

SECTION 03100
CONCRETE FORMWORK

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Formwork for Cast-in Place Concrete, Shoring, Bracing and Anchorage.
- B. Openings for Other Work.
- C. Form Accessories.
- D. Form Stripping.

1.2 RELATED SECTIONS

- A. Section 02520 - Portland Cement Concrete Paving.
- B. Section 03200 - Concrete Reinforcement.
- C. Section 03300 - Cast-in-Place Concrete.
- D. Section 03370 - Concrete Curing.

1.3 REFERENCES

- A. ACI 347 - Recommended Practice For Concrete Formwork.
- B. PS-1 - Construction and Industrial Plywood.

1.4 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300 – Submittals.
- B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.
- C. Product Data: Provide data on void form materials and installation requirements.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347, 301, 318.
- B. Maintain one copy of each document on Site.

1.7 QUALIFICATIONS

- A. Design formwork under direct supervision of a Professional Engineer experienced in design of structural work and licensed in the State of Michigan.

1.8 REGULATORY REQUIREMENTS

- A. Conform to ACI 347, ACI 301 and ACI 306R code for design, fabrication, erection and removal of formwork.

1.9 COORDINATION

- A. Coordinate work under provisions of Section 01039 – Coordination and Meetings.
- B. Coordinate this Section with other Sections of Work, which require attachment of components to formwork.
- C. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Engineer before proceeding.
- D. Notify Engineer 24-hours in advance of placing concrete that reinforcing steel and framework is installed according to contract documents and that it is ready to be inspected. The Engineer will not allow placement of concrete prior to inspection.

2. PART 2 PRODUCTS

- A. Plywood: 5-Ply Douglas Fir; sound undamaged sheets with clean, true edges.
- B. Lumber: No.2 common minimum grade; with grade stamp clearly visible.

2.2 FORMWORK ACCESSORIES

- A. Form Ties: Steel construction of adequate strength and of suitable design. Wire ties will not be permitted. Use one inch deep break off ties for all structures.
- B. Dovetail Anchor Slot: Galvanized steel, 22 gage thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork; manufactured by Heckmann Building Products or equivalent.
- C. Form Release Agent: Colorless mineral oil which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
- D. Corners: Chamfered, wood strip type; 1 x 1 inch size.
- E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- F. P.V.C. Waterstops: Made of virgin material, 4 inches wide with a 3/16 inches ribbed web. Make joints in accordance with the manufacturer's recommendations with a teflon-surfaced welding iron. Manufactured by B.F. Goodrich, W.R. Meadows or Greenstreak.

3. PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with plans.

3.2 EARTH FORMS

- A. Earth forms in general are not permitted.
- B. Earth forms, if shown on the drawings or specifically approved by the Engineer shall be hand trimmed both sides and bottom. Remove loose soil prior to placing concrete.

3.3 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of 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 dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.

3.4 APPLICATION - FORM RELEASE AGENT

- 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, which are effected by agent. 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. Furnish all hardware in the completion of the work. All items of miscellaneous metals shall be positioned within the forms and cast into concrete.
- B. Install accessories in accordance with manufacturer's recommendations, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.6 FORM CLEANING

- A. Clean and remove foreign matter within forms.
- B. Clean-formed cavities of debris prior to placing concrete.

- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts or water to clean out forms, unless formwork and concrete construction proceed within heat enclosures. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

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

3.8 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight.
- B. Tie clamps or sleeve nuts shall be loosened 24 hours after completion of concrete placement and form ties to be removed may be withdrawn at that time, with exception of a sufficient number to hold forms in place.
- C. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- D. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

3.9 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 damaged wood formwork. Do not patch formwork.
- C. Prior to the erection of forms, review the formwork operation with the Engineer and affected sub-contractors so all required inserts, openings, and embedded parts are included in the formwork.

END OF SECTION