

SECTION 03 11 00

CONCRETE FORMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete formwork, shoring, bracing, and anchorage.
- B. Concrete formwork accessories.

1.2 RELATED SECTIONS

- A. Section 03 20 00 – Concrete Reinforcing.
- B. Section 03 30 00 – Cast-In-Place Concrete.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
 - 1. ACI 301 – Specifications for Structural Concrete.
 - 2. ACI 347 – Guide to Formwork for Concrete.
 - 3. AHA A135.4 – Basic Hardboard.
 - 4. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - 5. PS 1 – Construction and Industrial Plywood.

1.4 DESIGN REQUIREMENTS

- A. Design, engineer, and construct concrete formwork, shoring, and bracing in accordance with design and code requirements, resulting in cast-in-place concrete conforming to required shape, line, and dimension.

1.5 SUBMITTALS

- A. General: Submit in accordance with Division 01.
- B. Product Data: Submit manufacturer's descriptive literature and product specifications for the following:
 - 1. Forms for architectural cast concrete finish.
 - 2. Accessories:

- a. Chamfer strips.
 - b. Keyed construction joint.
 - c. Form ties.
 - d. Form release agent.
- C. Shop Drawings: Indicate dimensions, materials, bracing, and location of joints and ties.
- 1.6 QUALITY ASSURANCE
- A. Conform to ACI 347 for design, fabrication, erection, and removal of forms.
 - B. Field Samples: Provide only as requested by Architect.
 - C. Pre-Installation Meetings:
 - 1. Conduct pre-installation meeting in accordance with Division 01.
 - 2. Convene pre-installation meeting prior to commencing work of this Section.
 - 3. Coordinate work in this Section with work in related Sections.

PART 2 PRODUCTS

2.1 FORM MATERIALS

- A. Architectural Cast Concrete Finish:
 - 1. Phenolic-faced plywood (minimum 167 g/m² on both faces); minimum 5/8 inch thickness; conforming to PS 1 APA HDO Plyform Class II or better; sound, undamaged sheets with clean, true edges, joints taped.
- B. Smooth Concrete Concealed from View: Plywood; 5/8 inch minimum thickness; conforming to PS 1 APA B-B Plyform Class II or better.
- C. Concrete Concealed from View:
 - 1. 2x lumber, plywood conforming to PS 1 APA Plyform Class II or better, tempered concrete form hardboard conforming to AHA A135.4, or other acceptable material.

2.2 ACCESSORIES

- A. Chamfer Strips: Wood, metal, or rubber strips; size as shown on Drawings, minimum 3/4 inch by 3/4 inch.
- B. Expansion Joint Filler: Refer to Section 03 30 00.
- C. Foam Board Separation: Expanded polystyrene in size and thickness to suit application.
- D. Keyed Construction Joint: Minimum 24 gauge galvanized steel; shaped with formed key (minimum 1-1/2 inch) for load transfer; and with knockouts for dowel placement.

1. Basis-of-Design Product: G-33 Screed Key Joint by Dayton/Richmond Concrete Accessories, Miamisburg, OH; 800-745-3700; www.daytonrichmond.com. Provide the named product or accepted equal.
- E. Form Ties: Provide as indicated and as required.
1. Galvanized steel; adjustable length; cone type; snap-off type with 1 inch back break dimension; free of defects that could leave holes larger than 1 inch in concrete surface.
 2. Substitution: In lieu of galvanized steel ties, Contractor may use stainless steel form ties of equal or higher strength.
 - a. Stainless Steel Form Tie System:
 - 1) Stainless Steel Snap Tie, Product No. A-44 by Dayton Superior, Miamisburg, OH; 800-745-37000; www.daytonsuperior.com.
 - 2) Stainless Steel Snap Ties by Meadow Burke, Tampa, FL; 877-518-7665, www.meadowburke.com.
 - 3) Or accepted equal.
- F. Plastic Stakes: At Contractor's option, solid plastic stakes may be used in lieu of wood and steel stakes. Provide solid plastic stakes for use in areas with continuous vapor retarder.
1. Basis-of-Design Product: VaporStake™ by VaporStake LLC, Chino Hills, CA; 714-519-4211, www.vaporstake.com.
 2. Material: Non-corrosive, leak-resistant, solid PVC, with one pointed end and multiple pre-drilled holes for nailing; diameter and length as recommended by stake manufacturer, and as required by field conditions.
- G. Nails, Spikes, Lag Bolts, Through-Bolts, Anchors: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- H. Spreaders: Metal; use of wood spreaders will not be permitted.
- I. Form Release Agent: Commercially formulated form release agents that will not bond with, stain or adversely affect concrete surface, and will not impair subsequent treatment of concrete surfaces, nor impede the wetting of surfaces to be cured with water or curing compounds. Product shall meet the VOC requirements at the location of use.
1. Product: Duogard as manufactured by W.R. Meadows or accepted equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine job site conditions and verify field dimensions.
- B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

3.2 EARTH FORMS

- A. Concrete may be placed against cut earth where feasible, conforming to the following criteria:
 - 1. Earth form trenches shall be able to stand without caving in.
 - 2. Sluffage will not be permitted.
 - 3. When, in the opinion of the Building Official and Architect, soil conditions do not require formwork per CBC Section 1808A.8.5.
- B. Hand trim sides and bottoms of earth forms. Remove loose soil prior to placing concrete.

3.3 FORMWORK ERECTION

- A. Erect formwork, shoring, and bracing in accordance with ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit ease of dismantling and stripping and prevent damage to concrete during stripping.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval from Architect before framing openings not specifically indicated on Drawings.
- F. Perform electrical and mechanical work requiring concrete formwork under provisions of this Section.
- G. Stakes (wood and metal) used to support formwork or reinforcement, will not be permitted to occur within finished concrete work.
 - 1. Pulling of stakes and puddling concrete in after concrete placement will not be permitted.
 - 2. Locate non-plastic stakes appropriately to prevent embedment of stakes in the concrete after placement.
 - 3. Plastic stakes, when used in areas with vapor retarder, shall not be removed.
 - 4. Seal plastic stakes with vapor retarder manufacturer's sealing mastic in accordance with ASTM E1643 and Section 03 30 00 requirements.
 - a. Dip pointed side of plastic stake in mastic before driving through vapor retarder to seal the stake perimeter at penetration.

3.4 FORM RELEASE AGENT APPLICATION

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent.

- D. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS AND OPENINGS

- A. Locate and set in place items which will be cast directly into concrete.
- B. Coordinate work of other Sections such as but not limited to openings, slots, reglets, recesses, chases, sleeves, bolts, anchors and other inserts.
- C. Install accessories in accordance with manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.
- D. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

3.6 CONSTRUCTION JOINTS

- A. Refer to Section 03 30 00.
- B. Locate construction joints so as not to impair the strength of the structure and only at locations indicated on Drawings and as acceptable to Architect. Form keys in cold joints as shown or required.

3.7 UNDERSLAB VAPOR RETARDER

- A. Protect underslab vapor retarder from damage at all times.

3.8 FORMWORK CLEANING AND INSPECTION

- A. Inspect erected formwork, shoring and bracing to ensure that work is in accordance with formwork design and that supports, fastenings, wedges, ties, and embedded items are secure to prevent displacement and distortions.
- B. Clean forms and adjacent surfaces as formwork is erected and prior to concrete placement. Remove wood chips, sawdust, dirt, and other debris.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain through cleaning ports.
- D. Close temporary openings with tight fitting panels, flush with inside face of forms and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.9 ADJUSTMENTS

- A. When a concrete pour has been stopped for a sufficient length of time so that shrinkage or warp has separated the forms and the concrete, provide for form adjustment to draw the forms into firm contact with concrete before placing additional concrete. Take precautions to prevent any shoulder or ledge from being formed at a cold joint.

3.10 FORM REMOVAL

- A. Refer to Section 03 30 00.

- B. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- C. Remove forms progressively and in accordance with ACI 347.

3.11 FORM REUSE

- A. Forms in good condition may be reused.
- B. Clean and inspect forms prior to reuse. Do not re-use split, warped, delaminated, or otherwise damaged forms that will impair surface condition and quality of cast concrete exposed to view.
- C. Do not reuse wood formwork more than three times for concrete surfaces to be exposed to view. Do not patch formwork.

3.12 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 347.
- B. Concrete work out of alignment, level or plumb will be cause for rejection of the whole work affected and, if so rejected, such work shall be removed and replaced, as directed by Architect, at no cost to Owner.
- C. All concrete exposed to view, except as otherwise indicated and specified shall have a smooth finish of uniform texture, free from form marks or other visible irregularities and free from form coating, oils or other matter that will prevent bonding of patching work, painting or other finish materials.

END OF SECTION