

SECTION 03100
CONCRETE FORMWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope

1. Furnish, erect and remove forms for cast-in-place concrete

B. Additional Requirements Specified Elsewhere

1. Section 01010: Summary of Work
2. Section 01340: Shop Drawings, Product Data and Samples
3. Section 01400: Quality Control
4. Section 01500: Construction Facilities and Temporary Controls

C. Related Requirements Specified Elsewhere

1. Section 03200: Concrete Reinforcement
2. Section 03300: Cast-in-Place Concrete

1.2 QUALITY ASSURANCE

A. Design Criteria

1. Design formwork for the loads, lateral pressure and allowable stresses outlined in ACI 347, Chapter 1 & 2

B. Allowable Tolerances

1. Variation from plumb
 - a. Lines and surfaces of columns, piers, and walls
 - 1) In any 10' of length: $\frac{1}{4}$ "
 - 2) Entire length: 1"
 - b. Exposed corner columns, control joint grooves and other conspicuous lines
 - 1) In any 20' of length: $\frac{1}{4}$ "
 - 2) Entire length: $\frac{1}{2}$ "
2. Variation from level or specified grade
 - a. Exposed sills, horizontal grooves and other conspicuous lines
 - 1) In any bay or any 20' of length: $\frac{1}{4}$ "
 - 2) Entire length: $\frac{1}{2}$ "
3. Variation of wall lines from established position
 - a. In any bay or any 20' of length: $\frac{1}{2}$ "
 - b. Entire length: 1"

4. Variation of formed surfaces from true plane
 - a. Surfaces exposed to view: 1/240 of span between structural members
5. Refer to ACI 301 Table 4.3.1 for additional requirements

C. References

1. Except as modified or supplemented herein all concrete formwork shall meet the requirements of the following standard specifications. Pertinent portions of the standards are included herein; refer to standards for detailed requirements
 - a. *American Concrete Institute Standards (ACI)*
 - 1) 301-99: Specifications for Structural Concrete for Buildings, Section 2, Formwork
 - 2) 347-01: Recommended Practice for Concrete Formwork
 - b. *AASHTO Standard Specifications for Highway Bridges*

1.3 SUBMITTALS

- A. Refer to Section 01340 - Shop Drawings, Product Data, and Samples; supplement with the following
 1. Include with shop drawings
 - a. Drawings for formwork, shoring, and reshoring
 - b. Location of construction joints
 - c. Schedule of form and support removal

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. General

1. Where "Smooth Form Finish" or "Grout Cleaned Finish" is specified, use
 - a. Prefabricated plywood or panel forms
 - b. Job-built plywood forms
 - c. Forms lined with plywood or fiberboard
2. Where "Rough Form Finish" is specified
 - a. Steel or unlined wooden forms may be used

B. Forms

1. Steel forms
 - a. Symons "Steel-Ply"
 - b. Simplex "Industrial Steel Frame Forms"
 - c. Universal "Uniform"
 - d. Or equivalent
2. Plywood
 - a. Product Standard PSI
 - b. Waterproof, resin-bonded exterior type, Douglas Fir, Grade B-B
3. Lumber
 - a. Straight
 - b. Uniform width and thickness

- c. Free from knots, offsets, holes, dents and other surface defects
- 4. Special formwork
 - a. "Paper Formed Void"
 - 1) Wall Void and Slab Void; Sure Void Products, Inc..
 - b. Use void sizes indicated

C. Accessories

- 1. Form ties
 - a. Commercially manufactured permanently embedded type
 - b. Removable ends
 - 1) Permanently embedded portion terminates not less than $\frac{3}{4}$ " from face of concrete
 - c. Provide waterseal washers located on permanently embedded portions of the ties at approximate center of the wall
- 2. Joints
 - a. Slab keyed joints may be formed using 24-gauge galvanized screed key joints of indicated slab depth and steel stake support at 24" maximum centers
- 3. Form Coating
 - a. Approved non-staining, chemical release agent that will not damage the concrete surface
 - b. For exposed surfaces not in contact with earth backfill
 - 1) Protex Industries "Pro-Cote"
 - 2) Symons Corp. "Magic Kote"
 - 3) L & M "Debond"
 - 4) Or equivalent
- 4. Chamfer Strips
 - a. Clear white pine
 - b. Planed surface against concrete

PART 3 - EXECUTION

3.1 ERECTION

A. General

- 1. Forms shall be substantial and sufficiently tight to prevent leakage of mortar
- 2. Brace or tie forms to maintain desired position, shape, and alignment during and after concrete placement
- 3. Where top of a wall will be exposed to weathering, the top of the forms on at least one side shall be brought to true line and grade
 - a. At other locations forms for concrete which is to be finished to a specified elevation, slope, or contour shall be brought to true line and grade or a wooden guide strip provided at the proper elevation so the top surface can be finished with a screed or template
- 4. At horizontal construction joints in walls, forms on one side shall not extend more than 2' above the joint
- 5. Provide temporary openings at the bottom of column and wall forms and at other locations where necessary to facilitate cleaning and inspection
- 6. Forms for exposed surfaces

- a. Laid out in a regular and uniform pattern
 - b. Long dimension of panels vertical
 - c. All joints aligned
 - d. Produce finished surfaces free from offsets, ridges, waves, and concave and convex areas
 - e. Uniformly space and align form ties in horizontal and vertical rows
7. Where concrete is placed against rock
 - a. Remove all loose pieces of rock
 - b. Clean exposed surface with a high-pressure hose
 8. Earth cuts shall not be used as forms for vertical surfaces
 9. Assemble and place void form in accordance with manufacturer's printed instructions. If void form is wrapped with polyethylene, the polyethylene shall be removed from sides of the form void before backfilling. Not allowed to wrap void form below slabs

B. Edges and Corners

1. Provide approved moldings and bevels to produce a $\frac{3}{4}$ " chamfer on all exposed projecting corners unless otherwise noted on the drawings

C. Preparation of Form Surfaces

1. Remove all mortar or grout from previous concrete and all other foreign material from form surfaces
2. Coat form surfaces with approved coating material before either the reinforcing steel or concrete is placed
3. Do not allow form coating to
 - a. Stand in puddles in the forms or
 - b. Come in contact with reinforcing steel or adjacent hardened concrete against which fresh concrete is to be placed

3.2 REMOVAL

A. General

1. Do not remove or disturb until
 - a. The concrete has attained sufficient strength to safely support all dead and live loads or
 - b. Adequate bracing is provided
2. Retain shoring in place and reinforce as necessary to carry any
 - a. Construction equipment
 - b. Materials
 - c. Other loads in excess of cured strength
3. Take care in form removal to prevent surface gouging, corner or edge breakage, and other damage to the concrete

END OF SECTION