

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Cast-in-place concrete quality control.
2. Concrete finishing standards

B. Related Sections:

1. Section 01400 - Quality Control: Concrete testing.
2. Section 02380 - Caissons.
3. Section 02520 - Portland Cement Concrete Paving: Including materials, curing compounds, and deicing protection.

1.2 SUBMITTALS:

A. Mix Designs:

1. Submit concrete mix designs a minimum of 30 days prior to first concrete placement.
2. For “Architectural Concrete” maintain single source “plant” of cement and quarry for sand and aggregate throughout. No substitutions to avoid change in color range.
3. Data for each mix shall include the following:
 - a. Mix identification.
 - b. Intended use.
 - c. Mix proportions, including admixtures.
 - d. Manufacturer's data and certifications for mix materials.
 - e. Wet and dry unit weight.
 - f. Entrained air content.
 - g. Design slump.
 - h. Required average strength qualification data per ACI 301 3.9.1 and 3.9.2.
 - i. Average strength qualification data (trial mix data or field test data per ACI 301 3.9.3).
 - j. Field test data shall include copies of the Concrete Testing Agency's report.

1.3 QUALITY ASSURANCE:

A. Field Constructed Samples:

1. Fabricate sample sections representative of specified finished surfaces, in locations on the site as directed by the Architect.
2. Form, reinforce, mix, cast, cure and finish sample units using selected materials and construction methods proposed for work.
3. Provide sample sections as follows:
 - a. Wall Section: "L"-shaped panels, approximately 4' high x 3' each side x 6" thick. Include not less than 2 form ties, 2 form panel intersections, each typical rustication, one vertical construction joint and one horizontal construction joint.
 - b. Column Section: 4' high and not less than 12" diameter for round sections and not less than 12" in least dimension for rectangular sections.
 - 1) Chamfer exposed edges of rectangular sample columns.
 - c. Pan-formed Section: At least 2 pan form units. Set units to illustrate method of blending exposed pan joints.
4. Coordinate special finishing, such as acid etching, abrasive blasting, scoring or bush-hammering. Conduct mechanical finishing in the presence of the Architect.
5. Perform revisions and corrective work required to produce finished concrete and surfaces as required by the Architect.
 - a. Construct additional sample panels as may be required if original results are not satisfactory to the Architect.
6. The continuity of color and texture for exposed concrete surfaces is of prime importance. Maintain such controls and procedures, in addition to those specified, as necessary to provide continuous match of concrete work with accepted samples.
7. Do not remove sample sections without written permission from the Architect. When directed, demolish sample sections and remove from the site.

FIELD SAMPLES ONLY REQUIRED AT LARGE ARCHITECTURAL CONCRETE INSTALLATIONS OR AT CONSPICUOUS LOCATIONS. REVISE SIZES AND REQUIREMENTS TO SUIT PROJECT.

PART 2 - PRODUCTS

2.1 CURING COMPOUND (ACI 301 12.2.1.7):

A. Interior Slabs With Resilient Flooring, Carpet or Left Exposed:

1. "Floor Seal VOX" by The Euclid Chemical Company.
2. "Dress and Seal WB" by L&M.
3. "Kure-N-Seal WB" by Sonneborn-Chemrex.
4. Approved substitute.

B. All Other Interior Slabs Including Slabs to Receive Concrete Topping, Mortar Setting Beds, Cementitious Flooring and Special Flooring:

1. Moisture curing methods only.

2.2 HARDENER (ACI 301 11.7.6):

A. Metallic Hardener: Apply hardener at the rate of 1.5 lbs. per sq. ft. Hardener shall be a mixture of specially processed and graded iron aggregate, Type I Portland Cement and necessary plasticizing agents.

1. "Euco-Plate" by the Euclid Chemical Company.
2. "Masterplate 200" by Master Builders.
3. Approved substitute.

B. Mineral Aggregate Hardener: Apply hardener at 1.0 lb. per sq. ft. Hardener shall be a mixture of specially processed and graded mineral aggregate, Type I cement and necessary plasticizers.

1. "Surflex" by the Euclid Chemical company.
2. Approved substitute.

PART 3 - EXECUTION

3.1 ROTATING EQUIPMENT SUPPORTS:

- #### A. Provide rotating equipment support bases as indicated on the detail following this section. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing the machines and equipment.

3.2 FIELD QUALITY CONTROL:

- A. Inspection: Provide free access for the Architect and Consulting Engineer to locations where concrete materials are stored, proportioned or mixed.
- B. Testing: Owner will employ and pay for the services of a qualified testing laboratory to perform specified tests. Contractor is responsible for timely notification and scheduling of testing agency.
- C. Quality Control Testing During Construction:

FOLLOW UBC CHAPTER 17 SPECIAL INSPECTION REQUIREMENTS AS A TYPICAL GUIDELINE. MODIFY AS NEEDED TO SATISFY STRUCTURAL/-CIVIL NEEDS OR PROJECT SPECIFIC REQUIREMENTS.

- 1. Perform sampling and testing for field quality control during the placement of concrete.
 - a. For concrete having specified strength of 5000 psi or greater, one test per 50 cu. yds., but not less than one test each day such concrete is placed.
 - b. For caisson concrete, one test for each 50 cu. yds. but not less than one test per caisson requiring more than one truckload and one test per truckload when used in more than one caisson.
- 2. For each 100 cu. yds. of concrete of each type poured in any one day provide one set of tests minimum. The cost for early or additional tests for the Contractor's convenience shall be paid for by the Contractor.
- 3. For concrete of each type poured in any one day, provide:
 - a. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94. Comply with ASTM C31 for compressive strength specimens. For concrete placed by pumping, take test specimens and concrete at the point of placement of concrete into the forms.
 - b. Slump: ASTM C143, one test for each set of compressive strength test specimens. Additional slump tests may be required by Architect to be provided by Contractor at no additional cost. Reject concrete where tests exceed specified limits.
 - c. Air Content: ASTM C231, pressure method; one test for each set of compressive test specimens, or when there is any indication of change.
 - d. Compression Test Specimens: ASTM C39, one set of 4 standard cylinders for each compressive strength test, unless otherwise directed.
 - 1) Cast and store cylinders for laboratory cured test specimens and filed cured test specimens as specified in ASTM C31.

- e. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below, and when 80 degree F. and above; and each time a set of compression test specimens is made.
 - f. Compressive Strength Tests: ASTM C39; one specimen tested at 7 days, 2 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
 - 1) When the frequency of testing will provide less than 5 strength tests for a given mix design, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
 - 2) When the total quantity of a given mix design of concrete is less than 50 cu. yds., the strength test may be waived by the Architect or the Owner if adequate evidence of satisfactory strength is provided.
4. Report test results in writing to the Architect, Engineer, Contractor, and Ready-Mix Supplier on the same day that tests are made. Include in reports of compressive strength tests, project identification, date of concrete placement, name of Contractor, name of concrete supplier and truck number, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials, concrete temperature, density, slump, air-content, compressive breaking strength and type of break for both 7 day tests and 28 day tests.

D. Additional Tests:

- 1. Additional tests of in-place concrete will be made when test results indicate possible concrete deficiency as judged and directed by the Architect.
- 2. Compression tests on cored cylinders complying with ASTM C42, or load testing specified in ACI 318, or other acceptable non-destructive testing methods will be used. The Contractor shall pay for such tests conducted, and any other additional testing as may be required, whether or not concrete is accepted.

E. Evaluation of Quality Control Tests:

- 1. Compressive strength test for laboratory-cured cylinders will be considered satisfactory if the averages of all sets of three consecutive compressive strength tests results equal or exceed the 28-day design compressive strength of the type of class of concrete; and no individual strength tests falls below the required compressive strength by more than 500 psi.
- 2. If the compressive strength tests fail to meet the minimum requirements specified, the concrete represented by such test will be considered deficient in strength and subject to additional testing as herein specified, or removal and replacement of the concrete which the test represents.

3.3 SLAB FINISHING TOLERANCES:

- A. Slope to Drain: 1/4 inch per foot.
- B. Scratched Finish: Class CX not exceeding 1/2" in 10' or not exceeding F_F of 15 (flatness) and F_L of 13 (levelness) where not sloped per ASTM E1155.
 - 1. Location: Slabs to receive concrete topping.
- C. Floated Finish: Class BX not exceeding 5/16" in 10' or not exceeding F_F of 20 (flatness) and F_L of 15 (levelness) where not sloped per ASTM E1155.
 - 1. Location: Slabs to receive trowel finish, membrane or elastic waterproofing, or membrane or elastic roofing.
- D. Trowel Finish: Class AX not exceeding 3/16" in 10' or not exceeding F_F of 25-30 (flatness) and F_L of 20 (levelness) where not sloped per ASTM E1155.
 - 1. Location: All slabs exposed to view and surfaces that are to be covered with carpet, resilient flooring, paint, or other thin-film finish coating system.
- E. Trowel and Fine Broom Finish: Apply trowel finish specified above then immediately follow by slightly scarifying surface with fine brooming.
 - 1. Location: Surfaces to receive mortar setting beds, cementitious flooring or special flooring.
- F. Non-Slip Broom Finish: Apply trowel finish specified above then slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to the main traffic route.
 - 1. Location: Pool decks, equipment rooms where wet conditions may occur, and Custodial Work Stations.
- G. Repairs: Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Grind surface defects smooth such that defects will not telegraph through applied floor system.
- H. Testing: Slabs will be considered acceptable if slabs meet specified tolerances using one of the two following methods. The Owner may require that either one of the following methods be utilized for the project.
 - 1. ACI 117: Per required Class finish when tested with a 10' straightedge placed on the surface at not less than two different right angles.
 - 2. ASTM E1155: Tolerances as specified.

REVIEW TOLERANCES TO ENSURE REQUIREMENTS ARE APPROPRIATE TO USE OF SPACE AND TYPE OF CONSTRUCTION. COORDINATE FLOOR DRAINS WITH SLOPED FLOORS. IF F_F - F_L SYSTEM SPECIFIED FULL ASSOCIATED CRITERIA TO BE INCLUDED FOR TESTING AND REFERENCE.

3.4 CURING (ACI 301 12.1):

- A. General: Apply specified curing compounds immediately after final finishing of slabs. Apply in quantities recommended by the manufacturer.

3.5 HARDENER (ACI 301 11.7.6):

- A. Apply metallic hardener according to manufacturer's instructions. Cure with clear curing and sealing compound.
- B. Apply mineral aggregate hardener according to manufacturer's instructions. Cure with clear curing and sealing compound.

END OF SECTION 03300