

SECTION 03100
CONCRETE FORMWORK

1. JOB BUILT AND PREFABRICATED FORMS:

1.01 GENERAL:

- A. Codes and Standards: Unless otherwise shown or specified, design, construct, erect, maintain and remove forms and related structures for cast-in-place concrete work in compliance with the American Concrete Institute Standard "Recommended Practice for Concrete Formwork."

1.02 DESIGN OF FORMWORK:

- A. Design, erect, support, brace and maintain formwork so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Carry vertical and lateral loads to the ground by the formwork system and by the in-place construction that has attained adequate strength for that purpose. Construction loads, including restoring loads, or in-place construction shall at no time exceed the live load for which the in-place construction was designed. If the contractor is uncertain about the design live loads, it shall be his responsibility to obtain these from the Engineer.
- B. Design forms and false work to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
- C. Provide shored and struts with positive means of adjustment capable of taking up all formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
- D. Support form facing materials by structural members spaced sufficiently close to prevent deflection of the form facing materials. Fit forms placed in successive units for continuous surfaces to accurate alignment to assure a smooth complete surface, free from irregularities and within the allowable tolerances. Provide camber in formwork as required for anticipated deflections in formwork due to weight and pressure of fresh concrete and construction loads for long-span members without intermediate supports. Final position of all structural members to be at elevations shown on drawings.

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- E. Design formwork to be readily removable without impact, shock or damage to the cast-in-place concrete surfaces and adjacent materials.

Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt all joints and provide backup materials at joints as may be required to prevent leakage and fins.

1.03 FORM MATERIALS:

- A. Forms for Exposed Finish Concrete: Unless otherwise shown or specified, construct all formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood-faced, or other panel type materials acceptable to the Engineer, to provide continuous, straight smooth exposed surfaces. Furnish in the largest practicable sizes to minimize number of joints and to conform to the joint system shown in the drawings. Provide form materials with sufficient thickness to withstand the pressure of newly placed concrete without bow or deflections.

1.04 FORM CONSTRUCTION:

- A. Construct forms to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, locations, grades, level and plum work in the finished structures. Provide for openings, offsets, sink ages, keyaways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads anchorages and inserts, and other features required on the work, and shown in the architectural, structural, and any other pertinent parts of the contract drawings. Use selected materials to obtain the required finishes.
- B. Provide temporary openings where interior area of formwork is inaccessible for client, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent the loss of concrete mortar. Locate consistent with the requirements of the work, and not in any exposed surface.
- C. Carefully form intersecting planes to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete. Back joints with extra studs or girts as required to maintain true and square intersections.
- D. Provide all openings in forms to accommodate other work, including mechanical and electrical work. No hole, blockout, or recess shall be allowed in any structural member without the written approval of the Engineer. Accurately place and securely support all items required to be built into the forms.

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- E. Forms for Exposed Concrete: Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
 - F. Control Joints: Locate where shown or directed. See Plans for treatment of control and construction joints, including wood screeds, metal keyways and sawcuts.
 - G. Provisions for other trades: Provide openings in concrete formwork to accommodate work of other trades, including those under separate prime contracts. Size and location of openings, recesses and chases are the responsibility of the trade requiring such items. No hole, blockout, or recess shall be allowed in any structural member without the written approval of the Engineer. Accurately place and securely support items to be built into forms.
 - H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before concrete is to be placed. Retighten forms immediately after concrete placement as required to eliminate mortar leaks.
- 1.05 PREPARATION OF FORM SURFACES: Coat the contact surfaces of forms with a form-coating compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds. Thin form-coating compounds only with the thinning agent of the type, and in amount, and under the conditions of the form-coating compound manufacturer's directions. Do not allow excess form coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with the manufacturer's instruction.
- 1.06 REMOVAL OF FORMS:
- A. Formwork not supporting the weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed 12-24 hours after placing the concrete, providing the concrete is sufficiently hard to not be damaged by the form removal operations, and provided that curing and protection operations are maintained.
 - B. Formwork supporting the weight of concrete., such as beam soffits, joists, slabs and other structural elements of work., may not be removed in less than fourteen (14) days and until the concrete has attained 70% of the design minimum compressive strength fir the applicable type of concrete. Determine potential

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compressive strength of in-place concrete by testing of field-cured specimens representative of the concrete location or members.

- C. Form facing material may be removed 4-days after placement, only if the shores and other vertical supports have been arranged to permit removal of the form facing material without loosening or disturbing the shores and supports.
 - D. These periods represent the cumulative number of days of fractions thereof, not necessarily consecutive, during which the temperature of the concrete is above 50° F.
- 1.07 RE-USE OF FORMS: Clean and repair the surfaces of forms that are to be re-used in the work, except that split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to all concrete contact form surfaces as specified for new formwork.

When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins, and tighten forms to close all joints. Align and secure all joints to avoid offsets. So not use "patched" forms for exposed concrete surfaces, except as acceptable to the Engineer.

END OF SECTION