

DIVISION 9: FINISHES

SECTION 09 05 61.13

MOISTURE VAPOR EMISSION CONTROL

16-mil Epoxy Moisture Vapor Remediation System

PART 1 GENERAL

1.1 SUMMARY

- A. Description: 16-mil 100% Active Solid Epoxy Moisture Vapor Remediation System

1.2 RELATED SECTIONS INCLUDE

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.
- B. Other Related Sections
1. Section 03 30 00: Cast-in-Place Concrete.
 2. Section 03 39 00: Concrete Curing.
 3. Section 07 95 00: Expansion Control.
 4. Section 09 62 00: Specialty Flooring.
 5. Section 09 64 00: Wood Flooring.
 6. Section 09 65 00: Resilient Flooring.
 7. Section 09 67 00: Fluid Applied Flooring.
 8. Section 09 68 00: Carpeting.

1.3 REFERENCE STANDARDS (MUST USE CURRENT VERSIONS ONLY)

- A. ASTM F3010: Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Covering
- B. ASTM D7234: Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
- C. ASTM C1583: Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)
- D. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- E. ICRI Guide 310.2R Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair
- F. RFCI Recommended Work Practices for the Removal of Resilient Floor Coverings

1.4 SUBMITTALS

- A. Product Data: Submit Manufacturer's data sheets and supporting information for each product and process specified including:
1. Approved Applicator
 2. Completed Jobsite Checklists and Reports (kretus.com/pre-and-post-job-checklists)
 3. Certificate of Compliance (quality control document for the goods specified herein)
 4. Technical Data Sheets (kretus.com/technical-data-sheets)
 5. Safety Data Sheets (kretus.com/safety-data-sheets)
 6. Installation Guides (kretus.com/installation-guides)
 7. Maintenance and Cleaning Guide (kretus.com/project-planning)
 8. Warranty Information

- B. Samples: A 12-inch square sample of the proposed system. Color, texture, and thickness shall be representative of the overall appearance of the finished system as described in section 1.1A.
- C. Test reports of cured products showing VOC Emission compliance with USGBC LEED Version 4, performed according to California Dept. of Public Health CDPH/EHLB/Standard Method V1.2.

1.5 VERIFIED SAMPLES WITH MOCKUPS

- A. Must be a minimum of 50 SF unless otherwise specified by the Manufacturer or Architect.
- B. Must employ the same materials, tools, and preparation methods used in the project installation.
- C. Product direct-to-concrete adhesion needs to be verified per ASTM D7234 (or ASTM C1583 if using approved alternative). Before proceeding with the installation, the results must be greater than 200 psi with concrete failure. The Manufacturer reserves the right to request additional mockup and adhesion pull tests.

1.6 QUALITY ASSURANCE

- A. Materials used must be manufactured, approved, and distributed by KRETUS® (info@kretus.com, 714-694-2061, kretus.com). No other parties shall be allowed without written approval.
- B. Manufacturer shall have a minimum of 15 years' experience in the production, sales, technical, and installation of material submitted as part of this specification.
- C. Manufacturer may provide a trained installation professional with knowledge of each product listed herein or any material that has been specified or provided.
- D. Manufacturer-trained professional Applicator. The Approved Applicator named must have no less than five years' experience with similar projects and complexity and be capable of handling installations of similar nature in all phases: surface preparation, application of the product, finishing procedure, safety, and work ethic.
- E. Submittal of a recorded (meeting minute submitted) pre-installation conference held between the Applicator, General Contractor, Facility Owner, Manufacturer or Manufacturer Representatives, Designer, Architect, and any responsible parties discussed for clarification of this specification and all supporting documents relating to this specification or the project itself.
- F. If concrete slabs have a history of existing floor failures, identify the cause of failure. Identifying the cause(s) may require core samples to be taken and to be analyzed by a qualified laboratory. The Manufacturer must be consulted for core extraction procedures and results.

1.7 WARRANTY

- A. The Manufacturer shall provide its standard materials warranty.
- B. Approved Applicator shall furnish a warranty for workmanship.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping
 - 1. All components of the system delivered to the site shall be clearly marked with the product name and batch number, free of damage, and in the original Manufacturer's packaging.
 - 2. All product safety data sheets, bills of lading, and any dangerous goods declaration documents must be included with product and project documents.
- B. Storage and Protection
 - 1. The jobsite shall provide a storage location for all components. The area shall be clearly marked, dry, out of direct sunlight and inclement weather, free of obstruction, and kept between 60°F and 80°F.

2. Copies of Safety Data Sheets (SDS) for all components shall be kept on site for review by the EH&S, department of health, or responsible party.
- C. Waste Disposal
1. There shall be adequate disposal on the jobsite for non-hazardous waste generated during the project.
- D. Handling
1. All Safety Data Sheets shall always be adhered to.
 2. All materials are to be treated as dangerous substances without firsthand knowledge. No untrained personnel shall touch, relocate, or use the materials without proper training or supervision.
 3. No congregating, eating, smoking, or drinking of any kind is allowed on or near the materials.

1.9 FIELD CONDITIONS

- A. If any of the following requirements are not met, the Manufacturer must be consulted before the installation begins.
- B. Site Requirements
1. The installation may proceed only when the ambient relative humidity of the site is less than 85%, the temperatures of the air, material, and substrate are between 40°F and 90°F, and the substrate temperature is at least 5°F above the dew point.
 2. The site shall be free of other trades during and, for a period of 24 hours, after installation.
 3. The Approved Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.
 4. The Approved Applicator shall ensure that the site is properly ventilated and shall provide its own power and any necessary equipment to get the job done correctly and in a timely manner.
- C. Safety Requirements
1. All open flames and spark-producing equipment shall be removed from the work area prior to the commencement of installation.
 2. "No Smoking" signs shall be posted at the entrances to the work area.
 3. The Facility Owner shall be responsible for the removal of foodstuffs from the work area.
 4. Non-related personnel in the work area shall be kept to a minimum.
- D. Existing Concrete Substrate Requirements
1. Measure compressive strength according to ASTM C805. Acceptable results: $\geq 3,000$ psi.
 2. Measure pH according to Test Method ASTM F710. Acceptable Results: 8-14.
 3. Coatings will not properly bond to contaminated concrete. Excessively weak, soft, dusty, cracked, or uneven surfaces may not be suitable substrates for installation. Before the system can be installed, additional testing and concrete surface removal or patching may be required.
 4. If contamination is present or suspected, test and evaluate the concrete. Acceptable methods include but are not limited to petrographic examination according to ASTM C856 and solvent extraction to analyze compounds that may affect the coating's ability to bond.
 5. The Facility Owner, Engineer, and/or General Contractor must be notified and advised of potential additional costs of testing to meet Manufacturer specifications.
- E. Moisture Testing Requirements
1. Do not install moisture control system if substrate testing reveals unacceptable conditions.
 2. Perform anhydrous calcium chloride test, ASTM F1869-98. The installation may proceed only when the MVER (moisture vapor emission rates) is less than or equal to 25 lbs./1,000 SF/24 hrs.
 3. Perform RH (relative humidity) test using in situ probes, ASTM F2170. The installation may proceed only when the RH level is less than or equal to 99%.
 4. If vapor emission exceeds the Manufacturer's specified RH or MVER requirements, the Facility Owner, Engineer, and/or General Contractor must be notified of potential additional costs to lower moisture values to meet Manufacturer's specifications.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. KRETUS® Inc., 1055 W. Struck Ave, CA 92867 (info@kretus.com, 714.694.2061, kretus.com).

2.2 MATERIALS REQUIRED FOR SYSTEM SPECIFIED

- A. MVR COAT: 16-mil 100% Active Solids Epoxy Moisture Vapor Remediation
1. KRETUS® TOP SHELF® EPOXY MVR made with CR-RESIN is a low odor, 100%-solids, 2-component system that can be adapted to meet changes in weather and climate. Based on recommended application temperatures, the Approved Applicator may select from the following components with no adverse effect on physical and mechanical properties of the coating when fully cured:
 - a. MVR-EZ: 60-95°F, <90% RH
 - b. MVR-FC: 41-77°F, <90% RH
- B. APPROVED ALTERNATIVE MVR COAT: 1/8" or 1/4" Urethane Polymer Concrete Self-Leveler Moisture Vapor Remediation for concrete that requires a deeper fill and leveling of surface imperfections
1. KRETUS® URETHANE POLYMER CONCRETE SL is a low odor, 100%-solids, 3-component system that can be adapted to meet changes in weather and climate. Based on recommended application temperatures, the Approved Applicator may select from the following components with no adverse effect on physical and mechanical properties of the coating when fully cured:
 - a. EZ: 60-90°F, <80% RH
 - b. AP: 40-80°F, <70% RH
 - c. FC: 40-80°F, <45% RH

2.3 PRODUCT REQUIREMENTS

A. MVR COAT

PHYSICAL PROPERTIES	TEST METHOD	TYPICAL VALUES
Adhesion Strength	ASTM D4541	400 psi, concrete failure
Compressive Strength	ASTM D695	13700 psi
Tensile Strength	ASTM D638	7800 psi
Tensile Elongation at Break	ASTM D638	5%
Flexural Strength	ASTM D790	9000 psi
Modulus of Elasticity	ASTM D790	5.0 x 10 ⁵ psi
Thermal Coefficient of Linear Expansion	ASTM D696	18.0 x 10 ⁻⁶ in/in/°F
Impact Resistance	ASTM D2794	120 in-lbs.
Abrasion Resistance	ASTM D4060	40 mg loss
Water Absorption	ASTM D570	<0.05%
Hardness (Shore D)	ASTM D2240	85
Moisture Vapor Permeance	ASTM E96	0.08 perms
Indoor Air Quality	CA 01350	Compliant
Microbial Resistance	ASTM G21	Passes, 0 growth
Flame Spread/ Critical Flux	ASTM E648	Class 1
Flame Spread/ Rate of Burning	ASTM D635	Self-extinguishing

B. APPROVED ALTERNATIVE MVR COAT

PHYSICAL PROPERTIES	TEST METHOD	TYPICAL VALUES
Adhesion Strength	ASTM D4541	>500 psi, concrete failure
Compressive Strength	ASTM C579	7000 psi
Tensile Strength	ASTM C307	2000 psi
Flexural Strength	ASTM C580	2700 psi
Flexural Modulus of Elasticity	ASTM C580	3.5 x 10 ⁶ psi
Thermal Coefficient of Linear Expansion	ASTM C531	2.0 x 10 ⁻⁵ in/in/°F
Linear Shrinkage	ASTM C531	0.20%
Impact Resistance	ASTM D2794	>160 in-lbs.



THOUGHTFULLY DESIGNED COATINGS

Abrasion Resistance	ASTM D4060	70 mg loss
Water Absorption	ASTM C413	<0.10%
Hardness (Shore D)	ASTM D2240	80
Moisture Vapor Permeance	ASTM E96	0.15 perms
Thermal Shock Resistance	ASTM C484	50 cycles, no cracking
Indoor Air Quality	CA 01350	Compliant
Microbial Resistance	ASTM G21	Passes, 0 growth
Flame Spread/ Critical Flux	ASTM E648	Class 1
Flame Spread/ Rate of Burning	ASTM D635	Self-extinguishing

2.4 RELATED MATERIALS

- A. Repair Materials: Use these products to repair surface imperfections before installation.
1. Shallow fill/patching (<1/4" deep)
 - a. KRETUS® TOP SHELF® EPOXY
 - b. KRETUS® URETHANE POLYMER CONCRETE SL
 2. Deep fill/patching (>1/4" deep)
 - a. KRETUS® TOP SHELF® EPOXY PATCH
 - b. Combine 64 oz of KRETUS® TOP SHELF® EPOXY Part A, 32 oz KRETUS® TOP SHELF® EPOXY Part B, and 40-50 lbs. of 30-mesh Manufacturer-approved clean, kiln-dried sand.
 - c. Combine standard 41-lb. kit of KRETUS® URETHANE POLYMER CONCRETE SL with 25-30 lbs. of 30-mesh Manufacturer-approved clean, kiln-dried sand.
 - d. Combine standard 56-lb. kit of KRETUS® URETHANE POLYMER CONCRETE MF with 10-15 lbs. of 30-mesh Manufacturer-approved clean, kiln-dried sand.
- B. Joint and Crack Fill Materials: Use these materials after installation.
1. Saw Cut Contraction/Construction Joint Filler and Crack Filler
 - a. KRETUS® POLY PATCH (indoor only)
 - b. KRETUS® TOP SHELF® EPOXY PATCH
 - c. Combine 64 oz of KRETUS® TOP SHELF® EPOXY Part A, 32 oz KRETUS® TOP SHELF® EPOXY Part B, and 40-50 lbs. of 30-mesh Manufacturer-approved clean, kiln-dried sand.
 - d. Combine standard 41-lb. kit of KRETUS® URETHANE POLYMER CONCRETE SL with 25-30 lbs. of 30-mesh Manufacturer-approved clean, kiln-dried sand.
 - e. Combine standard 56-lb. kit of KRETUS® URETHANE POLYMER CONCRETE MF with 10-15 lbs. of 30-mesh Manufacturer-approved clean, kiln-dried sand.
 2. Color to match adjacent finished surfaces.
- C. Prime Coat: Required when concrete is very porous, in poor condition, or when outgassing is suspected or prevalent.
1. Under MVR COAT
 - a. KRETUS® TOP SHELF® EPOXY: Apply with flat rigid blade and 3/8" non-shed nap roller. (Yields 300 SF per gallon.)
 2. Under APPROVED MVR COAT ALTERNATIVE
 - a. KRETUS® URETHANE POLYMER CONCRETE RC: Apply with 5-7 WFT-mil blade and 3/8" non-shed nap roller. (Yields 330-450 SF per 18-lb kit.)
- D. Application Tools
1. cove trowel
 2. trowel
 3. Frame & Clamp for blades: Midwest Rake Easy Squeegee™ Frame & Clamp, 26"
 - a. flat flexible blade: Midwest Easy Squeegee™ Blade, 26" Flat/Flexible M0 D65
 - b. flat rigid blade: Midwest Rake Easy Squeegee™ Blade, 26" Flat/Stiff M0 D65
 - c. 5-7 WFT-mil blade: Midwest Rake Easy Squeegee™ Blade, 26" Scalloped M5-7 D65
 - d. 15-20 WFT-mil blade: Midwest Rake Easy Squeegee™ Blade, 26" V Notch M15-20 D65 3/16" x 3/32"
 4. 1/2" wide x 3/8" deep V-notched squeegee: Midwest Rake Speed Squeegee HD™, 24", (46-55 Mil), Gray Rubber

5. gauge rake: CAM Gauge Rake, 36 Inch head
 - a. Size 2 CAM: CAM Set, Size 2, 3 Settings, 1/8 Inch (2 PK)
 - b. Size 3 CAM: CAM Set, Size 3, 3 Settings, 3/16 Inch (2 PK)
 6. 3/8" non-shed nap roller: Pro/Doo-Z Roller Cover, 18", 3/8" nap
 7. loop roller: Loop Roller Cover, 18 Inch (12 PK)
 8. spiked roller: Midwest Rake 1/2" Super Sharp Nylon Spiked Roller, 36 Inch
- E. All other materials must be manufactured or approved by KRETUS® (info@kretus.com, 714-694-2061, kretus.com).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Coordinate with adjacent trades to ease construction process.
- B. Verify project site conditions under Section 01 00 00.
- C. Before starting installation, correct all unsatisfactory conditions.

3.2 SURFACE PREPARATION

- A. Prevent damage to substrate during preparation.
- B. Mechanically prepare concrete to ICRI CSP 3. Required CSP may vary based on the condition of concrete. Always adhere to International Concrete Repair Institute's current standards.
- C. Shotblast with mobile steel shot and dust recycling machine using a 50/50 blend of 290/330 shot. Remove steel shots with MAG-Broom and remove any leftover dust, debris, and loose particles using a dust collector vacuum with wand adapter. If using a small 110V shot-blaster, this step may need to be repeated several times by cross-blasting.
- D. Edge Grinding: Grind all edges using an adjustable speed grinder to ensure all edges are clear of paints, sealers, and contaminants. Do not grind at high speed, as this may smooth out pores of the concrete and does not allow system to properly adhere to substrate.
- E. Cleaning and Dust Removal: Wear shoe covers. Remove all leftover dust and any loose particles by using dust collector. Completely remove all existing coatings, oil, water, adhesives, dust, debris, and other substances that may impede system's adhesion.

3.3 MIXING

- A. Follow Manufacturer's printed instructions. Careful measurements and thorough mixing are essential for a proper cure.
- B. Review KRETUS® Mixing Station Guide for general handling, storage, and preparation procedures.

3.4 SYSTEM INSTALLATION

- A. General
 1. It is essential to read and understand all Manufacturer instructions, guidelines, application methods, and the proper use of all application equipment.
 2. The system shall follow the contour of the substrate unless the Architect has specified pitching or other leveling work.
 3. Immediately prior to the application of any part of the system, the surface prepared shall be clean, dry, free of any contaminations, and any remaining dust or loose particles shall be removed using a vacuum.
 4. The handling, mixing, and addition of components shall be performed in a safe manner to achieve the desired results in accordance with experiences of the materials and working condition.

5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. MVR COAT

1. Apply coating with 15-20 WFT-mil blade and 3/8" nap non-shed roller. Yields 100 SF per gallon.

C. APPROVED ALTERNATIVE MVR COAT

1. Apply coating with gauge rake with Size 2 CAM. Smooth with loop or spiked roller. Yields 5060 SF per standard 41-lb kit.
2. Apply coating with gauge rake with Size 3 CAM. Smooth with loop or spiked roller. Yields 35-40 SF per standard 41-lb kit.

3.5 JOINT CUTTING, PREPARATION, AND FILLING

A. Follow Manufacturer preparation and application guidelines.

B. Coatings tend to pull away from free edges, termination points (anywhere concrete ends), joints, cracks, gutters, and drains. Anchor joints may need to be added 6" from termination points. Joints and cracks may need to be expanded to 2x the width and 1x the depth. Edges around drains and gutters may need a deeper slope.

C. Honor all existing joints. Locate original joint locations and sawcut through coating into the original joint. Saw blade must penetrate to the depth of the original joint or 2" deep, whichever is smaller. Prefill joints greater than 2" deep.

D. Ensure sawcut joint is completely free of dust/debris/laitance.

E. Avoid trapping air when installing joint filler: Fill joint from bottom to top. Slightly overfill to a crowned profile. After sufficient cure, shave excess filler. Filler profile should be flush with floor surface when dry. If filler profile is low/concave, remove top 1/2" of filler and re-apply.

3.6 FIELD QUALITY CONTROL

A. The following tests and reporting shall be conducted by the Approved Applicator:

1. condition of the area being installed
2. temperature: date, time, air temperature, concrete surface temperatures, dew point
3. product installed and coverage rates
4. batch number of all materials
5. project report shall be submitted upon completion of the work

B. Adhesion tests of primer coat to the concrete per ASTM D7234 (or ASTM C1583 if using approved alternative method) must show substrate failure with a minimal pull of 200 psi.

C. Replica of the system as installed must be provided to Manufacturer for approval and warranty.

D. Facility Owner reserves the right to invoke material testing procedures at any time and any number of times during the application process.

E. Facility Owner may engage service of an independent testing laboratory to sample materials being used on the jobsite. Samples of material may be taken, identified, and certified in the presence of the Approved Applicator.

3.7 CLEANING, CURING, AND PROTECTION

A. Cleaning

1. Perform detailed cleaning at floor termination to leave a cleanable surface for subsequent work of other sections.
2. Remove any spillage of cured and uncured materials from the site with a suitable solvent. Dispose of any temporary floor covering and leftover materials in accordance with federal, local, and building requirements.

B. Curing and Protection

1. After completion of an application, do not allow traffic on coated surfaces for a period of 24 hours.
2. Allow material to cure in compliance with Manufacturer instructions, taking care to prevent contamination during the installation and curing process.
3. "Return to Service" means the system can be walked on. However, typical resinous coatings require 7 days at 70°F to reach full cure. During this period, standing water, caustic chemicals, cleaning, or heavy traffic should be avoided as it may cause permanent damage to the finish.

END OF SECTION