

## SECTION 031100 - CONCRETE FORMING

## PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS: The General Conditions, any Supplementary General Conditions and Division 1, General Requirements, are hereby made a part of this Section as fully as if repeated herein.
- 1.2 SECTION INCLUDES
- A. Job-Built Formwork, Prefabricated Forms, Form Ties and Accessories; Design; Construction and removal of forms, including shoring, bracing, cribbing, and screeds.
1. Embedded Items: Provide accurate setting and placing of items built into the concrete to provide openings, recesses, attachment, or anchorage. Certain products are to be furnished as a part of this Contract and are specified in other sections.
  2. Formwork Design: Contractor shall hire a registered professional engineer who shall be responsible for the design of all temporary formwork including stripping procedures for concrete flat slabs, walls, columns, etc.
- 1.3 RELATED WORK
- A. Sections of Division 3, Concrete as well as all other sections involving interface with concrete work.
- 1.4 QUALITY ASSURANCE
- A. References: Comply with the following minimum standards:
1. ACI-347R94 (ANSI A 145.1) Recommended Practice for Concrete Formwork.
  2. ACI-318-95 (ANSI A 89.1) Building Code Requirements for Reinforced Concrete
  3. ACI-301-96 (ANSI A 138.1) Specification for Structural Concrete for Buildings.
  4. ACI-117-90 Standard Specifications for Tolerances for Concrete Construction and Materials.
  5. ASTM E-1155 Standard Method for Determining Floor Flatness & Levelness Using the F-Number System.
  6. ACI 302.1 R89 Guide for Concrete Floor and Slab Construction.
- 1.5 QUALITY CONTROL SUBMITTALS
- A. Certification: Form release materials will not discolor concrete and without removal from concrete are compatible with materials to be used for setting materials, adhesives, applied finishes, and coatings.
- 1.6 JOB CONDITIONS
- A. Design Loads: Do not place, handle or store products, equipment or other materials on structure, before concrete has reached its design strength and in such a manner as to not exceed design loads. Check with Structural Engineer for design loads of each area and review of construction loads. Any area damaged by construction operations must be repaired

or replaced at no costs.

## PART 2 - PRODUCTS

### 2.1 FORM MATERIALS

- A. Lumber: Western Wood Products or Southern Forest Products grading. Common or Utility grades for non-exposed surfaces. Structural or Construction grades for walers, braces and supports.
- B. Plywood: US Product Standard PA-1 "B-B (Concrete Form) Plywood" Class I, exterior grade or better, milled oiled and edge sealed, with each piece bearing legible inspection trademark.
  - 1. All form materials for exposed slabs, columns and spandrels shall be plastic coated or medium density.

### 2.2 ACCESSORIES: Furnish hairpin clips, bands, clamps, braces, adjustable shoring jacks, fasteners, form ties, etc., necessary to execute installation of formwork. No aluminum devices or fasteners (including nails) will be permitted.

- A. Form Ties: Non-corrosive, non-staining; minimum working strength as required by concrete sections being contained when full liquid concrete and construction loads; adjustable in length to permit complete tightening of forms and of such types as to leave no metal closer than 1-1/2" the surface, spacing as required to maintain formwork and finish concrete within tolerances and at a uniform spacing approved by the Architect, generally 24 inches on center.
- B. Form Release: Non-staining liquid which will impart a waterproof film to prevent adhesion of concrete and will not stain, cause imperfections, or leave a paint-impeding coating on the face of the concrete. When finished surface is to be painted or to receive other surface treatment, the material applied to form surfaces shall be compatible with the type of paint or surface treatment to be used.

## PART 3 - EXECUTION

### 3.1 DESIGN: Formwork and its supports shall carry adequately all liquid concrete, men, and equipment, in absolute safety under loads imposed during construction.

- A. Design and Placement of Forms: ACI 347, Chapter 2: Design and ACI 318, Chapter 6: Formwork, Embedded Pipes, and Construction Joints.
- B. Tolerances: ACI-347 paragraphs 3.3 and 3.4, and ACI 117 will be considered absolute maximum, unless otherwise indicated.

### 3.2 CONSTRUCTION: Construct forms to slopes, lines and dimensions shown, plumb and straight and sufficiently tight to prevent leakage; securely brace and shore forms to prevent displacement and to safely support construction loads. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts and other features required in work.

- A. Forms for exposed finish concrete shall be furnished in the largest practicable sizes to minimize the number of joints and to conform to the joint system shown on the drawings.
- 3.3 BUILT-IN EMBEDDED ITEMS: Provide for installation of fastening devices required for attachment of other work. Properly locate in cooperation with other trades; secure and maintain in position before concrete is poured.
- A. Coordination: Ascertain requirements and extent, location and details of items to be embedded or built into concrete. Templates or setting diagrams shall be furnished by the various trades or manufacturers when items are to be set, embedded or blocked -out by this trade. Ensure that anchors reach adequate penetration and engage with reinforcement. Temporary support shall not be evident when forms are removed.
- B. Work by Others: Allow sufficient time between erection of forms and placing of concrete for various trades to properly set embedded items required for their work. Maintain in position and protect all (provided and placed in the forms by the various trades) until concrete is completed.
1. Conduits: Cannot be run in the concrete.
- C. Anchorages: Items required to be set as a part of this work generally include: Inserts, sleeves, hangers, ties, anchors, bolts, base & leveling plates, frames, angle guards, dowels, anchor slots, reglets, nailing strips, blocking, grounds, sleepers, and adjustable wedge inserts. Refer to Miscellaneous Metals and Masonry Sections for certain products.
1. Accurately locate utilizing a level or transit. Set in position with proper penetration, exposure and engagement with reinforcement. Maintain in position by double bolting to formwork or wood templates.
  2. Plates, Frames, Sleeves, Blocking and Miscellaneous Metals: Set item with perimeter flush with concrete surface. Ensure adequate bonding, anchorage and protection of dissimilar materials. Items shall have a thickness of not less than 1/8" (i.e. no cans, cups, etc.) Prevent leakage and infiltration of mortar into openings.
- 3.4 LINES AND LEVELS: Check the lines and levels of the completed formwork for all exposed columns, grade beams, walls, etc., before concrete is placed. Make whatever corrections or adjustments to the formwork to correct any deviations which exceed specified tolerances allowed.
- 3.5 CLEANING FORMWORK: Force debris to and out of clean-out panels with a jet stream of compressed air. Clean-out all debris. Hose form thoroughly with water and air-jet out any standing water when weather permits.
- A. If concrete placing does not commence immediately after cleaning, cover openings in forms with tarpaulins.
- 3.6 FORM REMOVAL: Remove forms in accordance with ACI 301, Paragraphs 2.3.3 and 2.3.4; ACI 318 paragraph 6.2, and ACI 347 paragraphs 3.7 and 3.8. Removal strength of concrete for stripping shall be determined in accordance with ACI 301, paragraph 4.7.

- A. Appearance: No steel spreaders, ties, or other metal, shall project from or be visible on any concrete surface.
- B. Shoring: Leave shoring in place until concrete member will safely support its own weight, plus any loads that may be placed upon it. Any reshoring done must meet the requirements of ACI 347.

END OF SECTION 031100