SECTION 03 10 00

CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section describes the requirements for providing concrete formwork, shoring and reshoring for cast-in-place concrete at Parking Structure, site retaining walls, ramps, stairs and as required, and installation of items furnished by others, including anchor bolts, setting plates, bearing plates, anchorages, inserts, frames, nosings and other items to be embedded in concrete.

B. Section includes:

1. Forms for cast-in-place concrete.

2. Shoring, bracing, accessories and form coating.

C. Work installed but furnished in other Sections:

1. Inserts, bolts, anchors and other items furnished by other trades for installation in formed concrete.

1.2 SUBMITTALS

A. Procedure: In compliance with Division 01.

B. Records: Keep an accurate record of the dates of all form removal and furnish copies to the County's Representative.

1.3 QUALITY ASSURANCE

A. Lumber and plywood shall be grade-marked by a grading agency acceptable to the Building Department.

1.4 HANDLING

A. Procedure: In compliance with Division 01.

B. Storage: Store form facing materials above ground on framework or blocking. Protect from moisture and damage. Handle form-facing materials to prevent damages which could be transferred to the concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms for exposed concrete surfaces:

1. General: Plywood, metal, metal-framed/plywood-faced, or FRP which will provide continuous, flat, smooth exposed concrete surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings, where indicated.

2. Type:

a. For concrete surfaces to be sacked and rubbed: US Product Standard PS-1 'B-B (Concrete Form) Plyform", Class 1, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

b. Elsewhere where concrete will remain exposed, with or without a mechanical finish: Overlaid plywood complying with US Product Standard PS-1 'A-C or B-B High Density Overlaid Concrete Form,' Class 1, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for concealed concrete surfaces: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form ties and spreaders:

1. Provide cone or snap type ties designed to be completely removed from wall, or to break off and provide minimum 1-1/2 in. coverage over ends of the portion of snap tie remaining in the concrete. Plug all tie holes as required by the County's Representative.

2. Do not use wire ties, wood spreaders, or embedded types in which embedded portion is less than 1-1/2 in. from exterior face of concrete.

3. For concrete exposed in the finished work, coordinate all form tie locations to with the County's Representative prior to form fabrication.

D. Chamfer strips: Extruded PVC, with 3/4 in. diagonal faces unless otherwise indicated, by The Burke Co., Greenstreak Plastic Products Co., or Sonneborn-Rexnord, Inc. or equal, or oiled softwood shapes with the same profile.

E. Form coatings: Commercial formulation form-coating compounds that will, not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

F. Prefabricated construction joint keyways: Key-Loc by Form-A-Key Products Div., or Keyed Kold Joint by The Burke Co. or equal, complete with all accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate surfaces to receive concrete formwork and associated work and conditions under which work will be installed. Do not proceed until satisfactory conditions have been corrected in a manner complying with the Contract Documents and acceptable to the Installer. Starting of the work within a particular area will be construed as installer's acceptance of surface conditions.

3.2 FORM TYPES

A. General: Comply with the applicable provisions of ACI 347, Guide to Formwork for Concrete, and APA Design/Construction Guide, Concrete Forming.

1. The design and construction of forms and shoring is solely the Developer Design/Builder's responsibility but shall comply with specified requirements.

2. Form contact surfaces shall be clean, free from dents, holes and other imperfections.

3. Establish and maintain benchmarks mines and controls necessary to achieve specified tolerances. Take an accurate survey of the form location just prior to concrete pour.

B. Earth bank:

1. Except for exterior face of wall footings and grade beams which must be formed, earth banks may be used to form footings and grade beams if the soil is firm, neatly trimmed, and will retain concrete in the required size and shape.
2. The concrete coverage shall be increased as noted on the Drawings when concrete is cast against earth.

C. Wood forms:

1. Construct with plywood panels as large as practicable. Where because of their height walls or columns have a horizontal form joints, the horizontal joint shall be aligned throughout the same floor, or area, unless otherwise acceptable to the County's Representative.

2. Concrete surfaces which will remain exposed in the Work:

   a. Fill voids, fastener heads, and other imperfections in form contact surfaces with body putty sanded smooth.

   b. Seal joints between plywood panels flush with compound specifically designed to seal forms, or other approved material to prevent concrete paste leakage.

   c. Provide sharp, clean comers at form intersecting planes, without visible edges and offsets. Back joints with additional studs or girts.

   d. Form recesses and projections with smooth finish materials, and install in forms with sealed joints to prevent displacement.

   e. Drill holes accurately in forms to fit ties used. Prevent leakage of concrete around tie holes. Do not drive ties through undersized or improperly prepared holes.

3. Kerf backside of wood inserts used for forming keyways, regrets, recesses and similar treatments, to allow wood to swell without spalling concrete, and to assure easy removal.

D. Metal forms:

1. Fasten sections of forms tightly and interlock securely.

2. Provide precisely cut openings required by other trades.

3. Cut or drill forms for attaching sleeves or other items to be embedded in concrete.

E. Re-use of forms:

1. Form materials may be re-used if they produce finished surfaces equal to finished surfaces where new form materials are used.

2. Before re-use, thoroughly clean, recondition in every respect, suitable for their reuse purpose.

F. Tolerances: To obtain cast-in-place concrete not exceeding the tolerances specified in Section 03300, except support form facing material to limit deflection to U360 between supports for concrete exposed to view and U270 for all other concrete.

3.3 FORM CONSTRUCTION

A. Construction:

1. Rigidly support and construct forms to the lines, surfaces and profiles necessary to produce concrete of the design indicated.

2. Construct forms to be removable without prying against concrete.

3. Make forms tight, without cracks or holes, to prevent leakage of mortar or loss of fine particles from concrete.

4. Cover or fill holes that are not used and cracks that have opened-up flush with adjacent surfaces.

B. Wales and studs: Of adequate size and spacing to prevent form failure and to obtain concrete within the tolerances specified.

C. All formwork shall be cambered as specified on drawings.

D. Ties and spreaders: Place ties symmetrically, equally spaced, in plumb and level rows; tie placement in exposed concrete is subject to the County's Representative's approval. Do not permit wood, other than built-in treated bucks or nailing blocks, to remain permanently in the forms.

E. Form contact surfaces:

1. As specified above and as best suited to prevailing conditions; may be constructed of plywood, FRP, plastic, or steel.

2. Block plywood edges which do not occur at bearing points to eliminate joint offsets.

F. Special features:

1. Corners:

a. Form exposed corners between beams and columns to produce a square, smooth, solid joint without paste leakage.

b. Install chamfer strips in corners of all other forms, unless otherwise indicated. Miter chamfer strip at changes in direction.

c. Corners which will be concealed in the Work may be formed either square or chamfered.

2. Reglets, rebates, seats and pockets: Form as indicated or as necessary to receive or engage work of other trades.

3. Openings, chases and recesses:

a. Form as indicated or necessary to receive, pass and clear other work.

b. Verify sizes and locations with other trades before forming.

c. Closely cooperate in locating boxes, cans and sleeves furnished by other trades.

G. Form release agent: Thoroughly clean forms and coat with release agent prior to initial use (except when mill-oiled) and before each reuse.

1. Apply form coating in compliance with its manufacturer's printed instructions and coverage rates.

2. Coat steel forms with a non-staining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3. Provide a coating of uniform thickness. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete against which fresh concrete will be placed.

4. Apply form coating before reinforcement is placed.

3.4 FORM REMOVAL

A. Remove forms only after concrete has developed sufficient strength to not be damaged by form removal operation, and to safely sustain its own weight and superimposed loads, as determined by testing field cured concrete cylinders, but not sooner than specified in ACI 347.

B. Take care when removing forms that concrete surfaces are not marred or gouged, that comers are true, sharp and unbroken. Do not pry against concrete when removing forms.

C. Cut-off nails flush in concealed concrete surfaces. Cut back tie wires and nails in exposed concrete surfaces at least 1-1/2 in. Remove rod and cone ties and separators or similar devices and pull inward away from finished surfaces.

END OF SECTION