SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies cast-in-place concrete and related items, including formwork, steel reinforcement, concrete materials, mixture design, joints, templates, anchors, cutting and patching, placement procedures, sealants, and finishes.

B. Contractor shall provide all labor, materials, equipment, and services necessary to design, furnish, deliver and install all concrete work as indicated on the drawings, in accordance with local codes and standards, or as specified herein. This work includes but is not limited to all slabs, footings, retaining walls, beams, forming, shoring, bracing, welding, bending, form removal, finishing, cleaning, and related work.

C. Coordinate delivery with other work to avoid delay.

D. All work shall be coordinated with other Sections including but not limited to:

1. Section 07920, "Joint Sealants"
2. Appendix A – Soils Report

1.02 SUBMITTALS

A. Submittals shall be provided in accordance with Sections 01330.

B. Product Data: For each type of manufactured material and product indicated.

1. After the General Contractor has received the Notice to Proceed, the following shall be submitted:
   a. Materials list of items proposed to be provided under this section.
   b. Manufacturers' specifications, test data, and all other data required to show compliance with the specification and drawing requirements.
   c. Manufacturers' printed recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejection actual installation procedures used in the work.
2. Submit special concrete finishes describing products and level of finish to be provided. Include stain, and dye, and for project. Provide concrete finish mockup per Construction Manager's request.

C. Design Mixtures:

1. Submit mix design for each class of concrete to the Architect for review.
2. Review of mix design by the Architect will in no way relieve the Contractor of his responsibility for the performance of the concrete.

D. Shop Drawings for steel reinforcement and formwork:

1. Shop drawings shall show all bending and assembly diagrams, bent bar diagrams, bar schedules, stirrup spacings, splicings, laps, dimensions, shapes, details, sections, elevations, and accessories.
2. Include all special reinforcement required, and openings through concrete structures.

3. Prior to fabrication, contractor shall submit certified mill test reports for each grade of steel to be used, for review by the Architect.
4. Contractor shall submit five copies of manufacturers' specifications and installation instructions for all proprietary materials and reinforcement accessories.

E. Material test reports and certificates.

F. Substitutions shall be requested in accordance with Sections 01630 of this Specification.

G. LEED Submittals: Provide manufacturers' product data for paints and coatings, including printed statement of VOC content and chemical components.

H. Building Square Footage Certification Plan from surveyor shall be submitted by General Contractor prior to erection of walls above floor slab elevation.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in measuring, mixing, and delivery of ready-mixed concrete products.

1. The firm must comply with ASTM C 94/C 94M requirements for production facilities and equipment, except that time in mixer after water has been added at batch plant is limited to 1-1/2 hours.
2. Contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced in necessary crafts, and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this section

B. Contractor shall comply with the codes and standards including but not limited to:

1. ACI 301, "Specification for Structural Concrete", Sections 1 through 5, and Section 7, "Lightweight Concrete."
2. ACI 302, "Standard Practice for Concrete Floors and Slab Construction"
3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
4. ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete."
5. ACI 318, "Building Code Requirements for Structural Concrete."
6. AWS D1.4 "Structural Welding Code-Reinforcing Steel."
7. Concrete Reinforcing Steel Institute, "Manual of Standard Practice" and "Placing Reinforcing Bars".

C. Preinstallation Conference: Conduct conference at Project site.

D. Job-mixed concrete shall be subject to Architect's review of design, mixing and handling procedures.

E. Fly ash testing: Concrete test submittals must be reviewed and approved prior to the installation of any concrete, and should indicate the presence of fly ash.

1. Obtain samples in accordance with ASTM C172. Mold and cure specimens shall be in accordance with ASTM C31.
2. Test specimens in accordance with ASTM C39. Report all test results to the Architect where deviations from Specifications occur on the same day as the tests are made.

F. The design, engineering and construction of the formwork shall be the responsibility of the Contractor.

1. Shoring and reshoring for slabs, beams and walls shall be designed by a registered

Civil/Structural Engineer in state project is located.

2. Design the formwork in accordance with the loads and lateral pressures outlined in ACI-347, Part 3, paragraph 1.2.
3. Design formwork for wind loads as required by local codes, and as indicated on the drawings.
4. Protect all materials before, during, and after installation, and protect work and materials of all other trades. In the event of damage, immediately make replacements and repair to the approval of the Architect, and at no additional cost to the Owner.

G. Concrete slabs shall be washed and scrubbed two (2) weeks after pour, and a 10'-0" long straight edge shall be utilized for an on-site inspection by Owner Construction Manager to determine compliance with finish specification. (This inspection shall occur a second time prior to the installation of floor covering or sealer.)

1. Prior to any floor coverings, finishes, or sealers being placed on the slab, the slab must be acceptable to Owner in compliance with, but not limited to, the specifications contained herein, regarding stains, abrasions, gouging, marring, etc.
2. Any slab portion that is determined by the Owner as unacceptable or defective shall be removed and replaced immediately in accordance with the requirements of section 3.10 herein.
3. Concrete sealer manufacturer shall certify acceptability of applicator of sealer products and required grinding and polishing. Provide letter of Certification from concrete finish manufacturer stating that the installer is a certified applicator of special concrete finishes, and is familiar with proper procedures and installation requirements required by the manufacturer.
4. Contractor shall follow guidelines and procedures for compliance with certain LEED program requirements to achieve credits for certification. Provide required submittals, products, installation methods, measurements, and documentation of prerequisites.

H. Warranty:

1. 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 not a limitation of, other rights Owner may have under Contract Documents.
2. Warranty Period: two (2) years commencing on Date of Certificate of Occupancy.
3. Additional requirements for product warranties are included in Section 01788.

1.04 DELIVERY, STORAGE AND HANDLING

A. Transport and handle all materials in such a manner as to prevent damage. Dumping on the ground is not permitted.

B. Locate storage piles, stacks, or bins to avoid or protect material from heavy and unnecessary traffic.

C. Furnish temporary protection for all exposed corners and edges.

D. Deliver all packaged materials in original, unopened, undamaged containers, with identification labels intact, and bearing the name of the manufacturer and brand.

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

F. Store and protect materials from exposure to harmful weather conditions, and at temperature and humidity conditions recommended by manufacturer.

1. Some materials may need to be stored in protected enclosures, and handled by methods which avoid exposure to moisture.
2. Store moisture-sensitive materials off the ground, under cover, and in a dry location.

3. Additional requirements for product delivery, storage and handling are in Section 01600.

1.05 PROJECT CONDITIONS

A. Cold Weather Requirements: Comply with Cold Weather Concreting requirements contained in ACI 306.

B. Hot Weather Requirements: Comply with hot-weather concreting requirements contained in ACI 305.

C. Comply with concrete sealant manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.

PART 2 - PRODUCTS

2.01 GENERAL FORMWORK

A. The design, engineering and construction of the formwork shall be the responsibility of the Contractor.

1. Shoring and reshoring for slabs, beams and walls shall be designed by a registered Civil/Structural Engineer in the State the project is located.
2. Design the formwork in accordance with the loads and lateral pressures outlined in ACI-347.
3. Design formwork for wind loads as required by local codes, and as indicated on the drawings.
4. Protect all materials before, during, and after installation, and protect work and materials of all other trades. In the event of damage, immediately make replacements and repair to the approval of the Architect, and at no additional cost to the Owner.

B. Contractor shall provide forms for all concrete, except that which is authorized to be placed directly against earth in trenches.

C. Contractor shall provide positive means of adjustment of formwork and shoring to prevent excessive deflection or misalignment during concrete placement.

D. General formwork (concealed concrete) shall be constructed of plywood or approved patented formwork systems with plywood facings with as large a face dimension as possible.

E. Exposed concrete formwork shall be constructed of medium density overlaid form panel.

F. Formwork accessories shall be Burke Concrete Accessories, Inc.

1. Snap ties shall be Burke Architectural Snap Ties. Spreader cones on ties shall not exceed 1" in diameter.
2. Form coating requirements shall be determined by the form system being used. Form coating shall be compatible with the finishes used on concrete surfaces.

2.02 STEEL REINFORCEMENT

A. Contractor shall furnish and install all labor, materials, equipment and services as required herein to provide a complete concrete reinforcing system including but not limited to bars, wire fabric, ties, and supports.

B. Work in this section also includes furnishing and installation of all vertical reinforcing steel in masonry walls, and all bond beam steel.

C. All reinforcement shall be delivered to the project site bundled, tagged, and marked to facilitate sorting and placing.

1. Tags shall indicate bar sizes, lengths, grade, and other information corresponding to markings shown on placement diagrams.
2. Transport and store reinforcement at the site off the ground and in a manner to prevent damage to the materials.

D. Reinforcing Bars shall be provided as follows:

1. ASTM A 615/A 615M, Grade 60, deformed.
2. ASTM A 615, Grade 40 as noted on the drawings only.
3. ASTM A706 weldable rebar
4. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

E. Concrete reinforcement fabrication tolerances shall be as follows:

1. Sheared length: Plus 1", Minus 1"
2. All other bends: Plus 1", Minus 1"

F. Concrete reinforcement placing tolerances shall be as follows:

1. Depth D, in flexural members, walls and columns where D is 24" or less: ¼" ±.
2. Depth D, in flexural members, walls and columns where D is more than 24": ½" ±.
3. Longitudinal location of bends and ends of bars: 2"±, except that specified concrete cover at ends of members shall not be reduced.

G. Welded wire reinforcement:

1. Plain-steel welded wire reinforcement, ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
2. Deformed-steel welded wire reinforcement: ASTM A 497, flat sheet
3. Epoxy-coated welded wire reinforcement: ASTM A 884/A884M, Class A coated, type 1

H. All reinforcing steel shall be of new billet stock, deformed carbon steel bars.

I. Tie wire shall be annealed steel wire not lighter than 16-gauge, complying with ASTM A82

J. Welded wire fabric shall be electrically welded wire fabric of cold-drawn wire (70,000 psi yield point) of gauge and mesh indicated, conforming to ASTM A 185. Material shall have carbon content between 0.10% and 0.30%, and be welded with low hydrogen rods only.

K. Welding rods shall be of E-70 series low hydrogen conforming to AWS A-5.1.

L. Provide supports for reinforcement including bolsters, chairs, spacers, and other devices suitable for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place.

1. Use wire bar-type supports complying with PS 7. Wood, brick, and other materials are not acceptable for this application.
2. Manufacture bar supports according to CRSI's "Manual of Standard Practice."
3. Metal chairs shall be galvanized or plastic tipped for all exposed concrete. If fiberboard forms are used, provide chairs with runners to avoid joist loading or puncture.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type II modified, alkali content not to exceed 0.6%. Use only one brand of approved cement throughout the project unless use of more than one

approved brand is acceptable to Architect.
a. Fly Ash: (If permitted to be used) ASTM C 618, Class F.

B. Aggregates:

1. Coarse Aggregate shall meet the requirements of ASTM C33, Table II, size 57.
2. Normal weight Aggregates shall meet the requirements of ASTM C33, uniformly graded, not exceeding 1-1/2-inch nominal size.
3. Fine Aggregate shall meet the requirements of ASTM C33.
4. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.
5. All aggregates shall note contain water soluble sulphate higher than 0.10 by % of weight.

C. Water: potable complying with ASTM C94.

D. Air-Entraining Admixture shall comply with ASTM C260.

E. Use of Chemical Admixtures are allowed only with prior approval from Architect. As allowed, provide admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
7. Non-slip Admixture shall be Frictex NS as manufactured by Sonneborn Chemical Corporation.

2.04 VAPOR RETARDERS

A. Sub-slab vapor retarder shall be as required where required by ASTM E1745 and installation shall comply with ASTM E1643, and as follows:

1. 100% virgin material
2. Permeability of 0.050 or less, minimum 10.mil
3. Puncture resistant
4. Non-biodegradable

2.05 CURING MATERIALS

A. Hardening/Sealing/densifier Agent shall be L&M Seal Hard, as manufactured by L&M Construction Chemicals, Inc. 14851 Calhoun Road Omaha Nebraska 68152 1.800.362.3331.

B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

A. Curing and Sealing Compound: Ashford Formula - Manufacturer: Curecrete Distribution, Inc.

1. Contact: 1203 W. Spring Creek Place, Springville, UT 84663-0551; Telephone: (800) 998-5664, (801) 489-5663; Fax: (801) 489-3307; website: www.ashfordformula.com.

E. Water: Potable.

2.06 RELATED MATERIALS

A. Concrete accessories shall be as manufactured by Superior Concrete Accessory Company, or Burke Concrete Accessories.

B. Keyed Kold Joint shall be 24-Gauge or as approved by the Architect and manufactured by Burke.

C. Control joints (optional to Sawcut Joint) shall be Sealtight Speed-E-Joint with pull free top section. Provide 1-1/2" at slabs up to 6" thickness, and 2" at slabs 6" and thicker.

D. Leveling compound shall be as recommended by Ardex to be used in areas of floor covering only.

E. Non-shrink grout shall be Embeco premixed as manufactured by Master Builders Company, Burke Grouting Compound, 5 Star Grout. Grout shall have 28-day compressive strength of not less than 7500 psi conforming to ASTM C827.

F. Expansion- and Isolation-Joint-Filler Strips shall be as required by ASTM D 1752, type I or II preformed non-extruded, resilient type. ASTM D 1751, asphalt-saturated cellulosic fiber.

G. Semi rigid joint filler shall be Sonneborn, "Sonolastic NP-1".

H. Floor crack filler shall be non-metallic, non-shrink, waterproof filler having a minimum compressive strength of 4000 psi.

2.07 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on the drawings or structural calculations.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: Maximum slump 4" for all concrete, plus or minus 1 inch.
4. Air Content: 3 percent, plus or minus 1.0 percent at point of delivery for 1-1/2" nominal maximum aggregate size.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

2.08 CONCRETE MIXING

A. Design concrete mixes in accordance with ACI-211 to obtain a 28-day comprehensive strength as scheduled for the various building elements.

B. Use of water reducing admixture is not permitted in concrete for slabs on grade, unless approved by the Architect.

C. Proportion concrete for minimum slump of 3" and maximum slump of 5".

D. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F , reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Remove all debris and foreign material from the forms, and repair or replace damaged areas, prior to assembly.

C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

1. Formwork shall be constructed in a substantial manner, true to line and sufficiently tight to prevent leakage of cement paste.
2. Coat and contact surfaces of forms with a form coating compound before reinforcement is placed. Thin form-coating compound only as recommended by the form-coating manufacturer. Prevent excess accumulation of form coating or contact with concrete surfaces against which fresh concrete will be placed. Apply coating in compliance with manufacturer's instructions.
3. Construct shoring and centering to prevent perceptible deflection. Brace and double wedge on bearing blocks and mudsills to distribute the construction loads evenly and safely. Keep wedges tight during concrete placement and until shoring is removed.
4. Do not construct formwork more than one foot above a construction joint at the side from which the concrete will be placed.
5. Wet the wood forms and masonry units in contact with concrete.
6. No wood other than built-in-bucks or nailing blocks will be permitted to remain permanently inside the forms.
7. Provide blockouts in concrete as indicated on the drawings or as required for mechanical, plumbing, electrical or other work.
8. Provide slab slopes and concrete drainage trenches as indicated on the Drawings. Slopes on slabs and in trenches shall be uniform and pitched to drain.

D. Provide temporary openings at the base of forms and all other points to facilitate cleaning and inspection before the concrete is placed. After forms have been cleaned and inspected, close openings to prevent leakage of grout.

E. See Architectural drawings for chamfers and reveals. Where none is shown, provide ½" vinyl bead in all exposed angles to form a slightly rounded corner.

F. Form removal shall be performed in a manner to insure the complete safety and integrity of the structure. Supports or forms should not be disturbed until the concrete has hardened, and acquired sufficient strength to safely sustain its own weight and any additional load occurring during construction.

1. Form removal shall conform to the following minimum time schedule:
   a. Wall forms: Not less than 3 days after placing the concrete.
2. Refer to section 3.9 herein for curing procedures when forms are removed in less than 7 days.

3.02 EMBEDDED ITEMS

A. Contractor shall coordinate the necessary trades as required to provide the sleeves, bolts, anchors, holes, etc., to be built in.

B. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams,

instructions, and directions furnished with items to be embedded.

1. Install all bucks, nailing blocks, inserts, and anchors, in the precise position required.
2. Form all grooves, seats, reglets, etc., as required to receive the material and equipment indicated.

3.03 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E1643 and manufacturers' written instructions.

1. Lap joints 6 inches and seal with manufacturers' recommended tape.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" and ACI 318 for placing reinforcing steel.

1. Place the steel in accordance with the drawings and schedules, and secure in position to prevent displacement during placing of concrete. In earth trenches, provide concrete block supports; on formwork, provide approved metal or plastic chair and spacer supports. Secure with ties against displacement within the tolerances specified herein.
2. Adjust bar placement as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. Such adjustment is subject to approval of the Architect.
3. Lap splices a minimum of 32 bar diameters unless otherwise noted. Splices shall be subject to the approval of the Architect.
4. Bars shall be continuous insofar as practicable. Dowels shall be of sufficient length to develop the strength of the bar. Secure dowels in the forms prior to placing the concrete.
5. Use flat sheets of wire mesh reinforcing and cut to the required size and lay reasonably flat in place. In slabs-on-grade and in non-composite concrete topping, lap 2" minimum between outer most cross wires on each sheet. Elsewhere, lap one wire spacing plus 2" minimum between outer most cross wires on each sheet. Wire securely to each other and to the adjoining reinforcement. Chair mesh in place to its proper depth in concrete.
6. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Fabricate and place steel reinforcing in accordance with requirements of ACI 117.

C. Shop fabricated reinforcing bars shall conform to the required shapes and dimensions, with fabrication tolerances complying with ACI 117. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.

D. Bend bars cold and shop fabricate insofar as practible. Bends for stirrups and ties shall have radii on the inside of the bar not less than one bar diameter. Bends for all other bars shall have radii on the inside of the bar not less than the values listed below:

1. Bar Size	Minimum Radii
2. #3, #4, or #5	2-1/2 Bar Diameters
3. #6, #7, or #8	3 Bar Diameters
4. #9, #10, or #11	4 Bar Diameters

E. Reinforcement shall be free of excessive mill scale, excessive rust, oil or other deleterious material harmful to bonding qualities.

F. Reinforcement with any of the following defects will not be permitted in the work:

1. Bar lengths, depths, and bends exceeding the specified fabrication tolerances.
2. Bends or kinks not indicated on the Drawings or final Shop Drawings.
3. Bars with reduced cross section due to excessive rusting or other cause.

G. Welding of reinforcing steel shall comply with the requirements of AWS D1.4, Structural Welding Codes- Reinforcing Steel for field welding.

H. Prior to field welding, determine the weldability of the reinforcing bars by a laboratory chemical analysis of the steel. Only steel conforming to the chemical requirements specified in AWS D1.4 may be welded.

3.05 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Submit proposed locations of all construction joints and control joints, and obtain Architects approval prior to construction. In the event that additional reinforcing is required at some of these joints, labor and materials to install additional reinforcing shall be provided by contractor at no additional cost to the Owner.

C. All reinforcing shall be continuous through construction joints and control joints. Provide shear keys as detailed on the drawings.

D. At all exterior slabs-on-grade, provide a ½" wide expansion joint wherever slabs abut vertical elements whether indicated on the drawings or not. Provide expansive heavy traffic grade waterproof sealant at all exterior joints.

E. Construction Joints/Control joints:

1. Place constructions joints and control joints as indicated on the drawings and as specified herein.
2. See Drawings for locations of constructions joints and control joints in slabs-on-grade and in topping pours.
3. Install all joints so strength and appearance of concrete are not impaired, at locations indicated, or as approved by Architect.
4. Provide shop drawings indicating location of all joints.

F. Contraction Joints in Slabs-on-Grade:

1. Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
3. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

G. Comply with recommendations of ACI 302 for use of joint fillers as applicable to materials, application, and conditions indicated.

1. Joints must be clean and dry. All oil, dirt, debris, paint, and any other material that may be a bond breaker must be removed from the joint surfaces. Follow manufacturer's written instructions for installation of individual materials for each application.

H. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.06 CONCRETE PLACEMENT

A. Contractor shall comply with the recommendations of ACI-304 for measuring, mixing, transporting, and placing concrete, except as follows:

1. Cold-Weather Placement: Comply with the requirements of ACI-306, Cold Weather Concreting.
2. Hot-Weather Placement: Comply with the requirements of ACI-305, Hot Weather Concreting.

B. Before placing concrete, clean all of the equipment involved. Remove all concrete laitance, loose materials, rust, mill scale, and other material which may reduce bonding with the reinforcing steel.

C. Before placing concrete, verify that installation of all formwork, reinforcement, and embedded items are complete, and that required inspections have been performed.

D. Convey the concrete from the mixer to the place of final deposit by methods which will prevent segregation of aggregate or loss of material.

1. Place concrete at such a rate that the concrete is at all times plastic, and to insure a practically continuous flow of concrete.
2. Concrete not in place 1-1/2 hours after the water has been added at batch plant may be rejected by the Architect.
3. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness.
4. If a section cannot be placed continuously, provide construction joints as required.

E. Place the concrete as nearly as practible in its final position to avoid segregation due to rehandling or flowing. Do not deposit concrete that has partially hardened or been retempered.

F. Thoroughly compact all concrete by suitable means during the placing, and work around the reinforcement and embedded items to allow proper placement of concrete into the corners of the forms.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI-301.
2. Use vibrators to aid in the placement of the concrete, operated by experienced personnel.
3. Design forms to withstand the action of the vibrators.
4. Keep at least one spare operating vibrator on the job at all times during the concrete operations.
   a. Do not place concrete during rain unless adequate protection has been provided.

3.07 FINISHING FORMED SURFACES (WALLS, BEAMS, SOFFITS, COLUMNS, ETC.)

A. After forms are removed, fill tie rod holes, correct honeycomb spots, remove fins, and clean and finish damaged surfaces. Wipe off excess mortar and rub to match adjoining surfaces.

B. When excessive honeycombing is revealed, remove the defective material immediately after stripping forms to a depth of ¾" to 1". Cut edge of area perpendicular to surface to avoid weathered edges. Saturate with water for several inches beyond cutout, and brush-in a grout consisting of equal parts Portland cement and sand. Follow immediately with the patching mortar. Leave the patch slightly higher than the surrounding surface. After an hour or two, finish flush with the adjoining surface. Wipe and rub patch to match adjoining surfaces. Keep patches moist for 7 days.

C. Patching mortar shall consist of the same materials and proportions as the original concrete, except that the coarse aggregate shall be omitted. When color match is required, adjust mixture

to produce a finished color to match the adjoining concrete surfaces.

D. Cracks caused by expansion, shrinkage and the like, that occur in natural color concrete up through final acceptance of building, shall be carefully patched with floor stone, epoxy grouting mortar, or other method acceptable to the Architect.

E. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

F. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.08 FINISHING (FLATWORK) –FLOORS AND SLABS

A. All concrete finishing work shall comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Place screeds on legs and pads, rather than allowing stakes and pins to puncture the vapor retarder.

B. Tolerances for finished slab surfaces shall be class A. Refer to drawings for finish locations.

C. Seal interior building slabs where indicated on Drawing finish schedule.

1. Do not wet concrete surfaces.
2. Move the concrete into place with square tipped shovels, screed and compact with a light tamp, except do not tamp topping and slabs not on grade. "Saw screed" and float surface to bring fines to the top.
3. When concrete surface has hardened sufficiently so that excess fines will not be brought to the surface, trowel the slab with a steel trowel to provide a smooth surface, free of pinholes or other imperfections. A type of mechanical trowel with rotating blades approved by the Architect may be used for this operation.
4. After the surface has hardened sufficiently to ring under a trowel, trowel again with a steel trowel to a sealed, hardened, burnished surface free of excess concrete pour cuts, sprawls, cracks, warps, trowel marks, skips, rolled fines, tooling and ridging.
5. Concrete slabs scheduled to receive ceramic tile, concrete topping or similar finishes shall have a screeded finish but true and even to plane, with no sharp projections or ridges.
6. Use a small radius edger on all edges of exposed work. Use a deep cutting scoring tool to provide scoring as indicated on the drawings.
7. Refer to drawings for tactile warning details.
8. It is mandatory that the slab be leveled with the straight edge by the General Contractor 2 weeks after the slab is poured, maximum tolerance of 1/8" over 10'-0" and a maximum of the

entire floor of ¼". The General Contractor shall coordinate this event with the Owner's representative so that he may be present. The floor slab shall be ground smooth and level no earlier than 2 days prior to installation of the floor covering. Grinding shall only occur at areas of floor coverings such as V.C.T., rubber sheet goods, vinyl sheet goods, etc. After the slab is ground, a second check shall be performed by the General Contractor to verify compliance to the tolerances specified in the floor finish section. See section 1.3, Quality Assurance.

9. Sawcutting of flatwork shall be coordinated with locations shown on the contract documents, and shall occur at the time when concrete has sufficiently stiffened as to prevent raveling, pulling of aggregate, and to provide equipment support.
10. Broom Finish:
    a. Exterior flatwork to receive broom finish shall be installed as indicated on the drawings and as specified herein.
    b. This shall include concrete platforms, steps, ramps, may include surfaces subject to light foot traffic, and elsewhere as indicated.
    c. Exterior truck ramps shall receive a heavy broom finish.

D. Non-slip surfaces such as stair treads or ramps where concrete is exposed, as indicated on the drawings and in the specifications herein, shall receive an abrasive aggregate applied uniformly at the rate of no less than 25 lbs. Per 100 square feet, and as recommended by the manufacturers' instructions.

E. Exposed Aggregate:

1. Textured concrete shall be exposed aggregate comprised of river run ¼" to ½" aggregate size in the locations indicated on the drawings.

F. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
3. Apply scratch finish to surfaces in the locations indicated on the drawings.

G. Float Finish:

1. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats.
2. Restraighten, cut down high spots, and fill low spots.
3. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
4. Apply float finish to surfaces in the locations indicated on the drawings.

H. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Apply a trowel finish to surfaces in the locations indicated on the drawings.
5. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed the requirements of ACI 302.

I. Trowel and Fine-Broom Finish:

1. Apply a first trowel finish to surfaces in the locations indicated on the drawings.
2. While concrete is still plastic, slightly scarify surface with a fine broom.

3. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

3.09 CONCRETE PROTECTING AND CURING

A. Curing of all concrete surfaces shall be as follows:

1. Apply specified curing materials to fresh concrete surfaces after final troweling, when surface water glaze has disappeared.
2. Application is to be in strict compliance with manufacturers' recommendations, specifically manufacturers' precautions and coverage rates.
3. Protect all finished concrete surfaces from damage caused by construction equipment, materials, or methods.
4. During the curing period, protect the concrete from damaging mechanical disturbance; particularly load stresses, heavy shock, and excessive vibrations.
5. Adjust finish schedules when rain and other inclement weather may affect the drying of site concrete.
6. When moisture sensitive floor coverings are to be installed, refer to ACI 302.1R-96.

B. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with applicable ACI requirements for hot and cold weather protection during curing.

C. Protect all finished surfaces from stains, abrasions, etching, discoloration, gouging, scratches, and marring. Protect surfaces and edges by leaving forms in place, by providing temporary covers, diapers, plastic, etc., to avoid marring gouging, etc. Protect all concrete from rain, flowing water, or mechanical injury.

D. Protect floor slabs from the dropping of plaster, paint, dirt, and other marring by covering with polyethylene plastic sheet, well lapped, and sealed. Maintain covering in good condition until danger of damage is passed.

E. Equipment diapering is to be provided to protect slabs from the dripping of oils, acid, rust marks, etc.

F. If evaporation rate in first paragraph below is exceeded, ACI 305R states that plastic shrinkage cracking is probable. See manufacturers' literature or ACI 305R for estimated moisture-loss chart relating relative humidity, air and concrete temperature, and wind velocity to rate of evaporation.

G. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturers' written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

H. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturers' written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer, unless

manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

I. After curing, allow sufficient time for drying.

3.10 CONCRETE SURFACE REPAIRS

A. All floors which are not within the tolerances specified in the contract documents shall be corrected by one of the following methods:

1. Removal and replacement of the defective slab is the only allowed solution at areas of exposed concrete. Removal shall be from score to score.
2. Limited grinding of the surface of the concrete to bring it into compliance with specified tolerances. This is allowed at concrete slab areas only with Architect approval.
3. Refer to Section 02221, Demolition and Repair for cutting and patching, and other work requirements.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Concrete tests and inspections shall be made by an approved independent testing laboratory at the direction of the Architect. Approximately one test shall be made for each 50 cubic yards of each class of concrete when placed in large continuous pours. At least one test shall be made of pours less than 50 cubic yards.

1. Testing Services: Tests shall be performed according to ACI 301.
2. Tests shall be made for 7-day and 28 day strength. Mold 4 cylinders for each test; 1 for 7-day test, 2 for 28-day test and 1 for hold.

END OF SECTION 03300

SECTION 03366

CHEMICALLY STAINED CONCRETE FLOOR FINISH

PART 1 – GENERAL

1.01 DESCRIPTION

A. This Section Includes:

1. Chemically stained concrete floor finish on concrete floors where scheduled.

2. Sealer.

B. Related Sections:

1. Curing, sealing and hardening concrete floors is specified in Section 03395.

2. Cast-in-place concrete is specified in Section 03300.

3. Joint sealants are specified in Section 07920.

1.02 SUBMITTALS

A. Product Data: Manufacturer's technical data sheets and installation instructions for each product specified.

B. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.

C. Qualification Data: For firms indicated in "Quality Assurance" Article, including lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of stain and sealer products shall have minimum 10-years experience in the production of the specified products.

B. Installer Qualifications: Minimum 3-years experience in staining applications and successfully completed not less than 6 projects comparable in scale and complexity.

C. Regulatory Requirements: Products shall comply with the United States Clean Air Act for maximum Volatile Organic Compound (VOC) content as specified in PART 2 of this section.

D. Source Limitations: Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.

E. Mockups:

1. Provide under provisions of Section 01430.

2. At location on Project selected by Architect, prepare minimum (4) 4 x 4 mock-ups with different colors. Based upon final selection provide one 8-foot x 8-foot mockup for review and approval which will serve as the “approved” mock-up.

3. Construct mockup using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, expansion, and saw-cut joints in mockup panels.

4. Mockup shall be stained and sealed by the individual workers who will actually be performing the work for the Project.

5. Grout the score lines with Architect approved grout. Assume minimum of 4 test colors.

6. Obtain written approval of the mockup from Architect before start of work.

7. Retain approved mockup through completion of the Work for use as a quality standard for finished work.

8. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver the specified products in original, unopened containers with legible manufacturer's identification and information.

B. Store specified products in conditions recommended by the manufacturer.

1.06 PROJECT CONDITIONS

A. Environmental Conditions: Maintain an ambient temperature of between 50- and 90-deg. F. during application and at least 48-hours after application.

B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

1.07 PRE-CONSTRUCTION CONFERENCE

A. One week prior to the application of chemical stain a meeting will be held to discuss the project and application of materials.

B. The Architect, Contractor, Subcontractor and a Manufacturer Representative shall be present.

PART 2 – PRODUCTS

2.01 APPROVED MANUFACTURERS

A. L.M. Scofield Company "Chemstain" or approved equal.

2.02 MATERIALS

A. Chemical Stains: Reactive water-based solution of metallic salts which react with the calcium hydroxide in the cured concrete substrate to produce permanent, variegated or translucent color effects.

1. Colors: As selected by Architect from manufacturer's full range.

B. Sealer: L.M. Scofield "Selectseal-W", water-based, clear aliphatic polyurethane specifically formulated for protecting chemically stained concrete hardscapes and floors.

C. Sealants: L.M. Scofield "Lithoseal Trafficalk-3G".

1. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

B. Compliance with Manufacturer's Instructions: Comply with the current versions of the manufacturer's technical data sheets and installation instructions.

3.02 PREPARATION

A. New Concrete:

1. Newly placed concrete shall be sufficiently cured to allow concrete to become reactive, minimum 14-days. Increase curing time if required for selected color to meet water vapor transmission requirements.

2. Do not use liquid curing materials. Cure concrete flatwork with new, unwrinkled, non-staining, high quality curing paper. Do not overlap curing paper.

3. Surfaces shall be cured using the same method and different sections (pours) chemically stained when the concrete is the same age.

4. Immediately prior to chemically staining, thoroughly clean the concrete. Sweep surfaces, then pressure wash or scrub using a rotary floor machine. Use suitable, high quality commercial detergents to facilitate cleaning. Rinse surfaces after cleaning until rinse water is completely clean. Allow floor to dry completely prior to application of floor stain.

B. Scoring: Score decorative jointing in concrete surfaces 1/2-inch deep with diamond blades. Rinse until water is completely clean. Score concrete before staining as part of the slab control joint process see Concrete Scoring Plan and Structural Concrete Specifications.

C. Protect all "to be stained" concrete areas from foot traffic, spills, machinery, etc. with protective board until stain is applied.

3.03 APPLICATION OF CHEMICAL STAIN

A. Concrete surfaces shall be dry and properly prepared as described above. Protect surrounding areas from over-spray, run-off and tracking. Divide surfaces into small work sections using wall, joint lines, or other stationary breaks as natural stopping points.

B. Apply chemical stains full strength (undiluted) at the coverage rate recommended by the manufacturer and use application equipment described in the manufacturer's printed technical literature. The color of the liquid chemical stain has no resemblance to the final color produced on the concrete substrate.

C. Chemical stains normally fizz when reacting with the concrete. If fizzing does not occur, the substrate has not been adequately prepared or the concrete pH level is too low. If this should happen, contact the local representative for further recommendations.

D. Transfer chemical stain to the substrate by brush or spray and immediate scrub into surface.

E. Reaction time depends on wind conditions, temperatures, and humidity levels.

F. When multiple coats of one or more colors are required, washing and drying between colors is desirable to evaluate the color prior to the next coat.

G. After the final coat of chemical stain has remained on the surface for a minimum of four hours, remove all residue by wet scrubbing with commercial grade detergent. Rinse surfaces after scrubbing until rinse water is completely clean. Run off may stain the adjacent areas or harm plants. Collect rinse water by wet vacuuming or absorbing with an inert material.

3.04 APPLICATION OF SEALER

A. Concrete substrate shall be completely dry.

B. Sealer shall be produced by the chemical stain manufacturer.

C. Test surface for proper PH level prior to applying sealer.

D. Apply sealer according to manufacturer's written instructions at a rate of 300- to 500-square feet per gallon per coat.

E. Maintain a wet edge at all times.

F. Allow sealer to completely dry before applying additional coats.

G. Apply second coat of sealer at 90-degrees to the direction of the first coat using the same application method and rates.

H. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.05 Grout all score joints upon completion of sealer application, grout all joints/score lines as per approved mock-up.

3.06 PROTECTION

A. Protect stained and sealed concrete floor from traffic and any construction work until project completion.

3.07 MAINTENANCE

A. Maintain chemically stained and sealed floors by sweeping. Clean spills when they occur and rinse dirt off with water. Wet-clean heavily soiled areas by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Maintain interior floors that require polishing by using a compatible, premium-grade, emulsion-type, commercial floor polish, following manufacturer's instructions and safety requirements.

END OF SECTION

SECTION 03395

CURING, SEALING, AND HARDENING CONCRETE FLOORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Single application cure-seal-hardener for new concrete floors where scheduled.

B. Related Sections:

1. Cast-in-place concrete is specified in Section 03300.

2. Chemically stained concrete floor finish is specified in Section 03366.

1.02 SUBMITTALS

A. Material requirements for concrete to which cure-seal-hardener is to be applied, including cement type, water-cement ratio, type of trowel finish, limitations on admixtures, pigments, bonding agents, and bond breakers, etc.

B. Product Data: Manufacturer's data sheets, including product specifications, test data, preparation instructions and recommendations, storage and handling requirements and recommendations, and installation methods.

C. Maintenance instructions, including precautions for avoiding staining after application.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Applicator experienced with installation of product and certified by manufacturer, or applicator experienced with similar products and providing manufacturer's field technician on site to advise on application procedures; and providing adequate number of skilled workers trained and familiar with application requirements.

1.04 ENVIRONMENTAL QUALITY ASSURANCE

A. Concrete floor sealer shall have a maximum VOC content of 250 g/L.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver product in factory numbered and sealed drums, with numbers recorded for Owner's records.

B. Store products in manufacturer's unopened drums until ready for installation.

1.06 PROJECT CONDITIONS

A. No satisfactory procedures are available to remove petroleum or rust stains from concrete. Prevention is therefore essential. Take precautions to prevent staining of concrete prior to application of cure-seal-hardener and for minimum of three months after application:

1. Prohibit parking of vehicles on concrete slab.

2. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.

3. If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid, or other liquids.

4. Prohibit pipe cutting using pipe cutting machinery on concrete slab.

5. Prohibit temporary placement and storage of steel members on concrete slab.

B. Do not install products under environmental conditions outside manufacturer's absolute limits.

C. Do not use frozen material; thaw and agitate prior to use.

1.07 WARRANTY

A. Provide manufacturer's warranty that a structurally sound concrete surface prepared and treated according to the manufacturer's directions will remain permanently dustproof, hardened and water repellent. If after the specified sealing period the treated surface does not remain dustproof, hardened and water repellent, provide, at manufacturer's expense, sufficient material to reseal defective areas.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Curecrete Distribution, Inc "Ashford Formula" or approved equal.

2.02 MATERIALS

A. Cure-Seal-Hardener: Ashford Formula; water-based chemically-reactive penetrating sealer and hardener, that seals by densifying concrete so that water molecules cannot pass through but air and water vapor can, while allowing concrete to achieve full compressive strength, minimizing surface crazing, and eliminating dusting.

1. Colorless, transparent, odorless, non-toxic, non-flammable.

2. Containing no solvents or volatile organic compounds.

3. USDA approved for food handling facilities.

4. Allowing traffic on floors within 2 to 3 hours, with chemical process complete within 3 months.

5. No change to surface appearance except a sheen developed due to traffic and cleaning.

B. Water: Clean, potable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared and are suitable for application of product.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. If this is the applicator's first project using this product, provide the manufacturer's technical representative on-site to familiarize installers with proper procedures.

C. Prevent damage to and soiling of adjacent work.

D. New Concrete: Apply cure-seal-hardener to new concrete as soon as the concrete is firm enough to work on after troweling, except on colored concrete wait minimum of 30 days.

1. Spray on at rate of 200 square feet per gallon (4.8 sq m/L).

2. Keep surfaces wet with cure-seal-hardener for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather slipperiness may appear before the 30 minute time period has elapsed. If that occurs, apply more cure-seal-hardener as required to keep entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state.

3. After this period, when treated surface becomes slippery lightly mist with water until slipperiness disappears.

4. Wait for surface to become slippery again and then flush entire surface with water removing all residue of cure-seal-hardener.

5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.

6. Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.

3.04 PROTECTION

A. Protect installed floors until chemical reaction process is complete; at least three months.

1. Comply with specified precautions.

2. Clean floor regularly in accordance with manufacturer's recommendations because water will accelerate the sealing and scrubbing will impart a shine.

3. Clean up spills immediately and spot-treat stains with good degreaser or oil emulsifier.

END OF SECTION