

SECTION 096723.16 – 5-COAT SYSTEM FUEL RESISTANT RESINOUS FLOORING



PART 1 GENERAL

1.1 SUMMARY

The Contractor shall furnish all coatings, labor, materials, tools, supervision, and equipment, and perform all operations necessary to accomplish all work, complete in place, as specified herein. The work to be performed includes, but is not necessarily limited to the following principal features:

This system consists of concrete surface preparation and application of a high build, solid color epoxy mortar system at an average thickness of [?????] mils (WFT) with High Traffic CRU wear surface. This floor coating system consists of an epoxy primer followed by an aggregate filled chemical resistant 100% solids epoxy mortar with separate pigment packs, a gel-like epoxy grout coat over the epoxy mortar followed by a 100% solids epoxy pigmented body coat and a single topcoat of a pigmented, low odor/VOC High Traffic Chemical Resistant Polyurethane wear surface coating for protecting interior concrete floors yielding an attractive, abrasion resistant surface on approximately [?????] square feet at the [ENTER PROJECT NAME, CITY, STATE]. Complies with L.A. Rule 66 and Low VOC Regulations (complies with SCAQMD VOC regulations). This system is suitable for heavy traffic environments, such as aiseways exposed to heavy forklift traffic, etc., to protect and/or resurface concrete, yielding a new surface with greater abrasion and traffic erosion resistance than typical concrete.

Contractor is responsible to make and record all necessary field tests and measurements for completion of this work. Quantities shown are estimates for planning, scheduling and budgeting purposes only.

1.1.1 Performance Requirements

See manufacturer's technical data bulletin for specific material, cured coatings and a complete list of chemical resistant properties.

- a. Chemical Resistance: Excellent chemical resistance to Hydrochloric Acid 32% (Muriatic), Citric Acid 10%, Ethylene Glycol (Antifreeze), Sodium Hypochlorite (Bleach), Xylene, and with no adverse effects, as well as Good chemical resistance to Sulfuric Acid 25% (Battery Acid), Brake Fluid and Skydrol® LD4 based on 7-day spot testing on concrete (per ASTM D 1308 Test Method 3.1.1 3)
- b. Tensile Strength to Steel (in accordance with ASTM D4541) must be greater than 4,300 psi (27.57 MPa)
- c. Shore D (in accordance with ASTM D2240) must be at least 78 or better
- d. Impact Resistance must pass ASTM D3134 and ASTM D2794 with 160 in.lbs. with no delamination or chipping
- e. Must accept full traffic, to include forklift traffic, in no less than 24 hours at any application thickness when applied in normal room temperature environments (i.e. $\geq 72^{\circ}\text{F}$ and 50% Ambient Humidity)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM C307 (2003; R 2012)	Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing
ASTM C531 (2000; R 2018)	Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C579 (2001; R 2018)	Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes

SECTION 096723.16 – 5-COAT SYSTEM FUEL RESISTANT RESINOUS FLOORING



ASTM C679 (2003; E 2009; R 2009)	Tack-Free Time of Elastomeric Sealants
ASTM C884/C884M (2016)	Standard Test Method for Thermal Compatibility between Concrete and Epoxy-Resin Overlay
ASTM D1308 (2013)	Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D2240 (2015; E 2017)	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D2621 (1987; R 2016)	Standard Test Method for Infrared Identification of Vehicle Solids from Solvent-Reducible Paints
ASTM D2697 (2003; R 2014)	Volume Non-volatile Matter in Clear or Pigmented Coatings
ASTM D3335 (1985; R 2014)	Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
ASTM D3718 (1985; R 2015)	Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy
ASTM D3925 (2002; R 2015)	Sampling Liquid Paints and Related Pigmented Coatings
ASTM D 4060-84	Taber Abrasion Resistance Testing Standards
ASTM D412 (2016)	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D4541 (2017)	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D6237 (2009; R 2015)	Painting Inspectors (Concrete and Masonry Substrates)
ASTM D638 (2014)	Standard Test Method for Tensile Properties of Plastics
ASTM E11 (2016)	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM F1869 (2016)	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2170 (R 2019)	Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
ASTM F3010-18 (2013; R 2018)	Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings
EM 385-1-1	Safety and Health Requirements Manual
FED-STD-595 (Rev C; Notice 1)	Colors Used in Government Procurement
ICRI 310.2R-2013	Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair
NARA 29 CFR 1910.1000	Air Contaminants
NARA 29 CFR 1910.134	Respiratory Protection
NARA 29 CFR 1926.59	Hazard Communication
SSPC-TU 2/NACE 6G197 (1997)	Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment

SECTION 096723.16 – 5-COAT SYSTEM FUEL RESISTANT RESINOUS FLOORING



1.3 SUBMITTALS

The Contractor shall submit two copies of the submittals to the owner's representative. The submittals shall include the following:

- a) Product Data: Submit manufacturer's product data, including physical properties, chemical resistance, surface preparation, application instructions and manufacturers limited warranty.
- b) Applicator's warranty.
- c) Floor coating product manufacturers' written maintenance and cleaning instructions.

1.3.1 Quality Assurance

- a) Pre-Application Meeting: Convene a pre-application meeting 2 weeks prior to start of application of floor coating system with required attendance of parties directly affecting work of this section, to include the Owners Representative, Applicator, Architect, and/or Engineer Review the surface preparation, application, cleaning, protection and coordination with other work.
- b) Site Mock-up of full system of no less than 10 ft. x 10 ft. to be approved by owners representative.

1.3.2 Epoxy Slurry Floor Resurfacing System Information

- a) Manufacturer's specifications, brochures and other data needed to prove compliance with the specified requirements.
- b) Manufacturer's preparation and application instructions for all products used with chemical resistance chart for the final topcoat to confirm acceptable protection against any chemical, detergent, oil or fuel that may come in contact with the floor coating system.
- c) Manufacturer's Safety Data Sheets for all product components, solvents and cleaners used.

1.3.3 Joint Sealant Information

- a) Manufacturer's specifications, brochures and other data needed to prove compliance with the specified requirements.
- b) Submit test results confirming joint sealant complies with TABLE Ia
- c) Manufacturer's preparation and application instructions for all products used with chemical resistance chart for the final topcoat to confirm acceptable protection against any chemical, detergent, oil or fuel that may come in contact with the floor coating system.
- d) Manufacturer's Safety Data Sheets for all product components, solvents and cleaners used.

1.3.4 Proposed Work Schedules

- a) Submit detailed sequence of operation that includes intended methods of concrete surface preparation and flooring system application procedures.
- b) Work hours – Contractor shall have 24 hour access to facility during the application process of the floor coating system. Owner shall make access possible due to the necessary recoat window of the individual coating layers.
- c) Contractor shall notify owners representative 10 days prior to actually beginning work allowing the owner time to move portable equipment, planes and supplies from work areas.

SECTION 096723.16 – 5-COAT SYSTEM FUEL RESISTANT RESINOUS FLOORING



1.3.5 Contractor's Qualifications

- a) Contractor to provide at least 2 projects of reference of similar scope, size and coating system type which are not greater than 5 years old but not less than 1 year old to include contact information to the owners representative or general contractor project manager/field superintendent, scope of work including project size, products used, and project city/state. The Contractor understands and accepts that the Owner will discuss the satisfaction and quality of work performed with appropriate contacts related project references at the Owners will.
- b) The Owner reserves the right to make, or send a duly appointed representative to make, a site visit to inspect and evaluate the Contractor's previously installed work.

1.4 DELIVERY AND STORAGE

- a) Deliver materials in sealed, labeled containers bearing the Manufacturer's name, brand designation, batch number, color, and date of manufacture.

1.5 PREPARATION AND INSTALLATION

- a) Comply with the requirements of SSPC PA 3, ICRI CSP 3–5 and the requirements of the Manufacturer's Safety Data Sheets, whichever is more stringent.
- b) Should a concrete cleaning and/or degreasing process be deemed necessary by the Contractor, the Contractor shall use the following prior to mechanically preparation methods (following individual manufacturers product data and application guidelines):
 - a. Oil Removing - Smith's Oil Clean
 - b. Silicate Densifier Removal – Smith's Green Clean Pro
- c) The cleaning solution(s) shall be approved by the Abrasion Resistant Floor Coating System manufacturer as compatible with the Abrasion Resistant Floor Coating System.

1.6 ENVIRONMENTAL CONDITIONS

Application of the Abrasion Resistant Epoxy Slurry Resurfacing Floor Coating System may occur in dry environments within the following surface temperature ranges:

- a) Do not install flooring when temperature is below 50°F or above 95°F, or per Manufacturer's written instruction, whichever is the most stringent.
- b) Do not install flooring within 5 degrees of Dew Point.
- c) This range shall be maintained, 48 hours before, during and 48 hours after installation of flooring.
- d) Properly ventilate work site area where materials are being applied or installed.
- e) Erect suitable barriers and post legible signs at points of entry to prevent all traffic from entering the work area during application and while the floor is curing.
- f) Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor
- g) Substrate must be tested for moisture and pH prior to accepting conditions and proceeding with coating system application. Test concrete in accordance ASTM F1869 or F2170 procedures or visit www.astm.org to purchase the test methods. Testing which occurs in non-acclimated interior environments will void the results. Utilize both ASTM F1869 and F2170 testing methods to determine substrate moisture content, moisture vapor transmission and pH at time of testing prior to determining suitability of substrate and possible other treatments necessary:
 - i. Calcium Chloride testing (ASTM F1869) - readings must be below 3 pounds in accordance with properly testing as well as between 8.5 to 11.5 pH
 - ii. In-situ Relative Humidity testing (ASTM F2170) – readings must be below 75% relative internal concrete humidity

SECTION 096723.16 – 5-COAT SYSTEM FUEL RESISTANT RESINOUS FLOORING



2.1 MATERIALS

2.1.1 Epoxy Primer (7-9 mils) – Smith's Epoxy U100

- a) Percent Solids, ASTM D2369
 - i. 100% solids
- b) Tensile Strength, psi (MPa) to Steel ASTM D4541
 - i. $\geq 4,300$ psi (29.64 MPa)
- c) Volatile Organic Compounds (VOC), ASTM D3960
 - i. ≤ 50 g/L

2.1.2 Epoxy Mortar (TBD mils) – Smith's Epoxy U100 mixed with Fairmont Santrol's Black Lab ¼" Epoxy Trowel Aggregate Blend and Smith's ISC Color Packs

- a) Percent Solids, ASTM D2369
 - i. 100% solids
- b) Impact Resistance, ASTM D3134 and D2794
 - i. Pass
 - ii. 160 in.lbs,- no delamination/chipping
- c) Shore Hardness, ASTM D2240
 - i. 85-90
- d) Compressive Strength, ASTM D695
 - i. $\geq 10,499$ psi (72.39 MPa)
- e) Water Absorption, ASTM D543
 - i. 0.2%
- f) Color
 - i. TBD

2.1.3 Epoxy Grout Coat (8 mils) – Smith's Epoxy GEL150 mixed with Smith's ISC Color Packs

- a) Percent Solids, ASTM D2369
 - i. 100% solids
- b) Impact Resistance, ASTM D3134 and D2794
 - i. Pass
 - ii. 160 in.lbs. – no delamination/chipping
- c) Shore D Hardness, ASTM D2240
 - i. 85-90
- d) Compressive Strength, ASTM D695
 - i. $\geq 13,999$ psi (96.52 MPa)
- e) Flexural Strength, ASTM D790
 - i. $\geq 6,670$ psi (46.0 MPa)
- f) Tensile Strength (Adhesion to Steel), ASTM D4541
 - i. $\geq 3,200$ psi (22.1 MPa)
- g) Volatile Organic Compounds (VOC), ASTM D3960
 - i. ≤ 50 g/L
- h) Abrasion Resistance (Taber Abraser 1,000 cycles, 1,000 gram load, CS-17 Wheel), ASTM D4060
 - i. ≤ 70 mg loss (≤ 0.07 gram loss)
- i) Color
 - i. TBD

SECTION 096723.16 – 5-COAT SYSTEM FUEL RESISTANT RESINOUS FLOORING



- 2.1.4 Chemical Resistant Epoxy Body Coat (10-15 mils)** – Smith's Epoxy U100 with Smith's ISC Color Packs
- a) Percent Solids, ASTM D2369
 - i. 100% Solids
 - b) Impact Resistance, ASTM D3134 and D2794
 - i. Pass
 - ii. 160 in.lbs. – no delamination/chipping
 - c) Shore D Hardness, ASTM D2240
 - i. ≥ 70
 - d) Compressive Strength, D695
 - i. $\geq 13,500$ psi (≥ 93.1 MPa)
 - e) Flexural Strength, ASTM D790
 - i. $\geq 7,977$ psi (≥ 55.0 MPa)
 - f) Tensile Strength (Adhesion to Steel), ASTM D4541
 - i. $\geq 3,625$ psi (25 MPa)
 - g) Volatile Organic Compounds (VOC), ASTM D3960
 - i. ≤ 50 g/L
 - h) Abrasion Resistance (Taber Abraser 1,000 cycles, 1,000 gram load, CS-17 Wheel), ASTM D4060
 - i. ≤ 80 mg loss (≤ 0.08 gram loss)
 - i) Color
 - i. TBD

- 2.1.4 Aliphatic CRU Topcoat (3 mils)** – Smith's Hi-Wear 90S with Smith's ISC Color Packs
- a) Percent Solids, ASTM D2369
 - i. 90% solids
 - b) Pencil Hardness ASTM D6362
 - i. 3H
 - c) Elongation, ASTM D2370
 - i. 6%
 - d) Volatile Organic Compounds (VOC), ASTM D3960
 - i. ≤ 43 g/L
 - e) Abrasion Resistance (Taber Abraser 1,000 cycles, 1,000 gram load, CS-17 Wheel), ASTM D4060
 - i. ≤ 17.5 mg loss (≤ 0.0175 gram loss)
 - f) Gloss, (60 degrees)
 - i. 20-30° Low Sheen
 - g) Water Absorption, ASTM D543
 - i. 0.2%
 - f) Color
 - i. TBD

- 2.1.4 Traction grit** – Smith's Resin Sand 60 grit [OPTIONAL]

SECTION 096723.16 – 5-COAT SYSTEM FUEL RESISTANT RESINOUS FLOORING



2.1.5 Cleaning Solutions

- a) Should a concrete cleaning and/or degreasing process be deemed necessary by the Contractor, the Contractor shall use the following prior to mechanically preparation methods (following individual manufacturers product data and application guidelines):
 - i. Oil Removing - Smith's Oil Clean
 - ii. Silicate Densifier Removal – Smith's Green Clean Pro
- b) The cleaning solution(s) shall be approved by the Abrasion Resistant Floor Coating System manufacturer as compatible with the Abrasion Resistant Floor Coating System.

2.1.6 Conditioning Solutions

- a) Cleaners used for concrete conditioning shall not:
 - i. Generate hazardous waste using EPA criterion. Unbuffered solutions containing hydrochloric, sulfuric, phosphoric, muriatic or other acids are not acceptable for this purpose.
 - ii. Shall not produce acidic or other corrosive vapors which cause or have the potential to cause surface rust or "flash" rust on exposed metal in the work area.
- b) The final topcoat shall provide resistance to chemical spills, with no affect or a limited adverse effect from exposure to: battery acids, citric or acetic acids, alkaline cleaning solutions, JP4, gasoline, aromatic solvents, and miscellaneous chemicals such as chlorine bleach, SAE #20, brake fluid, Skydrol 500B, hydraulic fluid, tire marking/staining, and ethylene glycol.

2.1.6 Other Materials

- a) All other materials required to complete the contract shall be furnished by the Contractor.

PART 3 - EXECUTION

3.01 Examination

- a) Examine concrete surface to receive floor coating system. Notify the Owner or Architect if surface is not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.
 - i. Allow new concrete sections to cure a minimum of 30 days for every 1 inch in thickness. A moisture remediation primer may be used to meet the manufacturer's moisture guidelines.
 - ii. Moisture Testing – Refer to section 1.6.e
 - iii. CHECK THE TEMPERATURE AND HUMIDITY: Floor temperature and materials should be between 65°F (18°C) and 90°F (32°C). Ambient Humidity must be less than 80%. **DO NOT** coat unless floor temperature is more than five degrees over the dew point.

NOTE: Moisture testing is crucial but must be performed correctly in a properly acclimated environment. Moisture testing is not a guarantee against future problems as the test results can only depict conditions at the time testing occurs. A lack of or punctured under concrete slab moisture vapor barrier and/or suspected concrete contamination from chemical, oils and/or excessive salts as well as reactive alkaline aggregates in the concrete itself could manifest future problems.

SECTION 096723.16 – 5-COAT SYSTEM FUEL RESISTANT RESINOUS FLOORING



3.02 Preparation

- a) Prepare surface in accordance with manufacturer's instructions.
 - i. Cleaning:
 - 1) Scrub floor with Auto Scrubber, non-oil based degreaser/detergent and rinse with clean water to remove surface dirt, grease and oil. (See Section 2.1.5)
 - ii. Preparation:
 - 1) Mechanical - Achieve a CSP 3 to 5 (Concrete Surface Profile) in accordance with ICRI Guideline 310.2R2013, as published by the International Concrete Repair Institute) yielding a surface texture similar to 80 grit sand paper or more course in order to maintain long term adhesion to the substrate
 - 2) Methods:
 - **Diamond Grind**: Use soft bond 16 to 40 grit metal bond diamonds with an appropriate industrial, weighted head floor grinder attached to an appropriate HEPA filtered vacuum to thoroughly remove the concrete surface until uniformly white. This method is the least aggressive and should only be considered for smooth, non-contaminated new concrete preparation or for removal of existing floor coating systems.
 - **Steel Shot Blast (Shot size S-230 grit recommended)**: Uniformly profile and clean concrete substrates overlapping each pass by at least 1/2" until white, clean concrete exists. Use magnetic broom to remove excess shot, sweep to remove large debris and vacuum to remove fine dust. Avoid stationary blasting as micro-cracking the concrete surface may potentially causing future coating delamination.
 - 3) Edge Diamond Grinding necessary around fixed equipment, perimeters, drains, anchor points, walls and other hard to reach or difficult areas for larger equipment
 - 4) Repair all cracks and joints with an appropriate semi-rigid crack/joint filler such as Smith's Poly JF, Metzger/McGuire MM-80 or similar

3.03 APPLICATION

- a) Apply floor coating system in accordance with manufacturer's instructions.
- b) Equipment: Flat squeegee, Mortar Box, Epoxy Power-Trowel, Finishing Trowels, 1/16" V-Notched squeegee or Gauge Rake (body coat), 3/8" Mohair 18" wide roller covers with 18" wide Roller Frames attached to extension poles, 1/2" low speed drills (650 rpm max.), mixing paddles, painters tape, 7" diameter angle grinder with vacuumized shroud, vacuums, 1/8" wide diamond blade on a 4 1/2" or 7" angle grinder for keys cutting and crack chasing as well as other miscellaneous tools.
- c) Prior to installation of the floor coating system, the Contractor shall patch or otherwise repair concrete surface imperfections greater than 1/2" in depth by 1/2" in width such as bolt holes, pop outs, spalls, deteriorated cracks and joints, etc. using Smith's Epoxy GEL150, Smith's Epoxy GEL150/FC, or Smith's Poly PCF-45. Please contact manufacturer for recommendations for resurfacing excessive surface irregularities
- d) Primer Coat: 100% solids, pigmented epoxy at a rate of 175-225 ft²/gal.
- e) Epoxy Mortar: aggregate filled 100% solids, pigmented chemical resistant epoxy mortar at a rate of (TBD depending on need).
- f) Grout Coat: 100% solids, Thixotropic pigmented epoxy at a rate of 200 ft²/gal.
- g) Body Coat: 100% solids, pigmented Chemical Resistant epoxy at a rate of 107-160 ft²/gal.
- h) Topcoat: **Low Sheen** finish pigmented Aliphatic Chemical Resistant Polyurethane topcoat at a rate of 500-550 ft²/gal. [OPTIONAL - with 60 Grit Resin Sand either mixed into the topcoat]. *NOTE: Topcoat the epoxy within 24 hours at minimum of 70°F (21°C) and 50% relative humidity, otherwise, the epoxy must be scuffed prior to Urethane topcoat.*

SECTION 096723.16 – 5-COAT SYSTEM FUEL RESISTANT RESINOUS FLOORING



3.1 PROTECTION

- a) Close job site to traffic to allow coating to dry 24 hours at 72°F (24 degrees C) and 50% Ambient relative humidity for light foot traffic for a minimum 48 hours for vehicle traffic. Cooler temperature will require significantly no longer times and should allow for up to 72 hours cure prior to vehicle traffic depending on temperature.
- b) Wait a minimum of 3 days before exposing to water, mechanical cleaning equipment and neutral detergents. Only dust mopping for the first 3 days to allow the topcoat to achieve appropriate chemical and abrasion resistant. Failure to do so may cause etching and surface damage.
- c) The Contractor is responsible for leaving the work area free of all debris generated by the Contractor's work and is responsible for a final cleanup after the work is complete. Contractor shall return the area receiving work in the same or better condition of cleanliness as existed when received by the Contractor
- d) Protect all surfaces and items that do not receive work. These surfaces and items shall be restored to original condition after work is complete

- - END OF SECTION - -