

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

SUMMARY

This Section includes cast-in-place concrete, including reinforcement, concrete materials, mix design, placement procedures, and finishes.

See Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.

Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

MATERIALS

Formwork: Furnish formwork and form accessories according to ACI 301.

Steel Reinforcement:

Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

Concrete Materials:

Portland Cement: ASTM C 150, Type I or II.

Normal-Weight Aggregate: ASTM C 33, uniformly graded, not exceeding 1-1/2-inch (38-mm) nominal size.

Water: Complying with ASTM C 94.

Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

Admixtures:

Air-Entraining Admixture: ASTM C 260.

Water-Reducing Admixture: ASTM C 494, Type A.

Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

Vapor Retarder: Multi-ply reinforced polyethylene sheet, ASTM E 1745, Class C, not less than 7.8 mils (0.18 mm) thick; or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick.

Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 (4.75-mm) sieve and 10 to 30 percent passing a No. 100 (0.15-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

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Curing Materials:

Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

CONCRETE MIXES

Comply with ACI 301 requirements for concrete mixtures.

Prepare design mixes, proportioned according to ACI 301, for normal-weight concrete determined by either laboratory trial mix or field test data bases, as follows:

Compressive Strength (28 Days): 3000 psi (20.7 MPa).

Slump: 4 inches (100 mm).

Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 6.0 percent within a tolerance of plus 1.0 or minus 1.5 percent.

Air content of trowel-finished interior concrete floors shall not exceed 3.0 percent.

Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m).

CONCRETE MIXING

Ready-Mixed Concrete: Comply with ASTM C 94.

When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

INSTALLATION, GENERAL

Formwork: Design, construct, erect, shore, brace, and maintain formwork according to ACI 301.

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

Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

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Steel Reinforcement: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

Joints: Construct joints true to line with faces perpendicular to surface plane of concrete.

Construction Joints: Locate and install so as not to impair strength or appearance of concrete, at locations indicated or as approved by Architect.

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 the concrete thickness, as follows:

Tolerances: Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

CONCRETE PLACEMENT

Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

Consolidate concrete with mechanical vibrating equipment.

FINISHING FORMED SURFACES

Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch (6 mm) in height rubbed down or chipped off.

Apply to concrete surfaces not exposed to public view.

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. Completely remove fins and other projections.

Do not apply rubbed finish to smooth-formed finish.

Apply smooth-rubbed finish, defined in ACI 301, to smooth-formed finished concrete.

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.

FINISHING UNFORMED SURFACES

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

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 the surface.

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Do not further disturb surfaces before starting finishing operations.

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, built-up or membrane roofing, or sand-bed terrazzo.

Trowel Finish: Apply a hard trowel finish 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.

CONCRETE PROTECTION AND CURING

General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection, and follow recommendations in ACI 305R for hot-weather protection during curing.

Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions occur before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

Cure formed and unformed concrete for at least seven days as follows:

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.

END OF SECTION 03300