



SECTION 03 3543

DIAMOND POLISHING CONCRETE FLOORS

THE SUCCESS OF CONCRETE POLISHING ABSOLUTELY REQUIRES CERTAIN PROVISIONS BE INCLUDED IN THE CAST-IN-PLACE CONCRETE SPECIFICATION PREPARED BY THE STRUCTURAL ENGINEER. CPAA WILL BEAR NO RESPONSIBILITY FOR CONCRETE POLISHING THAT DOES NOT INCLUDE THESE REQUIREMENTS.

PART 1 - GENERAL

1.1 SUMMARY

RETAIN THE BRACKETED OPTION IN THE FOLLOWING SUB-SUBPARAGRAPH WHEN SPECIFYING COLORED FINISH.

- A. Section Includes: Products and procedures for [coloring and] diamond polishing concrete floors using multi-step wet/dry mechanical process, and accessories indicated, specified, or required to complete polishing.

1.2 DEFINITIONS

- A. Terminology: As defined by CPAA.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.
- B. Installer Qualifications: Data for company, principal personnel, experience, and training specified in PART 1 "Quality Assurance" Article.
- C. Field Quality Control – Static Coefficient of Friction Test Reports: Reports of testing specified in PART 3 "Field Quality Control" Article.
- D. Maintenance Data: For inclusion in maintenance manual required by Division 01.
 - 1. Include manufacturer's instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
 - 2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

- A. Polisher Qualifications:
 - 1. Experience: Company experienced 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.

DIAMOND POLISHING CONCRETE FLOORS

2. Supervision: Maintain competent supervisor who is at Project during times specified work is in progress, and is currently certified as Craftsman or Master Craftsman by CCAA.
 3. Manufacturer Qualification: Approved by manufacturer to apply liquid applied products.
- B. Walkway Auditor: Certified by NFSI to test polished floors for static coefficient of friction according to NFSI 101-A.
- C. Static Coefficient of Friction: Achieve not less than 0.5 for level floor surfaces as determined by quality control testing according to NFSI 101-A.
- D. Field Mock-up for Aesthetic Purposes: Before performing work of this Section, provide as many field mock-ups required to verify selections made under submittals and to demonstrate aesthetic effects of polishing. Approval does not constitute approval of deviations from Contract Documents, unless such deviations are specifically approved by Architect in writing.

RETAIN ONE OF BRACKETED OPTIONS IN THE FOLLOWING PARAGRAPH.

1. Grind, hone, and polish [10 ft] [12 ft] [20 ft] square floor area for each finish approved under sample submittals; include edges and joints.
2. Use same personnel, including supervisors, which will perform work.
3. Install products and materials according to specified requirements.
4. Work shall be representative of those to be expected for work.
5. Finish various components to show maximum variation that will exist in work.
6. Approval is for following aesthetic qualities:
 - a. Compliance with approved submittals.
 - b. Uniformity of exposed aggregate.
 - c. Uniformity of sheen.

RETAIN THE FOLLOWING SUB-SUBPARAGRAPH WHEN SPECIFYING COLORED FINISH.

- d. Uniformity of color.
 7. Obtain Architect's approval before starting work on Project.
 8. Protect approved field mock-ups from elements with weather resistant covering.
 9. Maintain field mock-ups during construction in an undisturbed condition as a standard for judging completed work.
 10. Do not demolish, alter, or remove field mock-ups until acceptable to Owner and Architect.
- E. Pre-Installation of Concrete Conference: Prior to placing concrete for areas scheduled for polishing, conduct conference at Project to comply with requirements of applicable Division 01 Sections.
1. Required Attendees:
 - a. Owner.
 - b. Architect.
 - c. Contractor, including supervisor.
 - d. Concrete producer.
 - e. Concrete finisher, including supervisor.
 - f. Concrete polisher, including supervisor.
 - g. Technical representative of liquid applied product manufacturers.
 - h. Walkway auditor.
 2. Minimum Agenda: Polisher shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, following:

DIAMOND POLISHING CONCRETE FLOORS

- a. Tour 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 Contract Document requirements.
 - c. Review approved submittals.
 - d. Review procedures, including, but not limited to:
 - 1) Details of each step of grinding, honing, and polishing operations.
 - 2) Application of liquid applied products.
 - 3) Protecting concrete floor surfaces until polishing work begins.
 - 4) Protecting polished concrete floors after polishing work is completed.
3. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

1.5 FIELD CONDITIONS

- A. Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to be polished.
1. Prohibit vehicle parking over concrete surfaces to be polished.
 2. Prohibit pipe cutting operations over concrete surfaces to be polished.
 3. Prohibit storage of any items over concrete surfaces to be polished for not less than 28 days after concrete placement.
 4. Prohibit ferrous metals storage over concrete surfaces to be polished.
 5. Protect from petroleum, oil, hydraulic fluid, or other liquid dripping from equipment working over concrete surfaces to be polished.
 6. Protect from acids and acidic detergents contacting concrete surfaces to be polished.
 7. Protect from painting activities over concrete surfaces to be polished.
- B. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.

PART 2 - PRODUCTS

2.1 LIQUID APPLIED PRODUCTS

- A. Liquid Densifier: Odorless, non-hazardous, silicate that penetrates concrete to react with free lime and calcium hydroxide to produce permanent chemical reaction that hardens and densifies concrete surface.

RETAIN THE ONE OR BOTH OF THE FOLLOWING TWO PARAGRAPHS WHEN SPECIFYING COLORED FINISH.

- B. Dyes: Extremely fine molecules of color solvent or dye for mixing with water or acetone that is designed to penetrate and color concrete surface.
- C. Pigmented Microstains: Extremely fine pigment particles in a water-based silicate solution that penetrates concrete and reacts with calcium hydroxide to lock in color particles.
- D. Polish Guard: Non-film forming, stain resistant, food resistant, chemical stain resistant, impregnating sealant designed to be used on concrete surfaces previously densified.

DIAMOND POLISHING CONCRETE FLOORS

2.2 ACCESSORIES

- A. Patching Compound: Compound composed of 40 percent portland cement, 45 percent limestone, and 15 percent vinyl acetate copolymer, when mixed with dust salvaged from grinding process forms a paste that hardens when surface imperfections are filled.
- B. Grout Material: Clear modified silicate sealant, containing no pore clogging latex, when mixed with dust salvaged from grinding process forms a paste that reacts with calcium hydroxide in concrete that hardens when surface imperfections are filled.
- C. Protective Cover: Non-woven, puncture and tear resistant, polypropylene fibers laminated with a multi-ply, textured membrane, not less than 18 mils in thickness.

2.3 POLISHING EQUIPMENT

- A. Field Grinding and Polishing Equipment:
 - 1. Variable speed, multiple head, counter-rotating, walk-behind machine with not less than 600 pounds of down pressure on grinding or diamond polishing pads.
 - 2. If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments.
- B. Edge Grinding and Polishing Equipment: Hand-held or walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.
- C. Burnishing Equipment: High speed walk-behind or ride-on machines capable of generating 1000 to 2000 revolutions per minute and with sufficient head pressure of not less than 20 pounds to raise floor temperature by 20 degrees F.
- D. Metal Bonded Pads: Grinding pads with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.
- E. Resin Bonded Pads: Polishing pads with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.
- F. Burnishing Pads: Maintenance pads for use with high speed burnishing equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Acceptance of Surfaces and Conditions:
 - 1. Examine substrates to be polished for compliance with requirements and other conditions affecting performance.
 - 2. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
 - 3. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

- A. Cleaning New Concrete Surfaces:
 - 1. Prepare and clean concrete surfaces.

DIAMOND POLISHING CONCRETE FLOORS

2. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, paint splatter, and other contaminants incompatible with liquid applied products and polishing.

RETAIN THE FOLLOWING ARTICLE AND THREE PARAGRAPHS WHEN SPECIFYING COLORED FINISH.

3.3 VAPOR TESTING CONCRETE FLOORS

A. Alkalinity:

1. Test Method: Measure pH according to method indicated in ASTM F 710.
2. Acceptable Results: pH between 8 and 10.

B. Moisture Vapor Transmission Rate:

1. Test Method: Perform anhydrous calcium chloride test according to ASTM F 1869.
2. Acceptable Results: Not more than 5 pounds per 1000 square feet in 24 hours.

C. Relative Humidity:

1. Test Method: Perform relative humidity test using in situ probes according to ASTM F 2170.
2. Acceptable Results: Not more than 75 percent.

RETAIN THE FOLLOWING ARTICLE, PARAGRAPH, AND SUB-PARAGRAPHS WHEN SPECIFYING COLORED FINISH.

3.4 COLORING CONCRETE FLOORS

A. Dye or Pigmented Microstain Application:

1. Apply solution by methods and techniques required by manufacturer to produce finish matching approved mock-ups.
2. Maintain wet edge, working newly applied solution into edges of adjacent wet edges of previously treated surfaces.
3. Maintain consistent saturation throughout application.
4. Avoid splashing, dripping, or puddling of solution on adjacent substrates.
5. When color matches approved mock-ups, neutralize as required by manufacturer.

3.5 POLISHING CONCRETE FLOORS

RETAIN ONE OF THE BRACKETED OPTIONS IN THE FOLLOWING PARAGRAPH.

- A. Sequence of Polishing: Perform polishing [before partition studs are erected.] [after partition studs are erected, but before gypsum board is installed.]

B. Initial Grinding:

1. Use grinding equipment with metal bonded grinding pads.
2. Begin grinding in one direction using sufficient size grit pad.
3. Make sequential passes with each pass perpendicular to previous pass using finer grit pad with each pass, up to 150 grit.
4. Achieve maximum refinement with each pass before proceeding to finer grit pads.
5. Vacuum floor using squeegee vacuum attachment after each pass.
6. Continue grinding until aggregate exposure matches approved field mock-ups.

DIAMOND POLISHING CONCRETE FLOORS

- C. Treating Surface Imperfections:
1. Mix patching compound and grout material with dust created by grinding operations to match color of adjacent concrete surface.
 2. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids.
 3. Work compound and treatment until color differences between concrete surface and filled surface imperfections are not reasonably noticeable when viewed from 10 feet away under lighting conditions that will be present after construction.
- D. Liquid Densifier Application: Apply undiluted to point of rejection, remove excess liquid, and allow to cure according to manufacturers instructions.
- E. Grout Grinding:
1. Use grinding equipment and appropriate grit grinding pads.
 2. While applying fresh grout material prior to, grind concrete in direction perpendicular to initial grinding to remove scratches.
 3. Vacuum floor using squeegee vacuum attachment after each pass.
- F. Honing:
1. Use grinding equipment with resin bonded grinding pads.
 2. Grind concrete in one direction starting with 50 grit pad and make as many sequential passes required to remove scratches, each pass perpendicular to previous pass, up to 400 grit pad reaching maximum refinement with each pass before proceeding to finer grit pads.
 3. Auto scrub or vacuum floor using squeegee vacuum attachment after each pass.
- G. Polishing:
1. Use polishing equipment with resin bonded polishing and burnishing pads.
 2. Begin polishing in one direction starting with 800 grit pad.
 3. Make sequential passes with each pass perpendicular to previous pass using finer grit pad with each pass, up to 3000 grit.
 4. Achieve maximum refinement with each pass before proceeding to finer grit pads.
 5. Auto scrub or vacuum floor using squeegee vacuum attachment after each pass.
 6. Continue polishing until gloss appearance, as measured according to ASTM E 430, matches approved field mock-ups.
- H. Polish Guard: Uniformly apply and remove excessive liquid according to manufacturer's instructions.
- I. Final Polish: Using burnishing equipment and finest grit burnishing pads, burnish to uniform sheen matching approved mock-up.
- J. Final Polished Concrete Floor Finish:

RETAIN ONE OF THE FOLLOWING FOUR SUBPARAGRAPHS.

1. Class A – Cream Finish: Polish portland cement paste resulting in little or no aggregate exposure.
2. Class B – Fine Aggregate (Salt and Pepper) Finish: Remove not more than 1/16 inch of concrete surface by grinding and polishing resulting in majority of exposure displaying fine aggregate with no, or small amount of, medium aggregate at random locations.

DIAMOND POLISHING CONCRETE FLOORS

3. Class C – Medium Aggregate Finish: Remove not more than 1/8 inch of concrete surface by grinding and polishing resulting in majority of exposure displaying medium aggregate with no, or small amount of, large aggregate at random locations.
4. Class D – Large Aggregate Finish: Remove not more than 1/4 inch of concrete surface by grinding and polishing resulting in majority of exposure displaying large aggregate with no, or small amount of, fine aggregate at random locations.

RETAIN ONE OF THE FOLLOWING FOUR SUBPARAGRAPHS.

5. Level 1 – Low Gloss Appearance:
 - a. Procedure: Not less than 4 step process with full refinement of each diamond pad up to 400 grit resin bonded pad with one application of densifier.
 - b. Gloss Reading: Not less than 40 according to ASTM E 430 before polish guard application.
6. Level 2 – Medium Gloss Appearance:
 - a. Procedure: Not less than 5 step process with full refinement of each diamond pad up to 800 grit resin bonded pad with one application of densifier.
 - b. Gloss Reading: Not less than 55 according to ASTM E 430 before polish guard application.
7. Level 3 – High Gloss Appearance:
 - a. Procedure: Not less than 6 steps with full refinement of each diamond pad up to 1500 grit resin bonded pad with one application of densifier.
 - b. Gloss Reading: Not less than 60 according to ASTM E 430 before polish guard application.
8. Level 4 – Very High Gloss Appearance:
 - a. Procedure: Not less than 7 steps with full refinement of each diamond pad up to 3000 grit resin bonded pad with one application of densifier.
 - b. Gloss Reading: Not less than 70 according to ASTM E 430 before polish guard application.

3.6 FIELD QUALITY CONTROL

- A. Field Testing: Engage a qualified walkway auditor to perform field testing according to NFSI 101-A to determine if polished concrete floor finish complies with specified static coefficient of friction.

3.7 CLOSEOUT ACTIVITIES

- A. Maintenance Training: CPAA Master Craftsman shall train Owner's designated personnel in proper procedures for maintaining polished concrete floor.

3.8 PROTECTION

- A. Covering: After completion of polishing, protect polished floors from subsequent construction activities with protective covering.

END OF SECTION