INSTRUCTIONS FOR EDITING

SECTION 03100

CONCRETE FORMWORK

1. General: This Section should be used only for projects involving major elements of concrete structure. For projects of limited scope, Section 03300 shall suffice.

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. Codes and Standards: Unless otherwise shown or specified, design, construct, erect, maintain and remove forms and related structures for cast-in-place concrete work in compliance with the American Concrete Institute Standard "Recommended Practice for Concrete Formwork."

1.03 RELATED WORK

A. Section 03300: Cast in Place Concrete

1.04 DESIGN OF FORMWORK

A. Design, erect, support, brace and maintain formwork so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Carry vertical and lateral loads to the ground by the formwork system and by the in-place construction that has attained adequate strength for that purpose. Concrete work has been designed to safely support construction loads, including reshoring loads. If the contractor is uncertain about the design live loads, it shall be his responsibility to obtain these from the Architect.

B. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated of formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of the structure during construction.

C. Provide shores and struts with positive means of adjustment capable of taking up all formwork settlement during concrete placing operations, using wedges or jacks or combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.

D. Support form facing materials by structural members spaced sufficiently close to prevent deflection of the form facing material. Fit forms placed in successive

unit for continuous surfaces to accurate alignment to assure a smooth completed surface, free from irregularities and within the allowable tolerances. Provide camber in formwork as required for anticipated deflections in formwork due to weight and pressure of fresh concrete and construction loads for long-span members without intermediate supports. Final position of all structural members to be at elevations shown on drawings.

E. Design formwork to be readily removable without impact, shock or damage to the cast-in-place concrete surfaces and adjacent materials.

F. Provide formwork sufficiently tight to prevent leakage of cement past during concrete placement. Solidly butt all joints and provide backup material at joints as may be required to prevent leakage and fins.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Unless otherwise shown or specified, construct all formwork for exposed concrete surfaces with plywood, metal-framed plywood-faced, or other panel type materials acceptable to the Architect, to provide continuous, straight smooth exposed surfaces. Furnish in the largest practical sizes to minimize number of joints and to conform to the joint system shown on the drawings. Provide form material with sufficient thickness to withstand the pressure of newly placed concrete without bow or deflections.

B. Exposed finished concrete shall be defined to mean any vertical surface or soffit concrete exposed to sight; i.e., exterior grade beams, retaining walls, etc. Hand rubbing of concrete surfaces is only required at locations indicated on the drawings.

PART 3 - EXECUTION

3.01 FORM CONSTRUCTION

A. Construct forms to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, locations, grades, level and plumb work in the finished structures. Provide for openings, offsets, sinkage, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required on the work, and shown in the architectural, structural, and any other pertinent parts of the contract drawings. Use selected materials to obtain the required finishes.

B. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent

the loss of concrete mortar. Locate consistent with the requirements of the work, and not in any exposed surface.

C. Chamfer exposed external corners and edges where shown, using chamfer strips accurately fabricated to produce uniform smooth lines and tight edge joints. Provide chamfers of wood, metal, PVC, or rubber, to form the required corner or edge shapes as shown.

D. Carefully form intersecting planes to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete. Back joints with extra studs or girts as required to maintain true and square intersections.

E. Provide all openings in forms accommodate other work, including mechanical and electrical work. No hole, blockout, or recess shall be allowed in any structural member without the written approval of the Architect-Engineer. Accurately place and securely support all items required to be built into the forms.

F. Forms for Exposed Concrete: Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes.

Do not use cover plates for patching holes or defects in forms.

G. Control Joints: Locate where shown or directed.

H. Provisions for Other Trades: Provide openings in concrete framework to accommodate work of other trades, including those under separate prime contracts. Size and location of openings, recesses and chases are the responsibility of the trade requiring such items. No hole, blockout, or recess shall be allowed in any structural member without the written approval of the Architect. Accurately place and securely support items to be built into forms.

I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is to be placed. Retighten forms immediately after concrete placement as required to eliminate mortar leaks.

3.02 PREPARATION OF FORM SURFACES

A. Coat the contact surfaces of forms with a form-coating compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

B. Thin form-coating compounds only with the thinning agent of the type, and in amount, and under the conditions of the form coating compound manufacturer's directions.

C. Do not allow excess form coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed.

D. Apply in compliance with the manufacturer's instruction.

3.03 REMOVAL OF FORMS

A. Formwork not supporting the weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed 24 hours after placing the concrete, providing the concrete is sufficiently hard to not be damaged by the form removal operations, and provided that curing and protection operations are maintained.

B. Formwork supporting the weight of concrete, such as beam soffits, joists, slabs and other structural elements of work, shall not be removed in less than fourteen (14) days or until the concrete has attained 70% of the design minimum compressive strength for the applicable type of concrete. Determine potential compressive strength of in-place concrete by testing of field-cured specimens representative of the concrete location or members.

C. Form facing material may be removed four (4) days after placement, only if the shores and other vertical supports have been arranged to permit removal of the form facing material without loosening or disturbing the shores and supports.

D. Note: These periods indicated above represent the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the concrete is above 50 degrees F.

3.04 RE-USE OF FORMS

A. Clean and repair the surfaces of forms that are to be re-used in the work, except that split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to all concrete contact form surfaces as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure all joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to the Architect.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the Work of this Section.

1.02 RELATED WORK

Section 03300: Cast-in place concrete.

1.03 QUALITY ASSURANCE

A. Comply with the latest adopted edition of the Virginia USBC.

B. Comply with pertinent recommendations contained in "Manual of Standard Practice for Detail Reinforced Concrete Structures," ACI 315, and "Building Code Requirements for Reinforced Concrete", ACI 318.

C. Comply with pertinent provisions of the CRSI "Manual of Standard Practice".

D. Installer Qualifications: A company specializing in placement of concrete reinforcement steel, with a minimum of 3 years experience on projects of similar size and scope.

1.04 REFERENCES STANDARDS

A. ASTM A615 - Specifications for Deformed Billet Steel Bars for Concrete Reinforcement.

B. ASTM A82 - Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement.

C. ASTM A1064 - Specifications for Wire Fabric for Concrete Reinforcement.

D. ASTM A36 - Structural Steel.

E. ACI 318 - Building Code Requirements for Reinforced Concrete.

F. CRSI - Manual of Standard Practice.

1.05 SUBMITTALS

A. Submit Shop Drawings indicating sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.

B. Provide bar schedules, stirrup spacing, and diagrams of bent bars.

C. Do not place any reinforcing until Shop Drawings are approved.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.

B. Protect concrete reinforcement before, during and after installation and the installed work and materials of other sections.

C. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.

D. Maintain identification after bundles are broken.

E. In event of damage, immediately make repairs and replacements necessary.

PART 2 - PRODUCTS

2.01 CONCRETE REINFORCEMENT

A. Concrete reinforcement materials: New, free from rust, and complying with the following:

1. Bars for reinforcement: A615, grade 60; stirrups and ties grade 60.

2. Wire fabric: ASTM A1064.

3. Bar supports: "Bar Support Specifications," CRSI Manual of Standard Practice, Type: plastic tipped accessories.

4. Tie Wire: Cold drawn steel; ASTM A-82.

a. Supports for reinforcement: Provide supports including bolsters, chairs, spacers and other devices for supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations.

b. For exposed-to-view concrete surfaces and where support legs are in contact with forms, provide supports with plastic protection (CRSI, Class1) or stainless steel protection (CRSI, Class 2).

2.02 FABRICATION

A. Fabricate reinforcement in strict accordance with accepted Shop Drawings, and in accordance with ACI 315 and CRSI recommended practice.

B. Fabricate bars with kinks or bends only as indicated on the drawings.

C. Do not field-bend or straighten steel. Do not re-bend or straighten reinforcement to correct fabrication errors.

D. Design:

1. Bend bars cold.

2. Make bend for stirrups and ties in accordance with ACI 315.

PART 3 - EXECUTION

3.01 PLACING

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

B. Clearance: Clear space between bars and cover for bars shall conform to the Requirements of ACI 318.

C. Splicing:

1. Horizontal bars:

a. Place bars in horizontal members with laps at splices in accordance with the Contract Documents and the Requirements of ACI-318 (Latest Edition).

b. Bars may be wired together at laps.

c. Wherever possible, stagger the splices of adjacent bars.

2. Wire fabric:

a. Make splices in wire fabric at least 1-1/2 meshes wide.

3. Other splices:

a. Make only those other splices indicated on accepted Shop Drawings or specifically accepted by Architect.

b. Place required steel dowels and securely anchor into position before concrete is placed.

c. In the event conduits, piping, inserts, sleeves or other items interfere with placing reinforcement as indicated or as otherwise required, immediately consult Architect and Owner's Representative and obtain approval of new procedure before placing concrete.

3.02 CLEANING REINFORCEMENT

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

3.03 PROTECTION DURING CONCRETING

Keep reinforcing steel in proper position during concrete placement.

3.04 INSPECTION BEFORE CONCRETE PLACEMENT

Do not place any concrete until reinforcing steel has been inspected and approved.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the Work of this Section.

1.02 RELATED WORK

A. Section 03200: Concrete reinforcement.

B. Section 04200: Masonry accessories cast in concrete.

C. Section 05500: Metal fabrications cast in concrete.

D. Section 01400: Testing services.

1.03 QUALITY ASSURANCE

A. Perform cast-in-place concrete work in accordance with ACI 318 (latest edition), unless specified otherwise in this Section.

1. The Owner will employ a testing laboratory to conduct tests and provide test results.

2. The testing laboratory shall conduct testing in accordance with the requirements of the Fairfax County Special Instructions Manual and other Fairfax County standards, review test results, and submit reports indicating whether test specimens comply with or deviate from applicable requirements.

1.04 TESTING LABORATORY SERVICES

A. Provide free access to work and cooperate with appointed firm.

B. Submit proposed mix design to inspection and testing firm for review prior to commencement of work.

C. Tests of cement and aggregates may be performed to ensure conformance with requirements stated herein.

D. Cast the following number of test cylinders for each 150 C.Y. or 5,000 S. F. (not less than one set of test cylinders for each days pour):

1. Two (2) Lab Cured for 28 days

2. Two (2) Lab Cured for 7 days.

3. All field cured cylinders as directed by local building official.

E. One additional test cylinder will be taken and held in reserve as required for 56 day testing, and be cured on job site under same conditions as concrete it represents.

F. One slump test will be taken for each set of test cylinders taken.

G. At contractor's option, cylinders may be either 6 x 12 inch or 4 x 8 inch.

1.05 SUBMITTALS

A. Submit pour schedule and diagrams of floor slabs, sidewalks, and footings to Architect for approval.

B. Submit concrete mix design, including material certificates for cement, aggregate and admixtures. Certificates shall state compliance with the applicable referenced ASTM standards.

C. Submit catalog data and written application instructions for all concrete compounds.

1.06 REFERENCE STANDARDS

A. ASTM C33 - Concrete Aggregates.

B. ASTM C150 - Portland Cement.

C. ASTM C595 – Blended Hydraulic Cements

D. ASTM C989 – Blast Furnace Slag

E. ASTM C618 – Fly Ash

F. ACI 301 - Specifications for Structural Concrete for Building.

G. ACI 318 - Building Code Requirements for Reinforced Concrete.

H. ASTM C260 - Air Entraining Admixtures for Concrete.

I. ASTM C94 - Ready-Mixed Concrete.

J. ASTM D994 - Pre-formed Asphalt Expansion Joint Fillers for Concrete Paving and Structural Construction.

K. ACI 305 - Recommended Practice for Hot Weather Concreting.

L. ACI 306 - Recommended Practice for Cold Weather Concreting.

M. ASTM C309/C1315 - Liquid Membrane-Forming Compound for Curing Concrete.

N. ACI 347 - Recommended Practice for Concrete Formwork.

O. APA - American Plywood Association.

P. ACI 315 - Recommended Practice for Detailing Reinforced Concrete Structures.

Q. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

1.07 ADJUSTMENT OF CONCRETE QUANTITIES

A. No payments will be made for extra concrete needed as a result of unauthorized material removed below the required depth found in the field.

PART 2 - PRODUCTS

2.01 CEMENT

A. ASTM C150, Type I/II or ASTM C595 Type IS. Use only one of these types of cement for the entire project.

2.02 AGGREGATE

A. Coarse aggregate for stone concrete: ASTM C33, with maximum size 3/4 in. for reinforced concrete and 1-1/2 in. for plain (unreinforced) concrete.

B. Fine aggregate: Clean, durable sand, uncoated, grains free from silt, loam, and clay. Graded from fine to coarse with 95-100 percent by weight passing a No. 4 sieve and 3-8 percent passing a No. 100 sieve. ASTM C33 with following maximum permissible limits for deleterious substances, measured in percentage by weight: clay lumps 1.00; coal and lignite 0.25; materials finer than No. 200 sieve 3.00.

2.03 WATER

A. Mixing Water: Drinkable in accordance with ACI 318

2.04 ADMIXTURES

A. Hydration Control: (ASTM C494, Type B and Type D)

1. Pozzolith 100-XR; Master Builders; (Degussa Admixtures, Inc)Cleveland, OH, 1-800-628-9990 (www.degussa.com)

2. Plastiment; Sika Chemical Corporation, Lyndhurst, NJ, 1-800-933-SIKA (www.sikausa.com).

B. Air-Entraining: ASTM C260.

C. Water-reducing: ASTM C494, Type A.

D. Water reducing/retarding: ASTM C494, Type D.

E. Water reducing/accelerating: ASTM C494, Type E.

F. Use of calcium chloride as an additive is **not permitted.** (Admixtures for concrete shall contain not more than 0.1 percent chloride ions by weight).

2.05 FORMS

A. Formwork: Comply with Building Code and ACI 347. Design, erect, support and maintain forms to safely carry all superimposed loads until such time as such loads can be safely supported by the concrete work. Construct formwork to shape, sizes and dimensions as shown on required to ensure accurate alignment and elevation, and level and plumb finished concrete work.

B. Forms for Unexposed Finish Concrete: Form with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two (2) edges and one side for tight fit.

C. Forms for Exposed Finish Concrete Column Wraps: Use two-piece fiberglass forms to provide a smooth exposed surface. Joints shall be placed so as to be parallel with the face of the radiused building.

D. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces.

E. Use plywood complying with U.S. Product Standard PS-1 “B-B (Concrete Form) Plywood”, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible trademark of an approved inspection agency.

F. Form Ties: Steel Wire snap ties with positive breakbacks which will leave no metal closer than 1” from formed surface of concrete, leave a cone-shaped recess.

G. Form Coatings:

1. Where surfaces are painted

a. “Duogard Plus”, W. R. Meadows, Inc., Hampshire, IL 1-800-342-5976, (www.wrmeadows.com)

b. “Majic Cote”, Symons, DesPlaines, IL 1-800-733-7654 (www.symons.com).

2. Other Surfaces (Nonstaining form oil): “Duogard II”, W. R. Meadows.

2.06 CONCRETE DESIGN MIX

A. Controlled concrete proportioned as outlined in Section 5.3 ACI 318, unless specified otherwise. Allowable design stresses are based on minimum 28-day compressive strength indicated. Submit design mix for each class of concrete for Architect's approval.

B. Proportions of aggregate to cement shall produce non-segregating plastic mixture of consistency required to give specified finish and be worked readily into corners and angles of forms and around reinforcement with method of placement employed. Accomplish variations in consistency by changes in proportioning of mix with changing W/C (water/cement) ratios established.

C. Admixtures:

1. Admixtures used in concrete: of one manufacturer.

2. Use air-entraining admixture in concrete exposed to elements to obtain air content of 5 percent, plus or minus 1.5 percent for 1-inch maximum aggregate and 6 percent plus or minus 2 percent for 3/4 inch maximum aggregate. Do not premix air-entraining admixture with other admixtures.

3. Retarding densifier: in concrete, except concrete for footings and isolated piers.

4. For low temperature conditions, an accelerating densifier may be used in lieu of a retarding densifier in walls.

5. A water-reducing admixture may be used in lieu of a retarding densifier in slabs.

6. Proportion admixtures in accordance with manufacturer's recommendations.

D. Slump Limits: 3" ± 1"; 4 inch maximum.

2.07 MIXING CONCRETE

A. Ready-mixed ASTM C94, except addition of water for material with insufficient slump shall not be permitted.

B. Provide a certificate signed by authorized official of supplier, with each load of concrete stating the following:

1. Time truck left plant.

2. Mix of concrete.

3. Amount of water and cement in mix.

4. Time truck is unloaded at project site.

C. Retain certificates at project site for inspection by testing laboratory.

D. Not more than one hour shall elapse from time water is introduced into mixer drum until drum is discharged. Do not use concrete that has stood outside the mixer drum for more than 30 minutes. Do not add water to a mix that has stiffened to increase workability. Retempering of partly set concrete is not permitted.

2.08 FORMWORK FABRICATION

A. Fabricate formwork mortartight, braced to prevent displacement under vibration and sagging between supports. For surfaces exposed to view in finished work, use new, clean, smooth plywood free from blemishes, square-cut and in sizes as large as practical.

B. Fabricate forms for removal without hammering or prying against concrete.

C. Provide temporary clean-out openings at base of forms and other locations in formwork to facilitate cleaning and inspection for placing concrete.

2.09 MISCELLANEOUS MATERIALS

A. Vapor Retarder: "Moistop Ultra 10, Fortifiber Building Systems Group, Reno, NV 1-800-773-4777 (www.fortifiber.com), 10 mil polyolefin film, or Stego Wrap 10 mil Class A Vapor Retarder, San Clemente, CA 1-877-464-7834 (www.stegoindustries.com) or Pre-bid approved equal. Barrier shall resist deterioration when tested in accordance with ASTM E154, and shall meet or exceed ASTM E1745 for Class A.

B. Porous Fill: Clean, water-worn tailings free from clay, dirt, wood and debris, graded from 2 in. to 3/4 in.

C. Expansion Joint Material: 1/2 inch (12.7mm) asphalt expansion joint filler complying with the following:

1. ASTM D994

2. FS HH-F-341F, Type III

3. AASHTO M33

4. FAA Specification P-610-2.7

D. Curing and Sealing Compound (for concrete floors scheduled to remain exposed only): Acrylic, water based curing compound, VOC compliant, non-yellowing, ASTM C-309/C1315, Type 1.

1. "Kure-N-Seal W", Sonneborn (Degussa Building Systems), Shakopee, MN, 1-800-443-9517 (www.DegussaBuildingSystems.com)

2. "VOCOMP-25-1315", W.R. Meadows, Inc.

E. Cement feathering compound: Ardex “SD-F Feather Finish”, Portland cement-based, latex-modified; or comparable.

F. Perimeter "Zip Strip": Provide a removable bond break "zip strip" capable of producing a clean 1/2" x 1/2" joint to be used for sealing all joints where walls penetrate and abut floor slab. "Sealtight Snap-Cap," W. R. Meadows, 1/2" (12.7mm), or comparable.

PART 3 - EXECUTION

3.01 FORMS

A. Construct formwork to lines, dimensions, and shapes of concrete indicated, to a tolerance of 1/8 inch in 10 feet. Provide watertight joints in forms. Provide support to maintain tolerance specified during placing of concrete.

B. Coat forms with form release agent prior to each use of form.

C. Secure keys in position by continuous wood blocking rigidly secured to forms or reinforcing.

D. Do not use pinch bars or other metal tools in exposed work to pry forms loose.

E. Use form ties to prevent form deflection, and to prevent spalling of concrete surfaces upon removal of forms.

3.02 COORDINATION WITH OTHER WORK

A. Provide in locations indicated slots, chases, recesses or openings not formed by sleeves, frames, boxes or equipment specified in other Sections.

B. Examine Contract Documents for work specified in other Sections requiring either building in or provisions for later setting. Set items specified in other Sections and provide protection required to prevent damage or displacement during placing of concrete.

C. Grout and fill with concrete as required throughout the project, except as otherwise specified, and including column base plates, door saddles, frames in concrete walls, and openings after pipes are in place.

D. Minimum 1-inch concrete cover is required over conduits and pipes embedded in concrete. Do not place pipes or conduits having an outside diameter larger than 1/3 slab thickness in slabs.

E. Place conduits and pipes as indicated. Place conduits and pipes to avoid changing location of reinforcing steel.

F. Provide inserts required to bond adjacent construction to concrete.

3.03 PREPARATION

A. Prior to placing concrete, clean equipment for transporting concrete. Remove debris and ice from spaces to receive concrete. Oil or wet form, as specified, and clean reinforcement of ice or other coatings. Remove water from areas to receive concrete.

B. Reinforcement, forms and earth in contact with concrete shall be free from frost. Do not place concrete during rainfall without adequate protection. Make preparation to protect newly placed concrete from rainfall until concrete has hardened sufficiently to preclude rainfall damage.

C. Place expansion joint material as indicated for slab isolation at perimeter walls and columns. Depress joint material 1/2 in. below finish slab for installation of “Zip Strip” specified in this section and sealant specified in Section 07900.

3.04 PLACING CONCRETE

A. Convey concrete to point of final placement by methods preventing segregation or loss of materials. Place concrete as near as practical in final position to avoid segregation due to handling and flowing. Do not use concrete that has partially hardened, been contaminated by foreign materials or been retempered.

B. Place concrete in layers not exceeding 18 inches in depth avoiding inclined planes and piling and concrete in forms permitting escape of water or free flow of concrete.

C. Place concrete for columns and walls through canvas, wood, rubber or metal elephant trunks, 6 inches in diameter minimum, to avoid segregation of concrete in free fall. Do not allow concrete to ricochet against forms for exposed surfaces. Deposit concrete directly to center of forms. Space drop chutes on 10-foot centers, maximum. Do not use drop chutes longer than 12 feet. Provide illumination to permit inspection of the interior of forms.

D. Vibration:

1. Exposed surfaces shall be finished with a smooth, dense, concrete without honeycombing. Tamp, space, and vibrate concrete thoroughly during placing.

2. Quantity, capacity and type of vibrators used is left to discretion of the Contractor. Maintain a reserve of vibrators in event of breakdown.

3. Exercise care in use of vibrators to prevent scarring or roughening of forms. Vibrators shall not cause separation of free water from mix. Do not vibrate in one spot to extent pools of grout are formed.

4. Do not vibrate to the extent of causing segregation of aggregate. Insert and withdraw vibrators slowly. Vibrators shall run continuously while being withdrawn. Insert unit in a depth to vibrate lower layer of concrete. Do not insert into concrete that is partly hardened or that will not become plastic under vibrator action. Do not apply vibration to steel reinforcing extending into partially hardened concrete.

5. Exercise care to prevent formation of water pockets and bubbles against form faces.

E. Place concrete in continuous operation until panel or section is completed. Locate construction joints at point of minimum shear.

3.05 FORMS REMOVAL

A. Forms not supporting weight of concrete, such as sides of beams, walls, columns, and similar work, may be removed after cumulatively curing at not less than 50° F. for at least 24 hours after placing concrete, provided that concrete is sufficiently hard so as not to be damaged by form removal, and provided that curing and protection measures are maintained.

B. Forms supporting the weight of concrete shall not be removed in less than 14 days or until the concrete has attained at least 70% of the design strength.

3.06 CURING AND PROTECTION

A. Curing:

1. Spray top surface of slabs with liquid membrane-forming compound in accordance with manufacturer's directions as soon as the newly placed surface has been finished and will not be marred by application.

2. Respray surfaces subjected to heavy rainfall within three hours of compound application.

3. Where practicable, keep forms in place for a seven-day curing period. Keep top exposed concrete surface wet and forms moist. Loosen forms to allow curing water to run down between concrete and forms.

4. If forms cannot remain in place for seven days, cover concrete with fabrics that have moisture-retaining properties. Examine fabrics to detect elements that might discolor concrete finish. Keep fabric moist continuously to ensure a film of water on concrete surface.

B. Cold weather protection:

1. Protection of concrete during cold weather shall comply with ACI 306; heating of concrete shall be in accordance with ASTM C94-78. Cold weather techniques shall be used where the mean daily temperature falls below 40 degrees F for at least two (2) consecutive days.

2. Temperature of the concrete at time of placement shall not be less than 50 degrees F. Temperature of the soil against which concrete to be placed shall not be less than 40 degrees F.

3. Concrete temperature shall be maintained at a minimum of 50 degrees F for at least seventy-two (72) hours after placement.

4. Contractor shall provide to the architect a description of cold weather protection procedures to be used, including the methods for determining the need for the procedures.

C. Hot Weather Protection:

1. Protection of concrete during hot weather shall comply with ACI 301 and ACI 305. Hot weather protection procedures shall be used when the temperature of the concrete mix exceeds 85 degrees F.
2. Temperature of the concrete mix may exceed 85 degrees F only if water reducing and retarding compound complying with ASTM C494 is used.

3. Hot weather precautions shall be instituted by the contractor when the anticipated rate of evaporation, as determined by guidelines in ACI 305, is expected to reach 0.2 pounds per square foot per hour (lb/sq. ft./hr.).

4. The contractor shall provide to the architect a description of hot weather protection procedures to be used, including the methods for determining when the procedures will need to be implemented. Provide written recommendations from the manufacturer for use of water reducing and retarding compounds.

3.07 CONTRACTION JOINTS FOR GRADE SLABS

A. Contraction joints shall be located as indicated on Drawings or, if not indicated, so as not to impair the strength and appearance of the structure. Joints shall be spaced at a maximum of 20 feet on center, in either direction and shall coincide with column grids, where present. Install contraction joints in accordance with approved joint location shop drawings.

B. Sawcut joints in grade slabs immediately after finishing, and after curing compound has been applied so that the slab surface is not damaged by equipment and sawcutting does not dislodge aggregate. In general, sawcutting of joints shall take place within a period of 7 to 14 hours after concrete is placed, depending on actual project conditions. Sawcutting shall be scheduled to occur within this timeframe to minimize the risk of shrinkage cracking. Work shall not be postponed until the following work day.

C. Contraction joints shall be 1/8 inch wide by a depth equal to 25% of slab thickness.

3.08 FINISHES OTHER THAN FLOORS

A. After removal of forms, remove fins and forms marks by grinding on exposed interior and exterior surfaces scheduled to receive paint or membrane waterproofing. Patch voids and honeycombs.

B. Interior and exterior exposed concrete surfaces: "Rubbed Finish." Apply grout, clean-down after the patching, grinding, and cleaning operations are complete. The grout wash shall follow the patching operation as soon as possible and the procedure shall be as follows:

1. Mix one part portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint. Use white portland cement for cement in grout. Wet the surface of the concrete sufficiently to prevent absorption of water from grout and apply grout with a brush or burlap completely filling air bubbles and holes. Immediately after applying grout, float surface with a cork or other suitable float, scouring vigorously. While the grout is still plastic, finish surface with a sponge rubber float, removing excess grout.

2. Finishing shall be done at time when grout will not pull from holes of depressions. Next, allow surface to dry until surface takes on a powdery appearance, then rub vigorously with dry burlap to remove completely dried grout. No visible film or grout shall remain after rubbing. Complete entire cleaning operation for an area the day it is started. Do not leave grout on overnight.

3. After the concrete has been grout-cleaned, if slightly dark spots or streaks remain, wipe off lightly with a fine abrasive hone without using water. Rubbing with the hone shall not be sufficient to change the texture of the concrete. Include final operation as part of grout cleaning where necessary.

C. In foundation walls below grade and both sides of pit walls, cut back ties and spreaders to a depth of approximately 1-1/2 in. Cut back honeycombed concrete and voids to sound concrete. Cuts shall be to depth of at least 1-1/2 in. with edges perpendicular to surface.

D. Concrete surfaces not exposed to view may be left "as is." Fill holes resulting from cutting back of scale pockets, honeycomb, surface voids and the removal of form wires or spreaders with cement mortar.

3.09 FLOOR AND SLAB FINISHES

A. Measure floor finish tolerances in accordance with ASTM E1155. Individual floor sections shall be bounded by construction joints, contraction (control) joints, or column lines that form the smallest sections.

B. Floor Slab Tolerance: After final troweling operation slab shall have a surface place tolerance not exceeding 1/4 inch in 10 feet when tested with a loft straightedge, but 1/4 inch shall not be cumulative.

C. Where specified tolerances in surface elevation of slabs are exceeded, grind or patch the surface to obtain specified tolerance. Grind as soon as possible but not before 3 days of cure. Install patching material in accordance with manufacturer's instructions.

D. Finishes:

1. Scratched finish for surfaces to receive bonded applied cementitious finishes: After the surface has been struck off, consolidated and leveled, roughen surface with stiff brushes or rakes before final set.
2. Troweled finish for surface to receive finish flooring or be exposed: Float finish surfaces first and then apply power-driven trowel and then hand trowel. First troweling after power floating shall be with a power trowel producing a smooth surface relatively free of defects. Additional troweling by hand after surface has hardened sufficiently to produce a ringing sound as the trowel is moved over the surface. Thoroughly consolidate surface by hand trowel operation. Finished surface shall be free of trowel markings and be uniform in texture and appearance. On surfaces receiving floor coverings, remove defects of sufficient magnitude to show through floor covering by grinding.

3. Broom finish: Light/medium broom on ramps and sidewalks, to be approved in field by Architect, finish to be consistent.

E. Floor Slab Recesses and Slopes:

1. Where floor drains are indicated on Drawings, slope floor slabs to drain.

3.10 QUALITY CONTROL TESTING DURING CONSTRUCTION BY OWNER

A. Concrete shall be sampled and tested for quality control during the placement of concrete as follows:

1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.

2. Slump: ASTM C143; one test for each concrete load at point of discharge, and one for each set of compressive strength test specimens. The testing laboratory or Owner's Representative shall have the authority to reject any concrete that does not have the specified slump.

3. Air Content: ASTM C231, pressure method; one for each set of compressive strength test specimens.

B. Compression Test Specimens

1. ASTM C31: One set of 5 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

2. Tests shall be made by an independent testing laboratory. Not less than one test for each 150 cubic yards of concrete, or fraction thereof, or each 5,000 sq. ft. of slab, for each class of concrete placed will be required, and in any event not less than one test for each day's pour of each class of concrete. Four specimens will be made for each test: ASTM C39 and C31.

3. Standard age of test shall be 28 days. Seven-day test results shall be reported to Architect for two cylinders of each class of concrete. Test 2 cylinders at 28 days and 2 at 7 days.

4. If strength of laboratory control cylinders for any portion of structure falls below the compressive strength required for the design, Architect shall have the right to order change in proportions of water content of concrete for remaining portions of structure. In addition, where there is question as to quality of concrete in structure, Architect may require tests in accordance with ASTM C42. Should such tests fail to develop minimum strengths specified, faulty concrete shall be replaced.

5. Report test results in writing to the Architect and the Contractor on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of Contractor, name of concrete supplier and truck number, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 7-day and 28-day tests. Furnish copy of each test to local building inspections office at same time other submittals are made.

6. Contractor must provide a concrete cylinder storage box acceptable to the testing and inspection laboratory.

END OF SECTION

SECTION 03350

POLISHED CONCRETE FINISHING SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: This Section specifies dyed and polished concrete.

B. Related Sections:

1. Section 03300 Cast-in-Place Concrete

1.02 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 302.1R Guide for Concrete Floor and Slab Construction.

B. ASTM International:

1. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

2. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete.

3. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.

C. National Floor Safety Institute (NFSI):

1. NFSI Test Method 101-A Standard for Evaluating High-Traction Flooring Materials, Coatings, and Finishes.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide polished flooring that has been selected, manufactured and installed to achieve the following:

1. Abrasion Resistance: ASTM C779, Method A, high resistance, no more than 0.008 inch (0.20 mm) wear in 30 minutes.

2. Reflectivity: Increase of 35% as determined by standard gloss meter.

3. Waterproof Properties: Rilem Test Method 11.4, 70% or greater reduction in absorption.

4. High Traction Rating: NFSI 101-A, non-slip properties.

B. Design Requirements:

1. New concrete shall be cured for minimum seven days before polishing shall begin

2. Hard-Steel Troweled (3 passes) Concrete: No burn marks. Finish to ACI 302.1R, Class 5 floor

3. Apply no curing agents to concrete floor prior to polishing

1.04 DRAWING AND MATERIAL SUBMITTALS

A. Shop Drawings: Indicate information on shop drawings as follows:

1. Typical layout including dimensions and floor grinding schedule.

2. Plan view of floor and joint pattern layout.

3. Areas to receive colored surface treatment.

4. Hardener, sealer, densifier in notes.

B. Product Data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products.

1. Material Safety Data Sheets (MSDS).

2. Preparation and concrete grinding procedures.

3. Colored Concrete Surface, Dye Selection Guides.

1.05 INFORMATION SUBMITTALS

A. Quality Assurance:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties as cited in 1.03 Performance Requirements.

2. Certificates:

a. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and

physical requirements.

b. Letter of certification from the National Floor Safety Institute confirming the system has been tested and passed phase Two Level of certification when tested by Method 101-A.

c. Current contractor's certificate signed by manufacturer declaring contractor as an approved installer of polishing system.

3. Manufacturer's Instructions: Manufacturer's installation instructions.

1.06 CLOSEOUT SUBMITTALS

A. Warranty: Submit warranty documents specified.

B. Operation and Maintenance Data: Submit operation and maintenance data for installed products to include:

1. Manufacturer's instructions on maintenance renewal of applied treatments.

2. Protocols and product specifications for joint filing, crack repair and/or surface repair.

1.07 QUALITY ASSURANCE

A. Qualifications:

1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

2. Installer trained and holding current certification for FGS PermaShine installation.

3. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

B. Regulatory Requirements.

1. NFSI Test Method 101-A Phase Two Level High Traction Material.

C. Mock-Ups:

1. Mock-Up Size: 100 ft^2 sample panel at jobsite at location as directed under conditions similar to those which will exist during actual placement.

2. Mock-up will be used to judge workmanship, concrete substrate

preparation, operation of equipment, material application, color selection and shine.

3. Allow 24 hours for inspection of mock-up before proceeding with work.

4. When accepted, mock-up will demonstrate minimum standard of quality required for this work.

5. Approved mock-up may remain as part of finished work.

D. Preinstallation Meetings: Conduct a preinstallation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Review the following:

1. Environmental requirements.

2. Scheduling and phasing of work.

3. Coordinating with other work and personnel.

4. Protection of adjacent surfaces.

5. Surface preparation.

6. Repair of defects and defective work prior to installation.

7. Cleaning.

8. Installation of polished floor finishes.

9. Application of liquid hardener, densifier.

10. Protection of finished surfaces after installation.

1.08 DELIVERY, STORAGE & HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Delivery:

1. Deliver materials in manufacturer's original packaging with identification labels and seals intact.

C. Storage and Protection:

1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

2. Protect concrete slab.

a. Protect from petroleum stains during construction.

b. Diaper hydraulic power equipment.

c. Restrict vehicular parking.

d. Restrict use of pipe cutting machinery.

e. Restrict placement of reinforcing steel on slab.

f. Restrict use of acids or acidic detergents on slab.

D. Waste Management and Disposal:

1. Remove from site and legally dispose of packaging materials

1.09 PROJECT AMBIENT CONDITIONS

A. Installation Location: Comply with manufacturer's written recommendations.

1.10 SEQUENCING

A. Sequence With Other Work: Comply with manufacturer's written recommendations for sequencing construction operations.

1.11 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Ensure manufacturer has minimum 5 years experience in manufacturing components similar to or exceeding requirements of project.

2.02 Polished Concrete Finishing Products

A. Manufacturer: L & M Construction Chemicals, Inc. is the design basis of this specification. **Other manufacturers may be proposed no later than ten days prior to bid date in accordance with Section 01630.**

1. Contact: 14851 Calhoun Rd., Omaha, NE 68152-1140; Telephone: (800) 362-3331, (402) 453-6600; Fax: (402) 453-0244; website: www.LMCC.com, www.fgs-permashine.com; E-mail: info@lmcc.com.

B. Products/Systems:

1. Hardener, Sealer, Densifier: Proprietary, water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film.

   a. Acceptable Material: L & M Construction Chemicals, Inc., FGS Hardener Plus.

2. Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A 80 or higher hardness.

   a. Acceptable Material: L & M Construction Chemicals, Inc., Joint Tite 750.

3. Oil Repellent Sealer: Ready to use, silane, siloxane and fluoropolymers blended water based solution sealer, quick drying, low-odor, oil and water repellent, VOC compliant and compatible with chemically hardened floors.

   a. Acceptable Material: L & M Construction Chemicals, Inc., Petrotex.

4. Concrete Dyes: Fast-drying dye, packaged in premeasured units ready for mixing with VOC exempt solvent; formulated for application to polished cementitious surfaces.

   a. Acceptable Material: L & M Construction Chemicals, Inc., Vivid Concrete Dyes.

5. Cleaning Solution: Proprietary, mild, highly concentrated liquid concrete cleaner and conditioner containing wetting and emulsifying agents; biodegradable, environmentally safe and certified High Traction by National Floor Safety Institute (NFSI).

   a. Acceptable Material: L & M Construction Chemicals, Inc., FGS Concrete Conditioner.

6. Finish: Standard High gloss (HG-1), 1500 grit

7. Color: As selected by Owner/Architect from standard palette of 24 colors

2.03 SOURCE QUALITY CONTROL

A. Ensure concrete finishing components and materials are from single manufacturer.

PART 3 EXECUTION

3.01 MANUFACTURERS INSTRUCTIONS

A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions and L & M Construction Chemicals, Inc., SPEC-DATA sheets.

B. Use only L & M certified FGS/PermaShine installers.

3.02 EXAMINATION

A. Site Verification of Conditions:

1. Verify that concrete substrate conditions, which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete finishing materials.

3.03 PREPARATION

A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.

B. Examine surface to determine soundness of concrete for polishing.

C. General Contractor to remove surface contamination.

3.04 INSTALLATION

A. Floor Surface Polishing and Treatment:

1. Provide polished concrete floor treatment in entirety of slab indicated by drawings. Provide consistent finish in all contiguous areas.

2. Apply floor finish prior to installation of fixtures and accessories.

3. Diamond polish concrete floor surfaces with power disc machine recommended by floor finish manufacturer. Sequence with coarse to fine grit using dry method.

a. Comply with manufacturer's recommended polishing grits for each sequence to achieve desired finish level. Level of sheen shall

match that of approved mock-up.

b. Expose aggregate in concrete surface only as determined by approved mock-up.

c. All concrete surfaces shall be as uniform in appearance as possible.

4. Dyed and Polished Concrete:

a. Locate demarcation line between dyed surfaces and other finishes.

b. Polish concrete to final finish level.

c. Apply diluted dyes to polished concrete surface.

d. Allow dye to dry.

e. Remove residue with dry buffer; reapply as necessary for desired result.

5. Apply FGS Hardener Plus, Hardener, Densifier As Follows:

a. First coat at 250 ft^2/gal (6.25 m^2/L).

b. Second coat at 350 ft^2/gal (8.75 m^2/L).

c. Follow manufacturer's recommendations for drying time between successive coats.

6. Remove defects and repolish defective areas.

7. Finish edges of floor finish adjoining other materials in a clean and sharp manner.

3.05 ADJUSTMENTS

A. Polish to higher gloss those areas not meeting specified gloss levels per mock-up.

B. Fill joints flush to surface.

3.06 FINAL CLEANING

A. Mechanically scrub treated floors for seven days with soft to medium pads with approved cleaning solution.

B. Upon completion, General Contractor must remove surplus and excess materials, rubbish, tools and equipment.

END OF SECTION

SECTION 03600

NONSHRINK GROUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the Work of this Section.

1.02 DESCRIPTION

A. This specification describes non-shrink cement-based grout to be used wherever shown or implied on the drawings or called for in the specifications.

PART 2 - PRODUCTS

2.01 GENERAL

A. Non-shrink grout shall consist of premeasured, prepackaged materials supplied by the manufacturer requiring only the addition of water. The manufacturer's instructions must be printed on the outside of each bag.

2.02 NONSHRINK CEMENT-BASED GROUT

The contractor shall submit information verifying that the grout exhibits the following:

A. Nonshrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%), and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.

B. Compressive Strength: A minimum 28-day compressive strength of 5,000 psi when tested in accordance with ASTM C-109.

C. Setting Time: A minimum set time of 60 minutes when tested in accordance with ASTM C-191.

D. Technical Service: The manufacturer shall provide technical service upon request.

E. Composition: For column base plates, grout containing metallic particles such as aluminum powders or iron fillings may be used. For any other applications, the grout shall not contain metallic particles or expansive cement.

2.03 WATER

A. Drinkable water shall be used in mixing grout. Use the minimum water necessary for proper installation in accordance with flowability requirements and manufacturers recommendations for specific applications.

PART 3 - EXECUTION

3.01 GENERAL

A. Placing: The Contractor shall perform all mixing, grouting, and curing in accordance with the manufacturer's recommendations.

B. Temperature: The temperature of the grouting surfaces and the grout shall be maintained between 50 degrees F and 90 degrees F during grouting and for a minimum of 24 hours thereafter.

C. Elimination of Voids: Grout placement shall proceed in a manner that will assure the filling of all spaces and intimate contact of the grout with contact surfaces. Grout holes shall be used; location to be approved by Architect/Engineer if not otherwise detailed.

3.02 SURFACE PREPARATION

A. Concrete Surfaces:

1. The concrete on which the grout will bear shall have attained its design strength before grouting.

2. Concrete shall be sound and all surfaces to be in contact with the grout shall be entirely free of oil, grease, laitance, curing compounds, and other deleterious substances.

3. Surfaces shall be roughened by chipping, sandblasting or other mechanical means to assure bond of the grout to the existing concrete.

4. Concrete surfaces shall be washed clean, then saturated with water for 24 hours prior to placement of cement-based grout. Excess water must be removed prior to grouting.

B. Metal Surfaces: All metal surfaces, which are to be in direct contact with the grout, shall be thoroughly cleaned to bare metal immediately before grouting.

3.03 GROUT REMOVAL

A. Treat adjacent surfaces and formwork with a bond breaking material to prevent bonding of excess grout.

END OF SECTION

SECTION 03650

CEMENT-BASED FLOOR UNDERLAYMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Conditions of Contract, including Division 1 Specifications Sections, apply to the work of this Section.

1.02 RELATED WORK

A. Cast-In-Place Concrete: Section 03300

B. Ceramic Tile: Section 09310

C. Resilient Tile Flooring: Section 09662

D. Carpet: Section 09680

1.03 QUALITY ASSURANCE

A. Installation of the underlayment shall be by an applicator approved by the manufacturer, who shall have had a minimum of five years successful experience in applying the underlayment to the types of substrates indicated on the drawings.

B. Mixing equipment, tools and other accessories shall be types approved by the underlayment manufacturer.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's specifications, product literature and other data on underlayment and primers in order to demonstrate compliance with the requirements of this Specification. Include manufacturer's recommended installation details for the type of substrate to be covered.

B. Provide evidence of applicator's qualifications.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened packaging. Protect from exposure to moisture, freezing temperatures, and direct exposure to sunlight. Store in a manner to prevent damage of disturbance of materials until ready for use.

PART 2 - PRODUCTS

2.01 CEMENT-BASED FLOOR UNDERLAYMENT

A. Approved Manufacturers:

1. ARDEX, Inc., Aliquippa, PA, 1-724-203-5000 (www.ardex.com) (ARDEX K-15 self-leveling underlayment concrete).

2. MAPEI, Deerfield Beach, FL 1-888-876-2734 (www.mapei.com) (MAPEI Ultraplan 1 Plus self-leveling underlayment concrete)

3. LATICRETE SUPERCAP, LLC, Bethany, CT 203-393-0010 (www.laticretesupercap.com) (LATICRETE SUPERCAP SC 500 self-leveling cementitious underlayment).

4. Pre-bid approved manufacturer(s) in accordance with Section 01630.

B. Product Characteristics

1. Cement based, with a blend of Calcium Aluminate Cement and Portland cement binder.

2. Flowing Time: Approximately 10 minutes at 70°F

3. Initial Set: Approximately 30 minutes at 70°F (ASTM C191)

4. Final Set: Approximately two (2) hours at 70°F (ASTM C191)

5. Compression Strength: Approximately 2,630 psi after 24 hours, 4,100 psi after 28 days (ASTM C-109/modified)

6. Flexural Strength per ASTM C348: 770 psi after 1 day, 900 psi after 28 days.

7. Flammability per ASTM E-84: Flame spread = 0, fuel contribution = 0, smoke development = 0.

C. Primer for absorbent concrete surfaces: ARDEX P-51. MAPEI Primer L. LATICRETE SUPERCAP PRIMER PLUS (per manufacturer's tech data sheet)

D. Primer for non-porous surfaces: ARDEX P-82 "Ultra-Prime". MAPEI Primer WE LATICRETE SUPERCAP PRIMER PLUS (per manufacturer's tech data sheets)

E. Aggregate (for underlayment thicker than 1 1/2"): Well-graded, washed, pea gravel (in the range of 1/8" to 1/4" or larger, but not larger than 3/8").

F. Water: Clean, potable, and not warmer than 70°F.

G. Mixing Drum: ARDEX T-10 drum with T-1 mixing paddle.

H. Pump Installations (where applicable): ARDEX "Levelcraft" II automatic mixing pump.

I. LATICRETE SUPERCAP computer controlled Mobile Blending Unit (The PUMP TRUCK)

J. Mixing with additives other than those provided or recommended by the underlayment manufacturer shall not be allowed.

PART 3 - EXECUTION

3.01 PREPARATION

A. Thoroughly inspect all surfaces prior to application of the underlayment, in order to identify and correct conditions, which would affect both application and performance. Coordinate installation of underlayment with the work of other trades.

B. All surfaces shall be solid, intact, clean and properly primed.

1. All concrete subflooring shall have reached specified design strength, shall be clean and free of oil, grease, dirt, curing compounds, or any other substance which may act as a bond break between the subfloor and the underlayment. Do not use acid etching as a means of removing such substances.

2. Non-porous surfaces such as ceramic tile and quarry tile shall be clean and free of all wax and sealers.

3. Repair cracks in the subfloor to minimize "telegraphing" of crack into underlayment.

3.02 PRIMING

A. Prime with manufacturer's recommended primer, insuring complete, uniform coverage with no bare spots. Remove puddles of excess primer. Allow primer to dry for recommended amount of time prior to applying underlayment.

1. For extremely absorbent concrete subfloors, provide an initial application for recommended primer, followed by a standard application of primer, in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Mixing Ratios: Following manufacturer's recommendations for bag: water ratio. Mix thoroughly to eliminate lumps and to provide even consistency.

B. Mix aggregates in recommended proportions where thickness is to exceed 1 1/2". Do not use sand as an aggregate.

C. Pour or pump underlayment and spread in place using recommended spreader. Use recommended smoother for feather edging and touch up. Installers shall wear cleated baseball footwear to avoid leaving marks in the liquid underlayment.

D. Allow underlayment to dry (per manufacturers tech data sheets) for at least two (2) hours at 70°F before accepting foot traffic.

E. Do not apply finished floor until underlayment has been in place for at least 16 hours.

F. Extend isolation and control joints through the underlayment.

G. Once application is complete, remove all excess materials, tools, trash and other debris associated with the work of this Section from the premises and dispose of legally. Clean adjacent surfaces in order to remove excess material or splatters.

END OF SECTION