RESINOUS FLOORING AND WALL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resinous Systems of the Following Types:
   1. RIO FLOORING SYSTEMS Quartz, customized systems.
   2. RIO FLOORING SYSTEMS Heavy Duty Quartz, customized systems.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM C29 / C29M - Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate.
   2. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   3. ASTM C128 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
   4. ASTM C307 - Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
   5. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
   6. ASTM C413 - Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   7. ASTM C566 - Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying.
   8. ASTM C570 - Standard Specification for Oil- and Resin-Base Caulking Compound for Building Construction.
   9. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   10. ASTM C580 - Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   11. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
   12. ASTM D257 - Standard Test Methods for DC Resistance or Conductance of Insulating Materials.
   13. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
   14. ASTM D471 - Standard Test Method for Rubber Property - Effect of Liquids.

15. ASTM D522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
16. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
17. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
18. ASTM D628 - Standard Specification for Asbestos Tubular Sleeving.
19. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
20. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
21. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
22. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
23. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between minus 22 to 86 degrees F (minus 30 and 30 degrees C) with a Vitreous Silica Dilatometer.
24. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
25. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
26. ASTM D1475 - Standard Test Method For Density of Liquid Coatings, Inks, and Related Products.
27. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
28. ASTM D2134 - Standard Test Method for Determining the Hardness of Organic Coatings with a Sward-Type Hardness Rocker.
29. ASTM D2196 - Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer.
30. ASTM D2240 - Standard Test Method for Rubber Property-Durometer Hardness.
31. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
32. ASTM D2369 - Standard Test Method for Volatile Content of Coatings.
33. ASTM D2370 - Standard Test Method for Tensile Properties of Organic Coatings.
34. ASTM D2393 - Test Method for Viscosity of Epoxy Resins and Related Components.
35. ASTM D2697 - Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings.
36. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
37. ASTM D3278 - Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus.
38. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
39. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
40. ASTM D4226 - Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products.
41. ASTM D4366 - Standard Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
42. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
43. ASTM D5441 - Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBE) by Gas Chromatography.
44. ASTM D7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
45. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
46. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete

Floor Slabs Using in situ Probes

47. ASTM F3010 - Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings
48. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
49. ASTM G154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.
50. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

B. Deutsches Institut fur Normung (DIN):
   1. DIN 53460 - Testing of Plastics; Determination of the Vicat Softening Temperature of Thermoplastics.

C. International Concrete Repair Institute (ICRI):
   1. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

D. Military Specifications (MIL):
   1. MIL-D-3134J - Deck Covering Materials.

E. National Floor Safety Institute (NFSI):
   1. ANSI/NFSI B101.1 - Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used, including properties, VOC content, wet static coefficient of friction, compressive strength, tensile strength, elongation and similar properties.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Verification Samples: Two representative units of each system, including color and texture.

D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

F. Manufacturer's Project References: Submit manufacturer's list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems furnished.

G. Applicator's Project References: Submit applicator's list of successfully completed resinous flooring system projects, including project name and location, name of architect, and type and quantity of flooring systems applied.

H. Care and Maintenance Instructions: Submit manufacturer's care and maintenance instructions, including cleaning instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Applicator's Qualifications:
   1. Applicator regularly engaged, for a minimum of 5 years, in application of resinous flooring systems of similar type to that specified.
   2. Employ persons trained for application of resinous flooring systems.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
   1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
   2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
   3. Retain mock-up during construction as a standard for comparison with completed work.
   4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.6 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and batch number.

B. Storage and Handling Requirements:
   1. Store and handle materials in accordance with manufacturer's instructions.
   2. Keep materials in manufacturer's original, unopened containers and packaging until application.
   3. Store materials in clean, dry area indoors between 65 and 80 degrees F (18 and 27 degrees C).
   4. Store materials out of direct sunlight.
   5. Keep materials from freezing.
   6. Protect materials during storage, handling, and application to prevent contamination or damage.

1.8 PROJECT CONDITIONS

A. Apply flooring system under the following ambient conditions:
   1. Ambient and Concrete Floor Temperatures: Between 65 and 85 degrees F (18 and 29 degrees C).
   2. Material Temperature: Between 65 and 85 degrees F (18 and 29 degrees C).
   3. Relative Humidity: Maximum 80 percent.
   4. Dew Point: Floor temperature more than 5 degrees over dew point.

B. Do not apply flooring system under ambient conditions outside manufacturer's limits.

1.9 WARRANTY

A. Submit manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:
RIO FLOORING SYSTEMS INC
2926 CHESTER AVE
CLEVELAND, OHIO 44114
888-287-2183

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 RIO FLOORING SYSTEMS QUARTZ

A. Customized Systems, RIO FLOORING SYSTEMS Quartz:
1. Primer: RIO-COAT EMP.
2. Troweled Quartz:
3. Grout Coat:
a. RIO-COAT EUV.
4. Top Coat:
a. RIO-COAT UHG.

2.3 RIO FLOORING SYSTEMS HEAVY DUTY

A. Customized Systems, RIO FLOORING SYSTEMS Heavy Duty Quartz:
1. Primer: RIO-COAT EMP.
2. Mortar: RIO-COAT EPT.
3. Broadcast Coat with decorative quartz broadcast:
a. RIO-COAT EMP.
4. Grout Coat:
a. RIO-COAT EUV.
5. Top Coat:
a. RIO-COAT UHG.

2.4 PRODUCT PROPERTIES

A. RIO-COAT UHG: A clear, high solids, two-component, gloss finish, aliphatic, moisture-cure urethane.
1. Percent Solids, by weight(by volume), ASTM D2369, A+B: 91.34 (91.60).
2. Volatile Organic Compound-VOC, ASTM D3960L: Mixed A + B: 0.06 lb/gal (7 g/l).
3. Abrasion Resistance, mg loss, Taber Abraser, C-17 Taber Abrasion Wheel, 1,000 g Load, 1,000 revs, ASTM D4060: 18.8.
4. Coefficient of Friction-COF, James Friction Tester: 0.61.
5. Wet Static Coefficient of Friction, BOT 3000, ANS/NFSI B101.1: 0.99.
6. Flammability, ASTM D635: 182 mm/min.
7. Resistance to Yellowing as Measured Using ASTM D2244 after 1000 Consecutive hrs UV Exposure in QUV, ASTM G154, Less than 10 increase of yellow units (CIE Lab delta b)
8. Tensile Strength, ASTM D2370: 6,250 psi (43.09 MPa).
9. Percent Elongation, ASTM D2370: 6.
10. Konig Hardness, (3 mil/76.2 micron film), ASTM D4366: 171.3.
11. Water Absorption, 24-hour immersion, ASTM C413: 0.2 percent weight increase.

B. RIO-COAT UHG: A clear high solids, three-component, satin finish, aliphatic, moisture-cure urethane.
1. Percent Solids, by weight (by volume), ASTM D2369, A + B + C: 94.02 (92.57).
2. Volatile Organic Compound-VOC, ASTM D3960L: Mixed A + B + C: 0.05 lb/gal (6 g/L).

3. Abrasion Resistance, mg loss, Taber Abraser, C-17 Taber Abrasion Wheel, 1,000 g Load, 1,000 revs, ASTM D4060: 18.
4. Coefficient of Friction-COF, James Friction Tester, ASTM D2047: 0.63.
5. Wet Static Coefficient of Friction, BOT 3000, ANSI/NFSI B101.1: 0.94.
6. Flammability, ASTM G154: 182 mm/min.
7. Resistance to Yellowing as Measured Using ASTM D2244 after 1000 Consecutive hrs UV Exposure in QUV, ASTM G154, Less than 10 increase of yellow units (CIE Lab Δb)
8. Tensile Strength, 24 hours, Resin Only, ASTM D2370: 6,250 psi (43,092 MPa).
9. Percent Elongation, 24 hours, Resin Only, ASTM D2370: 6.
10. Konig Hardness, (3 mil/76.2 micron film), ASTM D4366: 171.3.
11. Water Absorption, 24-hour immersion, ASTM C413: 0.2 percent weight increase.

C. RIO-COAT EMP: A neutral, two-component, high solids epoxy.
1. Percent Solids, by weight (by volume), ASTM D1475, A + B: 95.45 (94.56).
2. Volatile Organic Compound-VOC, ASTM D3960L: Mixed A + B: 0.41 lb/gal (49 g/L).
3. Abrasion Resistance, mg loss, Taber Abraser, C-17 Taber Abrasion Wheel, 1,000 g Load, 1,000 revs, ASTM D4060: 83.1.
4. Coefficient of Friction-COF, James Friction Tester, ASTM D2047: 0.59-0.62.
5. Adhesion to Concrete, ASTM D5441: 732 psi (4.48 MPa) concrete failed.
6. Adhesion to Concrete, ASTM D7234: 450 psi (3.10 MPa) concrete failed.
7. Compressive Strength, ASTM D695: 13,500 psi (93.079 MPa).
8. Tensile Strength, ASTM D2370: 8,000 psi (55.158 MPa).
9. Percent Elongation, ASTM D2370: 5.
10. Shor D Hardness, ASTM D2240: 80-85 at 0 sec, 75-80 at 15 sec.

CI. RIO-COAT EPT: A three-component filled, 100 percent solids epoxy system for resurfacing eroded interior concrete floors.
1. Percent Solids, by weight (by volume), ASTM D2369 A + B + C: 99.52 (98.8).
2. Volatile Organic Compounds-VOC, ASTM D3960L: A + B + C: 0.09 lb/gal (11 g/L).
3. Coefficient of Friction-COF, James Friction Tester, ASTM D2047: 0.60-0.63 (with seal coat and topcoat of PT Topcoat).
4. Coefficient of Thermal Liner Expansion, ASTM D696: 0.0000197 mm/mm/degrees C.
5. Adhesion to Concrete, ASTM D4541: 732 psi (4.48 MPa), concrete failed.
6. Adhesion to Concrete, ASTM D7234: 450 psi (3.10 MPa), concrete failed.
7. Compressive Strength, ASTM C570: 10,000 psi (68.95 MPa).
8. Flexural Strength, ASTM D790: 3,700 psi (25.51 MPa).
9. Flexural Modulus of Elasticity, ASTM D790: 180,000,000 psi (100,000 MPa).
10. Heat Deflection Temperature, ASTM D648: 140 degrees F (60 degrees C) at 264 psi (1.82 MPa) load, 151 degrees F (66 degrees C) at 66 psi (0.46 MPa) load.
11. Izod Impact Strength, ASTM D256: 0.26 l/in (45.53 N/m).
12. Tensile Strength, ASTM C307: 1,690 psi (11.65 MPa).
13. Shor D Hardness, ASTM D2240: 80-85 at 0 sec, 75-80 at 15 sec.

CII. RIO-COAT EUV: A two-component, high solids, UV resistant epoxy.
1. Percent Solids, by weight (by volume), ASTM D2369, A + B: 92.60 (92.11).
2. Volatile Organic Compound-VOC, ASTM D3960L: A + B: 0.67 lb/gal (81 g/L).
3. Abrasion Resistance, mg loss, Taber Abraser, C-17 Taber Abrasion Wheel, 1,000 g Load, 1,000 revs, ASTM D4060: 80-90.
4. Coefficient of Friction-COF, James Friction Tester, ASTM D2047: 0.59-0.62.
5. Compressive Strength, ASTM D69: 13,500 psi (93,150 MPa).
6. Tensile Strength, ASTM D2370: 8,000 psi (55,158 MPa).
7. Present Elongation, ASTM D2370: 5.
8. Shore D Hardness, ASTM D2240: 80-85 at 0 sec, 70-85 at 15 sec.

CIII. Decorative Quartz (Troweled): Description, Color-coated, uniformly shaped and sized quartz

granules
1. Grain Size: 25 mesh.
2. Mohs Hardness: 6.5-7.
3. Bulk Density, ASTM C29, packed: 90-105 pcf.
4. Specific Gravity, ASTM C128: 2.65.
5. Moisture Content, ASTM C566: Less than 0.05 percent.
6. Colorfastness/UV Stability, ASTM G155: 1,000 hours, pass.
7. Color: Selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine concrete surfaces to receive resinous system. Verify concrete is structurally sound.

B. Moisture Testing of Concrete: Perform at least one of the following two tests to determine moisture in concrete. Type of test and frequency as recommended by manufacturer and installer.
   1. Calcium Chloride Test:
      a. Measure moisture vapor emission rate of concrete in accordance with ASTM F 1869.
      b. Application of resinous system shall start only if test results are below the following amount.
         1) 3 pounds per 1,000 sq ft over a 24 hr period.
         2) 12 pounds per 1,000 sq ft over a 24 hr period.
         3) 23 pounds per 1,000 sq ft over a 24 hr period.
      c. If test results are above limits, notify Architect and flooring manufacturer in writing.
   2. In-Situ Probe Test:
      a. Measure relative humidity in concrete in accordance with ASTM F 2170.
      b. Application of resinous system shall start only if test results are below the following percentage relative concrete humidity.
         1) 75 percent.
         2) 77 percent.
         3) 85 percent.
         4) 95 percent.
         5) 99 percent.
      c. If test results are above limits, notify Architect and manufacturer in writing.

C. Do not begin preparation or installation until satisfactory moisture test results are achieved. Provide manufacturer's recommended moisture vapor control coating if required.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Protection of In-Place Conditions: Protect adjacent surfaces and adjoining walls from contact with resinous system materials.

C. Surface Preparation:
   1. Prepare concrete surface in accordance with manufacturer's instructions.
   2. Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, sealers, silicones, and other surface contaminants which could adversely affect application of resinous system.
   3. Steel shot blast concrete to a minimum surface profile of ICRI 310.2R, CSP 5.
   4. Key-cut termination points with 1/4-inch (6-mm) by 1/4-inch (6-mm) cut.
   5. Patch depressions, divots, and cracks in concrete in accordance with manufacturer's

instructions.
6. Mechanically remove loose, delaminated, and damaged concrete and repair in accordance with manufacturer's instructions.
7. Joints: Fill joints in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install resinous system in accordance with manufacturer's instructions and approved submittals at locations indicated on the Drawings.

B. Ensure concrete is dry, clean, and prepared in accordance with manufacturer's instructions.

C. Allow concrete to cure a minimum of 7 days before applying resinous system.

D. Mixing:
1. Mix material components together in accordance with manufacturer's instructions.
2. Mix only enough material that can be applied within working time.
3. Add and mix colorants with materials in accordance with manufacturer's instructions to achieve uniform color.

E. Apply resinous system materials to obtain consistent mil thickness and smooth, uniform appearance and texture.

F. Overlay: Apply overlay in accordance with manufacturer's instructions. Apply overlay to prepared concrete surface.

G. Traction Aggregate: Broadcast traction aggregate in accordance with manufacturer's instructions. Broadcast traction aggregate into wet overlay.

H. Cove:
1. Apply cove primer and cove in accordance with manufacturer's instructions at locations indicated on the Drawings.
2. Apply cove to height and shape as indicated on the Drawings.
3. Apply cove to create seamless, smooth transition between flooring and walls.

I. Seal Coat:
1. Apply seal coat in accordance with manufacturer's instructions.
2. Apply seal coat over traction aggregate.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.5 CLEANING AND PROTECTION

A. Allow resinous system to dry in accordance with manufacturer's instructions before opening to traffic.

B. Allow resinous system to dry a minimum of 1 week before cleaning by mechanical means.

C. Protect completed resinous system from damage during construction.

END OF SECTION