SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Section 03200 - Concrete reinforcement:

B. Section 03300 - Cast-in-place concrete:

C. Provision of inserts, anchors or sleeving for attaching or accommodating other materials.

1.02 QUALITY ASSURANCE

A. Codes and Standards:
1. In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in "Recommended Practice for Concrete Formwork", publication ACI 347-latest edition, of the American Concrete Institute.
2. Where provisions of pertinent codes and standards conflict with the requirements of this Section of these Specifications, the more stringent provisions shall govern.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Form lumber : Construct forms of one or a combination of the following materials:
1. "Plyform" class I or II, bearing the label of the Douglas Fir Plywood Association.
2. Douglas Fir-Larch, number two grade, seasoned, surfaced four sides.

B. Form sealers: All form sealers shall be first quality of their respective kinds and subject to the approval of the Architect.

2.02 TIES AND SPREADERS

A. Type: All form ties shall be a type which does not leave an open hole through the concrete and which permits neat and solid patching at every hole.

B. Design: When forms are removed, all metal shall be not less than one inch from the surface.

C. Wire ties and wood spreaders: Do not use wire ties and wood spreaders.

2.03 ALTERNATE FORMING SYSTEMS

A. Alternate forming systems may be used subject to the advance approval of the Architect.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for proper completion of concrete formwork, shall be as selected by the Contractor subject to the advance approval of the Architect.

PART 3 - EXECUTION

3.01 CONSTRUCTION OF FORMS

A. General: Construct all required forms to be substantial, sufficiently tight to prevent leakage of mortar, and able to withstand excessive deflection when filled with wet concrete. Finished concrete shall show no visible deflection.

B. Layout:
   1. Form for all required cast-in-place concrete to the shapes, sizes, lines, and dimensions indicated on the Drawings.
   2. Exercise particular care in the layout of forms to avoid necessity for cutting of concrete after it is in place.
   3. Make proper provision for all openings, offsets, recesses, anchorage, blocking, and other features of the Work as shown or required.
   4. Perform all forming required for work of other trades and do all cutting and repairing of forms required to permit such installation.
   5. Carefully examine the Drawings and Specifications and consult with other trades as required relative to provision for openings, reglets, chases, and other items in the forms.

C. Embedded items: Set all required steel frames, angles, grilles, bolts, inserts, and other such items required to be anchored in the concrete before the concrete is placed.

D. Bracing:
   1. Properly brace and tie the forms together so as to maintain position and shape and to ensure safety to personnel.
   2. Construct all bracing, supporting members and centering of ample size and strength to safely carry, without excessive deflection, all dead and live loads to which they may be subjected.
   3. Properly space the forms apart and securely tie them together, using metal spreader ties that give positive tying and accurate spreading.

E. Tolerances: Construct all forms straight, true, plumb, and square within a tolerance horizontally of one in 200 and a tolerance vertically of one in 500, except where the concrete abuts or forms the

substrate for materials demanding closer tolerances.

F. Wetting: Keep forms sufficiently wetted to prevent joints opening up before concrete is placed.

3.02 PLYWOOD FORMS

A. Design: Nail the plywood panels directly to studs and apply in a manner to minimize the number of joints.

B. Joints : Make all panel joints tight butt joints with all edges true and square. All joints shall be backed.

3.03 FOOTING FORMS

A. Wood forms: All footing forms shall be wood unless otherwise specifically approved by the Architect.

B. Earth forms:
1. Upon approval of the Architect, side forms for footings may be of earth provided the soil will stand without caving and the sides of the bank are made with a neat cut to the minimum dimensions indicated on the Drawings.
2. Make all necessary provisions to prevent cave-ins during placement of the concrete.

3.04 RE-USE OF FORMS

A. General: Re-use of forms shall be subject to advance approval of the Architect.

B. Requirements:
1. Except as specifically approved in advance by the Architect, re-use of forms shall in no way impart less structural stability to the forms nor less acceptable appearance to finished concrete.

3.05 REMOVAL OF FORMS

A. Do not disturb or remove forms until the concrete has developed sufficient strength to safely sustain its own weight and the superimposed loads above. After concrete is placed the following minimum time period shall elapse before the removal of forms.

	Forms	Shores
Walls, beam and girder sides columns	3 days	
Wall soffits at wall openings	2l days	2l days
Cantilever slabs and beams	28 days	28 days
Floor and roof slabs	l4 days	l4-2l days
Beam and girder soffit	l4 days	2l days

1. Use all means necessary to protect workmen, passersby, the installed work and materials of other trades, and the complete safety of the structure.
2. Cut nails and tie wires or form ties off flush, and leave all surfaces smooth and clean.
3. Remove metal spreader ties on exposed concrete by removing or snapping off inside the wall surface and pointing up and rubbing the resulting pockets to match the surrounding areas.
4. Flush all holes resulting from the use of spreader rods and sleeve nuts, using water, and then solidly pack throughout the wall thickness with cement grout applied under pressure by means of a grouting gun; grout shall be one part Portland Cement to 2-l/2 parts sand; apply grout immediately after removing forms.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Sections 03100 and 03300 - Placement of other embedded items.

B. Section 04340 - Reinforcement in concrete block masonry.

1.02 QUALITY ASSURANCE

A. Codes and Standards:
   1. In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in "Manual of Standard Practice for Detailing Reinforced Concrete Structures", publication ACI 315-latest edition of the American Concrete Institute.
   2. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent provisions shall govern.

B. Tests:
   1. Testing will be performed and paid for as described in Section 01000 of these Specifications.
   2. Reinforcing steel samples will be taken from bundles delivered from the mill.
   3. Where bundles are identified by heat number and a mill analysis accompanies the report, one tensile and one bending test specimen will be taken from each ten tons, or fraction thereof, of each size of reinforcement steel.
   4. Where positive identification of heat numbers cannot be made, or where random samples are taken, one series of tests will be made from each 2-1/2 tons, or fraction thereof, of each size and kind of reinforcement steel.

1.03 SUBMITTALS

A. The Contractor is not required to submit placing drawings for approval. All reinforcing will be checked in the field in place.

1.04 PRODUCT HANDLING

A. Protection:
   1. Use all means necessary to protect concrete reinforcement before, during, and after installation and to protect the installed work and materials of all other trades.
   2. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.
   3. Use all necessary precautions to maintain identification after the bundles are broken.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 CONCRETE REINFORCEMENT

A. All concrete reinforcement materials shall be new, free from rust, and complying with the following reference standards:
   1. Bars for reinforcement: "Specifications for Deformed Billet-Steel Bars for Concrete Reinforcement", ASTM A-615, #5 Bars and smaller, Grade 40 or 60, #6 Bars and larger, Grade 60.
   2. Wire for reinforcement: "Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement", ASTM A-82.
   3. Wire fabric: "Specifications for Wire Fabric for Concrete Reinforcement", ASTM A-185. 6x6; 10 x 10 to be used at all exterior flatwork.

2.02 SUPPORTS FOR REINFORCING BARS

A. Galvanized steel chairs. Where chairs make contact with exterior concrete, use plastic coated legs so that finished concrete surfaces will not be stained by rust.

B. For slabs on grade use precast concrete blocks made with a groove for the reinforcing steel to rest in.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of concrete reinforcement, shall be as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 BENDING

A. General:
   1. Fabricate all reinforcement in strict accordance with the approved Shop Drawings.
   2. Do not use bars with kinks or bends not shown on the Drawings.
   3. Do not bend or straighten steel in a manner that will injure the material.

B. Design:
   1. Bend all bars cold.
   2. Make bends for stirrups and ties around a pin having a diameter not

less than two times the minimum thickness of the bar.

3. Make bends for other bars, including hooks, around a pin having a diameter not less than six times the minimum thickness of the bar for #8 and smaller, and eight times the thickness of the bar for #9 and larger.

3.02 PLACING

A. General: Before the start of concrete placement, accurately place all concrete reinforcement, positively securing and supporting by concrete blocks, metal chairs or spacers, or by metal hangers.

B. Clearance:
   1. Preserve clear space between bars of not less than one time the nominal diameter of round bars.
   2. In no case let the clear distance be less than 1 inch or less than 1-1/3 times the maximum size of aggregate.
   3. Provide the following minimum concrete covering of reinforcement:
      a. Concrete below ground deposited against forms: Two inches.
      b. Concrete deposited against earth: Three inches.
      c. Concrete elsewhere: As indicated on the Drawings or otherwise approved by the Architect.

C. Splicing:
   1. Horizontal bars:
      a. Place bars in horizontal members with minimum laps at splices sufficient to develop the strength of the bars.
      b. Bars may be wired together at laps.
      c. Wherever possible, stagger the splices of adjacent bars.
      d. Splice 30 bar diameters minimum.
   2. Wire fabric: Make all splices in wire fabric at least 1-1/2 meshes wide.
   3. Other splices: Make only those other splices, which are indicated on the Drawings or specifically approved by the Architect.

D. Dowels: Place all required steel dowels and securely anchor them to position before the concrete is placed.

E. Obstructions: In the event conduits, piping, inserts, sleeves, or any other items interfere with placing reinforcement as indicated on the Drawings or as otherwise required, immediately consult the Architect and obtain approval of new procedure before placing concrete.

3.03 CLEANING REINFORCEMENT

A. Steel reinforcement, at the time concrete is placed around it, shall be free from rust scale, loose mill scale, oil, paint, and all other coatings which will destroy or reduce bond between steel and concrete.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Section 03100 - Concrete formwork:

B. Section 03200 - Concrete reinforcement:

1.02 QUALITY ASSURANCE

A. Codes and standards :
   1. In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations of "Structural Concrete for Buildings," publication ACI 30l-latest edition of the American Concrete Institute.
   2. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent provisions shall govern.

B. Tests:
   1. Take at least three test cylinders for each 100 cubic yards of concrete or portion thereof poured each day in accordance with ASTM C31. Test one cylinder at 7 days, one at 28 days, and the third stored at the laboratory until after the 28-day test is performed. The tests shall be made in accordance with ASTM C39. The third cylinder may be discarded at such time as the laboratory is directed by the Architect.
   2. Before taking test cylinders, slump tests shall be made in accordance with ASTM C143, "Standard Method of Slump Tests for Consistency of Concrete."
   3. If the 28-day tests fail to meet the minimum ultimate compressive design strength, the concrete shall be considered defective and cores from selected areas may be taken as directed by the Architect, all in accordance with ASTM C42.
   4. If the compressive tests of the core specimens fail to meet the design strength, the structural concrete work shall be assumed to be defective. Remove and replace or adequately strengthen in a manner acceptable to the Architect, all at no extra cost to the Owner.
   5. The costs of coring will be paid by the Owner, but will be back-charged to the Contractor.
   6. Testing will be performed and paid for as described in Section 01000 of these Specifications.

C. Inspections:
   1. The Contractor shall provide for continuous batch plant inspection by an inspector approved by the Structural Engineer. This Inspector shall check mix for compliance with the intent of these specifications and shall furnish with each truck a certificate

bearing his or her signature stating the actual content of the mix. These certificates shall be delivered to the Project site with the truck and handed to the Project Inspector. The cost of this inspection shall be paid by the District.

2. All concrete shall be continuously inspected upon arrival and during placement by a deputy inspector approved by the Structural Engineer. This inspector shall check reinforcing steel placement and concrete placement for conformance with the Contract Documents.

1.03 SUBMITTALS

A. Transit-mix delivery slips:
   1. Keep a record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slip certifying contents of the pour.
   2. Make the record available to the Architect for his inspection upon request.
   3. Upon completion of this portion of the Work, deliver the record and the delivery slips to the Architect.

1.04 PRODUCT HANDLING

A. Protection:
   1. Use all means necessary to protect cast-in-place concrete materials before, during, and after installation and to protect the installed work and materials of all other trades.
   2. Concrete shall not be placed in the rain unless completely covered and protected from splash and run-off.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 CONCRETE

A. General:
   1. All concrete, unless otherwise specifically permitted by the Architect, shall be transit-mixed in accordance with ASTM C-94.
   2. The control of concrete production shall be under supervision of a recognized testing laboratory, selected and paid for as described in Section 01000 of these Specifications, who shall design the mixes and furnish inspection of batched aggregates and transit-mixed concrete at the mixing plant and distribution plant. The Owner will pay for only one mix design for each concrete strength, color or aggregate type specified.
   3. Use same brand of cement or source of aggregates during course of work.

B. Compressive strength: All concrete shall have the following minimum compressive strengths at 28 days:

Location of Concrete	Minimum psi at 28 days
Footings; grade beams, and pedestals	3000
Building slab on grade; columns, walls, beams, girders and slabs above ground	3000
Exterior slabs and site work	2500

C. Cement: Standard brand, domestic Portland cement, conforming to ASTM C150, Type II, Low Alkali - total alkali content not to exceed 0.60%.

D. Aggregates: Conforming to ASTM C33 and selected from a source, which has a proven history of non-reactivity.
1. Coarse aggregate: Clean, hard, fine-grained, sound, crushed rock or gravel which does not contain more than five percent (5%) by weight of flat, chip-like, thin, elongated, friable or laminated pieces. Contain no more than two percent (2%) by weight of shale or silty material.
2. Fine aggregate: Washed natural sand having hard, strong, durable particles and containing not more than 2% by weight of deleterious substances such as clay lumps, shale, mica, schist.
3. Gradation: Maximum size 1".

E. Water: Potable.

2.02 EXPANSION JOINT FILLER

A. 1/2" thick "Flexcell."

2.03 CURING COMPOUND

A. Thompson's Water Seal, A.C. Horn Clearseal 150, or Hunt's Process MB7C. Coordinate compound with flooring manufacturer’s adhesives to verify compatibility.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of cast-in-place concrete, shall be as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:
1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that all items to be embedded in concrete are in place.
3. Verify that concrete may be placed to the lines and elevations indicated on the Drawings, with all required clearance from reinforcement.

B. Discrepancies:
1. In the event of discrepancy, immediately notify the Architect.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 PREPARATION

A. General:
1. Remove all wood scraps and debris from the areas in which concrete will be placed.
2. Thoroughly clean the areas to ensure proper placement and bonding of concrete.
3. Thoroughly wet the forms (except in freezing weather), or apply form release agent; remove all standing water.
4. Thoroughly clean all transporting and handling equipment.
5. Set anchors, bolts, angles and other required inserts accurately.

B. Notification: Notify the Architect at least 48 hours before placing concrete.

3.03 PLACING CONCRETE

A. Method:
1. Convey concrete from mixer to place of final deposit by methods that will prevent separation and loss of materials.
2. For chuting, pumping, and pneumatically conveying concrete, use only equipment of such size and design as to ensure a practically continuous flow of concrete at the delivery end without loss or separation of materials.
3. Deposit concrete as nearly as possible in its final position to avoid segregation due to rehandling and flowing.
4. Place concrete as dry as possible consistent with good workmanship, never exceeding the maximum specified slump.
5. Maximum free drop of concrete shall not be more than 5'-0". Use tremies in deep sections.

B. Rate of placement:
1. Place concrete at such a rate that concrete is at all times plastic and flows readily between bare bars.
2. When placing is once started, carry it on as a continuous operation until placement of the panel or section is complete.
3. Do not pour a greater area at one time than can be properly finished without checking; this is particularly important during hot or dry weather.

C. Compaction:
1. Thoroughly consolidate all concrete by suitable means during placement, working it around all embedded fixtures and into corners of forms.
2. During placement, thoroughly compact the concrete by hand tamping and by mechanical vibration.

D. Acceptability:
1. Do not use re-tempered concrete or concrete that has been contaminated by foreign materials.
2. Do not use concrete, which has stood for more than l5 minutes after leaving mixer.
3. Concrete must be placed in final position within 90 minutes after water is first added.

3.04 CONSTRUCTION JOINTS

A. Location: Make and locate construction joints so as to not impair the strength or appearance of the concrete.

B. Approval: Obtain the Architect's approval of location of all construction joints and control joints in the Work prior to start of concrete placement.

C. Preparation:
1. The flow surface of the freshly poured concrete shall be level wherever a pour is stopped.
2. Thoroughly clean and roughen all construction joints.
3. Remove laitance and expose coarse aggregate.
4. Sandblast entire original surface.
5. Before the placing of any concrete, the surface of the previously poured concrete shall be wet.

3.05 INTERIOR SLABS

A. General:
1. Tamp slabs with a jitterbug to depress the rock, and then pushfloat with a bullfloat as necessary.
2. Take care that the wet slab meets the screeds accurately and does not rise above or lower below them.
3. Carefully provide slab depressions as required for the finishes indicated on the Drawings.
4. Do not puncture the waterproof membrane with screed supports.

B. Finishing:
1. Unless otherwise indicated on the Drawings, make all slabs even and uniform in appearance and, where no slope is required, level within plus or minus l/8 inch in ten feet.
2. Where floor drains or floor slopes are indicated, slope slabs uniformly to provide even fall for drainage.
3. Trowel all interior slabs to a smooth, hard finish.

4. Areas depressed for tile or other finished floor materials shall be left rough.
5. Finish roof slabs with wood float to receive insulation and roofing materials.

3.06 EXTERIOR SLABS

A. General:
1. Set screeds and headers at proper elevation and grade.
2. Slope all walks to shed water.
3. Cast in alternate slabs.

B. Finishing:
1. Broom finish: Where indicated on the Drawings, and where no other exterior slab finish is indicated on the Drawings, finish the exposed concrete surface by lightly combing with a medium stiff broom after troweling is complete.

2. Rock salt finish:
   a. Evenly distribute extra coarse rock salt.
   b. Steel trowel to embed the salt.
   c. After concrete has set, wash out the salt.
   d. After final curing, clean surface with l0 percent muriatic acid solution, rinse with clean water.

3.07 CURING AND PROTECTION

A. Protect all concrete and keep moist for a period of l0 consecutive days after pouring.

B. Keep concrete in forms moist by spraying the forms with water. Keep forms moist continuously.

C. Cure floor and roof slabs, walks, etc. by the application of the specified curing compound, applied immediately after slab has been finish troweled in accordance with manufacturer's recommendations.

3.08 EXPOSED ARCHITECTURAL SURFACES

A. Concrete surfaces which are exposed, but are not to be plastered, shall be smooth and free from marks. Remove fins and irregularities of surface while the concrete is green. Remove all imperfections by rubbing or honing, and clean resulting surface grout as specified.

B. Patching:
1. Use drypack mix for shallow depressions and grout for deeper holes.
2. Patch immediately after forms removed.
3. Use bonding grout, such as Duraweld, as directed.
4. Drive patches into place and leave high on the surface to accommodate shrinkage.
5. Rub patches with carborundum stone to match adjacent surface.

6. Fill tie holes solid with mortar.

C. Where form marks, beads, or grooves are required, and surface patching is done, restore these characteristics by hand, flush with and matched to the correct adjoining surfaces.

D. Scrub surfaces formed by oil-coated forms with a solution of 1-1/2 pounds of caustic soda to one gallon of water or other approved method. After surfaces have been scrubbed as above specified, wash with clean water as soon as possible. Wash concrete surfaces, indicated or specified to receive painter's finishes.

E. Sacking:
1. Sack surfaces with a grout mixture of one part cement, one part fine silica and sufficient water to allow grout to be rubbed into surface.
2. Do sacking immediately after forms are removed.
3. After grout has set, rub vigorously with clean burlap.
4. Leave surfaces clean and smooth.

F. Sandblasting:
1. Sandblast to expose aggregate at least l/8" deep.
2. Prepare a sample panel for Architect's approval. Approved panel will serve as a standard for all subsequent sandblasting.

G. Particular attention is called to the need for care to be used in connection with exposed concrete surfaces. Any surfaces to be exposed, which, in the opinion of the Architect are unduly rough or do not resent a good appearance shall be ground or otherwise corrected to the satisfaction of the Architect.

3.09 CURBS AND GUTTERS

A. Comply with Section 73, Standard Specifications, California Department of Transportation, latest edition.

B. Install 1/2" wide expansion joints at 20 foot intervals.

3.12 DEFECTIVE WORK

A. Concrete will be considered defective when it fails to meet specified strengths, when it shows cracks beyond normal tolerances, when it is out of line, level or plumb, or when it shows rock pockets, excessive air pockets, voids, spalls, or exposed reinforcing. Replace all defective concrete with new work conforming to the specifications, at Contractor's expense, and by a method approved by the Architect.

END OF SECTION

SECTION 03346

CONCRETE FLOOR SEALER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surface treatment with concrete hardener and sealer as scheduled.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Prepared concrete floors ready to receive finish.

1.03 SUBMITTALS

A. Product Data: Provide data on finishing compounds, product characteristics, compatibility and limitations.

B. Manufacturer's Installation Instructions: Indicate criteria for preparation and application.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's packaging including application instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Hunt Process Product LM-Z.

B. Burke, BURK-O-LITH, 800-423-9140.

2.02 COMPOUNDS - HARDENERS AND SEALERS

A. Chemical Hardener: Magnesium and zinc silicone fluoride type.

B. VOC compliant in the locality of the Work.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the Work of this Section.

3.02 FLOOR SURFACE TREATMENT

A. Apply two coats of liquid hardener in accordance with manufacturer's instructions.

3.03 SCHEDULE

A. Provide floor sealer as final finish in Communications/ telephone equipment room.

END OF SECTION