

SECTION 03 3000- CAST-IN-PLACE CONCRÈTE

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide cast-in-place concrete, including form work and reinforcement, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
 - 1. The work of this Section includes special precautions to reduce cracking in concrete slabs.
- B. Related Sections:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 03 1510: Post-installed Anchors.
- C. Special Coordination Requirements: Coordinate with the work of the following sections to identify the finish flooring manufacturer's concrete slab requirements. Such requirements may be over and above the requirements of the Contract Documents and may require additional materials, means, or methods, which shall be included as part of the Work.

1.2 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300.
 - 1. Mix Designs: Secure concrete mix designs from the concrete supplier or the testing laboratory in accordance with provisions of Section 01 4520, and submit to the Architect for review and approval. Distribute approved mix designs to testing laboratory, batch plant, job site, and governmental agencies having jurisdiction.
 - a. Include a statement clearly indicating the concrete supplier's proposed basis of concrete mix proportions based on ACI 301-10, Section 4.2.3.
 - b. When ACI 301-10, Section 4.2.3 is used, strength records used for establishing and documenting concrete mixture proportions shall not be more than 24 months old.
 - 2. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements for the following:
 - 3. Shop Drawings: Submit shop drawings for the reinforcing steel.
 - 4. Submit cementitious materials certification to DSA complying with CBC Section 1910A.1.
 - 5. Submit batch tickets of each load to the Inspector of Record.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with 2016 California Building Code except where more stringent requirements are shown or specified.
- B. In accordance with CBC Section 1705A.3.5, do not place concrete until forms and reinforcement have been inspected, all preparations for placement have been completed, and preparations have been checked by the Inspector of Record, all subject to observation of the Architect, Structural Engineer and DSA.
- C. Placing Record: In accordance with CBC Section 1705A.3.6, keep a concrete placing record on site recording the time and date of placing the concrete in each portion of the structure. Keep placing record until completion of the structure and make available to the inspection of the Owner, Architect, Structural Engineer, Inspector of Record, and DSA.

1.4 NOTICE CONCERNING SLAB CURLING AND SHRINKAGE CRACKING

- 4) Anchors to be tested shall be selected at random by the special inspector.
 - d. Testing of shear dowels across cold joints in slabs on grade, where the slab is not part of the lateral force-resisting systems shall not be required.
 - e. Testing is not required for power actuated fasteners used to attach metal tracks of interior non-shear wall partitions for shear only, where there are at least three fasteners per segment of track.
- C. Test Loads: Test loads shall be listed in the contract drawings and shall be determined by one of the following methods:
- 1. Twice the maximum allowable tension load or 1-1/4 times the maximum design strength of anchors as provided in the anchor's ICC-ESR or in accordance with Appendix D of ACI 318.
 - a. Tension test load need not exceed 80% of nominal yield strength of anchor element ($0.8A_bF_y$).
 - 2. Tension or torque test values from the table within the contract drawings.
- D. Test Acceptance Criteria: Use the ICC-ESR for the anchor installed or the manufacturer's written instructions, acceptable to DSA. Field tests shall satisfy the following minimum requirements:
- 1. Hydraulic Ram Method: Anchors tested with a hydraulic jack or spring loaded devices shall maintain the test load for a minimum of 15 seconds and shall exhibit no discernible movement during the tension test, e.g. as evidence of loosening of the washer under the nut. For adhesive anchors, where other than bond is being tested, the testing devices shall not restrict the concrete shear cone type failure mechanism from occurring.
 - 2. Torque Wrenched Method: Anchors tested with a calibrated torque wrench must attain the specified torque within 1/2 turn of the nut.
 - a. Exceptions:
 - 1). Wedge or Sleeve type: 1/4 turn of the nut for a 3/8" sleeve anchor only.
 - 2). Screw Type: 1/4 turn of screw after initial seating of the screw head.
- E. Testing Procedure:
- 1. Testing procedure shall be as required by the manufacturer's ICC-ESR.
 - 2. Manufacturer's recommendation for testing may be approved by the enforcing agency, when ICC-ESR does not provide testing procedure.

END OF SECTION 03 1510

- A. The Contractor is hereby notified that concrete construction practices and concrete materials can significantly increase the potential for cracking and slab curling, which include the following:
 - 1. Placement of slabs over high-moisture content subgrade.
 - 2. Increased mix temperature.
 - 3. Excessive haul in transit mixture, too long a waiting period at the project site, or too many revolutions at mixing speed.
 - 4. Use of smaller size aggregate under conditions where larger could have been used.
 - 5. Use of mixture having high shrinkage characteristics.
 - 6. Excessive coatings on aggregate due to insufficient washing or contamination during handling.
 - 7. Use of aggregates of poor inherent quality with respect to shrinkage.
 - 8. Exceeding the maximum water/cement ratio.
- B. The Contractor is responsible for choosing concrete materials and for implementing concrete construction practices which minimize slab curling and shrinkage cracking.
- C. Special Concerns:
 - 1. The Contractor is hereby notified that the Work includes basketball, volley ball, tennis, and / or other uses which require minimum joints and minimum curling in the concrete slab playing surface.
 - 2. The Architect has taken normal and customary precautions in the design of the concrete slabs for these uses through the specification of concrete materials, mix, and execution criteria, and through detailing concrete joints and steel reinforcing.
 - 3. The Contractor is responsible to choose concrete materials and implement concrete construction practices which minimize slab curling and shrinkage cracking in these areas of special use.

1.5 SPECIAL WARRANTY

- A. **Manufacturer's Warranty:** In addition to the warranty requirements of the Contract Documents, submit 2 copies of a warranty from the interior slab curing product manufacturer with an extended correction period of 15-years covering labor and materials to replace or repair floor covering that fails due to moisture migration or moisture-born alkalinity contaminates originating from the concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 FORMS

- A. Design, erect, support, brace, and maintain formwork so it will safely support vertical and lateral loads which might be applied until such loads can be supported safely by the concrete structure.
- B. Except for metal forms, use new materials. Materials may be re-used during progress of the Work, provided they are completely cleaned and reconditioned, recoated for each use, and capable of producing formwork of the required quality.
 - 1. Form Facing for Exposed to View Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 - 2. Chamfer or radius outside corners of beams, joists, columns, and walls.
- C. Slip Dowel System: Speed Dowel by Westec Barrier Technologies; #4 rebar dowels x 24" long at 18" on center, minimum of 12" sleeve.

- D Snap Ties: Snap Ties by Dayton/Richmond Concrete Accessories (Constar Supply 559-564-5012), with A-8 Waterseal Washer.
- E Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

2.3 REINFORCEMENT

- A Comply with the following as minimums:
 - 1 Bars: ASTM A615, Grade 40 for #3 bars and smaller, Grade 60 for #4 bars and larger, using deformed bars for #3 and larger.
 - 2 Bending: ACI 318-14, Section 26.6.3.
 - a Bars shall be limited to one shop or field bend at any location on the bar.
 - b Partially embedded bars shall not be field bent, except as indicated on the Drawings or permitted by the Architect.
 - c A bar bent in the incorrect location shall not be straightened; such bars shall be discarded.
- B Fabricate reinforcement to the required shapes and dimensions, within fabrication tolerances stated in ACI 318-14.
- C Do not use reinforcement having any of the following defects:
 - 1 Bar lengths, depths, or bends exceeding the specified fabricating tolerances;
 - 2 Bends or kinks not indicated on the Drawings or required for this Work;
 - 3 Bars with cross-section reduced due to excessive rust or other causes.
- D Shop fusion welded stirrup/tie cages shall be permitted provided they are in conformance with CBC 1903A.8.

2.4 CONCRETE

- A Portland Cement: ASTM C150, Type II.
- B Fly Ash: Will be used as a partial substitute for Portland cement as follows:
 - 1 Fly ash: ASTM C618, Class Nor F (Class C is not permitted).
 - 2 Fly ash used may be included in the water/cement ratio calculation.
 - 3 At least 15% but not more than 20% by weight of fly ash shall be substituted for Portland cement.
- C Normal Weight Aggregate: ASTM C 33, except as modified in CBC Section 1903A.6. Provide aggregates from a single source for exposed concrete.
- D Water: ACI 318-14, Section 26.4.1.3.
- E Admixtures:
 - 1 Do not use calcium chloride admixtures.
 - 2 Admixtures are not permitted without approval from Architect and DSA.

2.5 NORMAL WEIGHT CONCRETE DESIGN MIX

- A Proportions: Concrete mix shall be proportioned based on field experience or trial mixtures in accordance with ACI 318-14, Section 26.4.3, and ACI 301-10, Section 4.2.3.
 - 1 Mix design submittals shall include a statement clearly indicating the concrete supplier's proposed basis of concrete mix proportions through the use of one of the following:

- a. Field experience under ACI 301-10 paragraph 4.2.3.4a, or
 - b. Trial mixtures under ACI 301-10 paragraph 4.2.3.4b.
 - 2. When ACI 301-10, Section 4.2.3 is used as the concrete supplier's proposed basis of concrete mix proportions, strength records used for establishing and documenting concrete mixture proportions shall not be more than 24 months old.
- B. Design Professional: A registered civil or structural engineer, licensed in California, with experience in concrete mix design shall select the relative amounts of ingredients to be used as basic proportions of the concrete mixes proposed for use.
- 1. Mix design submittals shall include the engineer's stamp and signature.
- C. Cement Content: Minimum of 5.5 sacks of cement per cubic yard.
- 1. Minimum of 5.0 sacks of cement per cubic yard for site concrete. Off-site concrete shall conform to governing agency standards.
- D. Type A Water Reducer (interior slabs only): 28.20 oz/cy, plus or minus 20%.
- E. Water/Cementitious Material Ratio:
- 1. Footings: Maximum of 0.56.
 - 2. Site Concrete: Maximum of 0.67.
 - 3. Interior Slabs/Parking Lots/Fire Lanes: Maximum of 0.50.
- F. Minimum Compressive Strength:
- 1. Footings, interior slabs, parking lots, fire lanes, Basketball courts and retaining walls: 3,000 psi at 28 days.
 - 2. Site Concrete: 2,500 psi at 28 days.
- G. Aggregate Gradation Optimization:
- 1. Workability Factor: 32-42%; **target 35%**.
 - 2. Coarseness Factor: 52-72%; **target 60%**.
 - 3. Fineness Modulus: 2.80 to 3.10.
 - 4. Paste Fraction: 27% plus or minus.
 - 5. Mortar Fraction: Passing the No. 8 sieve.
 - a. ¾" to 1" aggregate: 55-57%.
 - b. 1-1/2" aggregate: 53-54%.
- H. Aggregate Gradation Limits of Combined Mixture:

Sieve Size	% Passing	
	Basketball courts Parking Lots Fire Lanes 1-1/2"	Footings Site Concrete Retaining Walls 1"
2"	100	--
1-1/2"	95-100	100
1"	80-96	85-100
3/4"	65-80	70-90
3/8"	40-55	50-70
#4	35-46	35-60

#8	25-38	35-50
#30	10-20	10-20
#200	0-5	0-5

- I Slump Limits: Proportion and design mixes for slump at point of placement of 4" plus or minus 1".
- J Concrete Temperature: 90 deg F maximum at time of placement.
- K Ready-Mix Concrete: Comply with ASTM C94, and as herein specified.

2.6 OTHER MATERIALS

- A Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.
- B Expansion Joint Filler: Comply with ASTM D1751 or provide resin-impregnated fiberboard conforming to ASTM D1752.
- C Non-shrink Grout:
 - 1. Factory premixed grout; ASTM C1107.
 - 2. Compressive strength: 7,000 psi at 28 days.
- D Dry Pack Grout: One part Portland Cement to two parts fine sand.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FORMWORK INSTALLATION

- A Construct forms to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.
 - 1 **Non-Exposed Surfaces:** Where concrete surfaces are not exposed to view, construct formwork conforming to a Class B Surface, Paragraph 4.8.3 of ACI 117-10.
 - 2 **Exposed Surfaces:** Where concrete surfaces are exposed to view, construct forms so that concrete surfaces will have a tolerance of 1/2 of the tolerance limits of a Class A Surface, Paragraph 4.8.3 of ACI 117-10.
- B Forms shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape. Forms and their supports shall be designed so as not to damage previously placed structure.

3.3 SOIL TREATMENT OF SIDEWALK AND PAVEMENT AREAS WITH HERBICIDES

- A Just prior to placing concrete for pavements and sidewalks, apply herbicide soil treatment at recommended

rates for application. Protect desirable vegetation from herbicide treatment.

- B. Herbicide shall bear evidence of registration under Federal Insecticide, Fungicide, and Rodenticide Act for weed control application.

3.4 REINFORCING

- A. Comply with the following, as well as the specified standards, for details and methods of reinforcing placement and supports.
 - 1. Clean reinforcement and remove loose dust and mill scale, earth, oil, and other materials which reduce bond or destroy bond with concrete.
 - 2. Position, support, and secure reinforcement against displacement by forms, construction, and the concrete placement operations. Provide metal chairs, dobies, or other aids manufactured for this purpose.
 - 3. Place reinforcement to obtain the required coverages for concrete protection.
 - 4. Unless otherwise shown or noted on the Drawings, lap bars as noted on Lap Schedule in structural drawings.
 - 5. Partially embedded reinforcing shall not be bent without the approval of the DSA.

3.5 EMBEDDED ITEMS

- A. Do not embed piping, other than electrical conduit, in structural concrete. See structural drawings for provisions for pipes, sleeves, conduits or other penetrations into or through the footings.
- B. Set bolts, inserts, and other required items in the concrete, accurately secured so they will not be displaced, and, in the precise locations needed. **IN NO CASE SHALL ANY BOLT OR ANCHOR BE STABBED IN PLACE WHILE OR AFTER THE CONCRETE IS POURED.** Evidence of stabbing will necessitate testing at the expense of the contractor.
- C. Slip Dowel System: Install in accordance with manufacturer's written recommendations.

3.6 MIXING CONCRETE

- A. Transit mix the concrete in accordance with provisions of ASTM C94.
 - 1. Water shall only be added at the beginning of discharge and shall be a one-time addition of water. At a minimum, the drum shall be turned an additional 30 revolutions after addition of water. After discharge has begun the addition of water is prohibited.
 - 2. Discharge of the concrete shall be completed within 90 minutes, or before the drum has revolved 300 times after the cement has been exposed to the mixing water or aggregates.
- B. Cold Weather Requirements:
 - 1. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. All concrete materials and all reinforcement, forms, fillers, and ground with which concrete is to come in contact shall be free from frost. Frozen materials or materials containing ice shall not be used.
 - 2. When mixing concrete during freezing or near-freezing weather, the mix shall have a temperature of at least 55 deg F., but not more than 90 deg F. When necessary, concrete materials shall be heated before mixing. Special precautions shall be taken for the protection of transit-mixed concrete.
 - 3. The concrete shall be maintained at a temperature of at least 55 deg F. for not less than 72 hours after placing. After the initial curing period allow the concrete surface to dry prior to exposure. Do not permit the concrete to cool faster than the rate of 5 deg F per hour or more for the first 24 hours.
- C. Hot Weather Requirements:
 - 1. During hot weather, proper attention shall be given to ingredients, production methods, handling,

placing, protection and curing to prevent excessive concrete temperatures or water evaporation that may impair required strength or serviceability of the member or structure.

2. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

3.7 PLACING CONCRETE

- A. Concrete shall not be placed until the forms and reinforcement have been inspected, all preparations for the placement have been completed, and the preparations have been checked by the Inspector of Record, all subject to the observation of the structural engineer or Architect.
- B. Preparation:
 1. Remove foreign matter accumulated in the forms.
 2. Rigidly close openings left in the formwork.
 3. Wet wood forms sufficiently to tighten up cracks; wet other material sufficiently to maintain workability of the concrete.
 4. Use only clean forms and tools.
- C. Conveying: ACI 318-14, Section 26.5.2.1.
 1. Concrete shall be conveyed from mixer to place of final deposit by methods that will prevent separation or loss of materials.
 2. Conveying equipment shall be capable of providing a supply of concrete at site of placement without separation of ingredients and without interruptions sufficient to permit loss of plasticity between successive increments.
 3. Remove rejected concrete from the job site.
- D. Placing Concrete in Forms: ACI 318-14, Section 26.5.2.1.
 1. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concreting shall be carried on at such a rate that concrete is at all times plastic and flows readily into spaces between reinforcement.
 2. Where concrete is placed in lifts, each lift shall be thoroughly consolidated before the next layer is placed. The rate of placement shall be rapid enough so that previously placed concrete has not yet set when the next lift of concrete is placed upon it. Do not allow flow lines, seams, and planes of weakness (cold joints) to form as a result of placement means and methods.
- E. Placing Concrete Slabs:
 1. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
 2. Bring slab surfaces to the correct level with a straightedge, and then strike off.
 3. Use wood bullfloats or darbies to smooth the surface, leaving the surface free from bumps and hollows.
 4. Do not sprinkle water on the plastic surface. Do not disturb the slab surface prior to start of finishing operations.

3.8 CONSOLIDATION

- A. All concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around reinforcement and embedded fixtures and into corners'offorms.
 1. Where conditions make consolidation difficult, or where reinforcement is congested, batches of concrete adjusted to use smaller size aggregates shall be used as approved by the structural engineer and the enforcement agency.
 2. Do not vibrate forms or reinforcement.
 3. Do not use vibrators to transport concrete inside the forms.

4. Perform consolidation by experienced personnel.

3.9 JOINTS

A. Construction Joints (CJ):

1. Do not use horizontal construction joints except as may be shown on the Drawings.
2. If additional construction joints are found to be required, secure the Architect's approval of joint design and location prior to start of concrete placement.
3. Joints shall be constructed in accordance with ACI 318-14, Section 26.5.6.

B. Isolation Joints (IJ):

1. Do not permit reinforcement or other embedded metal items that are being bonded with concrete (except dowels in floors bonded on only one side of the joints) to extend continuously through any isolation joint, unless specifically noted.
2. Fill isolation joints full depth with joint material approved by the Architect.
3. Provide isolation joints as shown on plans.

C. Crack Control Joint (CCJ):

1. Provide template or guide as required for straight sawcut.
2. Joints shall be spaced as indicated on the Drawings, but not more than 10'-0" on center.
3. Saw cut joints before concrete begins to cool, within 2 to 12 hours after placing.
4. Use 1/8" thick blade and cut at least 1' deep but not less than one third (1/3) the depth of the slab.

3.10 CONCRETE SLAB FINISHING

A. Finish work shall be performed in accordance with ACI 302.IR-15, Chapter 10.

B. Finished Slab Surfaces: Except as may be shown otherwise on the Drawings, provide the following finishes at the indicated locations:

1. Scratch Finish: Apply to monolithic slab surfaces that are to receive concrete floor topping or mortar setting bed.
2. Float Finish: Apply to monolithic slab surfaces that are to receive trowel finish and other finishes specified hereinafter, and to slab surfaces which are to be covered with tile on a setting bed.
3. Trowel Finish: Apply to interior monolithic slab surfaces that are to be exposed to view, unless otherwise shown, and to slab surfaces that are to be covered with resilient flooring, carpeting, thin-set tile, paint, or other thin-film finish coating system.
4. Non-slip Broom Finish: Apply to exterior walks, stairs, drives, ramps, and similar pedestrian and vehicular areas. Coordinate required final finish with Architect/Owner before application.
 - a. Medium broom finish for slopes < 5%.
 - b. Heavy broom finish for slopes 5%.

C. Finish Concrete Slab Tolerances:

1. Slabs shall be level unless slope is otherwise specified.
2. Tolerances of finished slab surfaces shall comply with ACI 117.IR-14 "Class A Surface Finish Tolerance". Depressions in floor between high spots shall not be greater than 1/8" between a 10' long straight edge.
3. Depressed surfaces shall be leveled with an approved filler and sanded smooth.
4. High spots shall be ground down until level. Remove dislodged aggregate and patch floor.
5. Grind or fill surface defects which would telegraph through applied floor covering systems.
6. Owner reserves the right to test floors and concrete members for conformance to ACI 117.IR-14 Tolerance Specifications by Use of the "Dipstick Floor Profiler". Should tolerances not be within the limits specified, the Contractor shall be required to pay for all testing costs and repairs required to bring materials into compliance.

D. Exterior Flatwork Edge and Joint Finishing:

1. Finish slab edges, including those at formed joints, with an edger having a radius of 1/8".
 2. Edge transverse joints prior to brooming. Brooming shall eliminate the flat surface left by the surface face of the edger.
 3. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with the properly proportioned mortar mixture and then finished.
- E. Required Grinding of Interior Slab:
1. The Contractor shall anticipate that grinding will be required as a result of curling or other slab defects. Grinding required to bring the slab surface into acceptable tolerances for finished flooring installation shall be included as part of the Work.
 2. Provide a slip resistant surface after grinding and filling with a 0.6 coefficient of friction at exposed slabs and exterior flatwork.

3.11 CURING

- A. ACI 318, Section 26.5.3: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Avoid rapid drying at end of final curing period.
- C. Protection of Slabs After Curing: After curing is completed, do not allow water to stand on completed slabs. Remove standing water as soon as possible.

3.12 REMOVAL OF FORMS

- A. ACI 318, Section 6.2.
 1. Forms shall be removed in such manner as not to impair safety and serviceability of the structure. All concrete to be exposed by form removal shall have sufficient strength not to be damaged thereby.
- B. No portion of the forming and shoring system may be removed less than 12 hours after placing concrete. When stripping time is less than the specified curing time, measures shall be taken to provide adequate curing and thermal protection of the stripped concrete.
 1. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
 2. Do not strip vertical concrete in less than 7 days.
- C. Finished Surfaces:
 1. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged.
 2. Release sleeve nuts or clamps, and pull the form ties neatly.
 3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the Drawings.
- D. Repair of Surface Defects: Repair or replace deficient work at no additional cost to the Owner.
 1. Repair tie holes and other surface defects immediately after formwork removal.
 2. Where the concrete surface will be textured by sandblasting or bush-hammering, repair surface defects before texturing.
 3. Repair tie holes and surface defects to match surrounding concrete color and surface texture.
 4. Repair tie holes and surface defects in conformance with ACI 301-10, Paragraph 5.3.7.

3.13 SURFACE FINISH OF VERTICAL CONCRETE SURFACES

- A. Unexposed Form Finish: Rub down or chip off fins or other raised areas.

- B. Exposed (to view) Form Finish: Rub down or chip off and smooth fins or other raised areas.
 - 1. As-Cast Finish: Provide surface finish 3.0 in accordance with ACI 301-10, Paragraph 5.3.3.3.
 - 2. Rubbed Finish:
 - a. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
 - b. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
 - c. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.

3.14 FINISH OF CURBS AND GUTTERS

- A. Finish of Curbs and Gutters:
 - 1. Tool edges of gutter and top of curb with an edging tool to a radius of 1/2"
 - 2. Float and finish surfaces with a smooth wood float until true to grade, section and uniform in texture.
 - 3. Brush floated surfaces with a fine-hair brush using longitudinal strokes.
 - 4. Immediately after removing the front curb form, rub face of curb with wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. While still wet, brush surface in the same manner as the gutter and curb top.
 - 5. Finish the top surface of gutter and entrance drives to grade with a wood float.

3.15 MISCELLANEOUS CONCRETE ITEMS

- A. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- B. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.
- C. Dry Pack Grout:
 - 1. Pack solid under sill plates where indicated to provide continuous bearing.
 - 2. Provide dry pack prior to installation of roof framing.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Testing of concrete materials shall comply with Section 014520, CBC Chapter 17A, and CBC Section 1910A.
- B. The Owner will employ a testing laboratory to perform tests and to submit test reports. Sampling and testing for quality control during placement of concrete may include the following, as directed by the Architect.
- C. Sampling Fresh Concrete: Comply with requirements of ASTM C172.
 - 1. Slump: ASTM C143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - 2. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens are made.
 - 3. Compression Test Specimen: ASTM C31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 - 4. Compressive Strength Tests: ASTM C39; one set for each day's pour, but not less than one set for each 50 cubic yards or each 2,000 square feet of surface area of slabs or walls for each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days; and one specimen retained in reserve for later testing if required.

5. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
- D. Batch Plant Inspection:
1. Continuous batch plant inspection during mixing will be required on this project for structural concrete, including but not limited to footings, foundation walls, retaining walls, columns, and floor slabs in compliance with CBC Section 1705A.3.3.
 2. Batch plant inspection may be waived in accordance with CBC Section 1705A.3.3.1.
- E. Reinforcing Steel Testing will be required on this project, except for non-structural concrete work. Comply with CBC Section 1910A.2; testing will be waived if mill certificates are provided.
- F. Slab Finish Tolerance Testing: Where requested by the Architect, test slabs for finish tolerance in accordance with ACI 117 Tolerance Specifications by Use of the "Dipstick Floor Profiler".
- G. Test Results will be reported in writing to Architect and Contractor within 24 hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- H. Non-Destructive Testing: Rebound hammer, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- I. Additional Tests:
1. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect.
 2. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
 3. The Owner shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.
 4. The Owner shall be compensated for such additional testing by deducting the additional costs from the General Contractor's final payment.

END OF SECTION 03 3000