SECTION 033543 – POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: This Section specifies polished concrete.

B. Related Section:

1. Section 033000 Cast-in-Place Concrete.

1.3 REFERENCES

A. American Concrete Institute (ACI):
1. ACI 302.1R Guide for Concrete Floor and Slab Construction.

B. ASTM International:
1. ASTM C 309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
2. ASTM C 171 Standard Specification for Sheet Materials for Curing Concrete.
3. ASTM C 779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
4. ASTM C 1028 – Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
5. ASTM D 523 – Standard Test Method for Specular Gloss.
6. ASTM E 1155 – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.

C. Reunion Internationale des Laboratoires D'Essais et de Recherches sur les Materiaux et les Constructions (RILEM):
1. Rilem Test Method 11.4 Standard Measurement of Reduction of Moisture Penetration Through Horizontal Concrete Surfaces.

D. National Floor Safety Institute (NFSI):
1. NFSI Test Method 101-A Standard for Evaluating High-Traction Flooring Materials, Coatings, and Finishes.

1.4 SYSTEM DESCRIPTION

A. Installation of polished concrete floor system for new interior concrete floors by dry grinding and polishing with various size grit metal-bonded and resin-bonded diamonds and application of concrete densifier.

B. Performance Requirements: Provide polished flooring that has been selected, manufactured and installed to achieve the following:
   1. Abrasion Resistance: ASTM C779, Method A, high resistance, no more than 0.008 inch (0.20 mm) wear in 30 minutes.
   2. Reflectivity: Increase of 35% as determined by standard gloss meter.
   3. Waterproof Properties: Rilem Test Method 11.4, 70% or greater reduction in absorption.
   4. High Traction Rating: NFSI 101-A, non-slip properties.
   5. Static Coefficient of Friction, ASTM C 1028:
      a. Dry Surface: 0.5.
      b. Wet Surface: 0.5.
   6. Specular Gloss/Reflectance, ASTM D 523:
      a. 20 Degrees:
      b. 60 Degrees:
      c. 85 Degrees:
   7. Floor Surface Profile, ASTM E 1155:
      a. Floor Flatness Number (F_F): 50.
      b. Floor Levelness Number (F_L): 35.

C. Design Requirements:
   1. Hardened Concrete Properties:
      a. Minimum Concrete Compressive Strength: 3500 psi (24 MPa).
      b. Normal Weight Concrete: No lightweight aggregate.
      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. Flatness Requirements:
         1) Overall FF 50.
         2) Local FF 35.
   3. Hard-Steel Troweled (3 passes) Concrete: No burn marks. Finish to ACI 302.1R, Class 5 floor.
      a. Class 6 floors, special colored mineral aggregate hardener with repeated hard steel trowel finish.
   4. Curing Options:
      a. Membrane forming curing compounds (ASTM C309, Type 1, Class B, all resin, dissipating cure).
         1) Acrylic curing and sealing compounds not recommended.
      b. Sheet membrane (ASTM C171); polyethylene film not recommended.
      c. Damp Curing: Seven day cure.

1.5 SUBMITTALS

A. General: Submit listed action submittals in accordance with Contract Conditions and Section 013300 - Submittal Procedures.

B. Shop Drawings: Indicate information on shop drawings as follows:
   1. Typical layout including dimensions and floor grinding schedule.
   2. Plan view of floor and joint pattern layout.
   3. Hardener, sealer, densifier in notes.

C. Product Data: Submit product data, including manufacturer’s product sheet, for specified products.
   1. Preparation and concrete grinding procedures.

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

E. Certificates:
1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
2. Letter of certification from the National Floor Safety Institute confirming the system has been tested and passed phase Two Level of certification when tested by Method 101-A.
3. Current contractor's certificate signed by manufacturer declaring contractor as an approved installer of polishing system.
4. IPCI certification of installer and installer's employees.

F. Samples: Submit installers' samples of polished concrete.

G. Installer's Project References: Submit installer's list of successfully completed polished concrete floor system projects, including project name and location, name of architect, and type and quantity of polished concrete floor system installed.

H. Maintenance Manual: Submit installer's maintenance manual, including maintenance and cleaning instructions for polished concrete floor system.

1.6 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 - 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.

1.7 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. Certified IPCI installer.
3. Employ IPCI Certified Craftsmen for installation of polished concrete floor system.
4. Employ a minimum of one IPCI Certified Craftsmen for installation of polished concrete floor system involving color or decorative work.
5. Installer trained and holding current certification for the specific system installation.
6. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

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

C. Mock-Ups:
1. Construct mock-ups in accordance with Section 014500 - Quality Control.
2. Mock-Up Size: 10 ft^2 (9.3 m^2) sample panel at jobsite at location not exposed to permanent view 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, and shine.
4. Allow 24 hours for inspection of mock-up before proceeding with work.
5. When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up will not remain as part of finished work..

D. Preinstallation Meetings: Conduct a preinstallation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Review the following:
   1. Environmental requirements.
   2. Scheduling and phasing of work.
   3. Coordinating with other work and personnel.
   4. Protection of adjacent surfaces.
   5. Surface preparation.
   6. Repair of defects and defective work prior to installation.
   7. Cleaning.
   8. Installation of polished floor finishes.
   9. Application of liquid hardener, densifier.
   10. Protection of finished surfaces after installation.

1.8 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 01

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

C. Delivery:
   1. 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.
      a. Protect from petroleum stains during construction.
      b. Diaper hydraulic power equipment.
      c. Restrict vehicular parking.
      d. Restrict use of pipe cutting machinery.
      e. Restrict placement of reinforcing steel on slab.
      f. Restrict use of acids or acidic detergents on slab.

1.9 PROJECT AMBIENT CONDITIONS

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

1.10 SEQUENCING

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

1.11 WARRANTY

A. Manufacturer's Warranty: Submit, for Architect'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.

B. Warranty: Commencing on Substantial Completion Date.

1.12 MAINTENANCE

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 MATERIALS

A. Manufacturers:
   1. L & M Construction Chemicals, Inc.
   2. Concrete Polishing Solutions.

B. Products/Systems:
   1. Hardener, Sealer, Densifier: Proprietary, water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film.
      a. L & M Construction Chemicals, Inc., FGS Hardener Plus.
      b. Concrete Polishing Solutions, Armor Densifier MFL.
   2. Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A 80 or higher hardness.
      a. L & M Construction Chemicals, Inc., Joint Tite 750.
      b. Concrete Polishing Solutions, equivalent product.
   3. Oil Repellent Sealer: Ready to use, silane, siloxane and fluoropolymers blended water based solution sealer, quick drying, low-odor, oil and water repellent, VOC compliant and compatible with chemically hardened floors.
      a. L & M Construction Chemicals, Inc., Petrotex.
      b. Concrete Polishing Solutions, Armor Stain Shield MFL.
   4. Cleaning Solution: Proprietary, mild, highly concentrated liquid concrete cleaner and conditioner containing wetting and emulsifying agents; biodegradable, environmentally safe and certified High Traction by National Floor Safety Institute (NFSI).
      a. L & M Construction Chemicals, Inc., FGS Concrete Conditioner.
      b. Concrete Polishing Solutions, equivalent product.
   5. Finish: High gloss, 800 grit.

2.3 SOURCE QUALITY CONTROL

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

PART 3 - EXECUTION

3.1 MANUFACTURERS INSTRUCTIONS

A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions and specification sheets.

B. Use only certified installers.

3.2 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. Notify Architect of conditions that would adversely affect installation or subsequent use.
3. Do not begin surface preparation or installation until unacceptable conditions are corrected.

B. Verify Floor Finish:
1. Slabs and flatwork shall be placed and finished monolithically.
2. Strike off and laser screed slabs to true, plane surfaces at required elevations.
3. Thoroughly compact concrete with vibrators, floats, and tampers to force coarse aggregate below the surface.
4. Power trowel with no hand finishing.
5. Pan float.
6. Steel finish.
7. Surface should not be burned due to excessive troweling.
8. Imprints are not acceptable (i.e. boots, foreign objects dropped into concrete).

C. Verify Floor and Joints:
1. Free of debris and excessive dirt, dust, clay, and mud.
2. Dry.

D. Verify Floor Surface Profile:
1. Floor Flatness Number (F_F): 50.
2. Floor Levelness Number (F_L): 35.

E. Concrete Compressive Strength: 3,500 psi to 5,000 psi.

F. Lightweight Concrete: Not allowed if aggregate exposure is required.

G. Concrete Curing: Minimum 8 days water cured or dissipating curing compound applied.

H. Concrete Adjacent to Floor Penetrations: Troweled flat and level with surrounding concrete.

I. Concrete Adjacent to Drains, clean-outs, etc: Finish level to the top of the structure.

3.3 PREPARATION

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

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

C. General Contractor to remove surface contamination.

3.4 INSTALLERS

A. Consult IPCI to find certified IPCI installers.

1. International Polished Concrete Institute, PO Box 1174, Norris, Tennessee 37828. Toll Free (866) 421-9550. Phone (865) 494-7881. Fax (865) 494-0872. Website www.ipcionline.org. E-mail info@ipcionline.org.

3.5 EQUIPMENT TO BE USED FOR INSTALLATION

A. Floor Grinder:
1. Model: Concrete Polishing Solutions "G-320". (or equivalent)
2. Type: Multi-orbital, planetary-action, opposing-rotational, diamond-headed floor grinder.
3. Weight: 850 pounds.
4. Grinding Pressure: 675 pounds.
5. Grinding Width: 32 inches.
6. Motor: 15 HP.
7. Maximum RPM: 1,750.
8. Head: 3-head system contours to floor surface.

B. Vacuum System:
1. Model: Concrete Polishing Solutions "CAT 5 Dust Extractor". (or equivalent)
2. Filtration: Direct-connect, HEPA filtration system.

C. Diamond Tooling for Coating Removal, Initial Grinding, and Preparing Floor for Polishing:
1. Concrete Polishing Solutions "MFL" 40-grit metal-bonded diamonds. (or equivalent)
2. Concrete Polishing Solutions "MFL" 80-grit metal-bonded diamonds. (or equivalent)
3. Concrete Polishing Solutions "MFL" 150-grit metal-bonded diamonds. (or equivalent)

D. Diamond Tooling for Polishing Concrete:
1. Concrete Polishing Solutions "GST" 100-grit resin-bonded diamonds. (or equivalent)
2. Concrete Polishing Solutions "GST" 200-grit resin-bonded diamonds. (or equivalent)
3. Concrete Polishing Solutions "GST" 400-grit resin-bonded diamonds. (or equivalent)
4. Concrete Polishing Solutions "GST" 800-grit resin-bonded diamonds. (or equivalent)

3.6 INSTALLATION

A. Floor Surface Polishing and Treatment, General:
1. Provide polished concrete floor treatment in entirety of slab indicated by drawings. Provide consistent finish in all contiguous areas.
2. Apply floor finish prior to installation of fixtures and accessories.
3. Diamond polish concrete floor surfaces with power disc machine recommended by floor finish manufacturer. Sequence with coarse to fine grit using dry method.
   a. Comply with manufacturer’s recommended polishing grits for each sequence to achieve desired finish level. Level of sheen shall match that of approved mock-up.
   b. Expose aggregate in concrete surface only as determined by approved mock-up.
   c. All concrete surfaces shall be as uniform in appearance as possible.

B. Aggregate Exposure:
1. Small Aggregate: Mottled salt-and-pepper course aggregate exposure.

C. Polished Concrete Floor System: IPCI Sheen Level 3 – High Sheen.
1. Preparation Step:
   a. Remove existing floor coatings and level floor by grinding with 40-grit metal-bonded diamonds.

b. Open-up concrete to accept concrete densifier by grinding with 80-grit metal-bonded diamonds.
2. Apply concrete densifier to deeply saturate floor.
3. Remove residue of concrete densifier dried on floor surface by grinding with 150-grit metal-bonded diamonds.
4. Floor Closure Polishing:
   a. Remove 150-grit metal-bonded diamond scratches by grinding with 100-grit resin-bonded diamonds.
   b. Remove 150-grit metal-bonded and 100-grit resin-bonded diamond scratches by grinding with 200-grit resin-bonded diamonds.
   c. Prepare floor for polishing by grinding with 400-grit resin-bonded diamonds.
   d. Achieve light-reflective finish when viewed from a distance of 30 feet by grinding with 800-grit resin-bonded diamonds.
5. Apply concrete sealer.

D. Polished Concrete, General:
1. Locate demarcation line between polished surfaces and other finishes.
2. Polish concrete to final finish level.
3. Remove residue with dry buffer; reapply as necessary for desired result.

E. Cleaning Solution:
1. First coat at 250 ft^2/gal (6.25 m^2/L).
2. Second coat at 350 ft^2/gal (8.75 m^2/L).
3. Follow manufacturer's recommendations for drying time between successive coats.

F. Remove defects and repolish defective areas.

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

3.7 FIELD QUALITY CONTROL

A. Inspect completed polished concrete floor system with Owner, Contractor, Architect, and Installer.

B. Review procedures with Architect to correct unacceptable areas of completed polished concrete floor system.

C. Testing: Test the following from completed polished concrete floor system:
1. Static Coefficient of Friction, ASTM C 1028:
   a. Dry surface.
   b. Wet surface.
2. Specular Gloss/Reflectance, ASTM D 523:
   a. 20 degrees.
   b. 60 degrees.
   c. 85 degrees.
3. Floor Surface Profiles, ASTM E 1155:
   a. Floor Flatness Number (F_F).
   b. Floor Levelness Number (F_L).

D. Test Results:
1. Report test results in writing to Owner, Contractor, and Architect within 24 hours after tests.
2. Compare test results from tests performed before and after installation of polished concrete floor system.

3.8 ADJUSTMENTS

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

B. Fill joints flush to surface.

3.9 FINAL CLEANING

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

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

3.10 PROTECTION

A. Protect installed product from damage during construction.
   1. Protect with EZ Cover™ by McTech Corp., or comparable product.

B. Protect completed polished concrete floor system from damage until Substantial Completion.
   1. Do not allow vehicle and pedestrian traffic on unprotected floor.
   2. Do not allow construction materials, equipment, and tools on unprotected floor.

C. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed polished concrete floor system.

D. Repair damaged areas of completed polished concrete floor system to satisfaction of Architect.

END OF SECTION 033543