

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cast-in-place concrete building frame members, floors, shear walls, elevator shaft walls, foundation walls, footings, and supported slabs.
- B. Floors and slabs on grade.
- C. Control, expansion, and contraction joint devices associated with concrete work, including joint sealants.
- D. Equipment pads, light pole base, flagpole base, thrust blocks, and manholes.

1.2 REFERENCES

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- B. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete
- C. ACI 301 – Specifications Structural Concrete for Buildings
- D. ACI 302.2R - Guide for Concrete Floor and Slab Construction
- E. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete
- F. ACI 305R - Hot Weather Concreting
- G. ACI 306R - Cold Weather Concreting
- H. ACI 308.1 - Standard Specification for Curing Concrete
- I. ACI 318 - Building Code Requirements for Structural Concrete
- J. ACI 347 - Guide to Formwork for Concrete
- K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- L. ASTM C33/C33M - Standard Specification for Concrete Aggregates
- M. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete
- O. ASTM C150/C150M - Standard Specification Portland Cement
- P. ASTM C260/C260M - Standard Specification Air Entraining Admixtures for Concrete
- Q. ASTM C330/C330M - Standard Specification Light Weight Aggregates for Structural Concrete
- R. ASTM C494/C494 - Standard Specification for Chemical Admixtures for Concrete
- S. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcinated Natural Pozzolan for Use in Concrete
- T. ASTM C948 – Standard Test Method for Dry and Wet Bulk Density, Water Absorption and Apparent Porosity of Thin Sections of Glass-Fiber-Reinforced Concrete
- U. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
- V. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- W. ASTM D1751 - Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- X. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- Y. ASTM D6690 – Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavement

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Z. FBC - Florida Building Code

AA. Florida Department of Transportation - Standard Specifications for Road and Bridge Construction

BB. ASCE 7 – Minimum Design Loads for Buildings and other Structures.

1.3 RELATED SECTIONS

A. 31 20 00 Earth Moving

B. 31 31 16 Termite Control

C. 03 11 00 Concrete Formwork

D. 07 26 00 Vapor Retarders

1.4 SUBMITTALS FOR REVIEW and INFORMATION

A. Section 01 33 00 Submittals Procedures

B. Product Data: Provide data on joint devices, attachment accessories, admixtures, curing compound, sealers, and integral coloring.

C. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.

D. Samples: Submit two 12" long samples of expansion/contraction joint and control joint.

E. Shop Drawings:

1. Submit drawings indicating the locations of all joints in the concrete, construction joints, expansion joints, and contractions joints.

2. Include concrete placement schedule, method, sequence, quantities, location, and boundaries.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 77 00 Contract Closeout: Procedures for submittals

B. Accurately record actual locations of embedded utilities and components concealed from view.

1.6 DESIGN REQUIREMENTS

A. Design in conformance with Florida Building Code, ACI 318, and ACI 301.

B. Provide expansion joints, control joints, construction joints, and isolation joints to prevent uncontrolled stress cracks in the structure and according to the latest engineering standards.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Mix and deliver ready mixed concrete in accordance with ASTM C94/C94M.

C. Maintain one copy of each document on site.

D. Acquire cement and aggregate from same source for all work.

E. Conform to ACI 305R when concreting during hot weather.

F. Conform to ACI 306R when concreting during cold weather.

1.8 MOCK-UP

A. Comply with the requirements of section 01 40 00 Quality Control, Requirements for mock-up.

B. Construct and erect a field sample for architectural concrete surfaces receiving special treatment or finish as result of formwork.

C. Sample Panel: Sufficient size to indicate special treatment or finish required.

D. If requested by A/E, cast concrete against sample panel.

1. Obtain acceptance of resultant surface finish prior to erecting formwork.

E. Use the approved sample panel for basis of quality for the finished work.

1. Keep sample panel exposed to view for duration of concrete work.

F. Locate where directed.

G. Mock-up may not remain as part of the Work.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal, Portland type
- B. Fine and Coarse Aggregates: ASTM C33/C33M
- C. Lightweight Aggregate: ASTM C330/C330M
- D. Water: Clean and not detrimental to concrete
- E. Glass Fiber Reinforcement: ASTM C948

2.2 ADMIXTURES

- A. Air Entrainment: ASTM C260/C260M
- B. Chemical: ASTM C494/C494M
 - 1. Water Reducing - Type A
 - 2. Retarding - Type B
 - 3. Accelerating - Type C
 - 4. Water Reducing and Retarding - Type D
 - 5. Water Reducing and Accelerating - Type E
 - 6. Water Reducing, High Range - Type F
 - 7. Water Reducing, High Range and Retarding - Type G
 - 8. Flowing Concrete - ASTM C1017/C1017M
- C. Fly Ash: ASTM C618

2.3 ACCESSORIES

- A. Bonding Agent: Polymer resin emulsion, Polyvinyl Acetate, Latex emulsion, 2-component-modified epoxy resin, Non-solvent two-component polysulfide epoxy, Mineral filled polysulfide polymer epoxy, Mineral filled polysulfide polymer epoxy-resin, and Versamid cured epoxy.
- B. Vapor Barrier: Flexible, sandwich of heavy paper, reinforced fibers, and two layers of inert polyethylene, formed into one layer under heat and pressure. (Perm rating of 0.1)
- C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

- A. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt
- B. Joint Filler: ASTM D1752; Closed cell polyvinyl chloride foam, resiliency recovery of 95% if not compressed more than 50% of original thickness
- C. Construction Joint Devices: Integral galvanized steel; formed to tongue and groove profile, with removable top strip exposing sealant trough, ribbed steel spikes with tongue to fit top screed edge.
- D. Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient elastomeric filler strip with a Shore A hardness of 35 to permit plus or minus 25% joint movement with full recovery; extruded aluminum cover plate, of longest manufactured length at each location, flush mounted; color as selected.
- E. Sealant and Primer: Type, as specified in Section 07 92 00
- F. Sealant: Cold applied

2.5 CONCRETE MIX

- A. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94/C94M
- B. Select proportions for normal weight concrete in accordance with ACI 301 Method 3

- C. Select aggregate proportions for lightweight concrete in accordance with ASTM C330/C330M
- D. Use accelerating admixtures in cold weather only when approved by A/E
 - 1. Use of admixtures will not relax cold weather placement requirements.
- E. Use set retarding admixtures during hot weather only when approved by A/E
- F. Add air-entraining agent to normal weight concrete mix for work exposed to exterior

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Section 01 31 00.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- B. In locations where doweling new concrete to existing work, drill holes in existing concrete; insert steel dowels and pack solid with non-shrink grout.
- C. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.
- D. Remove all foreign matter and water from forms or structural excavations.

3.3 FORMWORK

- A. Conform to ACI 347
- B. Form foundations, earth forms not allowed, unless Engineer of record and the Soil's report can provide information to building official showing the soil conditions are conducive to earth forms.

3.4 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.
- B. Notify A/E minimum 24 hours prior to commencement of operations
- C. Ensure reinforcement, inserts, embedded parts, formed expansion, and contraction joints are not disturbed during concrete placement.
- D. Treat for termites per section 31 31 16.
- E. Install vapor retarder under interior slabs on grade, lap joints minimum 6", and seal watertight by taping edges and ends.
- F. Repair vapor retarder damaged during placement of concrete reinforcing.
 - 1. Repair with vapor retarder material; lay over damaged areas minimum 6" and seal watertight.
- G. Separate slabs on grade from vertical surfaces with joint filler.
- H. Place joint filler in floor slab pattern placement sequence.
 - 1. Set top to required elevations.
 - 2. Secure to resist movement by wet concrete.
- I. Extend joint filler from bottom of slab to within ¼" of finished slab surface.
 - 1. Conform to Section 07 92 00 for finish joint sealer requirements.
- J. Install joint devices in accordance with manufacturer's instructions.
- K. Install construction joint devices in coordination with floor slab pattern placement sequence.
 - 1. Set top to required elevations.
 - 2. Secure to resist movement by wet concrete.

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- L. Install joint device anchors.
 - 1. Maintain correct position to allow joint cover to be flush with floor and wall finish.
 - M. Install joint covers in one-piece length, when adjacent construction activity is complete.
 - N. Apply sealants in joint devices in accordance with Section 07 92 00.
 - O. Maintain records of concrete placement.
 - 1. Record date, location, quantity, air temperature, and test samples taken.
 - P. Place concrete continuously between predetermined expansion, control, and construction joints.
 - Q. Do not interrupt successive placement; do not permit cold joints to occur.
 - R. Place floor slabs in checkerboard or saw cut pattern indicated.
 - S. Saw cut joints within 24 hours after placing.
 - 1. Use $\frac{3}{16}$ " thick blade, cut into $\frac{1}{4}$ depth of slab thickness.
 - T. Screed floors and slabs on grade level, maintaining surface flatness of maximum $\frac{1}{8}$ " in 10'.
- 3.5 SEPARATE FLOOR TOPPINGS
- A. Prior to placing floor topping, roughen substrate concrete surface, and remove deleterious material, broom and vacuum clean.
 - B. Place dividers, edge strips, reinforcing, and other items being cast in the pour as required.
 - C. Apply bonding agent to substrate in accordance with manufacturer's instructions.
 - D. Place concrete floor toppings to required lines and levels.
 - E. Place topping in checkerboard panels with dimensions not exceeding 20'.
 - F. Joint spacing in the topping should be coordinated with joint spacing in the base slab.
 - G. Screen toppings level, maintaining surface flatness of maximum 1:1000.
- 3.6 CONCRETE FINISHING
- A. Provide formed concrete surfaces with exposed, concrete walls, columns, beams, joists, with smooth rubbed finish.
 - B. Finish concrete floor surfaces in accordance with ACI 301.
 - C. Wood-float the surfaces that receive quarry tile, ceramic tile, and terrazzo with full bed setting system.
 - D. Steel trowel surfaces that receive carpeting, resilient flooring, seamless flooring, thin-set quarry tile, and thin set ceramic tile.
 - E. Steel trowel surfaces scheduled to be exposed.
 - F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:50 nominal.
- 3.7 CURING AND PROTECTION
- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
 - B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - C. Cure floor surfaces in accordance with ACI 308.
 - D. Ponding: Maintain 100% coverage of water over floor slab areas continuously for 4 days.
 - E. Spraying: Spray water over floor slab areas and maintain wet for 7 days.
- 3.8 FIELD QUALITY CONTROL
- A. Architect, Owner, or Building Department may request field inspections per Section 01 40 00 1.7 Inspection Services
 - B. Provide free access to Work and cooperate with appointed firm.
 - C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

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- D. The Owner may perform tests of cement and aggregates to ensure conformance with specified requirements.
- E. Take three concrete test cylinders for every 150 cu yards or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Take one slump test for each set of test cylinders taken.

3.9 PATCHING

- A. Contractor shall allow A/E to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable; notify A/E upon discovery.
- C. Patch imperfections in accordance with ACI 301.

3.10 DEFECTIVE CONCRETE

- A. Defective concrete is concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. A/E shall determine the repair or replacement of defective concrete.
- C. Do not patch, fill, touch-up, repair or replace-exposed concrete except upon express direction of A/E for each individual area.

END OF SECTION