

DIVISION 3

CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the WORK under this Section.

1.02 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the concrete WORK, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".
- B. Including but not necessarily limited to the following:
 - 1. Form work, shoring, bracing and anchorage.
 - 2. Concrete reinforcement and accessories.
 - 3. Cast-in-place concrete.

1.03 RELATED WORK

- A. Section 02513 - Asphaltic Concrete Paving - General
- B. Section 02751 - Portland Cement Concrete Paving.
- C. Section 03300 - Cast-in-Place Concrete.
- D. All applicable sections of Division 1, 2, 3 and 4.

1.04 QUALITY ASSURANCE

- A. All WORK shall be in accordance with ACI 301, latest edition, a copy of which shall be maintained on site.
- B. Requirements of Regulatory Agencies: perform WORK in accordance with local building and other applicable codes.
- C. Installation: Performed only by skilled workmen with satisfactory record of performance on completed projects of comparable size and quality.
- D. Inspection and Testing:
 - 1. Test Cylinders - As per ASTM C-39.
 - a. Minimum of three (3) concrete test cylinder shall be taken for every 75 or less cubic yards of concrete placed each day.

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- b. Minimum of one (1) slump test shall be taken during any cold weather concreting, and be cured on job site under same conditions as the concrete it represents.
- 2. Slump Test - As per ASTM C-143.
 - a. Minimum of one (1) slump test shall be taken for each set of test cylinders taken.

1.05 SUBMITTALS

- A. Test Reports: Reports of concrete compression, yield, air content and slump tests.
- B. Certificates:
 - 1. Manufacturer's certification that materials meet specification requirements.
 - 2. Material content per cubic yards of each class of concrete furnished.
 - a. Dry weights of cement.
 - b. Saturated surface-dried weights of fine and course aggregate.
 - c. Quantities, type and name of all mixtures.
 - d. Weight of water.
 - 3. Ready-mix delivery tickets as per ASTM C-94.
- C. Shop Drawings:
 - 1. Show sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.
 - 2. Indicate reinforcement sizes, spaces, locations and quantities or reinforcing steel, and wire fabric, bending and cutting schedules, splicing and supporting and spacing devices.
 - 3. Indicate formwork dimensioning, materials, arrangement of joints and ties.
 - 4. Shop drawings shall be prepared under seal of a Professional Structural ENGINEER, registered in the State of Florida.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.
- B. Handle and store materials to prevent contamination.

1.07 JOB CONDITIONS

- A. Allowable concrete temperatures:

1. Hot weather: Maximum 90 degrees F as per ASTM C-94.
- B. Do not place concrete during rain, unless protection is provided.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Materials shall conform to ACI 301, latest edition.
- B. Plywood forms: Douglas Fir Species, solid one side, form grade, sound undamaged sheets.
- C. Lumber: Southern Pine Species, No. 2 Grade, with grade stamp clearly visible.
- D. Form Ties: Removable, snap-off metal, of fixed and adjustable length, cone ends.
- E. Tubular Column Type: Round, spirally wound laminated fiber material, clearly visible.

2.02 REINFORCING STEEL

- A. Reinforcing steel shall conform to ASTM A615, 60 ksi yield grade billet steel reformed bars; uncoated finish.
- B. Welded steel wire fabric shall conform to ANSI/ASTM A185, plain type; coiled rolls, uncoated finish.

2.03 CONCRETE MATERIALS

- A. Cement: shall conform to ASTM C150, normal Type II Portland, gray color.
- B. Fine and coarse aggregate shall conform to ASTM C33.
- C. Water: clean and not detrimental to concrete.

2.04 ADMIXTURES

- A. Air Entraining: ASTM C-260
- B. Chemical: Type (as required) ASTM C-494.
- C. Fly Ash and Pozzolans: ASTM C-618

2.05 ACCESSORIES

- A. Non-shrink grout: pre-mixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 3500 psi.
- B. Construction joints: locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to the ENGINEER. Place

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construction joints perpendicular to the main reinforcement, continue reinforcement across construction joints.

- C. Expansion joints: shall be a minimum of 3/4 inch thick asphalt impregnated fiberboard as per ASTM D-1751.
- D. Form release agent shall be a colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.
- E. Water shall be clean and potable.

2.06 CURING MATERIALS

- A. Water shall be clean and potable.
- B. Absorptive mat shall be burlap fabric of 9 oz./sq. yd. clean, roll goods complying with AASHTO M182, Class 3.
- C. Membrane curing compound shall conform to ASTM C309.
- D. Clear Sealer: "Clear Bond" as manufactured by Guardian Chemical Co. or approved equal.

2.07 CONCRETE MIX

- A. Mix concrete in accordance with ASTM C94.
- B. Concrete:
 - 1. Compressive strength (28 days): 3000 psi.
 - 2. Slump: 4(±) 1 inch.

PART 3 - EXECUTION

3.01 FORMWORK ERECTION

- A. Verify lines, levels, and measurement before proceeding with formwork.
- B. Hand trim sides and bottom of earth forms; remove loose dirt.
- C. Align form joints.
- D. Do not apply form release agent where concrete surfaces receive special finishes or applied coatings which may be affected by agent.
- E. Coordinate WORK of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts.

3.02 REINFORCING

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Place, support and secure reinforcement against displacement.

3.03 PLACING CONCRETE

- A. Notify ENGINEER minimum 24-hours prior to commencement of concreting operations.
- B. Scratch, float, trowel, broom or belt finish surfaces, as scheduled or indicated on the Drawings.

3.04 TOLERANCES

Provide Class B tolerance to floor slabs according to ACI 301. Pitch to drains 1/4 inch per foot.

3.05 FINISHES FOR EXPOSED SURFACES

Provide exposed surfaces with finishes as called for on the Drawings.

END OF SECTION 03010

**SECTION 03100
CONCRETE FORMWORK**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the WORK under this Section.

1.02 WORK INCLUDED

- A. Formwork for Cast-In-Place Concrete, with shoring, bracing, and anchorage.
- B. Openings for other affected WORK.
- C. Form accessories.
- D. Stripping forms.

1.03 RELATED WORK

- A. Section 03010 - Concrete.
- B. Section 03200 - Concrete Reinforcement.
- C. Section 03300 - Cast-In-Place Concrete.

1.04 SYSTEM DESCRIPTION

Design, engineer and construct formwork, shoring and bracing to meet design code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

1.05 QUALITY ASSURANCE

Construct and erect concrete formwork in accordance with ACI 301 and 347.

1.06 SUBMITTALS

- A. Indicate pertinent dimensions, materials, and arrangement of joints and ties.
- B. Prepare shop drawings under seal of Professional Structural Engineer registered in the State of Florida.
- C. Manufacturers certification that materials meet specification requirements.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle materials in accordance with manufacturers recommendations.
- B. Deliver form materials in manufacturer's packaging with installation instructions.
- C. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

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- D. Remove packaging from void forms.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Plywood: Douglas Fir Species; medium density overlaid one side grade; sound, undamaged sheets with straight edges.
- B. Lumber: Southern Pine Species; No. 2 grade; with grade stamp clearly visible.
- C. Tubular Column: Round, of spirally wound laminated fiber type; surface treated with release agent; of size required.

2.02 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off metal of adjustable length; cone type; 1 1/2 inch break back dimension; free of defects that will leave holes no larger than 1-1/4 inches diameter in concrete surface.
- B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding in color characteristics of coating intended for use on concrete.
- C. Fillets for Chamfered Corners: Wood strips or rigid PVC plastic in maximum possible lengths.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; or strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify lines, levels, and measurements before proceeding with formwork.

3.02 PREPARATION

- A. Hand-trim sides and bottoms of earth forms; remove loose dirt prior to placing concrete.
- B. Minimize form joints. Symmetrically align joints and make weathertight to prevent leakage of mortar.
- C. Arrange and assemble formwork to permit dismantling, stripping, so that concrete is not damaged during its removal.
- D. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

3.03 ERECTION

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- A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
 - B. Camber slabs and beams to achieve ACI 301 tolerances.
 - C. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly lifted so that joints will be apparent in exposed concrete surfaces.
 - D. Provide expansion strips on external corners of beams and columns, where exposed.
 - E. Install void forms. Protect from moisture before concrete placement. Protect from crushing during concrete placement.
 - F. Construct formwork to maintain tolerances in accordance with ACI 301.
- 3.04 APPLICATION OF FORM RELEASE AGENT
- A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
 - B. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes or applied coverings which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.
- 3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS
- A. Provide formed openings where required for WORK embedded in or passing through concrete.
 - B. Coordinate WORK of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
 - C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.
- 3.06 FORM REMOVAL
- A. Notify ENGINEER prior to removing formwork.
 - B. Do not remove forms and shoring until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it. Remove load supporting forms when concrete has attained 75 percent of required 28-day compressive strength, provided construction is reshored.
 - C. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the WORK, may be removed after cumulatively curing at not less than 50 degrees F for 24-hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

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- D. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28-days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location of members.
 - E. Reshore structural members due to design requirements or construction conditions to permit successive construction.
 - F. Remove formwork progressively so no unbalanced loads are imposed on structure.
 - G. Do not damage concrete surfaces during form removal.
 - H. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.
 - I. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.
- 3.07 CLEANING
- A. Clean forms to remove foreign matter as erection proceeds.
 - B. Ensure that water and debris drain to exterior through clean-out ports.

END OF SECTION 03100

**SECTION 03200
CONCRETE REINFORCEMENT**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the WORK under this Section.

1.02 WORK INCLUDED

- A. Reinforcing steel bars, welded steel wire fabric, fabricated steel bar or rod mats for cast-in-place concrete.
- B. Support chairs, bolsters, bar supports, spaces, for supporting reinforcement.

1.03 RELATED WORK

- A. Section 03010 - Concrete.
- B. Section 03100 - Concrete Formwork.
- C. Section 03300 - Cast-In-Place Concrete.

1.04 QUALITY ASSURANCE

- A. Perform concrete reinforcement WORK in accordance with CRSI Manual and Standard Practice, and Documents 63 and 65.
- B. Conform to ACI 301.

1.05 SUBMITTALS

- A. Indicate sizes, spacings, locations and quantities of reinforcing steel, bending and cutting schedules, splicing, stirrup spacing, supporting and spacing devices.
- B. Prepare shop drawings under seal of Professional Structural ENGINEER registered in the State of Florida.
- C. Submit mill test certificates and supplied concrete reinforcing, indicating physical and chemical analysis.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade billet-steel, deformed bars, uncoated finish.
- B. Welded Steel Wire Fabric: ANSI/ASTM A185 plain type; in coiled rolls; uncoated finish.

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CONCRETE REINFORCEMENT

- C. Stirrup Steel: ANSI/ASTM A82.

2.02 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gauge annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete, including load bearing pad on bottom to prevent vapor barrier puncture.
- C. Chairs, Bolsters, Bar Supports, Spacers Adjacent to Architectural Concrete Surfaces: Plastic coated or stainless steel type; sized and shaped as required.

2.03 FABRICATION

- A. Fabricate in accordance with ACI 315, providing concrete cover specified in Section 03300.
- B. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Before placing concrete, clean reinforcement of foreign particles or coatings.
- B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.
- C. Do not dispose or damage vapor barrier required by Section 03300.

END OF SECTION 03200

**SECTION 03300
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
2. Formwork accessories.
3. Form stripping.
4. Reinforcing steel for cast-in-place concrete.
5. Cast-in-place concrete, including concrete for the following:
 - a. Foundations, footings.
 - b. Slabs on grade.
 - c. Load-bearing building walls.
 - d. Building frame members.
 - e. Reinforced masonry.
6. Concrete curing.

1.02 REFERENCES

- A. ACI 117-90 -- Standard Tolerances for Concrete Construction and Materials; American Concrete Institute; 1990.
- B. ACI 211.1-91 -- Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute; 1991.
- C. ACI 301-96 -- Specifications for Structural Concrete for Buildings; American Concrete Institute; 1996.
- D. ACI 302.1R-96 -- Guide for Concrete Floor and Slab Construction; American Concrete Institute, 1996.
- E. ACI 304R-89 -- Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute; 1989.
- F. ACI 305R-91 -- Hot Weather Concreting; American Concrete Institute; 1991.
- G. ACI 318/318R-95 -- Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute; 1995
- H. ACI 347R-88 -- Guide to Formwork for Concrete; American Concrete Institute; 1988.
- I. ACI SP-66-88 -- ACI Detailing Manual; American Concrete Institute; 1998.

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- J. ASTM A 185-90a -- Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1990.
- K. ASTM A 615-92 -- Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement; 1992.
- L. ASTM C 31-91 -- Standard Practice for Making and Curing Concrete Test Specimens in the Field; 1991.
- M. ASTM C 33-92 -- Standard Specification for Concrete Aggregates; 1992.
- N. ASTM C 33-93a -- Standard Test Methods for Compressive Strength of Cylindrical Concrete Specimens; 1993.
- O. ASTM C 42-90 -- Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete; 1990.
- P. ASTM C 94-92a -- Standard Specification for Ready Mixed Concrete; 1992.
- Q. ASTM C 143-90a -- Standard Test Method for Slump of Hydraulic Cement Concrete; 1990.
- R. ASTM C 150-96 -- Standard Specification for Portland Cement; 1996.
- S. ASTM C 171-92 -- Standard Specification for Sheet Materials for Curing Concrete; 1992.
- T. ASTM C 172-90 -- Standard Practice for Sampling Freshly Mixed Concrete; 1990.
- U. ASTM C 173-78 -- Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 1978.
- V. ASTM C 231-91b -- Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 1991.
- W. ASTM C 260-94 -- Standard Specification for Air - Entraining Admixtures for Concrete; 1993.
- X. ASTM C 309-93 -- Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete; 1993.
- Y. ASTM C 494-92 -- Standard Specification for Chemical Admixtures for Concrete; 1992.
- Z. ASTM C 618-94a -- Standard Specification for Coal Fly Ash and Raw or Calcined natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete; 1994.
- AA. ASTM C 685-94 -- Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 1994.
- BB. ASTM C 881-90 -- Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 1990.

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- CC. ASTM C 1059-91 -- Standard Specification for Latex Agents for Bonding Fresh Hardened Concrete.
- DD. ASTM C 1107-91a -- Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink); 1991.
- EE. AWS D1.4-98 -- Structural Welding code - Reinforcing Steel; American Welding Society, 1998.
- FF. CRSI MSP-1-90 -- Manual of Standard Practice; Concrete Reinforcing Steel Institute; 1990.
- GG. The latest edition of the Broward County South Florida Building Code, Current Broward Edition.

1.03 DEFINITIONS

- A. Unexposed Finish: A general use finish, with no appearance criteria, applicable to all formed concrete appearance criteria, applicable to all formed concrete concealed from view after completion of construction.
- B. Exposed Finish: Concrete to be exposed to the weather or on sonotube type columns that will receive stucco with a smooth finish.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for the following:
 - 1. Formwork accessories.
 - 2. Concrete admixtures.
 - 3. Grout.
 - 4. Curing compound.
 - 5. Bonding compound.
 - 6. Epoxy bonding system.
- B. Aggregates: Submit test reports showing compliance with specified quality and gradation.
- C. Shop Drawings: Submit shop drawings for fabrication and placement of the following:
 - 1. Reinforcement: Comply with ACI SP-66. Include bar schedules, diagrams of bent bars, arrangement of concrete reinforcement, and splices.
 - a. Include details of reinforcement at openings through concrete structures.
 - b. Show stirrup spacing.

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- D. Quality Control Submittals: Submit the following information related to quality assurance requirements specified:
1. Design data: Submit proposed mix designs and test data before concrete operations begin. Identify for each mix submitted the method by which proportions have been selected.
 - a. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength $f (cr)$ calculations.
 - b. For mix designs based on trial mixtures, include trial mix proportions, test results, and graphical analysis and show required average compressive strength $f (cr)$.
 - c. Indicate quantity of each ingredient per cubic yard of concrete.
 - d. Indicate type and quantity of admixtures proposed or required.
 2. Certifications: Submit affidavits from an independent testing agency certifying that all materials furnished under this section conform to specifications.
 3. Certifications: Submit mill test certificates for all reinforcing steel furnished under this section, showing physical and chemical analysis.
 4. Submit batch tickets complying with ASTM C 94, as applicable, for each load of concrete used in the WORK.
 - a. Include on the tickets the additional information specified in the ASTM document.
 5. Hot weather concreting: Submit description of planned protective measures.

1.05 QUALITY ASSURANCE

- A. Codes and Standards: comply with the following documents, except where requirements of the contract documents or of governing codes and governing authorities are more stringent:
1. ACI 301.
 2. ACI 318.
 3. AWS D1.4.
 4. CRSI manual of Standard Practice.
 5. The Florida Building Code, Current Broward Edition.
- B. Testing Agency Services:
1. Owner will engage testing agency to conduct tests and perform other service specified for quality control during construction. The Contractor is responsible to engage testing

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laboratories and perform testing services as necessary to insure compliance with the plans and specifications.

- a. Only AWS Certified Welding Inspectors shall be used for tests and qualifications associated with welding of reinforcing steel.

C. Source of Materials: Obtain materials of each type from same source for the entire project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcement to project site bundled and tagged with metal tags indicating bar size, lengths, and other data corresponding to information shown on placement drawings.

1. Store concrete reinforcement materials at the site to prevent damage and accumulation of dirt or rust.

B. Store cementitious materials in a dry, weather tight location. Maintain accurate records of shipment and use.

C. Store aggregates to permit free drainage and to avoid contamination with deleterious matter or other aggregates. When stockpiled on ground, discard bottom 6 inches of pile.

D. Handle aggregates to avoid segregation.

1.07 PROJECT CONDITIONS

A. Hot Weather Concreting: Comply fully with the recommendations of ACI 305R.

1. Well in advance of proposed concreting operations, advise the ENGINEER of planned protective measures including but not limited to cooling of materials before or during mixing, placement during evening to dawn hours, fogging during finishing and curing, shading, and windbreaks.

PART 2 - PRODUCTS

2.01 FORMWORK

A. Facing Materials:

1. Unexposed finish concrete: Any standard form materials that produce structurally sound concrete.

B. Cylindrical Column Forms: Weather resistant tubes of metal, plastic, or laminated paper or fiber.

C. Formwork Accessories:

1. Form coating: Form release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
2. Metal ties: Commercially manufactured types; cone snap ties, taper removable bolt, or other type which will leave no metal closer than 10 inches from surface of concrete when forms are removed, leaving not more than a 1-inch-diameter hole in concrete surface.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: Provide deformed bars complying with the following, except where otherwise indicated.

1. ASTM A 615, Grade 60

B. In locations indicated, provide reinforcing complying with the following:

1. ASTM A 615, Grade 60

C. Welded Wire Fabric: ASTM A 185, cold-drawn steel, plain.

D. Reinforcing Accessories:

1. Tie wire: Black annealed type, 16-1/2 gage or heavier.
2. Supports: Bar supports conforming to specifications of CRSI "Manual of Standard Practice".

Precast concrete blocks of strength equal to or greater than specified strength of concrete or Class 3 supports equipped with sand plates, where concrete will be cast against earth. Concrete masonry units will not be accepted.

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2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, and as follows:
 - 1. Type I.
- B. Fly Ash: ASTM C 618, Type C or F.
- C. Water: Potable.
- D. Aggregates:
 - 1. Normal weight concrete: ASTM C 33
 - a. Class 1N.
 - 2. Maximum size of coarse aggregates, whichever is least:
 - a. One-fifth narrowest dimension between sides of forms.
 - b. One-third of depth of slabs.
 - c. Three-fourths of minimum clear distance between reinforcing bars or between bars and side of form.
 - d. Columns and piers: Two-thirds of minimum clear distance between bars.
- E. Admixtures - General: Admixtures which result in more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.
- F. Air-Entraining Admixture: ASTM C 260 and certified by manufacturer for compatibility with other mix components.
 - 1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
 - a. "Air Mix"; The Euclid Chemical Company.
 - b. "Sika-Aer"; Sika Corporation.
 - c. "Micro-Air"; Master Builders, Inc.
 - d. "Darex AEA"; W.R. Grace & Co.
 - e. "Burke 2001" or "Burke 2002"; The Burke Company.
 - f. "Air-Tite"; Cormix Construction Chemicals.
- G. Water Reducing Admixture: ASTM C 494, Type A.
 - 1. Product: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
 - a. "WRDA Hycol"; W.R. Grace & Co.
 - b. "PSI-N"; Cormix Construction Chemicals.
 - c. "Eucon WR-75"; The Euclid Chemical Company.
 - d. "Pozzolith Normal"; Master Builders, Inc.

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- e. "Plastocrete 161"; Sika Corporation.
 - f. "Prokrete N"; Master Builders, Inc. (former Conchem product)
- H. Water Reducing, Retarding Admixture: ASTM C 494, Type D.
- 1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
 - a. "Pozzolith Retarder"; Master Builders, Inc.
 - b. "Eucon Retarder 75"; The Euclid Chemical Company.
 - c. "Daratar-17"; W.R. Grace & Co.
 - d. "PSI-R Plus"; Cormix Construction Chemicals.
 - e. "Plastiment"; Sika Corporation.
 - f. "Protard"; Master Builders, Inc. (former Conchem product).

2.04 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Vapor Retarder: Membrane for installation beneath slabs on grade, resistant to decay when tested in accordance with ASTM E 154, and as follows:
 - 1. Polyethylene sheet, not less than 8 mils thick.
- B. Nonshrink Grout: ASTM C 1107
 - 1. Type: Provide non-metallic type only.
- C. Burlap: AASHTO M 182, Class2 jute or kenaf cloth.
- D. Moisture Retaining Cover: ASTM C 171, and as follows:
 - 1. Curing paper.
 - 2. Polyethylene film.
 - 3. White burlap-polyethylene sheeting.
- E. Liquid Curing Compounds:
 - 1. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
 - a. Master Builders, Inc.
 - b. Anti Hydro International, Inc.
 - c. The Euclid Chemical Company
 - d. A.C. Horn, Inc.
 - e. Dayton Superior Corporation.
 - f. W.R. Meadows, Inc.
 - g. The Burke Company.
 - h. Sonneborn Building Products Division / ChemRex, Inc.

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- i. L & M Construction Chemicals, Inc.
 - j. Setcon Industries, Inc.
 - k. Cormix, Inc.
2. Material - curing compounds: Comply with ASTM C 309, Type I.
- a. Non yellowing formulation where subject to ultraviolet light.
 - b. Where compounds are proposed for use on surfaces to which finishes, coating, or coverings subsequently will be applied, compound shall possess demonstrated compatibility with finish, coating, or covering, and use shall be subject to approval of the ENGINEER.
3. Material - curing and hardening compound: Free of waxes, resins, or oils; meet water retention requirements of ASTM C 309; penetrate concrete to change free lime to calcium silicate forming a permanently dense, hard, surface.
4. Solvents: Water based products where used on interior surfaces.
- F. Bonding Compound: Non-redispersable acrylic bonding admixture, ASTM C 1059, Type II.
1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
- a. "Everbond"; L & M Construction Chemicals, Inc.
 - b. "Flex-Con"; The Euclid Chemical Company
 - c. "Intralok"; W.R. Meadows, Inc.
- G. Epoxy Bonding Systems: ASTM C 881; type, grade, and class as required for project conditions.
1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
- a. "Concresive LPL"; Master Builders, Inc.
 - b. "Epoxite Binder (Code #2390)"; A.C. Horn, Inc.
 - c. "Sikadur 32 Hi-Mod" Sika Corporation.
 - d. "Euco #452 Epoxy System"; The Euclid Chemical Company.
 - e. "Burke Epoxy M.V."; The Burke Company.

2.05 CONCRETE MIX DESIGN

- A. Review: Do not begin concrete operations until proposed mix has been reviewed by the ENGINEER.
- B. Proportioning of Normal Weight Concrete: Comply with recommendations of ACI 211.1.
- C. Required Average Strength: Establish the required average strength f_{cr} of the design mix on the basis of either field experience or trial mixtures as specified in ACI 301, and proportion mixes accordingly. If trial mixtures method is used, employ an independent testing agency acceptable to the ENGINEER for preparing and reporting proposed mix design.

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- D. Specified compressive strength f (c) at 28 days: 3000 psi.
- E. Fly Ash:
1. The CONTRACTOR may elect to replace a portion of the portland cement with fly ash up to a maximum of 25 percent by weight of cement plus fly ash.
- F. Admixtures:
1. Air-entraining admixture: Add at rate to achieve total air content between 2 percent and 4 percent for concrete which will not be exposed to exterior conditions.
 - a. Do not use in slabs-on-grade scheduled to receive topping, unless manufacturer of topping recommends use over air-entrained concrete.
 2. Water reducing admixture: Add as required for placement and WORK ability.
 3. Water reducing and retarding admixture: Add as required in concrete mixes to be placed at ambient temperatures above 90 degrees F.
 4. Do not use admixtures not specified or approved.
- G. Mix Adjustments: Provided that no additional expense to owner is involved, CONTRACTOR may submit for ENGINEER's approval requests for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

2.06 CONTROL OF MIX IN THE FIELD

- A. Slump: A tolerance of up to 1 inch above approved design mix slump will be permitted for 1 batch in 5 consecutive batches tested. Concrete of lower slump than that specified may be used, provided proper placing and consolidation is obtained.
- B. Total Air Content: A tolerance of plus or minus 10 percent of approved design mix air content will be allowed for field measurements.
- C. Do not use batches that exceed tolerances.

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2.07 CONCRETE MIXING

- A. On Site Equipment: Mix concrete materials in appropriate drum type batch machine mixer, in compliance with ASTM C 685. Mix each batch minimum of 10 minutes and maximum of 5 minutes before discharging concrete. Clean thoroughly at end of day and before changing concrete type.
- B. Transit Mixers: Mix concrete materials in transit mixers, complying with requirements of ASTM C 94.
 - 1. At ambient temperatures of 85 to 90 degrees F, reduce mixing and delivery time to 90 minutes.
 - 2. At ambient temperatures above 90 degrees F, reduce mixing and delivery time to 75 minutes.

PART 3 - EXECUTION

3.01 CONCRETE FORM PREPARATION

- A. General: Comply with requirements of ACI 301 for formwork, and as herein specified. The CONTRACTOR is responsible for design, engineering, and construction of formwork, and for its timely removal.
- B. Earth Forms: Earth forms are not permitted.
- C. Design: Design and fabricate forms for easy removal, without impact, shock or damage to concrete surfaces or other portions of the WORK. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.
- D. Construction: Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown or otherwise required.
 - 1. Joints: Minimize form joints and make watertight to prevent leakage of concrete.
 - 2. Permanent openings: Provide openings to accommodate WORK of other trades, sized and located accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.
 - 3. Temporary openings: Provide temporary openings for cleaning and inspection in most inconspicuous locations at base of forms, closed with tight-fitting panels designed to minimize appearance of joints in finished concrete WORK.
- E. Tolerances for Formed Surfaces: Comply with minimum tolerances established in ACI 117, unless more stringent requirements are indicated on the drawings.
- F. Release Agent: Provide either form materials with factory-applied nonabsorptive liner or field-applied form coating. If field-applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces is unacceptable.

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3.02 VAPOR RETARDER INSTALLATION

General: Place vapor retarder sheet over prepared material, aligning longer dimension parallel to direction of pour and lapped 6 inches. Seal joints with appropriate tape. Cover with sand to depth shown on drawings.

3.03 PLACING REINFORCEMENT

- A. General: Comply with requirements of ACI 301 and as herein specified.
- B. Preparation: Clean reinforcement of loose rust and mill scale, soil, and other materials which adversely affect bond with concrete.
- C. Placement: Place reinforcement to achieve not less than minimum concrete coverages required for protection. Accurately position, support, and secure reinforcement against displacement. Provide Class C tension lap splices complying with ACI 318 unless otherwise indicated. Do not field-bend partially embedded bars unless otherwise indicated or approved.
 - 1. Use approved bar supports and tie wire, as required. Set wire ties to avoid contact with or penetration of exposed concrete surfaces. Tack welding of reinforcing is not permitted.
 - 2. Wire fabric: Install in maximum lengths possible, lapping adjoining pieces not less than one full mesh. Offset end laps to prevent continuous laps in either direction, and splice laps with tie wire.
- D. Welding: Welding of reinforcement is not permitted, except with the ENGINEER's specific approval.
 - 1. Perform welds in accordance with AWS D1.4.

3.04 JOINT CONSTRUCTION

- A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, located in manner which will not impair strength and will have least impact on appearance, as acceptable to the Engineer.
 - 1. Keyways: Provide keyways no less than 1-1/2 inches deep.
 - 2. Reinforcement: Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.
- B. Control Joints: Construct contraction joints in slabs poured on grade to form panels of sizes indicated on drawings, but not more than 15 feet apart in either direction.
 - 1. Saw cuts: Form control joints by means of saw cuts one-fourth the depth of the slab, or as detailed on the drawings, performed as soon as possible after slab finishing without dislodging aggregate within 6 Hours of pouring.

3.05 INSTALLATION OF EMBEDDED ITEMS

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- A. General: set anchorage devices and other items required for other WORK connected to or supported by cast-in-place concrete, using templates, setting drawings, and instruction from suppliers of items to be embedded.
 - 1. Edge Forms and screeds: Set edge forms and intermediate screeds as necessary to achieve final elevations indicated for finished slab surfaces.

3.06 CONCRETE PLACEMENT

- A. Preparation: Provide materials necessary to ensure adequate protection of concrete during inclement weather before beginning installation of concrete.
- B. Inspection: Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such WORK has been completed.
 - 1. Wood Forms: Moisten immediately before placing concrete in locations where form coatings are not used.
- C. Placement - General: Comply with requirements of ACI 304 and as follows:
 - 1. Schedule continuous placement of concrete to prevent the formation of cold joints.
 - 2. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation, joint location (s) to be approved by the Engineer.
 - 3. Deposit concrete as close as possible to its final location, to avoid segregation.
- D. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
 - 1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
 - 2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
 - 3. Do not use vibrators to move concrete laterally.
- E. Slab Placement: Schedule continuous placement and consolidation of concrete within planned construction joints.
 - 1. Thoroughly consolidate concrete without displacing reinforcement or embedded items, using internal vibrators, vibrating screeds, roller pipe screeds, or other means acceptable to ENGINEER.
 - 2. Strike off and level concrete slab surfaces, using highway straightedges, darbies, or bull floats before bleed water can collect on surface. Do not WORK concrete further until finishing operations are commenced.

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- F. Hot Weather Placement: Comply with recommendations of ACI 305R when ambient temperature before, during, or after concrete placement is expected to exceed 90 degrees F or when combinations of high air temperature, low relative humidity, and wind speed are such that the rate of evaporation from freshly poured concrete would otherwise exceed 0.2 pounds per square foot per hour.
1. Do not add water to approved concrete mixes under hot weather conditions.
 2. Provide mixing water at lowest feasible temperature, and provide adequate protection of poured concrete to reduce rate of evaporation.
 3. Use fog nozzle to cool formwork and reinforcing steel immediately prior to placing concrete.

3.07 FINISHING FORMED SURFACES

- A. Repairs, General: Repair surface defects, including tie holes, immediately after removing formwork.
1. Remove honeycombed areas and other defective concrete down to sound concrete, cutting perpendicular to surface or slightly undercutting. Dampen patch location and area immediately surrounding it prior to applying bonding compound or patching mortar.
 2. Before bonding compound has dried, apply patching mixture matching original concrete in materials and mix except for omission of coarse aggregate, and using a blend of white and normal portland cement as necessary to achieve color match. Consolidate thoroughly and strike off slightly higher than surrounding surface.
- B. Unexposed Form Finish: Repair tie holes and patch defective area. Rub down or chip off fins or other raised areas exceeding 1/4 inch height.

3.08 FINISHING SLABS

- A. Finishing Operations - General:
1. Do not directly apply water to slab surface or dust with cement.
 2. Use hand or powered equipment only as recommended in ACI 302.1R.
 3. Screeding: Strikeoff to required grade and within surface tolerances indicated. Verify conformance to surface tolerances. Correct deficiencies while concrete is still plastic.
 4. Bull Floating: Immediately following screeding, bull float or darby before bleed water appears to eliminate ridges, fill in voids, and embed coarse aggregate. Recheck and correct surface tolerance.
 5. Do not perform subsequent finishing until excess moisture or bleed water has disappeared and concrete will support either foot pressure with less than 1/4 inch indentation or weight of power floats without damaging flatness.

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6. Final floating: Float to embed coarse aggregate, to eliminate ridges, to compact concrete, to consolidate mortar at surface, and to achieve uniform, sandy texture. Recheck and correct surface tolerances.
- B. Coordinate appearance and texture of required final finishes with the ENGINEER before application.
1. Apply final finishes in the locations indicated on the drawings.
- C. Float Finish: As specified above.
- D. Slab Surface Tolerances:
1. Achieve flat, level planes except where grades are indicated. Slope uniformly to drains.
 2. Floated finishes: Depressions between high spots shall not exceed 5/16 inch under a 10-foot straightedge.
- E. Repair of Slab Surfaces: Test slab surfaces for smoothness and to verify surface plane to tolerance specified. Repair defects as follows:
1. High Areas: Correct by grinding after concrete has cured for not less than 14 days.
 2. Low area: Immediately after completion of surface finishing operations, cut out low areas and replace with fresh concrete. Finish repaired areas to blend with adjacent concrete. Proprietary patching compounds may be used when approved by the ENGINEER.
 3. Crazed or cracked areas: Cut out defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts. Dampen exposed concrete and apply bonding compound. Mix, place, compact, and finish patching concrete to match adjacent concrete.
 4. Isolated cracks and holes: Groove top of cracks and cut out holes not over 1 inch in diameter. Dampen cleaned concrete surfaces and apply bonding compound; place dry pack or proprietary repair compound acceptable to ENGINEER while bonding compound is still active:
 - a. Dry-pack mix: One part portland cement to 2-1/2 parts fine aggregate and enough water as required for handling and placing.
 - b. Install patching mixture and consolidate thoroughly, striking off level with and matching surrounding surface. Do not allow patched areas to dry out prematurely.

3.09 CONCRETE CURING AND PROTECTION

A. General:

1. Prevent premature drying of freshly placed concrete, and protect from excessively cold or hot temperatures until concrete has cured.

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2. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case.
- B. Curing Period:
1. Not less than 7 days for standard cements and mixes.
- C. Formed surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed.
1. Keep wooden or metal forms moist when exposed to heat of the sun.
 2. If forms are removed prior to completion of curing process, continue curing by one of the applicable methods specified.
- D. Surfaces Not in Contact with Forms:
1. Start initial curing as soon as free water has disappeared, but before surface is dry.
 2. Keep continuously moist for not less than 3 days by uninterrupted use of any of the following:
 - a. Water ponding.
 - b. Water-fog spray.
 - c. Saturated burlap: Provide 4-inch minimum overlap at joints.
 3. Begin final curing procedures immediately following initial curing and before concrete has dried.
- Acceptable curing methods:
- a. Water ponding.
 - b. Water-fog spray.
 - c. Saturated burlap: Provide 4-inch minimum over lap at joints.
 - d. Moisture retaining sheet.
 - e. Liquid curing compounds.
 - f. Moisture retaining cover: Lap not less than 3 inches at edges and ends, and seal with waterproof tape or adhesive. Repair holes or tears during curing period with same tape or adhesive. Maintain covering in intimate contact with concrete surface. Secure to avoid displacement.
 - 1) Extend covering past slab edges at least twice the thickness of slab.
 - 2) Do not use plastic sheeting on surfaces which will be exposed to view when in service.
 - g. Curing compound: Apply at rate stated by manufacturer to conform with moisture retention requirements specified, using second, immediate application at right angles to first, if necessary, and reapply if damaged by rain.
 - h. Curing and hardening compound: Apply one or more applications as recommended by manufacturer to achieve maximum hardness and at rate stated by manufacturer to conform with moisture retention requirements specified.

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- i. Using curing compounds only in locations permitted or required, and where use will not interfere with other finishes, coatings, or coverings to be applied.

4. Continue final curing to end of curing period.

E. Avoid rapid drying at end of curing period.

3.10 SHORES AND SUPPORTS

A. General: Comply with recommendations of ACI 347 for shoring and reshoring.

3.11 REMOVAL OF FORMS AND SUPPORTS

A. Non Load Bearing Formwork: Provided that concrete has hardened sufficiently that it will not be damaged, forms not actually supporting weight of concrete or weight of soffit forms may be removed after concrete has cured at not less than 50 degrees F for 24 hours. Maintain curing and protection operations after form removal.

B. Load Bearing Formwork: Do not remove shoring and forms supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, until concrete has attained at least the specified compressive strength f_c (c) and until compressive strength attained is adequate to support the weight of the concrete and superimposed loads.

C. Keep supports in place until heavy loads due to construction operations have been removed.

D. Test field cured specimens to determine potential compressive strength of concrete for specific locations.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Fill in holes and openings left in concrete structures for passage of WORK by other trades after such WORK is in place. Place such fill-in concrete to blend with existing construction, using same mix and curing methods.

B. Reinforced Masonry: Provide approved masonry grout for reinforced masonry where indicated on drawings and as scheduled.

3.13 CONCRETE REPAIRS

A. Perform cosmetic repairs of concrete surfaces as specified under concrete application.

B. Perform structural repairs with prior approval of the Engineer for method and procedure, using epoxy bonding systems.

3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Composite Sampling, and Making and Curing of Specimens:
ASTM C 172 and ASTM C 31

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1. Take samples at point of discharge.
 2. For pumped concrete, perform sampling and testing at the frequencies specified herein at point of delivery to pump, and perform additional sampling and testing at the same frequency at discharge from line. Results obtained at discharge from line shall be used for acceptance of concrete.
- B. Slump: ASTM C 143. One test per batch.
1. Modify sampling to comply with ASTM C 94.
- C. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on air-entrained concrete.
- D. Concrete Temperature:
1. Test hourly when air temperature is 90 degrees F or above.
 2. Test each time a set of strength test specimens is made.
- E. Compressive Strength Tests: ASTM C 39.
1. Compression test specimens: Mold and cure one set of 4 standard cylinders for each compressive strength test required.
 2. Testing for acceptance of potential strength of as delivered concrete:
 - a. Obtain samples on a statistically sound, random basis.
 - b. Minimum frequency:
 - 1) One set per 50 cubic yards or fraction thereof for each day's pour of each concrete class.
 - 2) One set per 3500 square feet of slab or wall areas or fraction thereof for each day's pour of each concrete class.
 - 3) When the above testing frequency would provide fewer than 5 strength tests for a given class of concrete during the project, conduct testing from not less than 5 randomly selected batches, or from each batch if fewer than 5.
 - c. Test one specimen per set at 7 days for information unless an earlier age is required.
 - d. Test 2 specimens per set for acceptance of strength potential; test at 28 days unless other age is specified. The test result shall be the average of the two specimens. If one specimen shows evidence of improper sampling, molding, or testing, the test result shall be the result of the remaining specimen; if both show such evidence, discard the test result and inform the ENGINEER.
 - e. Retain one specimen from each set for later testing, if required.
 - f. Strength potential of as delivered concrete will be considered acceptable if all of the following criteria are met:
 - 1) No individual test result falls below specified compressive strength by more than 500 psi.

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- 2) Not more than 10 percent of individual test results fall below specified compressive strength f (c).
 - 3) Average of any 3 consecutive strength test results equals or exceeds specified compressive strength f (c).
3. Testing for evaluation of field curing:
- a. Frequency: 1 field set of specimens per strength acceptance test.
 - b. Mold specimens from same sample used for strength acceptance tests. Field cure, and test at same age as for strength acceptance tests.
 - c. Evaluate construction and curing procedures and implement corrective action when strength results for field cured specimens are less than 85 percent of test values for companion laboratory cured specimens.
4. Removal of forms or supports: Mold additional specimens and field cure with concrete represented; test to determine strength of concrete at proposed time of form or support removal.
- F. Test Results: Testing agency shall report test results in writing to the ENGINEER and CONTRACTOR within 24 hours of test.
1. Test reports shall contain the following data:
 - a. Project name, number, and other identification.
 - b. Name of concrete testing agency.
 - c. Date and time of sampling.
 - d. Concrete type and class including mix design identification number.
 - e. Location of concrete batch in the completed WORK.
 - f. All information required by respective ASTM test methods.
 - g. Quality of water added on site.
 2. Nondestructive testing devices such as impact hammer or sonoscope may be used at ENGINEER's option for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection. The testing agency shall make additional tests of in place concrete as directed by the ENGINEER when test results indicate that specified strength and other concrete characteristics have not been attained.
 - a. Testing agency may conduct tests of cored cylinders complying with ASTM C 42, or tests as directed.
 - b. Cost of additional testing shall be borne by the CONTRACTOR when unacceptable concrete has been verified.

END OF SECTION 03300

**SECTION 03370
CONCRETE CURING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the WORK under this Section.

1.02 WORK INCLUDED

Maintenance of conditions for proper concrete curing.

1.03 RELATED WORK

Section 03300 - Cast-in-Place Concrete

1.04 QUALITY ASSURANCE

Conform to requirements of ACI 301.

1.05 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

1.06 SUBMITTALS

Provide product data for specified products.

1.07 ENVIRONMENTAL REQUIREMENTS

Maintain ambient temperature at 70 degrees F. for three (3) days.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Water: Clean and not detrimental to concrete.
- B. Absorptive Mat: Burlap fabric of 9 oz./sq. yd. clean, roll goods.
- C. Curing Compound: As per ASTM C309.

PART 3 - EXECUTION

**SECTION 03370
CONCRETE CURING**

3.01 INSPECTION

Verify concrete surfaces are ready for curing.

3.02 CURING COMPOUND

- A. Apply curing compound in two (2) coats with second coat at right angles to first.
- B. Apply in accordance with manufacturer's instructions.

3.03 SPRAYING

Spray water over slab areas; maintain wet for three (3) days.

3.04 ABSORPTIVE MAT

Saturate burlap side of burlap fabric mat. Place over slab areas, burlap side down; lap edges and ends 12 inches. Maintain in place for seven (7) days.

3.05 CURING

- A. Cure concrete as scheduled or indicated.
- B. Remove absorptive mat after curing.

END OF SECTION 03370