rod holes with corks, shave flush, and sand the concrete surface side. Do not patch forms other than filling tie rod holes, except in the case of Class II forms. Do not use metal patching discs on Class I forms.

### 3.04 REMOVAL OF FORMS

- A. Forms and shoring for elevated structural slabs or beams shall remain in place until the concrete has reached a compressive strength equal to the specified 28-day compressive strength as determined by test cylinders. Do not remove supports and reshore. The following table indicates the minimum allowable time after the last cast concrete is placed before forms, shoring, or wall bracing may be removed:

Sides of footings and encasements	24 hours
Walls, vertical sides of beams, girders, columns, and similar members not supporting loads	48 hours
Slabs, beams, and girders	10 days (forms only)
Shoring for slabs, beams, and girders	Until concrete strength reaches specified 28-day strength
Wall bracing	Until top or roof slab concrete reaches specified 28-day strength

- B. Do not remove forms from concrete which has been placed with outside air temperature below 50°F without first determining if the concrete has properly set without regard for time. Do not apply heavy loading on green concrete. Immediately after forms are removed, the surface of the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.

### 3.05 FORMED OPENINGS

Openings shall be of sufficient size to permit final alignment of pipes or other items without deflection or offsets of any kind. Allow space for packing where items pass through the wall to ensure watertightness. Provide openings with continuous keyways and waterstops. Provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with reinforcement as indicated in the typical structural details. Reinforcing shall be at least 2 inches clear from the opening surfaces and encased items.

### 3.06 EMBEDDED ITEMS

Set anchor bolts and other embedded items accurately and hold securely in position until the concrete is placed and set. Check all special castings, channels, or other metal parts that are to be embedded in the concrete prior to and again after concreting. Check all nailing blocks, plugs, and strips necessary for the attachment of trim, finish, and similar work prior to concreting.

### 3.07 PIPES AND WALL SPOOLS CAST IN CONCRETE

- A. Install pipes, wall spools, and wall anchors before placing concrete. Do not weld, tie or otherwise connect the pipes, spools or anchors to the reinforcing steel.
- B. Support pipe and fabricated fittings, to be encased in concrete, on concrete piers or pedestals.

### 3.08 BEVELED EDGES (CHAMFER)

Form 3/4-inch beveled edges on exposed concrete edges and corners, beam soffit corners, and where indicated on the Drawings. Reentrant corners in concrete members shall not have fillets, unless otherwise shown in the Drawings. The top edges of slabs, walkways, beams, and walls may be beveled with an edging trowel in lieu of using chamfer strips.

### 3.09 CONSTRUCTION JOINTS

- A. Layout of construction joints shall be as shown in the Drawings and according to the following guidelines:
  - 1. Provide horizontal construction joints at top of foundation members and slabs-on-grade and at the soffit of supported slabs and beams.
  - 2. Space the construction joints at a maximum horizontal distance of 25 feet and a maximum vertical distance of 16 feet.
  - 3. Space the corner vertical construction joints between 4 and 8 feet from the corner of walls or wall intersections.
  - 4. Space horizontal construction joints at least 8 inches below bottom of slabs.
- B. For slabs-on-grade that are not subject to hydraulic loading, use formed construction joints. Maximum size of pour shall be 30 feet each way for slabs with wire mesh reinforcement and 75 feet each way for slabs with bar reinforcement. Allow 24 hours between pours of adjacent slabs. Provide joints as specified or shown. Set continuous expansion joint strips between slabs and abutting vertical surfaces as indicated in the Drawings.
- C. Place expansion joint fillers every 30 feet in straight runs of walks, at right-angle turns, and wherever concrete walks butt into vertical surfaces.
- D. For control joints of nonstructural slabs, provide partial depth plastic strips set flush with finished surface or 1/8-inch-wide joints cut with a diamond saw. Use control joints one-quarter to one-third the depth of the slab unless otherwise indicated.

- E. Construction joints shall be keyed, unless otherwise detailed. Form keyways by beveled strips or boards placed at right angles to the direction of shear. Except where otherwise shown on the Drawings or specified, keyways shall be at least 1-1/2 inches in depth over at least 25% of the area of the section.
- F. When it is necessary to make a joint because of an emergency, furnish and place reinforcing dowels across the joint. Embed dowels 48 bar diameters each side of the joint. Size and number of dowels shall match reinforcing in the member. Furnishing and placing such reinforcing steel shall be at the Contractor's expense.
- G. After the pour has been completed to the construction joint and the concrete has hardened, thoroughly clean the entire surface of the joint of surface laitance, loose or defective concrete, and foreign material, and expose clean aggregate by sandblasting the surface of construction joints before placing the new concrete. Cover horizontal construction joints with mortar. Spread uniformly and work thoroughly into all irregularities of the surface. The water-cement ratio of the mortar in place shall not exceed that of the concrete to be placed, and the consistency of the mortar shall be suitable for placing and working.
- H. In case of emergency, place additional construction joints. (An interval of 45 minutes constitutes cause for an emergency construction joint.)

### 3.10 EXPANSION JOINTS

Provide expansion joints with continuous edge reservoirs, which shall be filled with a joint sealant. Leave the material used for forming the reservoirs in place until immediately before the grooves are cleaned and filled with joint sealant. After removing edge forms from the reservoir, remove grout, loose concrete, and fins; then sandblast the slots. Allow the reservoirs to become thoroughly dry; then blow out the reservoirs and immediately prime and fill with the expansion joint sealant and backup materials. The primer used shall be supplied by the same manufacturer supplying the joint sealant.

### 3.11 TIME BETWEEN POURS

At least two hours shall elapse after depositing concrete in the columns or walls before depositing in beams, girders, or slabs supported thereon. Place beams, girders, brackets, column capitals, and haunches monolithically as part of the floor or roof system, unless otherwise indicated on the Drawings.

### 3.12 INSTALLATION OF PREMOLDED JOINT FILLER

Install in joint accurately as shown. Attach to concrete with a bonding agent recommended by the joint sealant and joint filler manufacturer for compatibility.

### 3.13 INSTALLATION OF JOINT SEALANTS

- A. Immediately before installing the joint sealant, clean the joint cavity by sandblasting or power wire brushing. Install bond breaker tape per manufacturer's instructions.
- B. After the joints have been prepared as described above, apply the joint sealant. Apply the primer, if required, and joint sealant only with the equipment and methods recommended by the joint sealant manufacturer. Application criteria for the sealant materials, such as

temperature and moisture requirements and primer cure time, shall be in accordance with the recommendations of the sealant manufacturer.

- C. Apply masking tape along the edges of the exposed surface of the exposed joints. Trowel the joints smooth with a tuck pointing tool wiped with a solvent recommended by the sealant manufacturer.
- D. After the sealant has been applied, remove the masking tape and any sealant spillage.

### 3.14 INSTALLATION OF STEEL EXPANSION JOINT DOWELS

Install parallel to wall or slab face, perpendicular to the joint face, and in true horizontal position. Secure tightly in forms with rigid ties. Orient dowels to permit joint movement.

### 3.15 PLACING REINFORCEMENT

- A. Place reinforcing steel in accordance with the current edition of Recommended Practice for Placing Reinforcing Bars, published by the Concrete Reinforcing Steel Institute.
- B. Place reinforcing in accordance with the following, unless otherwise indicated:
  - 1. Reinforcement indicated on the drawings is continuous through the structure to the farthest extent possible. Terminate bars 2 inches clear from faces of concrete.
  - 2. Splices may be used to provide continuity due to bar length limitations. Minimum length of bars spliced for this reason is 40 feet. Splicing of reinforcement which is detailed to be continuous on the Drawings is not permitted.
- C. Reinforcing steel, before being positioned and just prior to placing concrete, shall be free from loose mill and rust scale and from any coatings that may destroy or reduce the bond. Clean reinforcing steel by sandblasting or wire brushing and remove mortar, oil, or dirt to remove materials that may reduce the bond.
- D. Do not straighten or rebend reinforcing steel in the field. Do not use reinforcing with bends not shown in the Drawings.
- E. Position reinforcing steel in accordance with the Drawings and secure by using annealed wire ties or clips at intersections and support by concrete or metal supports, spacers, or metal hangers. Do not place metal clips or supports in contact with the forms. Bend tie wires away from the forms to provide the specified concrete coverage. Bars additional to those shown on the Drawings, which may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position, shall be provided by the Contractor at his own expense.
- F. Place reinforcement a minimum of 2 inches clear of any metal pipe or fittings.
- G. Secure reinforcing dowels in place prior to placing concrete. Do not press dowels into the concrete after the concrete has been placed.
- H. Roll welded wire fabric used for reinforcement flat before placing concrete. Extend fabric to within two inches of the slab edges and lap splices at least 1-1/2 courses of the fabric and a minimum of 6 inches. Tie laps and splices at ends and at 24 inches on center. Pull the

fabric into position as the concrete is placed by means of hooks, and work concrete under the fabric to ensure that it is placed at the proper distance above the bottom of the slab.

- I. Position dowels for masonry walls to occur at reinforced block cells.

### 3.16 SITE-MIXED CONCRETE

Conform to ACI 304.

### 3.17 READY-MIXED CONCRETE

Conform to ASTM C 94.

### 3.18 PLACING CONCRETE

- A. Conform to ACI 304.
- B. Place ready-mixed concrete within the specified delivery time after initial batching based on the outside temperature. Ready-mixed concrete exceeding the delivery time will be rejected by the District's Representative.

<u>Outside Temperature</u>	<u>Delivery Time</u>
Below 40 degrees F (4 degree C)	See Cold Weather Placing
40 to 85 degrees F (4 to 29 degrees C)	90 Minutes
86 to 90 degrees F (30 to 32 degrees C)	75 Minutes
Above 90 degree F (32 degree C)	60 Minutes

### 3.19 PUMPING CONCRETE

Conform to ACI 304.2R-71.

### 3.20 WEATHER REQUIREMENTS

- A. Conform to ACI 305 for placing during hot weather.
- B. Conform to ACI 306 for placing during cold weather.
- C. Do not place ready-mixed concrete in the rain or at times when rain is expected or forecasted. The District's Representative in his sole judgement may reject any concrete work that is affected by rain.

### 3.21 BONDING TO OLD CONCRETE

Coat the contact surfaces with epoxy bonding compound. The method of preparation and application of the bonding compound shall conform to the manufacturer's printed instructions and recommendations for specific application for this project.

### 3.22 BACKFILL AGAINST WALLS

Do not place backfill against walls until the concrete has obtained a compressive strength equal to the specified 28-day compressive strength. Where backfill is to be placed on both sides of the wall, place the backfill uniformly on both sides.

Do not backfill the walls of structures that are laterally restrained or supported by suspended slabs or slabs on grade until the slab is poured and the concrete has reached the specified compressive strength.

### 3.23 CONCRETE FINISHES

Complete concrete surfaces in accordance with the following schedule:

<u>Finish Designation</u>	<u>Area Applied</u>
F-1	Beams, columns, and exterior walls not exposed to view.
F-3	Beams, columns, and walls of structures or buildings exposed to view. Underside of formed floors or slabs.
F-4	Exterior and interior surfaces to be coated.
S-1	Slabs and floors to be covered with concrete or grout.
S-4	Slabs and floors of structures or buildings exposed to view.
S-5	Slabs and floors at slopes greater than 10% and stairs.
E-1	Exposed edges. EXCEPTION: edges normally covered with earth.
E-2	Top of walls, beams, and similar unformed surfaces.

- A. Finish F-1: Repair defective concrete, fill Depressions deeper than 1/2-inch, and fill tie holes.
- B. Finish F-3: In addition to Finish F-1, remove fins, fill depressions 1/4-inch or deeper, fill depressions and airholes with mortar. Dampen surfaces and then spread a slurry consisting of one part cement and one and one-half parts sand by damp loose volume, over the surface with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.
- C. Finish F-4: Repair defective concrete, remove fins, fill depressions 1/16-inch or deeper, fill tie holes, remove mortar spatter, and remove bulges higher than 1/16-inch.
- D. Finish S-1: Screed to grade without special finish.
- E. Finish S-4: Steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.

- F. Finish S-5: Steel trowel finish without local depressions or high points. Apply a stiff bristle broom finish. Leave broom lines parallel to the direction of slope drainage.
- G. Finish E-1: Provide chamfer or beveled edges.
- H. Finish E-2: Strike smooth and float to an F-3 or F-4 finish.

### 3.24 CURING CONCRETE

- A. Conform to ACI 308.
- B. Water cure with burlap mats unless optional curing methods are permitted.
- C. Do not use curing compound on surfaces which are to be coated with clear floor hardener.
- D. It is the responsibility of the Contractor to select the appropriate curing method in response to climatical and/or site conditions occurring at the time of concrete placement. Take appropriate measures as described in ACI 305 and 306 for protecting and curing concrete during hot and cold weather.

### 3.25 REPAIR OF DEFECTS

- A. Do not repair defects until concrete has been reviewed by the District's Representative.
- B. Surface Defects: Repair surface defects that are smaller than 1-foot across in any direction and are less than 1/2-inch in depth.

Repair by removing the honeycombed and other defective concrete down to sound concrete, make the edges perpendicular to the surface and at least 3/8-inch deep, thoroughly dampen the surface, work into the surface a bonding grout (one part cement to one part fine sand), fill the hole with mortar, match the finish on the adjacent concrete, and cure as specified.

- C. Severe Defects: Repair severe defects that are larger than surface defects but do not appear to affect the structural integrity of the structure.

Repair by removing the honeycombed and other defective concrete down to sound concrete, make the edges of the hole perpendicular to the surface, sandblast the surface, coat the sandblasted surface with epoxy bonding compound, place nonshrink grout, match the finish on the adjacent concrete, and cure as specified.

- D. Major Defects: If the defects are serious or affect the structural integrity of the structure or if patching does not satisfactorily restore the quality and appearance to the surface, the District may require the concrete to be removed and replaced, complete, in accordance with the provisions of this section.

### 3.26 REPAIR OF CRACKS

- A. Repair cracks in concrete structures that are wider than 1/10-inch in width by cutting out a square edged and uniformly aligned joint 3/8-inch wide by 3/4-inch deep, preparing exposed surfaces of the joint, priming the joint, and applying polyurethane joint sealant.



- B. If the cracks are serious or affect the structural integrity or function of the element, the District's Representative may require the concrete to be removed and replaced, complete, in accordance with the provisions of this section.

### 3.27 CLEAR HARDENER APPLICATION (SURFACE APPLIED)

- A. Cure, clean, and keep floors dry to receive hardener. Complete work immediately above floors prior to applying hardener. Apply hardener evenly, using three coats, allowing 24 hours between coats. The first coat shall be one-third strength, second coat one-half strength, and third coat two-thirds strength. Apply each coat so as to remain wet on the concrete surface for 15 minutes. Apply proprietary hardeners in conformance with the manufacturer's instructions. After the final coat is completed and dry, remove surplus hardener from the surface by scrubbing and mopping with water.
- B. Apply hardener to the surfaces designated in the Drawings.
- C. Apply hardener to risers and treads of concrete stairs as described above.

### 3.28 ALUMINUM SURFACES IN CONTACT WITH CONCRETE

Coat aluminum surfaces in contact with concrete per Standard Specification Section 09900, System No. 51.

END OF SECTION