



# ALBUQUERQUE PUBLIC SCHOOLS

Facilities Design & Construction / Maintenance & Operations

## Polished Concrete Finishing

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## SECTION 03 3543

### POLISHED CONCRETE FINISHING

#### PART 1- GENERAL

##### 1.01 SUMMARY

- A. Section Includes: This Section specifies polished concrete.
- B. Related Sections:
  - 1. Section [03 01 30 Maintenance of Cast-in-Place Concrete].
  - 2. Section [03 30 00 Cast-in-Place Concrete].
  - 3. Section [07 92 00 Joint Sealants].

##### 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.
  - 4. ASTM D523 Standard Test Method for Specular Gloss.

##### 1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide polished flooring that has been selected, manufactured and installed to achieve the following:
  - 1. ASTM C779 Method A- standard test method for abrasion resistance of horizontal concrete surfaces.
  - 2. Reflectivity: ASTM D523, Specular gloss in accordance with architect's required gloss unit (GU) reading.
  - 3. ANSI B101.1- Test method for measuring wet SCOF of common hard surface floor materials.
- B. Design Requirements:
  - 1. Hardened Concrete Properties:
    - a. Minimum Concrete Compressive Strength: 4000 psi (24 MPa). Additional compressive strength over specification is considered desirable and does not constitute any pricing increase from polishing contractor
    - b. Normal Weight Concrete: No lightweight aggregate or deleterious materials.
      - i. Ensure all aggregates used are non-porous and polishable.
    - c. Non-air entrained.
  - 2. Placement Properties:
    - a. Natural concrete slump of 4 1/2 inches - 5 inches (114 - 127 mm). Admixtures may be used.
    - b. Any admixtures, plasticizers, slag, fly ash or anything taking the place of Portland cement shall not exceed 20%. A straight cement mix is recommended.
    - c. Flatness Requirements: Overall FF 50, Local FF 35.
    - d. Levelness Requirements: Overall FL 30, Local FL 20.
    - e. Hard-Steel Troweled (3 passes) Concrete: No burn marks. Finish to ACI 302.1R, Class 5 floor.
    - f. When placing edges use a 3' metal or wooden 2x 4 screed and run parallel with form or edge after initial screed and before floating.
    - g. Hand floating shall be parallel to edge and done in 2' increments to avoid lifting or depressing edges. Do not reach out beyond 2' of edge with hand tools or float in a fan direction pulling excessive mud to the forms.

3. Curing Options:
  - a. Membrane forming curing compounds (polyethylene film not recommended.)
  - b. Damp Curing: Seven day cure.
4. Slab Protection Immediately Following Placement (see also section 3.06):
  - a. Silicone chalks should NOT be used if at all possible. The RED and yellow chalks are PERMANENT DYES. RED Chalk, black markers, wax pencils should NOT be used for framing. White or Blue chalks are OK. Do not over mark for the framing. Do NOT use silicone sprays to "Hold" the lines. The sprays leave harsh, permanent scars on the floor.
  - b. Do not use , Tape, Glue, Solvents, Pine-Sol, Varnish, Non Breathing Plastics, Liquid Nail, Silicone, Plastics, Nails, Plumbers Glue, Foam Insulation, Bond Release Agents, Flux, Oils, Grease, Polyurethane, Paint, Markers (framers often write dimensions of doorways in marker on the slab. Ask them to make that note on the wood framing the doorway), Grease Sticks, Spray Paints, Crayons, Muriatic Acid, and other chemicals both before and after staining.
  - c. It is important that wood, sheet goods, insulation boards, plywood, press board, drywall, sections of framing and the like not lay on the slab for extended periods of time. They can transfer resins and tannins into the slab. This will alter the moisture content in the slab which leaves a pattern in the finished floor. Ram Board should be placed between the slab and the stacked material to minimize any unwanted transfers. Also avoid contact with slab by Food, Beverages, Oil, Glass, Metal, Paint, Caulk, or Primers.

#### 1.04 ACTION SUBMITTALS

- A. General: Submit listed action submittals in accordance with Contract Conditions and Section 01 3300 - Submittal Procedures.
- 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 or Colored Stain Selection Guides. ***[Note to Architect: Dyes or colored stains can only be included in the design with prior written approval from APS.]***

#### 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.A Performance Requirements.
  2. Certificates:
    - a. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
  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 in accordance with Section 01 7800 - Closeout Submittals.
  1. Include:
    - a. Manufacturer's instructions on maintenance renewal of applied treatments.
    - b. 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. Installers trained and holding current certifications in systems to be applied, if such certifications are available. Alternatively, installers may be certified Craftsman Level 1 or higher by the Concrete Polishing Association of America (CPAA).

- B. Mock-Ups:
  1. Construct mock-ups in accordance with Section 01 4000 - Quality Requirements.
  2. Mock-Up Size: 100 sq. ft. sample panel at jobsite at location as directed under conditions similar to those which will exist during actual placement.
  3. Mock-up will be used to judge workmanship, concrete substrate preparation, operation of equipment, material application, aggregate suitability, aggregate exposure, color selection and shine.
  4. Contractor shall notify Architect and Owner's Representative after initial grind of mock-up for approval of desired aggregate exposure before completing grinding and polishing of mock-up.
  5. Perform ASTM D523 Standard Test Method as cited in Section 2.02 Finishes and provide printed results to architect prior to commencement of work.
  6. Allow 24 hours for inspection of mock-up before proceeding with work.
  7. When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.
- C. Pre-installation Meetings: Conduct a pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 3100 - Project Management and Coordination. 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 concrete sealer.
  9. Application of liquid hardener, densifier.
  10. Protection of finished surfaces after installation.

#### **1.08 DELIVERY, STORAGE & HANDLING**

- A. General: Comply with 01 6000 - Product Requirements.
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original packaging with identification labels and seals intact.
- D. Storage and Protection:
  1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
  2. Protect concrete slab.
  3. Protect from petroleum stains during construction.
  4. Diaper hydraulic power equipment.
  5. Restrict vehicular parking.
  6. Restrict use of pipe cutting machinery.
  7. Restrict placement of reinforcing steel on slab.
  8. Restrict use of acids or acidic detergents on slab.
- E. Waste Management and Disposal:
  1. Separate waste materials for Reuse and Recycling in accordance relevant specifications sections dealing with Construction Waste Management and Disposal.
  2. Remove from site and dispose of packaging materials at appropriate recycling facilities.

## 1.09 PROJECT AMBIENT CONDITIONS

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

## 1.10 WARRANTY

- A. Project Warranty: Refer to Contract Conditions for project warranty provisions.
- B. 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.
- C. Installer Warranty: Commencing on date of Substantial Completion.

## 1.11 MAINTENANCE

- A. Comply with manufacturer's written instructions to maintain installed product.

## 1.12 EXTRA MATERIALS

- A. General Contractor to provide maintenance materials in accordance with Section 01 7800 - Closeout Submittals.

## PART 2- PRODUCTS

### 2.01 MANUFACTURERS

- A. Ensure that manufacturer has a minimum of 5 years' experience in manufacturing components similar to or exceeding the requirements of this project.

### 2.02 POLISHED CONCRETE FINISHING PRODUCTS

- A. Products/Systems:
  1. Hardener, Sealer, Densifier: Water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film. Silicate or amorphous silica designed specifically to be used in conjunction with concrete polishing. No silicate hardener will be accepted.
  2. Polyurea Control Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, control joint and crack filler with Shore A 80 or higher hardness.
  3. Crack and Spall Repair: Various products may be used, singly or in combination, as proposed by the concrete polishing contractor, demonstrated by a mock-up, and agreed upon by the Contractor, the Architect and the Owner prior to full application.
  4. Oil and Water Repellent Sealer: Shall be Ameripolish SR2 Sub-surface Stain Resistor, which is a full penetrating, concrete sealer designed specifically to be used in conjunction with polished concrete. Other polished concrete "guard" sealers, such as those which form acrylic microfilms, may only be used instead of SR2 with prior written approval from the Architect.
  5. Concrete Dyes and Colored Stains: ***[Note to Architect: Dyes and Colored Stains can only be included in the design with prior written approval from APS, otherwise, delete this paragraph.]*** Fast-drying dye, packaged in premeasured units ready for mixing with water or VOC exempt solvent; formulated for application to polished cementitious surfaces with UV stabilizers designed to help protect colorant from fading.
  6. Cleaning Solution: Mild, highly concentrated liquid concrete cleaner and conditioner; biodegradable, and environmentally safe. Cleaner must be ph neutral.
  7. Floor Protection: Option 1: Liquid applied latex base coat with impact and tear resistant fabric on top, OR Option 2: Ram Board with joints overlapped 1/4" and taped with breathable Vapor-Cure Tape (by Ram Board).
- B. Aggregate Exposure: ***[Note to Architect: Choose one of the following levels of exposure.]*** [Minimal exposure: Average of 1/16"-1/8" aggregate to be exposed and all paste removed from surface.], [Moderate exposure: Average of 1/4"-3/8" aggregate to be exposed.], [Heavy exposure: Consistently expose full diameter of specified aggregate throughout.] ***[Note to Architect: Moderate exposure floors have an average of 1/4"-3/8" exposure, but will likely have substantial inconsistencies in exposure throughout and should not be specified if consistency is crucial.]*** Contractor shall notify Architect and Owner's Representative after initial grinding of mock-up for approval of desired aggregate exposure before completing grinding and polishing of mock-up.

- C. Finish: Shall be semi-gloss, minimum of 45 GU (Gloss Units) @ 60° when tested in accordance with ASTM D523 test method. Testing shall be done before application of concrete sealer. If testing is desired by Owner, that testing will be done by the Owner's Representative within 48 hours of notification by Contractor. Owner will provide written results of any testing to Architect and Contractor. A minimum of 10 samples may be taken from each section of project to obtain an accurate average, and a minimum of one test per 1000 sq. ft. of floor area will be taken. Minimum test value must be no less than 75% of specified finish for any single test and no less than 85% as an average of all tests in that section. Note: Porous aggregates may provide artificially low readings and if present should not be included in measurements.

## **PART 3- EXECUTION**

### **3.01 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.
  - 2. Verify Concrete Slab Performance Requirements:
    - a. Verify that concrete is cured for 28 days to a minimum of 4000 psi (24 MPa) strength before beginning the polishing process, unless Architect gives written approval to begin the process sooner. Higher than the minimum specified psi strength is desirable and will not constitute justification for any changes to the awarded contract amount. Concrete test breaks at 7 days and 28 days will be made available to the Contractor by the Owner to assist the Contractor in their decision-making.
    - b. Verify concrete surfaces received a hard steel-trowel finish (3 passes) during placement.

### **3.02 PREPARATION**

- A. Remove previously installed flooring using self-propelled flooring removal equipment only. Use of chipping guns, rotor hammers, or other equipment not specifically designed for removal of sheet flooring is strictly prohibited as it can damage underlying concrete.
- B. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.
- C. Examine surface to determine soundness for concrete for polishing.
- D. Fill surface defects with acceptable cement based material compatible with polishing process.
- E. Fill large cracks and defects (1/8" or larger) using one or more products as proposed by the concrete polishing contractor, demonstrated by a mock-up, and agreed upon by the Contractor, the Architect and the Owner prior to full application. Final repair shall be flush with concrete surface.
- F. General Contractor to remove surface contamination.

### **3.03 INSTALLATION**

- A. Sequence of Polishing:
  - 1. Perform grinding steps to at least 100 grit resin before non-load bearing partition studs are erected. The Contractor has the option to continue to finer grits before non-load bearing partition studs are erected, but the polished slab must be effectively protected from damage during the remaining construction.
  - 2. Perform polishing steps after gypsum board and texture, but before casework and base are installed. Contractor has option to have painting done either before, or after, polishing.
- B. 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 concrete sealer prior to installation of fixtures and accessories.
  - 3. Apply patching compound and crack filler flush with concrete surface where necessary. Include patching 200 lineal feet of cracks for every 10,000 sq. ft. of floor area in the bid price. Patching cracks in excess of this quantity shall be considered justification for a cost increase change order.

4. Diamond polish concrete floor surfaces with planetary grinding machine with a minimum head pressure of 600 lbs (3-4 headed machine). Sequence coarse to fine grit.
    - a. Comply with diamond tooling manufacturer's recommended polishing grits for each sequence to achieve desired finish level. Level of sheen shall meet specified gloss unit measurements (see paragraph 2.02.B) when measured by Owner's Representative prior to application of concrete sealer. Failure to meet a minimum of 85% of specified average gloss reading will result in a reduction to the concrete polishing subcontract according to the following calculation:
      - i. ***Reduction in Subcontract*** =  $\frac{1}{2}$  of original subcontract  $\times$   $(1 - \frac{\text{Measured average gloss reading}}{\text{Specified average gloss reading}})$
    - b. Expose aggregate in concrete surface as determined by approved mock-up.
    - c. All concrete surfaces shall be as uniform in appearance as possible with no visible scratches anywhere in surface.
    - d. Contractor has option of polishing wet, or dry, or a combination of wet and dry. When dry polishing, always use the vacuum equipment and filter arrangement recommended by the manufacturer for the specific polishing equipment being used.
  5. Grind and polish edges to a maximum of 1/8" of walls to match field area of floor.
  6. Edge into corners with a maximum size of 5" diameter grinding & polishing discs.
  7. Apply silicate densifier/hardener per manufacturer's specifications.
  8. Remove defects and re-polish defective areas.
  9. Finish edges of floor finish adjoining other materials in a clean and sharp manner.
- C. Concrete Sealer:
1. Sealers or "guard" products other than the one specified in 2.02.A.4 above may only be used with prior written approval from the Architect.
  2. The appearance of any streaking or swirling from the use of film-forming sealing products will not be accepted. Identification of such issues will require the surface be ground off and re-polished.
  3. Burnish using pads recommended by sealer manufacturer.
- D. Dyed or Stained Polished Concrete (option): ***[Note to Architect: Dyes or colored stains can only be included in the design with prior written approval from APS, otherwise, delete this paragraph.]***
1. Locate demarcation line between dyed surfaces and other finishes.
  2. Apply dye per manufacturer's specifications.
- E. Joint Fill:
1. Product not to be used on tooled, expansion, keyed, or isolation joints. Refer to section 07 9200 Joint Sealants for these joints.
  2. Apply polyurea joint filler to saw cut contraction joints only.
  3. The Contractor has the option of installing the joint filler either: a) at some point partway through the polishing process, or b) when the polishing process is complete. In either case, the Contractor shall be responsible to repair or replace the joint filler if filler separates from the sides of the joint before Substantial Completion.
  4. Stain prevention measures must be taken to protect finished floor from staining by overfill of joint.
  5. Slightly overfill joints to create a crown and allow the material to cure for 15-20 minutes or until dry to the touch.
  6. Shave excess joint fill off flush with the top of the slab with a razor blade to create a seamless finish.
- F. Floor Protection:
1. Option 1: Apply latex base coat to clean polished concrete surface using 1/4"- 3/8" nap roller or paint sprayer. Allow to dry completely. Apply second coat of latex base coat over initial coat and immediately place fabric mat over the top. Roll out fabric mat with a nap roller to ensure good adhesion. Allow 4-6 hours before opening to traffic.  
OR,
  2. Option 2: Ram Board with joints overlapped 1/4" and taped with breathable Vapor-Cure Tape (by Ram Board).

### **3.04 ADJUSTMENTS**

- A. Polish to higher gloss those areas not meeting specified gloss levels per mock-up.
- B. Fill joints flush to surface.

### **3.05 FINAL CLEANING**

- A. Do cleanup in accordance with relevant specification sections.

### **3.06 PROTECTION**

- A. It is important that wood, sheet goods, insulation boards, plywood, press board, drywall, sections of framing and the like not lay on the slab for extended periods of time. They can transfer resins and tannins into the slab. This will alter the moisture content in the slab which leaves a pattern in the finished floor. Ram Board should be placed between the slab and the stacked material to minimize any unwanted transfers. Also avoid contact with slab by Food, Beverages, Oil, Glass, Metal, Paint, Caulk, or Primers
- B. It is extremely important that you do not tape directly to the polished floor! Duct Tape, Masking Tape, Packaging Tape, Strap Tape, Blue Tape, Green Tape, and Electrical Tape there are NO exceptions. The tape alters the natural curing process and transfers chemicals to and from the slab. Tape, Plastics and other Adhesives can contribute to Plasticizer Migration. This WILL SHOW in the finished product.

**END OF SECTION**