

**SECTION 03 35 43  
CONCRETE FINISHING - REVISED**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section specifies bonded abrasive polished concrete including, reinforcement accessories, concrete materials, concrete mixture design, placement procedures, protection during construction prior to polishing, and finishes, including the following:

1. Furnish all labor, material, equipment and services necessary for the dry diamond grinding and polishing of concrete floors per manufacturers technical data.
2. Applying densifying impregnator/sealer and polishing to specified sheen level and aggregate exposure.

B. Related Requirements:

1. See structural drawings for concrete not designated as polished concrete.
2. See structural drawings for formwork material, fabrication, installation requirements for steel reinforcement, and field quality control.
  - a. Note: Standard installation practices alone for regular concrete is not acceptable for polished concrete. Comply with special provisions of this Section.
3. Section 079200 "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

**1.2 PREINSTALLATION MEETINGS**

A. Preinstallation Conference: Conduct conference at Project site with concrete installer and finisher prior to placing concrete for areas scheduled for polishing.

1. Minimum Agenda: Polisher shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, following:
  - a. Tour field mock-up and representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of procedures, and other preparatory work performed by other installers.
  - b. Review procedures, including but not limited to the following:
    - 1) Contract Document requirements.
    - 2) Approved submittals and field mock-up.
    - 3) Specific concrete mix design.
    - 4) Specified curing methods and procedures.
    - 5) Projected 3, 10, and 28 day compressive strength test results and project phasing.
    - 6) Protection of concrete substrate during construction and prior to polishing.
    - 7) Project phasing and scheduling for each step of grinding, honing and polishing operations, including liquid applied products.

- 8) Proper disposal of concrete slurry and/or concrete dust.
  - 9) Protecting polished concrete floors after polishing work is complete.
- c. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

1.3 **Section Deleted.**

1.4 **INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For installers, applicators, and finishers.
1. For products required to be installed by workers approved by product manufacturers, include letters of acceptance by product manufacturers certifying that installers are approved to apply their products.
- B. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.
- C. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
  2. Vapor retarders.
  3. Repair materials.
  4. Liquid floor treatments.
- D. Minutes of preinstallation conference.

1.5 **CLOSEOUT SUBMITTALS**

- A. Maintenance procedures.

1.6 **QUALITY ASSURANCE**

- A. Concrete Polishing Association of America (CPAA).
- B. National Floor Safety Institute/American National Standards Institute (NFSI/ANSI) B101.1 - Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.
- C. Concrete Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician with 3 years of experience placing concrete.
- D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- E. Polisher Qualifications: Company with 10 years experience in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful

in-service performance; and with sufficient production capability, facilities, and personnel to produce specified work.

1. Supervision: Maintain competent supervisor who is at Project during times specified work is in progress, and is currently certified as Craftsman - Level I or higher by CPAA.

F. Paragraph Deleted.

1. Paragraph Deleted.

G. Testing: Installer to understand that this floor can be tested at any time to ensure compliance for bonded abrasive polished concrete floors for dynamic and static coefficient of friction according to ANSI B101.1 and B101.3.

1. ANSI B101.1 Static Coefficient of Friction - Achieve a minimum of 0.42 for level floor surfaces.
2. ANSI B101.3 Dynamic Coefficient of Friction - Achieve a minimum of 0.35 for level floor surfaces.

H. Mockups: The area(s) defined as the Mockup is to demonstrate the aesthetic of what the finished floor as specified will look like including typical joints, surface finish, texture, tolerances, and standard of workmanship. Mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Document approved mockup aesthetic with pictures and description.
2. Remove mockup to ensure seamless blending of mockup area to match adjacent finish floor area.

## 1.7 **FIELD CONDITIONS**

A. Protection: Protect areas to receive polished concrete finish at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured:

1. Prohibit use of markers, spray paint, and soapstone.
2. Prohibit application of liquid membrane film forming curing compounds.
3. Provide diapers on all hydraulic powered equipment to avoid staining of the concrete.
4. Prohibit all vehicle parking on the finish slab area. If necessary to complete their scope of work, place drop cloths under vehicles at all times.
5. Do not allow pipe cutting machine on the finish floor slab.
6. Do not place steel on the finish slab to avoid rusting.
7. Acids and acidic detergents shall not come in contact with slab.
8. Painters shall use drop cloths on the concrete. Immediately remove paint that gets on the concrete.
9. Inform all trades that the slab must be protected at all times.

B. Environmental Limitations for Chemicals: Do not apply when air and substrate temperatures are outside limits permitted by manufacturer. During hot weather, cool chemical components before mixing, store mixed products in shade, and cool unused mixed products to retard setting. Do not apply to wet substrates unless approved by manufacturer.

- C. Application Time: 24 hours to cure, but MUST be burnished before floor turn over.
- D. Close finish concrete area to traffic during finish floor application and after application, for the time as recommended by installer.

## **PART 2 - PRODUCTS**

### **2.1 CONCRETE, GENERAL**

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 302.1R, "Guide for Concrete Floor and Slab Construction."

### **2.2 CONCRETE MATERIALS**

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Material:
  - 1. Portland Cement: ASTM C 150, Type I/II, gray.
- C. Normal-Weight Aggregates: ASTM C 33, Class 1N coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
  - 1. Maximum Coarse Aggregate Size: 1/2 inch.
  - 2. Gradation: Uniformly graded.
- D. Normal-Weight Fine Aggregate: ASTM C 33 or ASTM C 144, manufactured limestone sand, from same source for entire Project.
- E. Water: Potable, complying with ASTM C 94/C 94M except free of wash water from mixer washout operations.
- F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

### **2.3 Section Deleted**

## 2.4 RELATED MATERIALS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Stego Industries, LLC; Stego Wrap 15 mil Class A.
- B. Joint Sealants: Two-part polyurea control joint filler in colors to be selected by Architect.
  - 1. QuikJoint 200 by The Euclid Chemical Company.
  - 2. HT-PE85 Flexible Control Joint Sealer by Hi-Tech Systems.
- 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.
- E. Protective Cover: Heavy duty, synthetic, rigid floor protection board.
  - 1. Product: SkudoBoard by Skudo USA.

## 2.6 CONCRETE MIXTURES FOR POLISHED CONCRETE FINISHING

- A. Proportion concrete mixtures for one cubic yard of polished concrete as follows:
  - 1. Portland Cement: 564 lbs.
  - 2. Course Aggregate: 1,750 lbs.
  - 3. Fine Aggregate: 1,493 lbs.
  - 4. Water: 32 gallons.
  - 5. Air Content: No air entrained.
  - 6. Water Reducer: 45.12 oz.
- B. Compressive Strength (28 Days): 3500 psi for slabs on grade.
  - 1. Slump Limit: 4-1/2 to 5-1/2 inches.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.

## 2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and furnish batch ticket information.
  - 1. Clean equipment used to mix and deliver concrete to prevent contamination from other concrete.
  - 2. Maintain concrete temperature below 85 degrees. Keep concrete as cool and moist for as long as possible. In essence, decrease rate of hydration and drying to minimize cracking.
  - 3. 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.

4. Use one source for cement and aggregates throughout the job. Monitor and control incoming material consistency. Do not use calcium chloride-based admixtures. Non-chloride admixtures may be used.

## 2.8 POLISHED CONCRETE LIQUID FLOOR TREATMENTS

- A. Densifier Basis-of-Design: 3D-SF Densifier, manufactured by Ameripolish; Consolideck, manufactured by Prosoco; RetroPlate, manufactured by Curecrete Distribution, Inc.
- B. Sealer Basis-of-Design: SR-2 Sealer, manufactured by Ameripolish.
- C. Floor Grinder: 3 or 4 head counter rotating variable speed grinder with at least 600 pounds down pressure.
- D. Dust Extraction System: Pre-separator, and squeegee attachments with minimum flow rating of 322 cubic feet per minute.
- E. Grinding Heads:
  1. Metal bonded 16, 25, 40, 80, 150 and/or 300 grits.
  2. Resin bonded, phenolic diamonds, 100, 200, 400, 800, 1500 and 3000 grits.
- F. Grinding Pads for Edges:
  1. Edges must match interior surface area of open slab in both exposure and sheen.
  2. Deleted.
- G. Hand Grinder with dust extraction attachment and pads.

## 2.9 SEALED CONCRETE LIQUID TREATMENTS

- A. Surface Prep Agent: Basis-of-Design: EZ Etch, manufactured by Ameripolish, Inc.
  1. Application: Spray or brush manufacturer specified thickness.
- B. Sealer: Basis-of-Design: SR2 Penetrating Sealer, manufactured by Ameripolish, Inc.
- C. Colors and finish: As indicated on Architectural drawings.

## PART 3 - EXECUTION

### 3.1 VAPOR RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
  1. Lap joints 6 inches and seal with manufacturer's recommended tape.

### 3.2 REINFORCEMENT AND INSERTS

- A. General: Comply with Section 033000 "Cast-in-Place Concrete" for fabricating and installing steel reinforcement.

### 3.3 CONCRETE PLACEMENT

- A. Comply with ACI 301 for measuring, batching, mixing, transporting, and placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.

### 3.4 FINISHING FLOORS AND SLABS FOR SUBSEQUENT POLISHED FINISHING

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
  - 1. Apply a trowel finish to surfaces that will be polished.
  - 2. Take care to not over trowel the concrete surface so aggregate will not be pushed down too deep. The aggregate must remain close to the surface to be polished.
  - 3. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 40; and of levelness, F(L) 30.

### 3.5 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. 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 manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. 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.

### 3.6 PREPARATION FOR POLISHING CONCRETE

- A. Examine and approve concrete substrate with installer for conditions affecting performance of finish. Correct conditions that are found to be out of compliance with the requirements of this Section. Repairs are not acceptable unless specifically approved on a case-by-case basis by the Architect.
- B. Verify that base slab meets floor flatness and floor levelness requirements.
- C. Clean floor of materials and debris.
- D. Protect adjacent surfaces as required to prevent damage by the concrete polishing procedure.
- E. Ensure floor has cured a minimum of 28 days prior to polishing.
- F. Concrete Substrate Tests: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Alkalinity: Perform tests prior to installing sealer as recommended by sealer manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 8 or more than 10 pH.
  - 3. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer's written recommendations, but not less stringent than the following:
    - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation of liquids only after substrates have maximum moisture-vapor-emission rate of 5 lb of water/1000 sq. ft. in 24 hours.
    - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation of liquids only after substrates have a maximum 75 percent relative humidity level.

### 3.7 JOINTS

- A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- B. Contraction Joints: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane of concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades that have a triangular arbor configuration. 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.

### 3.8 **POLISHING AND FINISHING CONCRETE**

- A. Polished Concrete Finish: Match approved mockup.
- B. Surface Prep: CSP1 Level Grind.
- C. Maintain uniformity of special finishes over construction joints, unless otherwise indicated.
- D. Grind the concrete floor to within 1/4 inch of walls with 16, 25, 40 and 80 grit removing construction debris, floor slab imperfections and until there is a uniform scratch pattern and desired concrete aggregate exposure is achieved. Vacuum the floor thoroughly using a squeegee vacuum attachment.
- E. Apply densifying impregnator undiluted at approximately 200 square feet per gallon using a stiff, long bristled broom. Cover the entire work area liberally and allow to sit for 10 minutes. Apply again to areas where the densifying impregnator has soaked in and allow to sit for an additional 30 minutes. Squeegee excess material off the floor. Allow 12 to 24 hours for full cure.
- F. Grind the floor to within 1/4 inch of walls with metal bonded diamond grits of 150 and/or 300, grinding 90 degrees from each previous grind and removing all the scratches from the previous grit. Vacuum the floor thoroughly after each grind, using a squeegee vacuum attachment.
- G. Apply acetone-based or water-based dyes to achieve desired colors.
  - 1. Deleted.
  - 2. Apply dyes after the 200 grit level.
  - 3. Apply stains and dyes using a low pressure sprayer applicator and broomed or brushed in to ensure uniform coverage.
  - 4. Allow stain or dye to react with the concrete for a minimum of 4 hours before resuming polishing.
- H. Polish the floor, to desired sheen level, with phenolic resin bonded diamond grits of 100, 200, 400, and 800, removing all scratches from the previous grit. After each polish, clean the floor thoroughly using clean water and an autoscrubber or a mop and a wet vacuum.
  - 1. Aggregate Exposure Class B – Fine / Sand Aggregate Finish: Remove not more than 1/16 inch of concrete surface by grinding and polishing.
  - 2. Sheen Level: Level 2 Semi-polished; medium reflective sheen.
- I. Apply a single coat of polish guard to final polished concrete surfaces using a low pressure sprayer. Apply sufficient material to wet the surface without producing puddles. Use a clean soft-bristle push broom to spread the product and ensure uniform wetting.
- J. Allow treated surfaces to dry. Remove any dried powder residue using a stiff broom, power sweeper, or floor-scrubbing machine.

### 3.9 **JOINT FILLING**

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.10 **FIELD QUALITY CONTROL**

- A. General: Comply with concrete notes on the structural drawings for field quality-control requirements, and the following:
  - 1. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.
- B. Field Testing: Engage a qualified walkway auditor to perform field testing to determine if polished concrete floor finish complies with specified coefficient of friction.
- C. Measure gloss rating using Horbia 320 gloss meter; re-polish if required to achieve specified gloss rating.

### 3.11 **REPAIRS AND PROTECTION**

- A. Repair and cure damaged finished surfaces of polished concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.
  - 1. Remove and replace polished concrete that cannot be repaired and cured to Architect's approval.
- B. Protect polished concrete from staining, laitance, and contamination during remainder of construction period.

### 3.12 **MAINTENANCE DEMONSTRATION AND TRAINING**

- A. Maintenance Program: Prepare a written plan for maintenance of the polished concrete, including each phase or process, protection of surrounding materials during operations, and control of debris and runoff during the Work. Describe in detail materials, methods, equipment, and sequence of operations to be used for each phase of the Work.
- B. Review the maintenance procedures with Owner's maintenance staff, including periodic care requirements, regular cleaning, and application of sealers when necessary.
- C. Provide a minimum two hour demonstration and training of Owner's maintenance staff in the proper purchase of maintenance materials, application, and use of the polishing equipment.

**END OF SECTION 03 35 43**