SECTION 03 11 00
CONCRETE FORMWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

1.2 FORMWORK FOR CONCRETE
- A. Related accessories

1.3 REFERENCES
- A. ACI 301 - Specifications for Structural Concrete Buildings
- B. ACI 318 - Building Code Requirements for Structural Concrete
- C. ACI 347 - Guide to Formwork for Concrete
- D. ACI SP-4: Formwork for Concrete
- E. ASME A17.1 - Safety Code for Elevators and Escalators
- F. 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
- G. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
- H. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

1.4 SYSTEM DESCRIPTION
- A. Concrete Formwork: For surfaces of cast-in-place concrete to be unexposed or to receive rubbed finish.
- B. Form footings and slabs on grade, earth forming are not allowed.
- C. Design/Performance Requirements: Design, engineering and construction of formwork and shoring is the responsibility of the Contractor.
  1. Design formwork with sufficient strength to withstand forces due to placement and vibration and sufficient rigidity to maintain specified tolerances.
  2. Design loads, lateral pressure, and allowable stresses in accordance with ACI 347.

1.5 SUBMITTALS
- A. Product Data: Proprietary materials and items, including forming accessories, water stops, joint systems, and others
- B. Structural Calculations (Threshold Buildings):
  1. Prepare and submit complete design calculations, plans, and details for shoring and re-shoring procedures, indicating conformance to specified performance and design criteria; signed, and sealed by a professional engineer registered in the State of Florida.
  2. Submit calculations for review information only, will not check for accuracy

PART 2 PRODUCTS

2.1 FORM MATERIALS
- A. Concrete Forms for Beams, Columns, and Slabs:
  1. New or properly reconditioned material designed to conform to requirements of ACI SP-4 and to support wet concrete without deflection.
  2. Plywood Panels: PS-1 B-B plywood, Class 1, EXT-APA, sanded, mill oiled, and edge sealed.
- B. Structural Concrete Forms for Joists: New or properly reconditioned removable 18-gauge steel or fiberglass pan forms with tapered end closures.
- C. Cylindrical Column Forms:

1. Metal, fiberglass reinforced plastic, or paper or fiber tubes.
2. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection.
    a. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.

2.2 RELATED MATERIALS

A. Vapor Retarder: Related section 07 26 00.
B. Form Coatings: Colorless commercial formulation form release and sealer compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
C. Form Ties: Adjustable length, removable or snap off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal, 1½" break back, and maximum hole left 1¼" diameter.
D. Bevels and Rustications: Wood strips milled to shapes indicated or formed rigid plastic strips.
E. Dovetail Anchor Slots: 24-ga. galvanized steel with release tape sealed slots and bent tab anchors.
F. Flashing Reglets shall be 16-oz. copper with release tape sealed slots and alignment splines at end joints.
G. Construction Joints shall be 24-ga. galvanized steel keyway form type with knockout holes spaced 6" o. c. to receive doweling.
H. Carton Forms: Fiberboard void boxes capable of supporting min. load of 600 lbs./sq ft
I. Form Joint System for Architectural Concrete Forms:
    1. Gaskets shall be closed cell foam tape - Source Product/Mfg. - No. 4016 by 3M.
    2. Caulk: Rubberized, non-staining silicone compound GE Product/Mfg. - No. 1201.
    3. Tape: 2-mil Mylar - source Product/Mfg. - No. 371 by 3M.
J. Mastic Water stop: Preformed plastic or butyl resin strips. Source Products/Mfg:
    1. Synko-Flex/Synko-Flex Products Co.
    2. ConSeal CS-102/Concrete Sealants
K. Joint Fillers: Pre-molded mastic strips, asphalt impregnated, ASTM D1751.
L. Fasteners and Anchorages: Nails, spikes, bolts, lag bolts, and other types sized as required to maintain formwork in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and measurements required before proceeding with formwork.
B. Coordinate the installation of joint materials, reinforcing steel, and vapor retarders with placement of forms.

3.2 INSTALLATION TOLERANCES

A. Allowable tolerances for Structural Concrete Forms shall comply with ACI 301 and 347.
B. Allowable tolerances for camber in slabs and beams shall comply with ACI 301.
C. Allowable tolerances for plumbness in elevator shafts shall comply with requirements of ASME A17.1.

3.3 ERECTION

A. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that may occur before permanent bracing can support such loads.
B. Construction:

1. Construct formwork so finished concrete members and structures are of correct size, shape, alignment, elevation, and position.
2. Build formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
3. Provide openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required.
4. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
5. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
6. Provide temporary openings at bottoms of forms to facilitate cleanout and inspection.
    a. Close openings with tight fitting panels and neat joints so that joints will not be apparent in exposed concrete surfaces.

C. Chamfer exposed corners and edges as indicated, or if not indicated, provide ¾" x ¾".
D. Provide openings in concrete formwork to accommodate work of other trades.
    1. Determine size and location of openings, recesses, and chases from trades providing such items.
    2. Accurately place and securely support items built into forms.
E. Thoroughly clean forms and adjacent surfaces to receive concrete.
    1. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete.
    2. Retighten forms and bracing after concrete placement to eliminate mortar leaks and maintain proper alignment.
F. Construction Joints:
    1. Locate and install formed construction joints at rustications or, if not indicated, locate so as not to impair strength and appearance of the structure, and as approved by the A/E.
    2. Provide keyways at least 1½" deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
    3. Place construction joints perpendicular to main reinforcement.
        a. Continue reinforcement across construction joints, except as otherwise indicated.
G. Isolation Joints in Slabs-on-Ground: Construct continuous joint filler at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundations walls, grade beams, and elsewhere as indicated.
H. Water stops: Provide mastic water stops in construction joints of below grade walls and in joints between below grade slabs and walls.
    1. Install water stops to form continuous diaphragm in each joint.
    2. Fabricate field joints in water stops in accordance with manufacturer's printed instructions.
I. Form Coatings: Apply after erecting forms and sealing the joints but prior to placing reinforcing steel, anchoring devices, and embedded items.
    1. Seal surfaces of wood rustications with two coats of form sealer.
    2. Spray-apply one coat of release agent to formwork faces except concrete surfaces scheduled to receive special finishes or special coatings.
    3. Coat steel forms with a non-staining, rust- preventative form oil to protect against rusting.
        a. Rust-stained steel formwork is not acceptable.
J. Embedded Items: Set and build into work anchorage devices and other embedded items required for other work attached to, or supported by, cast-in-place concrete.

K. Reglets: Install to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
L. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E1643 and manufacturer's written instructions.

3.4 RE-USE OF FORMS
A. Clean re-used forms of concrete matrix residue, repair, and patch as required returning forms to acceptable surface condition.
B. Recoat contact surfaces of forms with a form-coating compound as specified.

3.5 SHORES AND SUPPORTS
A. Comply with ACI 347 for shoring and re-shoring in multistory construction, for beams, girders, raised slabs, and as herein specified.
B. Space all shoring in such a manner as to prevent any floor or member from excessive loading or inducing stress in any of the concrete members.
1. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.

3.6 REMOVAL OF FORMS AND SHORING
A. Remove formwork and shoring progressively and in accordance with ACI 301 and ACI 347 to prevent unbalanced loads on the structure.
B. Do not remove shoring and formwork until members have acquired strength as specified by the engineer of record.
1. Re-shore structural members as original shores are removed as specified by the engineer of record.
C. In the event the Contractor wishes to remove formwork at an earlier time than specified, the Contractor shall pay for and have testing laboratory obtain two additional concrete test cylinders to confirm strength requirement for early form removal.

END OF SECTION