SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Concrete for composite floor construction.

C. Concrete slabs on grade and foundations.

D. Concrete Elevator pit walls..

E. Concrete reinforcement.

F. Joint devices associated with concrete work.

G. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.

H. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 02751 - Portland Cement Concrete Paving: Sidewalks, curbs and gutters.

B. Section 03356 - Concrete Floor Finishing.

C. Section 07900 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International.

C. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete; American Concrete Institute International.

D. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International.

E. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International.

F. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International.

G. ACI 305R - Hot Weather Concreting; American Concrete Institute International.

H. ACI 306R - Cold Weather Concreting; American Concrete Institute International.

I. ACI 308R - Guide to Curing Concrete; American Concrete Institute International.

J. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International.

K. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute International.

L. ASTM A 185/A 185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

M. ASTM A 497/A 497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

N. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

O. ASTM C 33 - Standard Specification for Concrete Aggregates.

P. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

Q. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete.

R. ASTM C 143/C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.

S. ASTM C 150 - Standard Specification for Portland Cement.

T. ASTM C 171 - Standard Specification for Sheet Materials for Curing Concrete.

U. ASTM C 173/C 173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

V. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.

W. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

X. ASTM C 330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

Y. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.

Z. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

AA. ASTM A706A/ 706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

AB. ASTM C 685/C 685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

AC. ASTM C 881/C 881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

AD. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete.

AE. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

AF. ASTM C 1107/C 1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

AG. ASTM C 1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.

AH. ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

AI. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

AJ. ASTM D 3963/D 3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy Coated Reinforcing Steel Bars.

AK. ASTM E 1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers.

AL. ASTM E 1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor

Levelness Numbers [Metric].

AM. ASTM E 1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

AN. AWS D1.4 - Structural Welding Code - Reinforcing Steel; American Welding Society.

AO. COE CRD-C 48 - Method of Test for Water Permeability of Concrete.

AP. COE CRD-C 513 - COE Specifications for Rubber Waterstops; Corps of Engineers.

AQ. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; Corps of Engineers.

AR. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute.

AS. CRSI (P1) - Placing Reinforcing Bars; Concrete Reinforcing Steel Institute.

AT. NSF 61 - Drinking Water System Components - Health Effects.

1.04 SUBMITTALS

A. See Section 01350 - Submittals, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

C. Samples for Pigment Color Selection: Submit manufacturer's complete sample chip set, including pigment number and required dosage rate for each color.

D. Verification Samples: Submit sample chips of specified colors indicating pigment numbers and required dosage rates, for subsequent comparison to installed concrete.

E. Samples: Submit samples of underslab vapor retarder to be used.

F. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.

G. Reinforcing Shop Drawings: Only when deviations are made from the contract documents, submit shop drawings under provision of Section 01350 with deviations clearly identified.
   1. Indicate sizes, spacings, locations and quantities of reinforcing steel, wire fabric, bending and cutting schedules, splicing, stirrup spacing, supporting and spacing devices.

H. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

I. Reports: Submit certified copies of mill test report of reinforcement materials analysis, indicate physical and chemical analysis.

J. Shop Drawings: Submit drawings locating slab-on-grade construction joints, control joints, and isolation joints.

K. Mix Designs:
   1. Submit proposed concrete mix designs for each class or use at least 30 days prior to required delivery.
   2. Mixes shall be prepared by a professional engineer licensed in the state in which the project is located.
   3. Specifically indicate where each class of concrete is to be used.
   4. Indicate individual and combined aggregate gradations and aggregate source and characteristics.

L. Test Reports: Submit aggregate and concrete mix test reports from independent testing laboratory.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. Acquire cement from same source and aggregate from same source for entire project.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347 to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Coating: Release agent that will not adversely affect concrete.
   3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface and free of defects that could leave holes larger than 1-inch in concrete surface.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.
   3. Where reinforcement is to be welded, use ASTM A706/A706M deformed low-alloy, steel bars, unfinished.

B. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
   1. Form: Coiled Rolls.
   2. Mesh Size and Wire Gage: As indicated on drawings.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide galvanized components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I or Type II, low alkali portland type.

B. Fine and Coarse Aggregates: ASTM C 33.

C. Lightweight Aggregate: ASTM C 330.

D. Water: Clean and not detrimental to concrete.

E. Admixtures:
   1. Calcium chloride, thiocyanates, or admixtures containing more than 0.05 percent chloride ions are not permitted unless approved by Architect.
   2. Air Entraining: ASTM C260.
   3. Water-reducing: ASTM C494, Type A.
   4. Water-reducing, Retarding: ASTM C494, Type D.

2.04 CURING MATERIALS

A. Sheet Curing Materials: ASTM C171; white opaque polyethylene film, white polyethylene coated burlap sheeting, or regular waterproof paper.

B. Dissipating Resin Curing Compounds:
   1. ASTM C309, Type 1, clear or translucent, Class B, free of natural or petroleum waxes. Class A not acceptable.

C. Acrylic Curing/Sealing Compounds:
   1. ASTM C1315, Type I, clear or translucent, Class A, free of natural or petroleum waxes.

D. Water Based Acrylic Curing/Sealing Compounds:
   1. ASTM C1315, Type I, Class A, VOC compliant, free of natural or petroleum waxes. Dries clear with high (medium) gloss sheen.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Multi-layer, plastic extrusion, complying with ASTM E 1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.
   1. Acceptable Products:
      a. Stego Wrap Class A Vapor Retarder, 10 mils by Stego Industries (877) 464-7834..
      b. Substitutions: See Section 01640 - Product Requirements..

B. Non-Shrink Grout: ASTM C 1107/C 1107M; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 28 Days: 7,000 psi.
   2. Product: As indicated on drawings.

2.06 JOINTING PRODUCTS

A. Waterstops: Rubber, complying with COE CRD-C 513.
   1. Configuration: As indicated on the drawings.
   2. Size: As indicated on the drawings.

B. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751,

C. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum diameter holes for conduit or rebars to pass through at 6 inches on center; ribbed steel stakes for setting.
   1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
   2. Height: To suit slab thickness.

D. Sealant and Primer: As specified in Section 07900.

2.07 CONCRETE MIXES

A. Mix Design:
   1. Submit design mixes for each type and class of concrete based on laboratory trial batch method or field experience methods described in ACI-318, Chapter 5.
   2. If trail batch method is used, employ an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs. Mix designs are to be prepared by a professional engineer licensed in the state in which the project is located. Contractor employed testing agency shall not be same firm as Owner employed testing agency.
   3. The proportioning of ingredients shall provide a concrete readily worked into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.
   4. Do not place concrete until design mix for that class and type of concrete is reviewed by Architect.
   5. Identify each mix design with code number which will be used on batch tickets.

B. Design Compressive Strengths: As indicated on Structural Drawings.
   1. Normal Weight Concrete:

a. Compressive strength, when tested in accordance with ASTM C 39/C 39M, strength at 7 days shall be at least 60 percent of the minimum required 28 day strength unless noted otherwise on drawings.
b. Maximum slump 4 inches +/- 1 inch.

2. Lightweight Weight Concrete:
   a. Compressive strength, when tested in accordance with ASTM C 29/C 39M, strength at 7 days shall be at least 60 percent of the minimum required 28 day strength unless noted otherwise on drawings.
   b. Maximum slump 4 inches +/- 1 inch.
   c. The air dry unit weight shall be determined by ASTM C567, except that the drying time shall be 90 days.

C. Maximum Size of Coarse Aggregate:
1. 1/5 narrowest dimension between form sides.
2. 1/3 depth of slabs.
3. 3/4 of minimum clear distance between reinforcing bars, wires, or bundles of bars.
4. 1-inch maximum for normal weight concrete or 3/4 inch maximum for light weight concrete.

D. Concrete Slump at Point of Discharge:
1. Ramps and Sloping Surfaces: Not more than 3 inches.
2. Reinforced Foundations: Not less than 1 inch and not more than 4 inches.
3. Other Concrete: Not less than 1 inch and not more than 4 inches.
4. Allowable tolerances of up to 1 inch above maximum indicated provided average of 10 most recent batches tested is less than maximum.

E. Minimum Cement Content: Not less than 470 pounds of total cementitious material per cubic yard of concrete. Not more than 25 percent flyash or pozzolan cement substitute and not less than 385 pounds of cement per cubic yard of concrete.

F. Water-Cement Ratios for Concrete (by weight):
1. Maximum permissible water cement ratio: 0.50 unless noted otherwise on drawings.

G. Admixtures:
1. Only use admixtures which have been tested and approved in mix designs.
2. Air Entraining Admixture:
   a. Use in concrete exposed to freezing and thawing at any time during construction or in completed structure.
   b. Use in concrete placed at ambient temperatures below 40 degrees F.
   c. Tolerance on air content as delivered: Plus or minus 1-1/2 percent.
3. Conform to air content requirements indicated on Drawings.

H. Maximum water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days contributed from all ingredients, expressed as percent by weight of cement as follows:
1. Concrete over galvanized deck: 0.06 percent.
2. Concrete exposed to chloride in service: 0.15 percent.
3. Other concrete: 1.00 percent.

I. Shrinkage Tests:
1. Prior to placing any concrete for wall or horizontal surfaces, a trial batch of each mix design of structural concrete shall be prepared using the aggregates, cement and admixture (if any) proposed for the project. From each trial batch at least 3 specimens for determining drying shrinkage shall be prepared. The drying shrinkage specimens shall be a 4" x 4" x 11" prisms fabricated, cured, dried, and measured in accordance with the requirements of Tentative Method of Test for Length Change of Cement Mortar and Concrete, ASTM C157. The measurements shall be made and reported separately for 7 and 28 days of drying after 7 days of moist curing. The effective gage length of the specimens shall be 10 inches, and except for the foundation concrete, the average drying shrinkage at 35 days shall not exceed .054 percent.

2.08 MIXING

A. On Project Site (for Non-Structural Concrete Only): Mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C 94/C 94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

B. Verify forms are free of debris and water.

C. Verify excavations are free of loose material and water.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

E. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

F. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

G. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends. Cover with sand to depth shown on drawings; repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Alexander + Hibbs AIA, Inc. not less than 48 hours prior to commencement of placement operations.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

F. Separate slabs on grade from vertical surfaces with joint filler.

G. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

H. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.

I. Install joint devices in accordance with manufacturer's instructions.

J. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

K. Apply sealants in joint devices in accordance with Section 07900.

L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

M. Place concrete continuously between predetermined expansion, control, and construction joints.

N. Do not interrupt successive placement; do not permit cold joints to occur.

O. Place floor slabs in pattern indicated.

P. Saw cut joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

Q. Screed floors level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

R. Convey concrete from mixer to place of deposit by method that will prevent segregation or loss of material, and that will not require addition of water to produce desired slump at point of placement. Do not use supported reinforcing as runway base for concrete conveying equipment.

S. Depositing:
   1. Deposit concrete as nearly as practicable to its final location.
   2. Do not allow free fall of concrete to exceed 4 feet. Do not allow free fall of concrete containing high-range water reducing admixture to exceed 10 feet.
   3. Drop concrete in vertical direction, not at incline.
   4. Place concrete without displacing reinforcing and accessories.

3.05 DEPOSITING

A. Concrete shall be continuously deposited. When continuous placement is not possible, construction joints shall be located as approved by the Architect. Concrete shall be deposited as close to its final point of placement as possible.

B. Concrete shall be consolidated by vibration, spading, rodding or forking. Work concrete around reinforcements, embedded items and into corners. Eliminate all air or rock pockets and other causes of honeycombing, pitting or planes of weakness.

C. Internal vibration shall have a minimum frequency with amplitude to consolidate the concrete effectively. See ACI 309, "Recommended Practice for consolidation of concrete."
   1. Vibrators shall be operated by experienced and competent workmen.
   2. Use of vibrators to transport concrete shall not be allowed.

3. Vibrators shall be vertically inserted every 18 inches for 5 to 15 seconds and then withdrawn.

3.06 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
   2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
   3. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.

D. Concrete Slabs: Finish to requirements of Section 03356.

E. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include ceramic tile with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 301.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, and thin set ceramic tile.
   3. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
      a. Chemical Hardener: After slab has cured, apply water-diluted hardener in three coats per manufacturer's instructions, allowing 24 hours between coats.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.07 CURING AND PROTECTION

A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.
   2. High early strength concrete: Not less than 4 days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by saturated burlap.
   3. Final Curing: Begin after initial curing but before surface is dry.
      a. Moisture-Retaining Cover: Seal in place with waterproof tape or adhesive.
      b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01410.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 50 cu yd or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C 143/C 143M.

3.09 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Alexander + Hibbs AIA, Inc., Structural Engineer and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Alexander + Hibbs AIA, Inc. and Structural Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Alexander + Hibbs AIA, Inc. and Structural Engineer for each individual area.

END OF SECTION

SECTION 03356

CONCRETE FLOOR FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finishing slabs on grade.

B. Surface treatment with sealer.

1.02 RELATED REQUIREMENTS

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

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International.

B. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International.

C. ASTM E 1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.05 SUBMITTALS

A. See Section 01350 - Submittals, for submittal procedures.

B. Product Data: Provide data on, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance upkeep of applied coatings.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.1R.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 FIELD CONDITIONS

A. Maintain light level equivalent to minimum 200 W light source, placed 8 feet above the floor surface, for each 425 sq ft of floor being finished.

B. Do not finish floors until interior heating system is operational.

C. Maintain ambient temperature of 50 degrees F minimum.

D. Provide ventilation sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Concrete Floor Finishes:
   1. L&M Construction Chemicals, Inc: www.lmcc.com.
   2. Substitutions: See Section 01640.

2.02 COMPOUNDS - SEALERS

A. Sealer: Penetrating epoxy type.
   1. Product: Pentox manufactured by L&M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

3.02 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1R.

B. Wood float surfaces that will receive ceramic tile with full bed setting system.

C. Steel trowel surfaces that will receive carpeting, resilient flooring, seamless flooring, thin set quarry tile, or thin set ceramic tile.

D. Steel trowel surfaces that are scheduled to be exposed.

E. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 1/8 inch per foot nominal.

F. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains as indicated on drawings.

3.03 FLOOR SURFACE TREATMENT

A. Apply sealer to scheduled floor surfaces in accordance with manufacturer's instructions.

3.04 TOLERANCES

A. An independent testing agency, as specified in Section 01410, will inspect finished slabs for flatness.

B. Measure flatness of slabs in accordance with ACI 302.1R.

C. Finish concrete to achieve the following tolerances:
   1. Maximum Variation of Surface Flatness For Exposed Concrete Floors: 1/4 inch in 10 ft.
   2. Maximum Variation of Surface Flatness Under Seamless Resilient Flooring: 1/4 inch in 10 ft.
   3. Maximum Variation of Surface Flatness Under Carpeting: 1/4 inch in 10 ft.

D. Measure for F(F) and F(L) tolerances for floors in accordance with ASTM E 1155, within 48 hours after slab installation.

E. Finish concrete to achieve the following tolerances:
   1. Under Glazed Tile on Setting Bed: Ff 30 and Fl 20.
   2. Under Glossy Resilient Finishes: Ff 75 and Fl 50.
   3. Exposed to View and Foot Traffic: Ff 20 and Fl 15.

F. Correct the slab surface if tolerances are less than specified.

G. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

END OF SECTION