

SECTION 03100
CONCRETE FORMWORK

PART 1- GENERAL**1.01 RELATED DOCUMENTS**

- A. Related Documents: General and Supplemental Conditions of the Contract, Division 1 – General Requirements, and Drawings are collectively applicable to this Section.

1.02 SECTION INCLUDES

- A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
- B. Openings for other affected work.
- C. Form accessories.
- D. Stripping forms.

1.03 SYSTEM DESCRIPTION

- A. Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

1.04 QUALITY ASSURANCE

- A. Construct and erect concrete formwork in accordance with ACI 301 and 347.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable building code.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials under provisions of Section 01600.
- B. Deliver materials in manufacturer's packaging with installation instructions.
- C. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

1.07 COORDINATION

- A. Coordinate work under provisions of Section 01300.
- B. Notify responsible trades of schedules of concrete pours so as to allow adequate time for installation and coordination of their work.
- C. Coordinate the Section with other Sections of work which require attachment of components to formwork.
- D. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Architect / Engineer before proceeding.

- E. Verify plumbing, conduit, raceways, ducts, etc. are installed prior to concrete placement.

PART 2- PRODUCTS

2.01 WOOD FORM MATERIALS

- A. Plywood: solid one side grade; sound, undamaged sheets with clean, true edges.
- B. Lumber: No.2 or better, grade stamp shall be clearly visible.

2.02 PREFABRICATED FORMS – MATERIALS

- A. Preformed Steel Forms: Minimum 16 gage matched, tight fitted, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

2.03 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off metal or adjustable length; cone type; 1 inch break back dimension; free of defects that will leave holes no larger than 1-1/4 inches diameter in concrete surface.
- B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or affect bond of subsequent surface finish, or impair natural bonding or color characteristics of coating intended for use on concrete;
 - 1. Acceptable Manufacturer's: Subject to compliance with requirements herein, provide products from one of the following:
 - a) Nox-Crete.
 - b) Symons.
- C. Fillets for Chamfered Corners and other justifications: Wood strips, sizes and configurations as detailed.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete
- E. Form Sealer
 - 1. Acceptable Manufacturer's: Subject to compliance with requirements herein, provide products from one of the following:
 - a) Formfilm by W.R. Grace.
 - b) Synthex by Industrial Synthetics Corporation.
 - c) Pre-Form by Nox-Crete Co.
 - d) Substitutions: Submit in accordance with Section 01600.
- F. Waterstop: 1 inch by 3/4 inch size, comprised of butyl rubber and bentonite clay.
 - 1. Acceptable Manufacturer's: Subject to compliance with requirements herein, provide products from one of the following:
 - a) Volcay Waterstop-RX by American Colloid Co.
 - b) Synco-Flex by Synco-Flex Products, Inc.
- G. Formed Construction Joints: Galvanized steel, tongue and groove type, knock-out holes spaced at 6 inches on center, with anchors.
- H. Void Forms:

1. Composition: Moisture resistant, corrugated, laminated, fiberboard; with interior fabrication of a uniform, cellular, configuration, composed of non-wax impregnated components.
 2. Depth: As indicated on Drawings.
 3. Profile: Rectangular shape in cross section.
 4. Strength: Capable of sustaining a working load of 1,000 psf.
 5. Acceptable Manufacturers:
 - a) SureVoid Products Inc., Englewood, CO. 800-458-5444
 - b) Substitutions: Submit in accordance with Section 01600.
- I. Side Retainers: Retainers shall be installed, continuously, on either side of the grade beam and void forms to retain the cavity after the void forms biodegrade. Retainers shall extend a minimum of 2 inches above the bottom of grade beam and 2 inches into the soil below the void form.
1. Strength: Capable of sustaining a lateral earth pressure equivalent to 500 psf.
 2. Acceptable Manufacturers:
 - a) SureVoid Products Inc., Englewood, CO. 800-458-5444
 - b) Substitutions: Submit in accordance with Section 01600.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and measurements before proceeding with formwork.

3.02 EARTH FORMS

- A. Earth forms are not permitted, except for footings where soil is conducive and approval is received from authorities having jurisdiction and structural engineer.
- B. Hand-trim sides and bottoms of earth forms; remove loose dirt prior to placing concrete.

3.03 ERECTION

- A. Minimize form joints. Symmetrically align joints and make watertight to prevent leakage of mortar.
- B. Arrange and assemble formwork to prevent stripping, so that concrete is not damaged during its removal.
- C. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.
- D. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- E. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.
- F. Provide chamfer strips on external corners of beams, and columns where they will be exposed to view after completion of construction.
- G. Do not displace or damage vapor barrier placed by Section 03300.

- H. Construct formwork to maintain tolerances in accordance with ACI 301.
- I. Construct form full depth of concrete to be placed.
- J. Install void forms in locations indicated in accordance with manufacturer's recommendations.

3.04 APPLICATION OF FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
- B. Do not apply form release agent where concrete surfaces are schedule to receive special finishes which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.
- C. Do not apply form release agent where wood graining characteristics are required on finished concrete surfaces. Leave formwork dry.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed opening where required for work embedded in or passing through concrete.
- B. Locate and set in place items which will be cast directly into concrete.
- C. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- D. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during placement of concrete.
- E. Install waterstop in single lengths where possible. Install where details and wherever water penetration through constructions joints is anticipated. Make provisions to support and protect water stops during progress of the work.
- F. 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.
- G. 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.
- H. Install construction joint device in coordination with floor slab patten placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

3.06 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.

3.07 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties and items are secure.

- B. Do not reuse wood formwork for concrete surfaces to be exposed to view. Do not patch formwork.
- C. Refer to Section 03300 for testing.

3.08 FORM REMOVAL

- A. Do not remove forms, shoring and bracing until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it.
- B. Remove formwork progressively so no unbalanced loads are imposed on structure.
- C. Do not damage concrete surfaces during form removal.
- D. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.
- E. When repair of surface defects or finishing is required at early age, remove forms as soon as concrete has hardened to resist damage from removal operation.
- F. Top forms on sloping surfaces of concrete may be removed as soon as concrete has attained sufficient stiffness to prevent sagging.
- G. Perform needed repairs or treatment required on sloping surfaces at once and follow with curing.
- H. Loosen wood forms for openings as soon as loosening can be accomplished without damage to concrete.
- I. Formwork for walls, sides of beams, and other parts not supporting weight of concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations.
- J. When shores and other vertical supports are so arranged that non load-carrying form facing material may be removed without loosening or disturbing shores and supports, form facing material may be removed at earlier age.
- K. For exposed concrete surfaces, do not reuse formwork when it has deteriorated to the point where usage will affect the finished concrete appearance. Do not patch formwork.
- L. Do not place wood forms which cannot be retrieved after concrete placement. Use steel forms.

3.09 CLEANING

- A. Clean forms to remove foreign matter as erection proceeds.
- B. Ensure that water and debris drain to exterior through clean-out ports.
- C. During cold weather, remove ice and snow from forms. Do not use de-icing salts. Do not use water to clean out completed forms. Unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

3.10 FORM RE-USAGE

- A. Thoroughly clean surfaces of forms and remove nails before reuse. Do not reuse damaged or worn forms. Inspect forms and retighten rustications as required.
- B. Reuse of architectural forms is subject to Architect's approval. Forms which are damaged, worn, or unsuitable for producing quality finishes, in the Architect's opinion, shall be rejected.

END OF SECTION