

SECTION 09 67 23.60

RESINOUS (urethane AND epoxy mortar) FLOORING (RES-6)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies Resinous (Resinous urethane and epoxy mortars) flooring with integral cove base [and trench liner]:
 - 1. High Abuse Climatic Troweled and Sealed Urethane Mortar Flooring System.
 - 2. High Abuse Non-Climatic Troweled and Sealed Epoxy Mortar Flooring System.

1.2 RELATED WORK

- A. Concrete and Moisture Vapor Barrier: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Color and location of each type of resinous (urethane and epoxy mortar) flooring: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
- C. 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 manufacturerTMs 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 preconsumer recycled content.
 - a. Include statements indicating costs for each product having recycled content, and low emitting materials.
 - 2. Product data for field applied, interior, paints, coatings, and primers, include printed statement of VOC content indicating compliance with environmental requirements.
- E. Samples:
 - 1. Each color and texture specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Shop Drawings: Include plans, sections, component details, and attachment to other trades. Indicate layout of the following:
 - 1. Patterns.

2. Edge configuration[s].

G. Certifications and Approvals:

1. Manufacturer's certification of material and substrate compliance with specification.
2. Manufacturer's approval of installer[s].
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 manufactured and in use for a minimum of five (5) 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 five (5) 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 five (5) projects of similar size and complexity. Include list of at least five (5) 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. 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 contaminants
 - b. Protection of surfaces not scheduled to be coated
 - c. Inspect and discuss condition of substrate and other preparatory work performed
 - d. Review and verify availability of material; installer™s personnel, equipment needed
 - e. Design and pattern and edge conditions.
 - f. Performance of the coating with chemicals anticipated in the area receiving the resinous (urethane and epoxy mortar/cement) 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
 - E. Manufacturer™s Field Services: Manufacturer™s representative shall provide technical assistance and guidance for surface preparation and application of resinous flooring systems.
 - F. 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 urethane and epoxy mortar/cement flooring materials installation. The Contractor shall maintain these records for one year after Substantial Completion.
 - G. Volatile Organic Compound content to remain under 100g/liter.
- 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 applications.
 - 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.
- 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.
- D. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

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 (including substrata) for both material and workmanship for a extended period of three (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 three (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. American Society for Testing and Materials (ASTM):
 - 1. B221-08 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - 2. C307-03 (2008) Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing
 - 3. C413-01(2006) Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes
 - 4. C531-00(2005) Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
 - 5. C579-01(2006) Standard Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer

Concretes

6. C580-02(2008) Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
 7. C811-98(2008) Standard Practice for Surface Preparation of Concrete for Application of Chemical-Resistant Resin Monolithic Surfacing
 8. D1308-02(2007) Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
 9. D2047-04 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
 10. D2240-05 Standard Test Method for Rubber Property – Durometer Hardness
 11. D4060-07 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
 12. D4226-09 Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products
 13. D7234-05 Standard Test Methods for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
 14. F1869-09 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 15. F2170-09 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
- C. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 501 Finishes for Aluminum

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION FOR RES-6A (heavy duty Climatic)

A. System Descriptions:

1. Monolithic, multi-component urethane chemistry resinous flooring system, Screed and steel finish trowel applied, chemical and thermal cycling and shock resistant. Self priming multiple component polyurethane mortar, quartz aggregates for texture and associated high performance urethane sealer. Temperature resistance to 250 degrees F (121 degrees C) where required.

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. Mortar (Body coat):

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- a. Resin: Urethane with rapidly renewable resin components.
 - b. Formulation Description: Multiple component high solids.
 - c. Application Method: Screed and steel finish trowel.
 - d. Thickness of coat(s): Verify thickness as systems vary by manufacturer; Nominal thickness 3/16 to 1/4 inch (4.76 to 6.35mm).
 - e. Number of Coats: One.
 - f. Aggregates: Quartz texture broadcast into wet urethane mortar base.
2. Seal Coat(s):
- a. Resin: Urethane.
 - b. Formulation Description: Pigmented Two-component, high solids.
 - c. Application Method: Squeegee and Back roll.
 - d. Number of Coats: One.
- D. Physical Properties:
1. Physical Properties of flooring system when tested as follows:

| Property | Test | Value |
|--|--------------|----------------------------------|
| Compressive Strength | ASTM C579 | 5,000 psi after 7 days |
| Tensile Strength | ASTM C307 | 1,000 psi |
| Flexural Strength | ASTM C580 | 2,400 psi |
| Water Absorption | ASTM C413 | 0.056% |
| Coefficient of friction dry/slip index wet | ASTM D2047 | >1.0 dry >1.0 wet |
| Impact Resistance | ASTM D4226 | > 160 in. lbs |
| Abrasion Resistance | ASTM D4060 | 0.05 gm maximum weight loss |
| Thermal Coefficient of Linear Expansion | ASTM C531 | 1.1 x 10 ⁻⁵ mm/ °C mm |
| Hardness Shore D | ASTM D2240 | 80 to 84 |
| Bond Strength | ASTM D7234 | >300 psi 100% concrete failure |
| | ASTM D1308 | No Effect |
| Acetic acid | 5 percent | |
| Ammonium hydroxide | 10 percent | |
| Citric Acid Fatty acid Motor Oil, 20W | 50 percent | |
| Hydrochloric acid | 10 percent | |
| Salt water | | |
| Sodium Hydroxide | 10 percent | |
| Sulfuric acid | 10 percent | |
| Trisodium phosphate | 5 percent | |
| Urine | | |
| Feces | | |
| Hydrogen peroxide | 28 percent | |
| Distilled Water | | |
| Sodium Hypochloride | 5.28 percent | |

E.

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2.2 SYSTEM DESCRIPTION FOR RES-6B (heavy duty " Non Climatic)

A. System Description:

1. Epoxy resinous Troweled mortar includes: concrete epoxy primers, three component, 100% solids resin, amine and quartz aggregate mortar, and associated 100% solids general service epoxy sealer. Optional: aliphatic polyurethane sealer finish coat for higher UV stability, and chemical resistance. Texture dependant on use of areas.

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 manufacturerTMs standard components, compatible with each other and as follows:

1. Primer (Bond Coat): Verify inclusion of primer in manufacturerTMs system.
 - a. Resin: Epoxy.

- b. Formulation Description: 100 percent solids.
 - c. Application Method: Apply by Squeegee and back roller.
 - 1) Coats: Single (one).
 - 2. Mortar:
 - a. Resin: Epoxy with rapidly renewable resin components.
 - b. Formulation Description: 100 percent solids.
 - c. Application Method: Verify specific requirements as systems vary by manufacturer.
 - 1) Trowel application only:
 - a) Thickness of coats: Nominal 3/16 to 1/4 inch (4.76 to 6.35 mm).
 - b) Number of coats: One.
 - 2) Slurry application: Not accepted for non-climatic finish.
 - d. Aggregates: Quartz/silica blend with 25% Recycled Glass.
 - 3. Topcoat:
 - a. Resin: Epoxy.
 - b. Formulation Description: 100 percent solids.
 - c. Application Method: Squeegee and finish roll.
 - 1) Thickness of coats: 3 mils.
 - 2) Number of Coats: one (aggressive texture profiles may require more than one coat)
 - d. Aggregates: For added slip resistance dependant on area.
 - 1) Dry silica sand (30 Mesh or larger).
 - 2) Aluminum oxide.
- D. System Characteristics:
- 1. Color and Pattern: As selected by Architect from manufacturer's standard colors.
 - 2. Integral cove base: 1 inch (25.4 mm) radius epoxy mortar cove keyed into concrete substrate and or resinous flooring mortar system. No fillers integral cove base must be troweled in place with specified resinous mortar base.
 - 3. Overall System Thickness: Nominal 3/16 to 1/4 inches (4.76 to 6.35 mm).
 - 4. Finish: standard .
 - 5. Temperature Range: Systems vary by manufacturer; approximate range from a minimum of 45 to 150 degrees F.
- E. Physical Properties:

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

| Property | Test | Value |
|----------------------|-----------|-------------------------|
| Compressive Strength | ASTM C579 | 10,000 psi after 7 days |
| Tensile Strength | ASTM C307 | 1,750 psi |

| | | |
|---|---------------------------------------|-----------------------------------|
| Flexural Strength | ASTM C580 | 4,000 psi |
| Water Absorption | ASTM C413 | 0.2% |
| Slip Resistance Index | ASTM D2047 | 0.83 dry 0.66 wet |
| Impact Resistance | ASTM D4226 | > 160 in. lbs |
| Abrasion Resistance | ASTM D4060 CS-17 1000g 1000 cycles | 0.1 gm maximum weight loss |
| Thermal Coefficient of Linear Expansion | ASTM C531 | 1.5×10^{-5} mm/ °C mm |
| Hardness Shore D | ASTM D2240 | > 70 |
| Bond Strength | ASTM D7234 | >300 psi 100% concrete failure |
| | ASTM D1308 | No Effect |
| Acetic acid | 5 percent | |
| Ammonium hydroxide | 10 percent | |
| Citric Acid | | |
| Fatty acid Motor Oil, 20W | 50 percent | |
| Hydrochloric acid | 10 percent | |
| Salt water | | |
| Sodium Hydroxide | 10 percent | |
| Sulfuric acid | 10 percent | |
| Trisodium phosphate | 5 percent | |
| Urine | | |
| Feces | | |
| Hydrogen peroxide | 28 percent | |
| Distilled Water | | |
| Sodium Hypochloride | 5.28 percent | |

2.3 SUPPLEMENTAL MATERIALS

- A. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service or joint conditioned indicated.
- B. Waterproof Membrane: Type recommended or produced by manufacturer of resinous floor coatings for type of service and conditions as [indicated in Drawings] [and/or specified].
- C. Provide a chemical resistant epoxy novolac top coat capable of resisting sustained temperatures up to 120° C (250° F).
- D. Crack Isolation Membrane: Type recommended or produced by manufacturer of resinous flooring for conditions as [indicated in Drawings] [and/or specified] .
- E. Anti-Microbial Additive: Incorporate anti-microbial chemical additive to prevent growth of most bacteria, algae, fungi, mold, mildew, yeast, etc.
- F. Patching and Fill Material: Resinous product of or approved by resinous coating manufacturer for application indicated. Resinous based materials only. Cementitious or single component product are not expectable.

2.4 TROWELED COVE BASE [AND TRENCH LINER]

- A. Same physical properties as specified resinous mortar system. [climatic, non-climatic].

2.5 BASE CAP STRIP

- A. Aluminum, Extruded: ASTM B221, Alloy 6063-T6.
- B. Shape for 3/16 inch (4.76 mm) depth of base material, "J" configuration.
- C. Finish:
 - 1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
 - 2. Aluminum: NAAMM Amp 501:
 - a. Clear anodic coating, AA-C22A41 chemically etched medium matte, with Architectural Class 1, 0.7 mils (0.018 mm) or thicker.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where monolithic resinous (urethane and epoxy mortar) 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 (urethane and epoxy mortar) 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 recirculates the shot by vacuum pickup.
 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 3 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 75-80 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 [and trench liner]:
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 [and trench liner] 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. Climatic and non-climatic resinous flooring systems may vary slightly on mode of application. Application should be based upon the following: Uniformly spread mortar over substrate using a specially designed screed box adjusted to manufacturer's recommended height. Metal trowel (hand or power) single mortar coat in thickness indicated for flooring system, grout to fill substrate voids. When cured, sand to remove trowel marks and roughness
- E. 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 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

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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.

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