SECTION 09 67 23.30
RESINOUS (EPOXY BASE) HIGH PERFORMANCE DECORATIVE MORTAR FLOORING (RES-3)

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies a seamless resinous (epoxy resin composition) and aliphatic poly urethane sealer, flooring systems with integral cove base.

1.2 RELATED WORK

A. Concrete and Moisture Vapor Barrier: Section 03 30 00, CAST-IN-PLACE CONCRETE.

B. Substrate Preparation for Floor Finishes: Section 09 05 16.

C. Color and location of each type of resinous (epoxy resin composition) flooring: Section 09 06 00, SCHEDULE FOR FINISHES.

D. Floor Drains: Division 22, PLUMBING.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product to be provided.
2. Application and installation instructions.
3. Maintenance Instructions: Submit manufacturer’s written instructions for recommended maintenance practices.

C. Qualification Data: For Installer.

D. Sustainable Submittal:

1. Product data for products having recycled content, submit documentation indicating percentages by weight of postconsumer and pre consumer recycled content.
   a. Include statements indicating costs for each product having recycled content, and low emitting materials.
2. Product data for Environmental Quality Credit EQ 4.2 low emitting materials, include printed statement of VOC content indicating compliance with environmental requirements.
3. Product data for Material Resource Credit MR 4.1, 12%-35% post-consumer recycled glass content.

E. Samples:

1. Each color and texture specified in Section 09 06 00, SCHEDULE FOR FINISHES.
2. Samples for verification: For each (color and texture) resinous flooring system required, 6 inches (152 mm) square, applied to a rigid backing by installer for this project.
3. Sample showing construction from substrate to finish surface in thickness specified and color and texture of finished surfaces. Finished flooring must match the approved samples in color and texture.

F. Shop Drawings: Include plans, sections, component details, and attachment to other trades. Indicate layout of the following:
1. Patterns.
2. Edge configurations.

G. Certifications and Approvals:
1. Manufacturer's certification of material and substrate compliance with specification.
2. Manufacturer's approval of installers.
3. Contractor's certificate of compliance with Quality Assurance requirements.

H. Warranty: As specified in this section.

1.4 QUALITY ASSURANCE

A. Manufacture Certificate: Manufacture shall certify that a particular resinous flooring system has been in use for a minimum of (5) five years.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this project for a minimum period of (5) five years, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
2. Contractor shall have completed at least (5) five projects of similar size and complexity. Include list of at least (5) five projects. List must include owner (purchaser); address of

installation, contact information at installation project site; and date of installation.

3. Installer's Personnel: Employ persons trained for application of specified product.

C. Source Limitations:

1. Obtain primary resinous flooring materials including primers, resins, hardening agents, grouting coats and finish or sealing coats from a single manufacturer.
2. Provide secondary materials, including patching and fill material, joint sealant, and repair material of type and from source recommended by manufacturer of primary materials.

D. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48 inch (1200 mm) square floor area selected by VA Resident Engineer.
   a. Include 48 inch (1200 mm) length of integral cove base.
2. Test mock-up with anticipated chemicals to be used in the designated area.
3. Approved mockups not damaged during the testing may become part of the completed work if undisturbed at time of Substantial Completion.
4. Sign off from VA Resident Engineer on texture for slip resistance and clean ability must be complete before installation of flooring system.

E. Pre-Installation Conference:

1. Convene a meeting not less than thirty days prior to starting work.
2. Attendance:
   a. Contractor
   b. VA Resident Engineer
   c. Manufacturer and Installer's Representative
3. Review the following:
   a. Environmental requirements
      1) Air and surface temperature
      2) Relative humidity
      3) Ventilation
      4) Dust and contaminates
   b. Protection of surfaces not scheduled to be coated

c. Inspect and discus condition of substrate and other preparatory work performed
d. Review and verify availability of material; installer’s personnel, equipment needed
e. Design and patterns and edge conditions.
f. Performance of the coating with chemicals anticipated in the area receiving the resinous (epoxy resin composition) flooring system
g. Application and repair
h. Field quality control
i. Cleaning
j. Protection of coating systems
k. One-year inspection and maintenance
l. Coordination with other work

F. Manufacturer’s Field Services: Manufacturer’s representative shall provide technical assistance and guidance for surface preparation and application of resinous flooring systems.

G. Contractor Job Site Log: Contractor shall document daily; the work accomplished environmental conditions and any other condition event significant to the long term performance of the resinous flooring systems installation. The Contractor shall maintain these records for one year after Substantial Completion.

1.5 MATERIAL PACKAGING DELIVERY AND STORAGE

A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.

B. Protect materials from damage and contamination in storage or delivery, including moisture, heat, cold, direct sunlight, etc.

C. Maintain temperature of storage area between 60 and 80 degrees F (15 and 26 degrees C).

D. Keep containers sealed until ready for use.

E. Do not use materials beyond manufacturer’s shelf life limits.

F. Package materials in factory pre-weighed and in single, easy to manage batches sized for ease of handling and mixing proportions from entire package or packages. No On site weighing or volumetric measurements are allowed

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

1. Maintain material and substrate temperature between 65 and 85 degrees F (18 and 30 degrees C) during resinous flooring application and for not less than 24 hours after application.
2. Concrete substrate shall be properly cured per referenced section 03 30 00, CAST-IN-PLACE CONCRETE. Standard cure time a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade.
   a. Resinous flooring applications where moisture testing resulting in readings exceeding limits as defined in this specification under part 3, section 3.4, paragraph B, shall employ an multiple component 15 mil thick system designed to suppress excess moisture in concrete.
   b. Application at a minimum thickness of 15 mils, over properly prepared concrete substrate as defined in section 3.4.
   c. Moisture suppression system must meet the design standards as follows:

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	EPA & LEED	25 grams per liter
Permeance	ASTM E96 @ 16mils/ 0.4mm on concrete	0.1 perms
Tensile Modulus	ASTM D638	$1.9X10^5$ psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufactures Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

1.7 WARRANTY

A. Work subject to the terms of the Article “Warranty of Construction” FAR clause 52.246-21.

B. Warranty: Manufacture shall furnish a single, written warranty covering the full assembly for both material and workmanship for a extended period of (3) full years from date of installation, or provide a joint and several warranty signed on a single document by manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (3) full years from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

1.8 APPLICABLE PUBLICATIONS

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

B. ASTM Standard C722-04 (2012), "Standard Specification for Chemical-Resistant Monolithic Floor Surfacings," ASTM International, West Conshohocken, PA, 2006, DOI: 10.1520/C0722-04R12, www.astm.org.

1. Specification covers the requirements for aggregate-filled, resin-based, monolithic surfacings for use over concrete.

C. American Society for Testing and Materials (ASTM):

C307 (2012).....Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings

C531 (2012).....Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

C579 (2012).....Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

C580 (2012).....Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

D638 (2010).....Tensile Properties of Plastics

D1308 (2013).....Effect of Household Chemicals on Clear and Pigmented Organic Finishes

D2240 (2010).....Rubber Property—Durometer Hardness

D2794 (2010).....Resistance of Organic Coatings to the Effects of Rapid Deformation Impact

D4060(2010).....Abrasion Resistance of Organic Coatings by the Taber Abraser

D4259 (2012).....Abrading Concrete to alter the surface profile of the concrete and to remove foreign materials and weak surface laitance

D7234 (2012).....Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers

E96/E96M (2013).....Water Vapor Transmission of Materials

F1679.....Variable Incidence Tribometer for determining the slip resistance

F1869 (2011).....Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

F2170 (2011).....Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION FOR RESINOUS FLOORING

1. Monolithic, multi-component epoxy chemistry, steel trowel applied resinous flooring mortar system, nominal 3/16"/5mm thick system comprised of a penetrating primer, multi component 100% solids epoxy mortar, grout coat sealer and clear VOC compliant, aliphatic polyurethane non-reflective finish.
2. Decorative quartz broadcast systems will not be accepted. Steel trowel finish mortars only

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.

C. System Components: Verify specific requirements as systems vary by manufacturer. Verify mortar base product, build up layers of broadcast systems will not be accepted. Verify compatibility with substrate. Use

manufacturer's standard components, compatible with each other and as follows:

1. Primer (Bond) Coat: Verify inclusion of primer in manufacturer's system.
   a. Resin: Epoxy.
   b. Formulation Description: 100% solids.
   c. Application Method: Apply by Squeegee and finish roller.
2. Mortar (Base) Coat: Verify mortar composition.
   a. Resin: Epoxy.
   b. Formulation Description: 100% solids, UV stable.
   c. Application Method: Screed and steel finish trowel.
      1) Thickness of coat: Verify thickness as systems vary by manufacturer; approximately from 3/16 to 1/4 inch (4.76 to 6.35 mm).
   d. Aggregate: Pigmented color quartz silica, and a minimum or 12% recycled glass aggregates integral component to mortar.
3. Grout Coat: Verify inclusion of base coat in manufacturer's system.
   a. Resin: Epoxy.
   b. Formulation Description: 100 percent solids, UV stable.
   c. Application Method: Flat squeegee and roller applied.
   d. Number of coats: (2) two, wet on wet application.
4. Top (Seal) Coat: Verify inclusion of water based aliphatic polyurethane sealer coat as systems vary by manufacturer.
   a. Resin: multi-component water based aliphatic polyurethane.
   b. Formulation Description: High UV stability, stain and mar resistant. LEED compliant low V.O.C.
   c. Application Method: Finish roller, dip into coating and back roll.
      1) Number of coats: (1) one
   d. Aggregates: Optional if needed verify inclusion of slip-retardant aggregates in sealer coat.

D. System Characteristics:
1. Color and Pattern: As indicated in Section 09 06 00, SCHEDULE OF FINISHES.
2. Integral cove base: 1 inch (25.4 mm) radius epoxy mortar cove keyed into concrete substrate. Verify cove base installation with manufacturer's system.

3. Overall System Thickness: Verify thickness as systems vary by manufacturer; between 3/16 inch (4.76 mm) and 1/4 inch (6.35 mm)
4. Finish: Textured anti-slip resistant to meet or exceed 0.06 dry; 0.08 wet.

E. Physical Properties:

1. Physical Properties of flooring system when tested as follows:

Property	Test	Value
Compressive Strength	ASTM C579	6,000 psi after 7 days
Volatile Organic Compound Limits (V.O.C.)	EPA & LEED	Below 50 g/l
Tensile Strength	ASTM C307	1,500 psi
Flexural Modulus of Elasticity	ASTM C580	5.0×10^5 psi
Water Absorption	ASTM C413	0.1%
Slip Resistance Index	ASTM F1679	0.81 dry and 0.56 wet. Minimal levels
Impact Resistance	ASTM D2794	> 160 in. lbs
Abrasion Resistance	ASTM D4060 Cs-17 wheel, 1000 cycles	0.06 gm maximum weight loss
Thermal Coefficient of Linear Expansion	ASTM C531	1.8×10^{-5} mm/ °C mm
Hardness Shore D	ASTM D2240	85 to 90
Bond Strength	ASTM D7234	100% Bond to concrete failure

F. Chemical Resistance in accordance ASTM D1308 - 02(2007) “Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes”. ASTM International, West Conshohocken, PA, 2006, DOI: 10.1520/D1308-02R07, www.astm.org. No effect to the following exposures:

1. Acetic acid (5%)
2. Ammonium hydroxide (10%)
3. Citric Acid (50%)
4. Fatty Acid
5. Motor Oil, 20W
6. Hydrochloric acid (20%)
7. Sodium Chloride

8. Sodium Hypochlorite (10%)
9. Sodium Hydroxide (30%)
10. Sulfuric acid (25%)
11. Urine, Feces
12. Hydrogen peroxide (10%)

2.2 SUPPLEMENTAL MATERIALS

A. Textured Top Coat: Type recommended or produced by manufacturer of seamless resinous flooring system, slip resistance type and profile of for desired final finish.

B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service or joint conditioned indicated.

D. Provide a chemical resistant epoxy novolac top coat capable of resisting sustained temperatures up to 120^{0}C (250^{0}F).

E. Crack Isolation Membrane: Type recommended or produced by manufacturer of resinous flooring for conditions as specified.

F. Anti-Microbial Additive: Incorporate anti-microbial chemical additive to prevent growth of most bacteria, algae, fungi, mold, mildew, yeast, etc.

G. Patching and Fill Material: Resinous product of or approved by resinous coating manufacturer for application indicated. Resinous based materials only. Cementitous or single component product are not expectable.

2.3 BASE CAP STRIP

A. Zinc cove strip

B. Shape for 2mm depth of base material, "J" or “L” configuration.

C. Finish:

1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where monolithic resinous flooring system with integral base is to be installed with the VA Resident Engineer.

B. Moisture Vapor Emission Testing: Perform moisture vapor transmission testing in accordance with ASTM F1869 to determine the MVER of the substrate prior to commencement of the work. See section 3.4, 3.

3.2 PROJECT CONDITIONS

A. Maintain temperature of rooms (air and surface) where work occurs, between 70 and 90 degrees F (21 and 32 degrees C) for at least 48 hours, before, during, and 24 hours after installation. Maintain temperature at least 70 degrees F (21 degrees C) during cure period.

B. Maintain relative humidity less than 75 percent.

C. Do not install materials until building is permanently enclosed and wet construction is complete, dry, and cured.

D. Maintain proper ventilation of the area during application and curing time period.

1. Comply with infection control measures of the VA Medical Center.

3.3 INSTALLATION REQUIREMENTS

A. The manufacturer's instructions for application and installation shall be reviewed with the VA Resident Engineer for the seamless resinous flooring system with integral cove base //and trench liner//.

B. Substrate shall be approved by manufacture technical representative.

3.4 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Prepare concrete substrates as follows:

a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and re circulates the shot by vacuum pickup.

b. Comply with ASTM D4259 requirements, unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

3. Verify that concrete substrates are dry.

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of [**5 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)** in 24 hours.

b. MVT threshold for monolithic resinous Non - climatic flooring shall not exceed 5 lbs/1000 square feet (0.0001437 kPa) in a 24 hour period. MVT threshold for monolithic resinous climatic flooring shall not exceed 6 lbs/1000 square feet (0.0002155 kPa) over a 24 hour period.

c. When MVT emission exceeds this limit, apply manufacturer’s recommended vapor control primer or other corrective measures as recommended by manufacturer prior to application of flooring or membrane systems.

d. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.

e. Provide a written report showing test placement and results.

4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for flooring manufacturer recommended joint fill material, and concrete crack treatment.

F. Prepare wall to receive integral cove base:

1. Verify wall material is acceptable for resinous flooring application, if not, install material (e.g. cement board) to receive base.
2. Fill voids in wall surface to receive base, install undercoats (e.g. water proofing membrane, and/or crack isolation membrane) as recommended by resinous flooring manufacturer.
3. Install base prior to flooring if required by resinous flooring manufacturer.
4. Grind, cut or sand protrusions to receive base application.

3.5 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
      a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply Primer: over prepared substrate at manufacturer's recommended spreading rate.

C. Apply cove base: Trowel to wall surfaces at a 1 inch radius, before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, and troweling, sanding, and top coating of cove base. Round internal and external corners.

D. Trowel mortar base: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using a specially designed screed box adjusted to manufacturer's recommended height. Metal trowel hand or plastic blade power trowel, single mortar coat in thickness indicated for flooring system, Pre fill or grout to fill substrate voids. When cured, scrape or lightly stone mortar base to remove left unbounded material.

E. Grout coat: Mix and roller apply the grout coats with strict adherence to manufacturer's installation procedures and coverage rates. (2) Two grout coatings to insure uniform coverage with wet on wet application.

F. Topcoat: Mix and roller apply the topcoat(s) with strict adherence to manufacturer's installation procedures and coverage rates.

3.6 TOLERANCE

A. From line of plane: Maximum 1/8 inch (3.18 mm) in total distance of flooring and base.

B. From radius of cove: Maximum of 1/8 inch (3.18 mm) plus or 1/16-inch (1.59 mm) minus.

3.7 ENGINEERING DETAILS

A. Chase edges to “lock” the flooring system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal resinous system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

E. Treat control joints to bridge potential cracks and to maintain monolithic protection. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

F. Discontinue Resinous floor system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.8 CURING, PROTECTION AND CLEANING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process.

B. Close area of application for a minimum of 24 hours.

C. Protect resinous flooring materials from damage and wear during construction operation.

1. Cover flooring with kraft type paper.
2. Optional 6 mm (1/4 inch) thick hardboard, plywood, or particle board where area is in foot or vehicle traffic pattern, rolling or fixed scaffolding and overhead work occurs.

D. Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer. - - - E N D - - -