

DIVISION 9: FINISHES
SECTION 09 05 61.13
MOISTURE VAPOR EMISSION CONTROL
SECTION 09 65 36
STATIC-CONTROL RESILIENT FLOORING
35-mil ESD TS System with TS Top Coat

PART 1 GENERAL

1.1 SUMMARY

- A. Description: 35-mil ESD System with Epoxy Moisture Vapor Remediation and an Epoxy Top Coat.

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.

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 C1583: Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)
- C. ASTM D7234: Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
- D. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- E. ASTM F3010: Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Covering
- F. ANSI/ESD S20.20: Electrostatic Discharge Standard
- G. ANSI/ESD S7.1: Floor Materials - Resistive Characterization of Materials
- H. ANSI/ESD STM 97.1: Floor Materials and Footwear - Resistance in Combination with a Person
- I. ANSI/ESD STM 97.2: Floor Materials and Footwear - Voltage measurement in Combination with a Person.
- J. ICRI Guide 310.2R Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair
- K. RFCI Recommended Work Practices for the Removal of Resilient Floor Coverings, Resilient Floor Covering Institute

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 overall appearance of 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.
- D. Moisture tests: Follow Manufacturer's Pre-Job Checklist for Concrete Testing. An independent Testing Agency shall perform testing. Provide all moisture test results to the Architect, Facility Owner, General Contractor, and Manufacturer. Additional testing may be required at the discretion of Manufacturer.

1.5 VERIFIED SAMPLES WITH MOCKUPS

- A. Must be minimum of 50 SF unless otherwise specified by Manufacturer or Architect.
- B. Must employ same materials, tools, and prep methods to be used in project installation.
- C. Product Testing
 - 1. All testing required by End User specifications (if any).
 - 2. Direct to concrete adhesion per ASTM D7234. Acceptable results: >200 psi with concrete failure before proceeding with the installation.
 - 3. Static resistance qualities per ANSI/ESD S7.1. Acceptable results: Between >10⁴ and <10⁹ ohms.
- D. Manufacturer reserves the right to request additional mockups and testing.

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 shall provide a trained installation professional onsite with knowledge of each product listed herein or any material that has been specified or provided.
- D. Manufacturer-trained professional Applicator. Approved Applicator named must be capable of handling application of similar nature in all phases: surface preparation, application of the product, finishing procedure, safety, and work ethic for not less than five years of similar projects or complexity.
- E. A recorded (minutes submitted) pre-installation conference meeting between Applicator,



General Contractor, Facility Owner, Material Manufacturer Representative, Designer, Architect, and any responsible party shall be held to discuss and review this specification and any supporting documents relating to this specification or the project itself.

1.7 WARRANTY

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

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping
 - 1. All components of the system shall be delivered to the site in the original Manufacturer's packaging, clearly identified, non-tampered with, and clearly marked with product type and batch number.
 - 2. Product safety data sheets, bill of lading, any dangerous goods declaration documents.
- B. Storage and Protection
 - 1. The jobsite shall provide a location for storage of all components. The area shall be between 60°F and 80°F, dry, out of direct sunlight, free of obstruction, and clearly marked.
 - 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 jobsite for non-hazardous waste generated during installation of the system.
- D. Handling
 - 1. All Safety Data Sheets shall be adhered to at all times. No untrained personnel shall touch, relocate, or use the materials without proper training or supervision. No congregating, eating, smoking, or drinking of any kind allowed on or near the materials. All materials are to be treated as dangerous substances without firsthand knowledge.

1.9 FIELD CONDITIONS

- A. Site Requirements
 - 1. Application may proceed while air, material, and substrate temperatures are between 40°F and 90°F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
 - 2. The ambient relative humidity in the specific location of the application shall be less than 85% and the surface temperature shall be at least 5°F above the dew point.
 - 3. The Applicator shall ensure that adequate ventilation is available for the work area.
 - 4. The Applicator shall be supplied with lighting that is equal to the final lighting level during their preparation and installation of the system.
 - 5. Applicator shall provide their own power or any necessary equipment to get the job done correctly and in a timely manner.
 - 6. Job area shall be free of other trades during and, for a period of 24 hours, after installation.
- B. Safety Requirements
 - 1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
 - 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.
- C. Existing concrete substrates must have
 1. $\geq 3,000$ psi compressive strength when measured according to ASTM C805.
 2. 8-14 pH when measured according to ASTM F710.
- D. Moisture Testing Requirements
 1. Follow Manufacturer's Pre-Job Checklist for Concrete Testing.
 2. Perform anhydrous calcium chloride test, ASTM F1869. Application will 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 F 2170. Application will proceed only when the RH level is less than or equal to 99%.
 4. If MVER or RH exceed requirements, then Owner, Engineer, and/or General Contractor must be notified and advised of any additional costs for a self-leveling underlayment moisture mitigation or any other means to lower values to a level approved by the Manufacturer.
 5. Do not install the system if substrate testing reveals unacceptable conditions.
- E. Concrete Contamination: Coatings will not properly bond to contaminated concrete. Excessively weak, soft, dusty, cracked, or uneven surfaces may require additional testing, removal, or patching before the system can be installed.

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

- A. Color(s) determined by Architect/Facility Owner
- B. Top coat texture is to be determined by KRETUS® Technical Representative and based on system requirements. Recommended textures include
 1. 50/50 blend of KRETUS® Anti-Slip Bead 50 and Anti-Slip Bead 100
- C. Epoxy MVR Coat
 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
- D. Conductive Primer
 1. KRETUS® WB Conductive Primer is a water-based, 2-component epoxy system.
 - a. Recommended Application Temperature: 55-85°F, <90% RH
- E. ESD Top Coat
 1. KRETUS® Top Shelf® Epoxy made with A-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. EZ: 60-110°F, <90% RH
 - b. AP: 60-95°F, <90% RH

- c. FAST: 41-85°F, <90% RH
- 2. KRETUS® ESD Additive
- 3. Texture: See 2.2.B.
- 4. KRETUS® Top Shelf® Epoxy Colorant: to be determined by Architect

2.3 PRODUCT REQUIREMENTS

A. Epoxy MVR Coat

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

B. Conductive Prime Coat

PROPERTIES	TEST METHOD	TYPICAL VALUES
Adhesion Strength	ASTM D4541	400 psi, concrete failure
Adhesion Strength	ASTM D4541	500 psi, natural quartz failure
Body Voltage Generation	ANSI STM97.2, with footwear	<15 volts
Compressive Strength	ASTM D695	>9,000 psi
Resistance After Top Coat	ANSI S7.1	>10 ⁴ and <10 ⁹ ohms
Resistance Before Top Coat	ANSI S7.1	10 ⁰ -10 ³ ohms
Flame Spread/Critical Flux	ASTM E648	Class 1
Flame Spread/Rate of Burning	ASTM D635	Self-extinguishing
Hardness (Shore D)	ASTM D2240	75-80
Impact Resistance	ASTM D2794	120 in-lb
Indoor Air Quality	CA 01350	Compliant
Microbial Resistance	ASTM G21	Passes, 0 growth
Tensile Elongation at Break	ASTM D2370	10%
Tensile Strength	ASTM D2370	3,250 psi
Water Absorption	ASTM D570	<0.05%

C. ESD Top Coat

PROPERTIES	TEST METHOD	TYPICAL VALUES
Abrasion Resistance with Anti-Slip	ASTM D4060	24–30 mg
Adhesion Strength	ASTM D4541	400 psi, concrete failure
Adhesion Strength	ASTM D4541	500 psi, natural quartz failure
Body Voltage Generation	ANSI STM97.2, with footwear	<15 volts
Compressive Strength	ASTM D695	13,700 psi
Resistance	ANSI S7.1	>10 ⁴ and <10 ⁹ ohms
Flame Spread/Critical Flux	ASTM E648	Class 1
Flame Spread/Rate of Burning	ASTM D635	Self-extinguishing
Flexural Strength	ASTM D790	9,000 psi
Hardness (Shore D)	ASTM D2240	85
Impact Resistance	ASTM D2794	120 in-lb
Indoor Air Quality	CA 01350	Compliant
Microbial Resistance	ASTM G21	Passes, 0 growth
Modulus of Elasticity	ASTM D790	5.0 x 10 ⁵ psi
Tensile Elongation at Break	ASTM D2370	5%
Tensile Strength	ASTM D2370	7,800 psi
Thermal Coefficient of Linear Expansion	ASTM D696	18.0 x 10 ⁻⁶ in/in/°F
UV Resistance	ASTM D4587	Low (Level 1)
Water Absorption	ASTM D570	<0.05%

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. 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.
 - b. Combine standard 41-lb. kit of KRETUS® Urethane Polymer Concrete SL with 25-30 lbs. of 30-mesh Manufacturer-approved clean, kiln-dried sand.
 - c. 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 Joint Filler (indoor only)
 - b. KRETUS® Top Shelf® Epoxy EZ 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. All other materials, including those applied over the Moisture Vapor Remediation System, must be manufactured by or approved for use 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 the 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 APPLICATION

- A. General
 - 1. Follow Manufacturer's printed instructions.
 - 2. Materials shall be applied in 3 distinct steps:
 - a. Epoxy MVR Coat
 - b. Conductive Prime Coat
 - c. ESD Top Coat
 - 3. It is essential to read through and understand all Manufacturer application guidelines and its methods and the proper use of the application equipment.
 - 4. 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.
 - 5. 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.
 - 6. The system shall follow the contour of the substrate unless the Architect has specified pitching or other leveling work.
 - 7. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.
- B. Grounding: Coordinate with a certified electrician to ensure all copper grounds are attached

to the common ground before installing ESD Topcoat.

- C. Application Tools
 - 1. **Frame & Clamp for Easy Squeegee™ blades:** Jon-Don Part # SQ-MR78256-EA, Midwest Rake Easy Squeegee™ Frame & Clamp 26"
 - a. **5-7 WFT-mil blade:** Jon-Don Part # SQ-MR79857-EA, Midwest Rake Easy Squeegee™ Blade, 26" Scalloped M5-7 D65
 - b. **8-12 WFT-mil blade:** Jon-Don Part # SQ-MR79860-EA, Midwest Rake Easy Squeegee™ Blade, 26" Scalloped M8-12 D65
 - c. **15-20 WFT-mil blade:** Jon-Don Part # SQ-MR79863-EA, Midwest Rake Easy Squeegee™ Blade, 26" V Notch M15-20 D65 3/16" x 3/32"
 - 2. **3/8" non-shed nap roller:** Jon-Don Part # RC-WOR64218-EA, Pro/Doo-Z Roller Cover, 18", 3/8" nap
- D. Epoxy MVR Coat
 - 1. Mix application according to manufacturer's instructions.
 - 2. Apply coating with 15-20 WFT-mil blade and 3/8" non-shed nap roller (yields 100 SF/gal).
- E. Conductive Primer
 - 1. Mix application according to manufacturer's instructions.
 - 2. Apply coating with 5-7 WFT-mil blade and 3/8" non-shed nap roller (yields 233 SF/gal).
- F. ESD Top Coat
 - 1. Mix application according to manufacturer's instructions.
 - 2. Apply coating with one of the following methods:
 - a. 5-7 WFT-mil blade and 3/8" non-shed nap roller (yields 233 SF/gal).
 - b. dip-and-roll method using 3/8" non-shed nap roller (yields 400 SF/gal).

3.5 JOINT CUTTING, PREPARATION, AND FILLING

- A. Coatings tend to pull away from free edges, termination points (anywhere concrete ends), joints, cracks, gutters, 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.
- B. 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.
- C. Ensure sawcut joint is completely free of dust/debris/laitance.
- D. Avoid trapping air when installing joint filler. Fill joint from bottom to top.
- E. Slightly overfill to a crowned profile. After sufficient cure, shave excess filler. Filler profile should be flush with floor surface when dry.
- F. If filler profile is low/concave, remove top 1/2" of filler and re-apply.

3.6 FIELD QUALITY CONTROL

- A. Reporting - The following tests shall be conducted by the Applicator:
 - 1. Condition of the area being installed.
 - 2. Temperature: Date & Time, Air temperature, Concrete surface temperatures, Dew point.
 - 3. Product Installed & Coverage Rates.
 - 4. Batch number of the materials.
 - 5. Project report shall be submitted upon completion of the work.

- B. Product Testing
 - 1. All testing required by End User specifications (if any).
 - 2. Direct to concrete adhesion per ASTM D7234. Acceptable results: >200 psi with concrete failure before proceeding with the installation.
 - 3. Static resistance qualities per ANSI/ESD S7.1. Acceptable results: Between $>10^4$ and $<10^9$ ohms.
- C. Provide replica of the system as installed to Manufacturer for approval and warranty.
- D. The Facility Owner reserves the right to invoke material testing procedures at any time, and any number of times during the application process.
- E. The 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 Applicator/Contractor.

3.7 CURING, PROTECTION, AND CLEANING

- A. Cure flooring material in compliance with Manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination to leave cleanable surface for subsequent work of other sections.
- C. Protection: After completion of application and clean up, do not allow heavy traffic on coated surfaces for a period of 24 hours at 75°F. Typical resinous floor coatings will take 7-14 days to fully cure.
- D. Cleaning: Remove any materials or spillage from site. Clean any uncured areas with suitable solvent. Dispose of any temporary floor covering and leftover materials in accordance with federal, local, and building requirements.

END OF SECTION