

SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.01 SCOPE

Includes furnishing all materials, equipment, transportation and facilities, and performing all labor necessary for constructing Concrete Formwork.

1.02 SUBMITTALS

- A. Construction Joints. Submit diagram for proposed construction joints not shown on the Drawings prior to or concurrent with reinforcing bar shop drawings.
- B. Form Ties-Tapered Through Bolts. Proposed method of sealing form tie hole; coordinate with details shown.

PART 2 PRODUCTS

2.01 MATERIALS

A. Forms

- 1. Wood forms for unexposed concrete surfaces shall be built of No. 2 Common Southern Yellow Pine Lumber or other material of equal qualifications (subject to the checking of the OWNER) of sufficient thickness to be capable of sustaining the loads to be imposed thereon, dressed to uniformly smooth contact surfaces, and so constructed as to be readily removable.
- 2. Wood forms for all slabs shall be faced with presanded High Density Overlay (HDO) concrete form plywood, equivalent to Simpson A-Matte or Regular Formguard or better. All joints shall be caulked.
- 3. Wood forms for other exposed concrete surfaces shall be constructed of Commercial Standard Douglas Fir, moisture-resistant, concrete form plywood, not less than five (5) ply, and at least nine-sixteenths inch (9/16") thick, with one (1) smooth face.

B. Form Ties

1. Form ties for exposed concrete surfaces shall be manufactured to allow a positive break back of no less than one inch (1") inside the concrete surface. Ties shall be equipped with a plastic cone of not less than five-eighths inch (5/8") diameter and one inch (1") long which will completely cover the hole and prevent the leakage of any mortar.
 2. Form ties for unexposed surfaces shall be bolt rods or patented devices having a minimum tensile strength of three thousand (3,000) pounds when fully assembled. Ties shall be adjustable in length and free of lugs, cones, washers or other features which would leave a hole larger than seven-eighths inch (7/8") in diameter, or depressions back of the exposed surface of the concrete. Ties shall be of such construction that, when the forms are removed, there will be no metal remaining within one inch (1") of the finished surface of the concrete.
- C. Form Oil. Nonstaining, free of kerosene oils, waxes or resins, L&M Construction Chemical "DEBOND" or Non-Crete Chemicals "Chemical Form release".
- D. Corner Chamfer. 3/4 inch polyvinyl chloride form strip equal to CSF type as manufactured by Burke Concrete Accessories, Inc.
- E. Carton Forms. Shall be one of the following types or an approved equal:
1. Voidco Fiberboard Void Forms
 2. Savway Carton Forms
- F. Form Sealer
1. Surface sealer that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces when applied to most forms or form liners. A ready-to-use water based material formulated to reduce or eliminate surface imperfections, containing no mineral oil or organic solvents. Environmentally safe, meeting local, state, and federal regulations.
 2. Manufacturer: Master Builders, Inc., Rheofinish.

2.02 FORM TOLERANCES

- A. General: Surface, design, and construct forms in accordance with applicable portions of ACI 347-89 and ACI 318-89 and the following tolerances for finishes specified.
- B. Wall Tolerances
 - 1. Straight Vertical or Horizontal Wall Surface. Flat planes with tolerance specified.
 - 2. Surface Finish. As specified in Section "Structural Concrete."
 - 3. Wall Type W-A.
 - a. Plumb with 1/4 inch in 10 feet or within 1 inch in entire height from top to bottom for walls over 40 feet high.
 - b. Depressions in Wall Surface. Maximum 5/16 inch when 10-foot straightedge is placed on high points in all directions or at any location.
 - c. Wall Thicknesses. Maximum 1/4 inch minus or 1/2 inch plus from dimensions shown.
 - 4. Wall Type W-B.
 - a. Plumb within 1/8 inch in 10 feet or within 1/2 inch in entire height from top to bottom for walls over 40 feet high.
 - b. Depressions in Wall Surface. Maximum 1/8 inch when 10-foot straightedge is placed on high points in all directions or at any location.
 - c. Wall Thicknesses. Maximum 1/4 inch minus or 1/2 inch plus from dimensions shown.
- C. Slab Tolerances.
 - 1. Exposed Slab Surfaces. Comprise of flat planes as required within tolerances specified.
 - 2. Slab Finish Tolerances and Slope Tolerances. Crowns on floor surface not to be too high as to prevent 10-foot straightedge from resting on end blocks, nor low spots that allow a block of twice the tolerance in thickness to pass under the supported 10-foot straightedge.

3. Slab Type S-A. Steel gauge block 5/16-inch thick.
4. Slab Type S-B. Steel gauge block 1/8-inch thick.
5. Slab Type S-A and S-B.
 - a. Finish Slab Elevation. Slabs designed to slope to floor drain and gutter will adequately drain regardless of tolerances.
 - b. Thickness. Maximum 1/4 inch minus or 1/2 inch plus from thickness shown, except where thickness tolerance will not affect slope, drainage, or slab elevation.

D. Beams and Columns Tolerances.

1. Exposed Straight Horizontal and Vertical Surfaces. Flat planes within tolerances specified.
2. Beam Type B-A.
 - a. Physical Dimensions. Maximum 1/4 inch minus or 1/2 inch plus from dimension shown.
 - b. Elevations. Within 1/2 inch plus or minus except where tops of beams become part of finished slab. In this case refer to slab tolerances.
3. Column Type C-A.
 - a. Physical Dimensions. Maximum 1/4 inch minus or 1/2 inch plus from dimension shown.
 - b. Plumb within 1/4 inch in 10 feet in all directions with maximum 1/2 inch out-of-plumb at top with respect to bottom.

PART 3 EXECUTION

3.01 MATERIAL STORAGE

Form lumber shall be delivered to the job site as far in advance of its use as is practical, and shall be carefully stacked clear of the ground in such a manner as to facilitate air-drying.

3.02 GENERAL

- A. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the CONTRACTOR. Formwork tolerances shall conform to ACI 301.
- B. All concrete members shall be adequately shored to safely support all loads and lateral pressures outlined in "Recommended Practice for Concrete Formwork" (ACI 347) without distortion, excessive deflection or other damage.
- C. All necessary forms, centering, shores and molds shall be built to conform to the shapes, lines and dimensions of the various members of concrete construction, as shown or scheduled on the Drawings. They shall be sufficiently tight and so substantially assembled as to prevent bulging, or the leakage of mortar. All forms shall be assembled to facilitate their removal without damage to the concrete.
- D. Provide temporary openings at the bottom of walls, columns, and elsewhere as required to facilitate cleaning, drainage and observation.
- E. Construct forms with such care as to produce concrete surfaces which will not have unsightly or objectionable form marks in exposed concrete surfaces. Lumber once used as forms shall have all contact surfaces thoroughly cleaned before reuse.

3.03 FORM TIES

Form ties shall be employed in such places and at such intervals as to securely hold the forms in position during the placing of concrete, and to withstand the weight and pressure of the wet concrete. Ties of a type intended to be entirely removed shall be coated with an acceptable lubricant to safeguard against damaging the concrete during such removal. The use of wire ties will not be permitted.

3.04 WOOD STRIPS, BLOCKING AND MOLDINGS

Place in the forms wood strips, blocking, moldings, nailers, etc., as required to produce the finished profiles and surfaces shown on the Drawings and to provide nailing for wood members or other features required to be attached to concrete surfaces in such manner. Coat wood strips, blocking, and molding with form oil.

3.05 CHAMFERS

All exposed external angles of concrete members shall have 3/4" chamfer strips placed in the forms to relieve the angles.

3.06 FORM COATING

Coat the contact surfaces of all wood forms, before placing any metal reinforcement, with form oil.

3.07 CONSTRUCTION JOINTS

- A. Except as otherwise specifically indicated on the Drawings, each pier, column, beam, wall and slab shall be considered as a single unit of operation, and all concrete for the same shall be placed continuously in order that such unit will be monolithic in construction. Should construction joints prove to be absolutely unavoidable, the same shall be located at or near the midpoints of spans.
- B. Additional construction joints shall not be made under any circumstances without the written authorization of the OWNER. All construction joints must be either plumb or level. Provide appropriate keys in all construction joints, whether horizontal or vertical.

3.08 WALLS

Construct concrete walls to the heights, thicknesses and profiles shown on the Drawings. Provide temporary openings at the bottom of all wall forms to facilitate cleaning and observation. Close such openings securely immediately in advance of pouring concrete in the wall forms. Provide appropriate keys and haunches in walls to receive edges of concrete floors.

3.09 COLUMNS

Columns shall be of the sizes and shapes shown on the Drawings. Provide temporary openings at the bottom of all column forms to facilitate cleaning and observation, and close the same securely before placement of concrete.

3.10 BEAMS AND JOISTS

- A. Concrete beams and joists shall be of sizes and shapes as shown.
- B. Joists forms may be reconditioned and reused if they meet all other specification requirements.

3.11 SLABS

- A. Form all openings in concrete slabs as required for the vertical passage of ducts, pipes, conduits, etc.

- B. All structurally supported concrete slabs shall be poured, on wood or metal forms, to the required thicknesses as indicated or scheduled.

3.12 MISCELLANEOUS

- A. Construct forms for any and all items for concrete work required for or in connection with the satisfactory completion of the project, whether each such item is specifically shown or referred to or not.
- B. Do not sleeve any columns or beams unless such sleeves are indicated on the structural drawings.

3.13 REMOVAL OF FORMS

- A. Forms shall not be removed until the concrete has adequately hardened and set. Clamps or tie rods may be loosened twenty-four (24) hours after the concrete is placed; ties, except for a sufficient number to hold the forms in place, may be removed at that time.
- B. Through-wall ties that are to be wholly withdrawn shall be pulled toward the inside face of the respective wall or beam. Cutting ties back from the face of the concrete will not be permitted, and care shall be exercised to avoid spoiling concrete surfaces.
- C. Formwork for beam soffits and slabs and other parts that support the weight of concrete shall remain in place until the concrete has reached 75% of its specified 28 calendar day strength, unless otherwise specified or permitted.
- D. When reshoring is permitted or required, the operations shall be planned in advance and shall be subject to review by the OWNER. Reshoring shall comply with ACI 301, "Specifications for Structural Concrete for Buildings".
- E. Under normal conditions, the minimum period of time to be allowed to elapse before forms may be removed shall be as indicated in the table below, but its observance shall not operate to relieve the CONTRACTOR of the responsibility for the safety of the structure.

Temperature	Above 60°F	50 to 60°F	40 to 50°F	Less than 40°F
Side Forms of Beams & Walls	3 Days	5 Days	7 Days	See Note
Bottom Forms of Slabs	7 Days	7 Days	10 Days	See Note

NOTE: When temperatures below forty (40) degrees Fahrenheit prevails, the forms shall remain in place an additional period equal to the time the structure has been exposed to such lower temperature.

END OF SECTION