

SECTION 033543

POLISHED CONCRETE FINISHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cementitious polished non-structural topping/overlay for traffic bearing surface with applied surface treatments as scheduled using a multiple-step process and accessories to achieve a specified level of gloss.

1.2 RELATED SECTIONS

- A. Section 03 30 00 – Cast-In-Place Concrete Installation.
- B. Section 07 26 00 – Surface Applied Vapor Reduction Systems
- C. Section 07 92 00 – Joint Sealants.

1.3 REFERENCES

- A. ASTM C78 – Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
- B. ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50.8 mm Cube Specimens)
- C. ASTM C191 – Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
- D. ASTM C348 – Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
- E. ASTM C469 – Standard Test Method for Static Modulus of Elasticity and Poisson's Ration of Concrete in Compression

- F. ASTM C580 – Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing's, and Polymer Concretes

- G. ASTM C1028 – Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

- H. ASTM C1583 – Standard Test Method of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)

- I. ASTM D4259 – Standard Practice for Abrading Concrete

- J. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers

- K. ASTM E430 – Standard Test Methods for Measurement of Gloss of High-Gloss Surfaces by Abridged Goniophotometry

- L. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

- M. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

- N. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

- O. ASTM F2420 – Standard Test Method for Determining Relative Humidity on the Surface of Concrete Floor Slabs Using Relative Humidity Probe Measurement and Insulated Hood

- P. ASTM F3010 – Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings

- Q. ASTM E1907 – Standard Practices for Determining Moisture-Related Acceptability of Concrete Floors to Receive Moisture-Sensitive Finishes

- R. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials

- S. ACI (American Concrete Institute)

- T. ACI 201.1R Guide for Conducting a Visual Inspection of Concrete in Service

- U. ACI 224.1R07 Causes, Evaluation, and Repair of Cracks in Concrete Structures

- V. ANSI/NFSI B101.0 – American National Standard Institute/National Floor Safety Institute B101.0 Walkway Surface Auditing Procedure for the Measurement of Walkway Slip Resistance

- W. ICRI No. 310.2 - 1997 (International Concrete Repair Institute) - Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers, and Polymer Overlays

- X. TCNA (Tile Council of North America) - Handbook for Ceramic Tile Installation

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.

- B. *Maintenance Data*: Provide instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition for the intended usage. These instructions should contain precautions against cleaning products and methods that may be detrimental to the finish and performance.

- C. *Product Data*: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Manufacturer's printed installation instructions for each product.

1.5 QUALITY ASSURANCE

- A. *Manufacturer Qualifications*: Firm specializing in manufacture of cementitious underlayments and toppings, with minimum 10 years' experience.

- B. *Installer Qualifications*: Firm specializing in installation of cementitious underlayments and toppings, with minimum 5 years documented experience with projects of similar scope, design, and materials. Installation of the HB Fuller Construction products must be completed by a factory-trained applicator, **INSTALL Substrate Prep Certified Installer**, or equal, using mixing equipment and tools approved by the manufacturer.

- C. *Mock-Up*: Provide an on-site mock-up of each type of installation, which includes a specified process, surface, finish, color, and joint design/treatments for review and approval of quality of workmanship. These on-site mock-ups should be installed using the same installer personnel who will be performing the work. Approved mock-ups may become part of the completed work, if undisturbed at time of substantial completion.

- D. *Static Coefficient of Friction:* A reading of not less than 0.5 for level floor surfaces shall be achieved and documented, as determined by a certified NFSI walkway auditor using the NSF 101-A quality control test

- E. *Pre-Installation Meeting:* At least three weeks prior to commencing underlayments and toppings work conduct a meeting at the project site to discuss contract requirements and job conditions; require the attendance of installers, representative of installation materials manufacturer, and installers of related materials; notify Architect in advance of meeting. Agenda shall include a review of the site conditions, constructions documents, schedule, installation and protections procedures, and submittals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

- B. Store all materials subject to damage by freezing or overheating in a dry, climate-controlled environment at a minimum of 55°F (13°C) and a maximum of 85°F (30°C).

- C. Maintain records of manufacturer's product batch numbers.

- D. Deliver and store materials on site at least 24 hours before work begins.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

- B. *Lighting:* Provide permanent lighting or, if permanent lighting is not in place, simulate lighting conditions during moisture reduction barrier installation. The simulation lighting is to be overhead lighting that would equal to the subsequent permanent lighting. The general contractor and/or construction manager will verify the lighting conditions by testing.

- C. *Temperature:* Maintain surface and ambient air temperatures at not less than 50 degrees F, exercise caution when temperatures exceed 80 degrees F

- D. Proceed with underlayments and toppings work after surface defects have been repaired and projections through substrate have been completed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

H.B. Fuller Construction Products Inc.

1105 South Frontenac Street, Aurora, IL 60504-6451

Toll Free: 800 832 -9023, Fax: 630-952-1235

Web: www.tecspecialty.com or www.chapco-adhesive.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

D. Obtain products from a single manufacturer.

2.2 CEMENTITIOUS NON-STRUCTURAL TOPPING/OVERLAY

A. Product: **TEC® Level Set® Wear Topping**, polished or unpolished, as manufactured by H.B. Fuller Construction Products.

1. Application: From 1/4 inch to 2 inches (6.35 to 50.8 mm) without extension with aggregate, and up to 5 inches (127 mm) extended.
2. Working Time at 70 degrees F (21 degrees C): 25-35 minutes.
3. Set Time per ASTM C191 at 70 degrees F (21 degrees C): Initial set 80 minutes, final set 140 minutes.
4. Compressive Strength ASTM C109: 28 days - > 6,000 psi (42.1 MPa).
5. Flexural Strength ASTM C348: 7 days – 720 psi (5.0 MPa), 28 days - 1,200 psi (8.3 MPa).
6. Accepts foot traffic in 2-3 hours and rubber wheel traffic within 48 hours
7. Accepts stains, sealers and coatings within 24 hours.
8. Integral colorant can be added at the time of mixing.
9. Colors: Bright White, White, or Gray

2.3 FLOOR PATCHES

- A. Product: **TEC® Floor Patch Pro or CHAPCO® Patch** as manufactured by H.B. Fuller Construction Products.
1. Application: fast setting, easy-to-mix, cement based patch and skim coating compound for use under ceramic tile, hardwood flooring, resilient flooring, VCT and carpet. Featheredge to 2" (5 cm) in thickness.
 2. Percentage Water: Water ratios differ for skim coat vs. thicker applications.
 3. Working Time at 70 degrees F (21 degrees C): 8 to 15 minutes.
 4. Compressive Strength ASTM C109: 28 days - >4,000 psi (24.1 MPa).
 5. Accepts tile and stone applications as well as moisture sensitive floor coverings in as little as 30 minutes, or when completely dry.
 6. Can be applied to concrete with a relative humidity (RH) up to 90% or MVER up to 10lbs/1000 ft² /24 hrs.
 7. Compatible with sealed gypsum based flooring.
- B. Product: **TEC® Feather Edge Skim Coat or CHAPCO® SmoothFinish™** as manufactured by H.B. Fuller Construction Products.
1. Application: Featheredge up to ½" (12 mm) in one application without cracking.
 2. Set Time ASTM C191 at 70 degrees F (21 degrees C): Initial set 15 minutes, final set 25 minutes.
 3. Compressive Strength ASTM C109: 24 hours 2,100 psi (14.5 MPa), 28 days 3600 psi (24.6 MPa).
 4. Rapidly sets to accept most floor coverings in as little as 15-60 minutes, with exceptional performance.

2.4 EPOXY PRIMER

- A. Product: **TEC® Level Set® Epoxy Primer** as manufactured by H.B. Fuller Construction Products.
1. TEC® Level Set® Epoxy Primer is required for use as a primer for Level Set® Wear Topping that is to be polished. Contact TEC® Technical Services for further information.
 2. Solids Content: 100% solids
 3. Color: Part A – Amber Yellow, Part B – Black
 4. Application: Apply a smooth wet 8 to 10 mil even coating over the substrate using a flat squeegee followed by a 3/8" (9 mm) nap roller (Level Set® Epoxy Primer can also be applied with a nylon paintbrush for hard to reach areas). Apply at a coverage rate of 150-200 ft²/gal (3.6-4.9 m²/L) depending on the surface profile. For more information, please refer to the Product Data Sheet.
 5. Mix Ratio per volume: 1 part A: 1 part B.
 6. Open Time: 60 minutes
 7. Tensile Strength per ASTM D638 Type 1, 7d: 2500 – 5000 psi (17-34 MPa)
 8. Water Absorption per ASTM D570, 7d: 0.4%

2.5 MOISTURE MITIGATION: To be used as a moisture mitigator in high concrete moisture applications, such as slab on grade.



- A. Product: **TEC® LiquiDam™**, **CHAPCO'S DEFENDER two-part** 100% solids epoxy, **CHAPCO® DEFENDER EZ™**; or **TEC® LiquiDam EZ™ 1-part**, polymeric emulsion as manufactured by H.B. Fuller Construction Products.
1. Direct application onto green concrete up to 100% RH per ASTM F2170 (or MVER of 25 lbs. per 1,000 ft² per 24 hours per ASTM F1869)
 2. Application: must be mixed and applied according to the Product Data Sheet on tecspecialty.com
 3. Moisture Vapor Transmission per ASTM E 96: Less than 0.10 perms
 4. Effect of pH 14 solution per ASTM D1308: No effect
 5. Tensile Bond Adhesion per D7234: >200 - 100% concrete failure
 6. LiquiDam™ or CHAPCO'S DEFENDER surface must be primed with undiluted TEC® Multipurpose Primer prior to installation of cementitious underlayment.
 7. LiquiDam EZ™ or CHAPCO® DEFENDER EZ™ doesn't require a primer before the application of TEC® or Chapco surface preparation products.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces, to receive topping, and conditions under which toppings will be installed to be structurally sound.
- B. Do not proceed with work until surfaces and conditions comply with requirements required by manufacturer's printed instructions.

3.2 PREPARATION

- A. Concrete Substrates:
1. Movement joints are mandatory – Architect must specify type, show location, and detailed drawings of joint placement
 2. Clean area and remove all unsound concrete, grease, oil, paint and any other foreign materials that will inhibit adhesion.
 3. Substrates shall be stable, solid and structurally sound. Weak or contaminated surfaces must be mechanically removed. See Product Data Sheet for Surface Evaluation and Preparation Guidelines
 4. After cleaning and profiling, test for MVER (moisture vapor emission rate – reference ASTM F 1869) and concrete substrates's relative humidity (RH) – reference ASTM F 2170. If the MVER is greater than 5lbs / 1000 sq. ft. / 24 hours and /or the RH greater than 75% or the MVER and/or RH exceed the sealer manufacture recommendations, use moisture mitigation barrier as specified.

5. Repair deep areas, holes and nonmoving cracks with Skim Coat or Patch prior to application and allow curing for a minimum of 3 hours.
6. Mechanically prepared surfaces must support a minimum adhesion strength of 150 psi (1 MPa) when tested per ASTM D7234 (tensile bond test).
7. Substrate temperature shall be a minimum of 50°F (10°C) during application and air maintained between 50-90°F (10-32°C)
8. All substrates require Epoxy Primer with a sand broadcast
9. Isolate, using foam tape or caulking, all perimeters and sharp corners such as column bases, pedestals, supports, and etc...
10. Install a bond breaker where vertical surfaces meet the new underlayment or topping, such as a self-adhering ¼" minimum foam tape or similar product

3.3 INSTALLATION

A. Priming:

1. Prepare the substrate to ICRI Concrete Surface Profile to a minimum of CSP 3. Confirm area has a depth enough to accept a minimum of 3/8" from the highest point of the floor to receive the Wear Topping. Completely clean the substrate to remove debris from the surface using a vacuum.
2. Substrate must be completely dry prior to the application of the Epoxy Primer.
3. Mix primer in accordance with the manufacturers' published instructions on tecspecialty.com.
4. This Primer must be applied over the entire substrate leaving no bare spots, puddles, or excess primer. **Do not apply over standing water.**
5. Apply a smooth wet 8 to 10 mil even coating over the substrate using a flat squeegee followed by a 3/8" (9 mm) nap roller (Epoxy Primer can also be applied with a nylon paintbrush for hard to reach areas). Apply at a coverage rate of 150-200 ft²/gal (3.6-4.9 m²/L) depending on the surface profile. For more information, please refer to the Product Data Sheet.
6. While the epoxy is still fresh (within 30 minutes), dry sand broadcast may be added, to refusal (#20-#35 sand). Typically 2/3 to 1 lb/ft² (3.3-4.9 kg/m²) is required. Ensure that sand is broadcast evenly, leaving no areas of un-sanded epoxy. Walking is permitted on the surface with spiked shoes.
7. Allow 3-6 hours cure time.
8. After 4-6 hours or just before Self-leveling underlayment or Wear Topping installation, remove all loose sand by sweeping and vacuuming the surface, in both directions.
9. Check for any bald spots and reapply in those areas.

B. Topping Installation and Joint Filling:

1. Temperature shall be a minimum of 50°F (10°C) and shall not exceed 80°F (27°C), within 24 hours of application.
2. Close all windows, doors, and HVAC vents to minimize air flow.
3. Divide the areas to permit continuous placement without cold joints.
4. Barrel mix or pump with a batch mixer, to a minimum thickness of 3/8" from the highest point, of the pre-blended material into place and disperse with a 3/8" minimum gauge rake followed by smoothing the surface with a surface smoother.
5. To prevent ridges between batches, use a smoother tool and work a narrow dimension.
6. For placements greater in depth than 2" but less than 5" contact Technical Service, as noted on the Product Data Sheet, available on tecspecialty.com.

7. Honor all control and expansion joints through out the system, from the concrete slab up through the topping. Allow for movement at abutments, columns, and wall corners.
8. Saw cut all existing control, expansion, and designed joints within 3 – 6 hours after topping material installation has been completed to a minimum depth of the original joint or 2", whichever is the lesser.
9. All designed saw cut joints are to be cut through to the epoxy primer and shall be no greater than 8' to 10' in all directions.
10. Apply a stain prevention film or other masking agent along the surface on both sides of the joint prior to filling the joint with a flexible joint sealant.

11. Install the joint sealant in a continuous motion in to the joint. Fill from the bottom of the joint, being careful not to entrap air.
12. Slightly overfill the joint.
13. Remove any excess sealant with a razor scraper or similar tool after the sealant has set up enough to cut through with a razor scraping tool in a continuous motion.

C. Polishing Process: Any substitutions from the specified products and/or process without manufacturer approval will void the system warranty.

1. Wet grinding and polishing is prohibited.
2. Allow the Wear Topping to cure a minimum of 24 – 72 hours prior to proceeding with the polishing process. Time frame is a function of jobsite conditions, as well as thickness of application.
3. After a minimum of 24 hours fill all joints with an approved polyurea and shave off excess prior to the first grinding of the Wear Topping, caution should be taken as joints fillers could stain the overlay. Joint filler shall be installed in accordance with the manufacturer's recommendation.
4. Dry grind to remove the cream and polish to achieve the desired gloss reading. Floor must be broomed and vacuumed between each step to remove all dust. Gloss attainment shall be in
5. accordance with test method ASTM E430. Readings shall be taken no less than 10' on center in field areas and within 1' of floor area perimeters. In no case shall a reading be below 2% of the specified minimum sheen.
 - a. Low Gloss Finish: 30 – 40 per ASTM E430
 - b. Medium Gloss Finish: 41 – 55 per ASTM E430
 - c. High Gloss Finish: 56 or higher per ASTM E430
6. For instructions on achieving gloss levels refer to the appropriate machine and diamond manufacturers.
7. Grinding of the topping should be done with metal hard bonded diamonds.
8. Densify the surface prior to proceeding with the resin bonded diamonds.
9. Dry polish floor with resins to desired gloss level.
10. Apply final sealer once desired gloss finish has been achieved.
11. Burnish floor using higher grit pads.

D. Edge Work:

1. Where desired, polished edge work shall be done with a hand held or walk behind polishing tool. The edge work process shall match the corresponding steps outlined above to achieve the desired gloss level. Each polishing step shall be done immediately after the matching main polishing step has been completed.

E. Acceptance

1. Remove all installation materials from the project.
2. Clean surfaces and materials
3. Post job walk-through to ensure the project has been completed per the SPEC'd process
4. If requested or required take pictures of final product for documentation and submittal.

F. Protection and Maintenance

1. Protect the new floor from spills or stains from coming in contact with the floor for the duration of construction. If construction equipment must be used, cover all the components that may have fluids drips. Protect the surface by installing an approved breathable protective floor covering.
2. Avoid moisture for 72 hours after final installation.
3. Do not permit standing water or wet mopping during the 72 hour period.
4. Allow the coating to fully cure prior to any protective plastic sheeting, rubber matting, rugs, or furniture placement that can prevent proper drying and trap moisture which will result in a cloudy discolored effect on the floor.
5. DO NOT USE cleaners that are acidic or that have citrus or Butyl components.
6. IMPORTANT: adherence to a recommended cleaning schedule will help the floor maintain its polished gloss longer and will greatly reduce the absorption of spilled liquids.
7. Specified maintenance recommendations shall be provided by the installer performing the work.

END OF SECTION



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H.B. Fuller Construction Products Inc.
1105 South Frontenac Street
Aurora, IL 60504-6451