

BuildingName
The Description of the Project
P00000000 0000

SPECIFICATION DIVISION 3

NUMBER SECTION DESCRIPTION

DIVISION 03 CONCRETE

SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

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DIVISION 03 CONCRETE

SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

THIS SECTION HAS BEEN PRE-EDITED TO APPLY ONLY TO VERY SMALL PATCHING-TYPE PROJECTS ONLY. USE AIA MASTERSPEC SECTION 033000 "CAST-IN-PLACE CONCRETE" FOR MORE SUBSTANTIAL PROJECTS.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 01 Specification Sections, and other applicable Specification Sections, in particular the Related Sections listed below, apply to this Section.
- B. Related Sections:
 - 1. Section 079200 - Joint Sealants

1.2 SUMMARY

- A. Section includes:
 - 1. Cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

INCLUDE BELOW FOR LEED PROJECTS.
- B. Sustainable Design Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

"PRODUCT CERTIFICATES FOR CREDIT MR 5" SUBPARAGRAPH BELOW APPLIES TO LEED-NC, LEED-CS, AND LEED FOR SCHOOLS.

RETAIN "DESIGN MIXTURES FOR CREDIT ID 1.1" SUBPARAGRAPH BELOW IF FLY ASH, SLAG CEMENT, SILICA FUME, OR OTHER MATERIALS ARE USED AS PORTLAND CEMENT REPLACEMENTS FOR LEED CREDIT ID 1.1. TO ACHIEVE THIS CREDIT, REPLACEMENT MATERIALS MUST BE SUBSTITUTED FOR AT LEAST 40 PERCENT OF THE PORTLAND CEMENT THAT WOULD OTHERWISE BE USED.

- 2. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements. For each design mixture submitted, include an equivalent concrete mixture that does not contain portland cement replacements, to determine amount of portland cement replaced.
- C. Design Mixtures: For each concrete mixture.

1. Submit written report to Architect for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to Architect.
- D. Laboratory Reports: Submit two (2) copies of laboratory test or evaluation reports for concrete materials and mix designs.

1.4 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

PART 2 - PRODUCTS

2.1 FORMWORK

- A. Form Materials: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
1. Wood or metal forms, sufficient to withstand pressure of placed concrete without bow or deflection.

RETAIN BELOW IF DESIRED.

- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum, unless otherwise indicated on Drawings.
- C. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.2 CONCRETE, GENERAL

- A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:
1. "General Requirements."
 2. "Formwork and Formwork Accessories."
 3. "Reinforcement and Reinforcement Supports."
 4. "Concrete Mixtures."
 5. "Handling, Placing, and Constructing."
 6. "Lightweight Concrete."
- B. Comply with ACI 117.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

- C. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- D. Plain-Steel Wire: ASTM A 1064, as drawn.
- E. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

- B. Cementitious Materials:

TYPE I LISTED BELOW (TYPICAL PORTLAND CEMENT), TYPICAL. CONSIDER TYPE III (HIGH EARLY STRENGTH) FOR SELECT APPLICATIONS (COLD WEATHER CONDITIONS AND EARLY LOADING REQUIREMENTS, DOES NOT HELP WITH CURE TIME FOR FLOORING INSTALLATION)

- 1. Portland Limestone Cement: ASTM C 595, Type II, unless otherwise indicated.
- 2. Fly Ash: ASTM C 618, Class C or F.
- C. Normal-Weight Aggregate: ASTM C 33, selected and uniformly graded and as follows:
 - 1. Class: Severe weathering region, but not less than 3S for foundations and walls and not less than 4S for flatwork.
 - 2. Nominal Aggregate Size: In accordance with ACI 318.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494, Type A.
 - 2. Retarding Admixture: ASTM C 494, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- F. Water: ASTM C 94; potable.

TYPICALLY INCLUDE FOR EXTERIOR WORK AND INTERIOR TRENCHING. FIBER HELPS TO REDUCE SHRINKING AND CRACKING.

- G. Synthetic Fiber: Monofilament non-metallic polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.
- H. Prepackaged Concrete Mix for Project Site Mixing: Preblended mixture of Portland cement/Portland limestone cement and aggregates requiring only the addition of water with 28 day compressive strength of 4000 psi.
 - 1. Products:
 - a. Quikrete Concrete Mix No. 1101; Quikrete Companies.
 - b. Sakrete Concrete Mix; King Packaged Materials Company.

2.5 RELATED MATERIALS

EDIT LIST TO BE PROJECT SPECIFIC

- A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A, polyethylene, minimum 15 mils thick. Include manufacturer's recommended pressure-sensitive tape.
- B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- C. Self-Expanding Bentonite Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite, for adhesive bonding to concrete, 3/4 by 1 inch.
 - 1. Products:
 - a. Carlisle Coatings & Waterproofing, Inc.; MiraSTOP.
 - b. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
 - c. Greenstreak; Swellstop.
- D. Bonding Agent: ASTM C 1059, Type I, acrylic emulsion.
 - 1. Product: Polyweld; Chem-Masters, or equivalent.
- E. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces:

SELECT TYPES FROM TWO OPTIONS IN SUBPARAGRAPH BELOW BASED ON SERVICE LOADINGS.

- 1. Types IV and V, for bonding hardened or freshly mixed concrete to hardened concrete.
- 2. Product: EUCO 352 or 452; Euclid Chemical Company, or equivalent.

2.6 CURING MATERIALS

- A. Water: Potable.

BELOW IS CURING ONLY.

- B. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 - 1. VOC Content: 200 g/L or less.
 - 2. Products:
 - a. Dayton Superior Corporation; Clear Cure WB (J7WB).
 - b. Euclid Chemical Company (The); Tammscure WB 30.
 - c. Meadows, W. R., Inc.; 1100 Clear.

BELOW IS CURING AND SEALING COMPOUND. CONSIDER SEALING EXPOSED CONCRETE TO PROVIDE A MORE DURABLE FINISH.

- C. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 - 1. VOC Content: 100 g/L or less.
 - 2. Products:
 - a. Dayton Superior Corporation; Clear & Seal EF 1315
 - b. Euclid Chemical Company (The); Super Aqua Clear VOX.
 - c. Meadows, W. R., Inc.; Vocomp-30.

2.7 CONCRETE MIXTURES

- A. Comply with ACI 301.
- B. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 3000 psi at 28 days, unless otherwise indicated.
 - 2. Maximum W/C Ratio: 0.48.
 - 3. Fly Ash: Maximum 25 percent by weight of cementitious material.
 - 4. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture, plus or minus 1 inch.
 - 5. Air Content: Use air-entraining admixture in all concrete; maintain within range permitted by ACI 301.
 - a. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.
 - b. Provide not less than 4 percent nor more than 8 percent entrained air for concrete exposed to freezing and thawing.
 - c. Provide from 2 percent to 4 percent for all other concrete.
- C. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate but not less than a rate of 1.5 lb/cu. yd.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, [**and ASTM C 1116/C 1116M (for fiber reinforced concrete)**] and furnish batch ticket information.
 - 1. When material temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 - 2. When material temperature exceeds 95 deg F, material is unsuitable for installation.
- B. Project-Site Mixing: Use prepackaged concrete mix that requires only the addition of water at project site. Mix prepackaged concrete mix and water in appropriate drum-type batch machine mixer.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Notify Owner's Representative 48 hours before placing concrete. Do not place concrete before Architect has approved completed reinforcement installation.

3.2 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

INCLUDE BELOW IF DESIRED.

1. Provide chamfer strips in the corners of concrete forms to produce beveled corners on walls and columns which will be exposed to view in finished construction.

3.3 FORMWORK REMOVAL

- A. Forms may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained. And as follows:

1. Do not remove formwork until cylinder break test indicates concrete has reached 2500 psi strength.

3.4 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.5 VAPOR-RETARDER INSTALLATION

- A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.

1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and re-seal vapor retarder before placing concrete.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces. Exterior exposed concrete slab on grade pavement contraction joints shall be hand tooled/grooved, unless otherwise indicated.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

3.8 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment according to ACI 301.

INCLUDE BELOW IF BONDING AGENT REQUIRED

- D. Application of Bonding Agent: Clean existing surfaces free of dirt, oil, grease and cleaning agents. Apply bonding agent in accordance with manufacturer's directions. Do not allow bonding agent to puddle in low spots. Place new concrete within time limits recommended by bonding agent manufacturer.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding 1/2 inch.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
 1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- E. Floor Slab Flatness: Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

SELECT ONE OF THE FOLLOWING TWO PARAGRAPHS.

- 1. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

CRITERIA ABOVE APPLY TO FLOORS TO RECEIVE THINSET TILE OR RESILIENT FLOORING. CRITERIA BELOW APPLY TO CARPETED FLOORS. USUALLY SELECT ABOVE AND DELETE BELOW. SEE MASTERSPEC EVALUATION SHEETS FOR ADDITIONAL EXPLANATION. NOTE THAT EVEN USING THE ABOVE CRITERIA THERE MAY STILL BE A NEED FOR FLOOR LEVELING FOR THINSET OR RESILIENT TILE DUE TO CONCRETE CURLING AND RIGID ACCEPTANCE CRITERIA BY FLOORING CONTRACTORS. CONSIDER INCLUDING AN ALLOWANCE IN DIV. 03 OR 09 SECTIONS FOR FLOOR PREPARATION.

- 2. Flatness and Levelness Criteria: overall values F(F) 25, and minimum levels of flatness F(F) 17 flatness tolerance; overall values of levelness F(L) 20, and minimum values of levelness F(L) 15 levelness tolerance, when tested in accordance with ASTM E 1155.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 308, ACI 306.1 for cold-weather protection and with ACI 305 for hot-weather protection during curing.
- B. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- C. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
- D. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
- E. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

3.14 CONCRETE WASHOUT

A. Do Not Discharge concrete/grout washout into storm drains, catch basins, the sanitary sewer system, ditches, or surface waters. Perform washing of concrete trucks and materials clean-up in designated areas or an approved off site location. Use as little water as necessary.

1. See Division 01, Section 015000 - Temporary Facilities and Controls for additional Concrete and Grout Washout requirements.

END OF SECTION 033053