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USACE / NAVFAC / AFCEC / NASA | UFGS-09 67 23.14 (August 2016)
Change 1 - 08/18

Preparing Activity: USACE | Superseding
UFGS-09 67 23.14 (August 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SECTION 09 67 23.14

CHEMICAL RESISTANT RESINOUS FLOORING
08/16, CHG 1: 08/18

****
NOTE: This specification covers the requirements for trowelled-on industrial resinous flooring, conductive resinous flooring, and decorative resinous flooring except resinous terrazzo.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL

****
NOTE: The floor systems covered by this guide specification are primarily intended for use in biological laboratories, in similar areas which are subject to hard wear or spillage of chemicals and require a high degree of cleanliness, and for explosive and ammunition facilities.

These systems are for use over normal weight concrete and will not be used over lightweight concrete. The selection of a floor system for a location where resistance to specific chemical conditions is important should be based upon the ability of the system to withstand required exposure

conditions. For example, polyesters are suitable for use where resistance to detergents is required but should not be used in laboratory or other areas where spillage of sodium hydroxide or similar strong alkaline solution occurs; epoxies should not be used where resistance to oxidizing acids is required or where resistance to temperatures in excess of 54 degrees C 130 degrees F is required. Each job should be evaluated on its own merits considering exposure conditions, costs, flammability of materials, and local experience with the various systems. All provisions relating to the systems not selected will be deleted.

Check other sections of the specifications to ensure:

1. No vermiculite or perlite aggregates in concrete substrates.

2. No curing compounds or sealers on concrete substrates.

3. New concrete receives single trowelled finish; and no burnished finishes.

4. Vapor barrier is provided under all concrete slabs-on-grade.

5. Only exterior grade plywood on new plywood substrates. No interior grade or interior grade with exterior glue. Plywood is nailed with annular ring or spiral nails only.

6. No dimension lumber substrate in new construction; when existing lumber substrates are to be covered, overlay with 50 by 50 mm (2 by 2 inch) mesh hardware cloth.

On the drawings, show:

1. Location of resinous flooring. If more than one type is to be used, key each to location on the drawings.

2. Details of special items such as coved bases, expansion joints, control joints, stairs, and floor drains.

3. Details for grounding of conductive floors.

****

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date,

and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

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

ASTM INTERNATIONAL (ASTM)

ASTM C307	(2023) Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings
ASTM C413	(2018) Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacings and Polymer Concretes
ASTM C531	(2018) Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacings, and Polymer Concretes
ASTM C579	(2023) Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
ASTM C580	(2018) Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
ASTM C722	(2018) Standard Specification for Chemical-Resistant Resin Monolithic Floor Surfacings
ASTM D1308	(2002; R 2013) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D4060	(2019) Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM D4263	(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the

	Plastic Sheet Method
ASTM E162	(2022) Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 99	(2021; TIA 20-1; TIA 21-2) Health Care Facilities Code

NATIONAL TERRAZZO AND MOSAIC ASSOCIATION (NTMA)

NTMA Info Guide	(2017) Terrazzo Reference Guide

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113	(2016) Architectural Coatings

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards

1.2 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required

as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Flooring Systems; G[, [_____]]

SD-03 Product Data

Sealer and Resin; G[, [_____]]

Floor Surfacing; G[, [_____]]

Conductive Sparkproof Flooring; G[, [_____]]

Indoor Air Quality for Primer; S

Indoor Air Quality for Top Coating; S

Indoor Air Quality for Sealer And Resin; S

Mixing; G[, [_____]]

SD-04 Samples

Flooring Systems; G[, [_____]]

SD-06 Test Reports

Testing; G[, [_____]]

SD-07 Certificates

Qualifications of Installer; G[, [_____]]

SD-08 Manufacturer's Instructions

Application; G[, [_____]]

SD-10 Operation and Maintenance Data

Flooring Systems; G[, [_____]]

1.3 QUALITY ASSURANCE

1.3.1 Qualifications of Installer

Perform installation by an applicator approved by the manufacturer of the floor surfacing materials. Furnish a written statement from the manufacturer detailing the Qualifications of Installer.

1.3.2 Shop Drawings

Submit drawings indicating the type and layout of the flooring system for approval.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver the materials to the project site in unopened bags and containers clearly labeled with the name of the manufacturer, type of material, batch number, and date of manufacture. Store materials, other than aggregates, away from fire, sparks, or smoking areas. Maintain the storage area between 10 and 32 degrees C 50 and 90 degrees F.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain the ambient room and floor temperatures at 18 degrees C 65 degrees F, or above, for a period extending from 48 hours before installation until one week after installation. Cure concrete for at least 28 days and keep it free of water for at least 7 days prior to receiving surfacing in accordance with ASTM D4263. Measure and insure moisture content of wood substrates between 8 and 10 percent prior to application.

PART 2 PRODUCTS

2.1 MATERIALS

Provide materials (except aggregate) used in the flooring from a single manufacturer. Furnish and install [trowel applied type epoxy finish of 6 mm 1/4 inch thickness with properties and chemical resistance conforming to the requirements specified in NTMA Info Guide.] [trowel or spray applied [1.6 mm 1/6 inch] [3.17 mm 1/8 inch] [6.35 mm 1/4 inch] thick, epoxy, polyester, or other resinous material conforming to ASTM C722 with [Type A surfacings (chemical resistance and moderate to heavy traffic resistance)] [Type B surfacings (mild chemical resistance and severe thermal shock stability)]] resin-based flooring. Meet the following material requirements:

2.1.1 Primer

Type recommended by the manufacturer to penetrate into the pores of the substrate and bond with the floor surfacing matrix to form a permanent monolithic bond between substrate and surfacing matrix. Primer products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for primer.

2.1.2 Aggregate

****

NOTE: Select the desired colors for colored quartz from the following and specify the percentage of each color in the mixture; white, grey, brown, buff, green, and red.

Use first bracketed sentence when industrial resinous and conductive industrial resinous flooring are required (biological laboratories, industrial facilities, clean rooms, laundries, and other areas subject to hard wear or spillage). Use second bracketed sentence when decorative floor is desired and floor is subject to spillage or requires high degree of cleanliness (gang showers, clean rooms, laundries, laboratories, and small kitchens where quarry tile is not economically feasible).

****

Provide [silica sand, quartz, granite, or other suitable chemical resistant material having a Mohr's hardness of not less than 6.0] [angular, translucent quartz covered with a colored inorganic coating as [indicated] [selected from manufacturer's standard aggregates]] aggregate.

2.1.3 Binder

****

NOTE: Delete unsuitable matrix or matrices in accordance with the following:

Do not use latex or resin emulsion matrices where maximum resistance to solvents, strong acid or alkaline solutions is required; where high stain resistance is required; where maximum resistance to compressive loads and indentation are required; or where colored quartz decorative aggregate is specified.

Do not use epoxy matrix where resistance to strong oxidizing acid solutions is required; where maximum fire resistance is required; where subject to prolonged temperatures in excess of 54 degrees C 130 degrees F; where frequently exposed to steam or boiling liquids; where white or light colored quartz decorative aggregates are specified or where substrate cannot be thoroughly dried.

Do not use polyester matrix where resistance to strong alkaline solutions is required; where maximum fire resistance is required; where maximum slip resistance is required; where building will be occupied during installation; or where food stuffs will be stored within building during installation.

****

Provide [synthetic rubber latex or resin emulsion] [thermo-setting epoxy] [or] [medium reactive nonthixotropic modified polyester] binder.

2.1.4 Fillers

If required, provide inert silica, quartz or other hard aggregate material fillers as recommended by the flooring manufacturer. Furnish fillers in the quantity necessary to impart the required color and physical characteristics. Provide a filler containing sufficient fines to obtain an even-textured, nonslip type of surface on the finished topping.

2.1.5 Top Coating

****
NOTE: Specify clear top coat for decorative aggregate flooring. Top coatings are available in light grey, dark grey, red, blue, tan, brown, dark green, and light green for industrial resinous floors. Conductive resinous floorings are dark grey to black and should be specified with conductive clear top coats only.
****

Furnish [clear] [[_____] color] coating of type recommended by the manufacturer. Floor top coating products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for top coating.

2.2 FLOORING SYSTEMS

Submit cured samples of each floor finish or color combination and Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. The complete systems, after curing, must have the following properties when tested in accordance with the test methods listed for each property.

2.2.1 Latex or Resinous Emulsion Matrix Floor Surfacing

****
NOTE: Resistance to reagents specified in item j. is required to withstand cleaning agents and spillage associated with normal use. Where resistance to specific chemicals associated with laboratories, plating shops, etc., is required, these chemical solutions and concentrations should be added to the lists. Manufacturer's literature should be checked to assure that the matrix is capable of resistance to these chemicals.
****

2.2.1.1 Compressive Strength

ASTM C579, 31 MPa 4500 psi minimum at 7 days.

2.2.1.2 Tensile Strength

ASTM C307, 4.2 MPa 600 psi minimum at 7 days.

2.2.1.3 Flexural Strength

ASTM C580, 5.6 MPa 800 psi minimum at 7 days.

2.2.1.4 Thermal Coefficient of Expansion

ASTM C531; 5.5 x 10-4 mm per 100 mm 0.01 mil per inch per degree C F maximum.

2.2.1.5 Bond Strength

1.4 MPa 200 psi minimum with 100 percent concrete failure.

2.2.1.6 Flame Spread Index

ASTM E162, 4.0 maximum.

2.2.1.7 Smoke Developed

ASTM E162, 0.4 gm maximum.

2.2.1.8 Abrasion Resistance

ASTM D4060; 30 mg weight loss.

2.2.1.9 Moisture Absorption

ASTM C413; 3.5 percent maximum.

Chemical Resistance

ASTM D1308; no effect when exposed to the following reagents for 7 days:

Acetic Acid: 5 percent solution
Ammonium Hydroxide: 10 percent solution
Citric Acid: 5 percent solution
Coffee
Cola Syrup
Isopropyl Alcohol
Mineral Oil
Sodium Hydroxide: 5 percent solution
Tri-Sodium Phosphate: 5 percent solution
Urea: 6.6 percent solution

2.2.2 Epoxy Matrix Floor Surfacing

****

NOTE: The first set of figures in brackets for items b. and c. represents epoxy and polyester matrix containing more fillers and extenders and are suitable for most installations. The second set of figures in brackets represents high resin content epoxy and polyester matrices and should be specified only when higher strengths or increased chemical resistance is required.

Resistance to reagents specified in item k. is required to withstand cleaning agents and spillage associated with normal use. Where resistance to

specific chemicals associated with laboratories, plating shops, etc., is required, these chemical solutions and concentrations should be added to the lists. Manufacturer's literature should be checked to assure that the matrix is capable of resistance to these chemicals.

****

2.2.2.1 Compressive Strength

ASTM C579; 64 MPa 10,000 psi minimum at 7 days.

2.2.2.2 Tensile Strength

ASTM C307; [4.2] [10.3] MPa [600] [1500] psi minimum at 7 days.

2.2.2.3 Flexural Modulus of Elasticity

ASTM C580; [1610] [3215] MPa [250,000] [500,000] psi minimum at 7 days.

2.2.2.4 Thermal Coefficient of Expansion

ASTM C531; 22 by 10-4 mm per 100 mm 0.00004 inches per inch per degree C F maximum.

2.2.2.5 Shrinkage

ASTM C531; 0.5 percent maximum.

2.2.2.6 Bond Strength

1.9 MPa 300 psi minimum with 100 percent concrete failure (16 MPa 2500 psi Compressive Strength Concrete).

2.2.2.7 Flame Spread Index

ASTM E162; 25 maximum.

2.2.2.8 Smoke Deposited

ASTM E162; 4 mg maximum.

2.2.2.9 Abrasion Resistance

ASTM D4060; 15 mg maximum weight loss.

2.2.2.10 Moisture Absorption

ASTM C413; 1.0 percent maximum.

2.2.2.11 Chemical Resistance

ASTM D1308; no effect when exposed to the following reagents for 7 days:

Acetic acid: 5 percent solution
Ammonium Hydroxide: 10 percent solution
Citric Acid: 5 percent solution
Coffee
Cola Syrup

Isopropyl Alcohol
Mineral Oil
Sodium Hydroxide: 5 percent solution
Tri-Sodium Phosphate: 5 percent solution
Urea: 6.6 percent solution

2.2.3 Polyester Matrix Floor Surfacing

****
NOTE: The first set of figures in brackets for items a., b., c., and e. represents epoxy and polyester matrix containing more fillers and extenders and are suitable for most installations. The second set of figures in brackets represents high resin content epoxy and polyester matrices and should be specified only when higher strengths or increased chemical resistance is required.

Resistance to reagents specified in item q. is required to withstand cleaning agents and spillage associated with normal use. Where resistance to specific chemicals associated with laboratories, plating shops, etc., is required, these chemical solutions and concentrations should be added to the lists. Manufacturer's literature should be checked to assure that the matrix is capable of resistance to these chemicals.
****

2.2.3.1 Compressive Strength

ASTM C579; [51] [64] MPa [8000] [10,000] psi minimum at 7 days.

2.2.3.2 Tensile Strength

ASTM C307; [3.8] [10.3] MPa [600] [1500] psi minimum at 7 days.

2.2.3.3 Flexural Modulus of Elasticity

ASTM C580; [3215] [6430] MPa [500,000] [1,000,000] psi minimum at 7 days.

2.2.3.4 Thermal Coefficient of Expansion

ASTM C531; 22 by 10-4 mm per 100 mm 0.00004 inches per inch per degree C F maximum.

2.2.3.5 Shrinkage

ASTM C531; [0.6] [1.0] percent maximum.

2.2.3.6 Bond Strength

1.9 MPa 300 psi minimum with 100 percent concrete failure.

2.2.3.7 Flame Spread Index

ASTM E162; 25 maximum.

2.2.3.8 Smoke Deposited

ASTM E162; 4 gm maximum.

2.2.3.9 Abrasion Resistance

ASTM D4060; no more than 0.025 mm 1.0 mil loss of thickness.

2.2.3.10 Porosity

ASTM D4060; no more than 8 percent gain in weight and no evidence of cracking, peeling, blistering, or loss of adhesion.

2.2.3.11 Impact Resistance

ASTM D4060; no evidence of cracking, spalling, or loss of adhesion.

2.2.3.12 Fungistatic and Bacteriostatic Resistance

ASTM D4060; no support for growth of fungus or bacteria.

2.2.3.13 Ultraviolet Light Resistance

ASTM D4060; no evidence of chalking, cracking, peeling, blistering, or loss of adhesion.

2.2.3.14 Thermal Shock Resistance

ASTM D4060; no evidence of cracking, peeling, blistering, spalling, or loss of adhesion.

2.2.3.15 Stain Resistance

ASTM D4060; no permanent staining.

2.2.3.16 Adhesion

ASTM D4060; 90 percent failure of concrete substrate.

2.2.3.17 Chemical Resistance

ASTM D1308; no effect when exposed to the following reagents for 7 days.

Acetic Acid: 5 percent solution
Ammonium Hydroxide: 10 percent solution
Citric Acid: 5 percent solution
Coffee
Cola Syrup
Isopropyl Alcohol
Mineral Oil
Sodium Hydroxide: 5 percent solution
Tri-Sodium Phosphate: 5 percent solution
Urea: 6.6 percent solution

2.3 CONDUCTIVE SPARKPROOF FLOORING

****

NOTE: Conductive floors will be used at operations where explosives having an electrostatic sensitivity

of 0.1 joule or less such as primer, detonator, igniter, and incendiary mixtures are exposed. Conductive floors are also required where the following are performed:

a. Loose unpacked ammo with electric primers.
b. Exposed electro-explosive devices.
c. Electrically initiated items with exposed electric circuitry.
d. Hazardous materials that could be ignited by static discharge from humans.

****

Trowel or spray apply conductive sparkproof industrial resin-based flooring [1.6 mm 1/16 inch] [3 mm 1/8 inch] [6 mm 1/4 inch] thick, epoxy, polyester, or other resinous material conforming to ASTM C722with [Type A surfacings (chemical resistance and moderate to heavy traffic resistance)] [Type B surfacings (mild chemical resistance and severe thermal shock stability)]. Ground conductive flooring and conform to the requirements for conductive flooring of NFPA 99.

2.4 SEALER AND RESIN

Provide a sealer product recommended by the industrial resin-based flooring manufacturer; when applied to the resin topping and dried, it must be nonslip and resistant to staining and suitable for the type application indicated. Floor resin and sealer products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation for Indoor Air Quality for Sealer and Resin.

2.5 ANTIMICROBIAL

****

NOTE: Include the requirement for this item only on projects where this additional feature is needed.

****

Treat industrial resin-based flooring to be resistant to fungi and bacteria.

2.6 COLOR

Provide color [as indicated] [in accordance with Section 09 06 00 SCHEDULES FOR FINISHES] [_____].

PART 3 EXECUTION

3.1 SURFACE PREPARATION

****

NOTE: Resinous floor systems should not be installed over existing resilient tile or sheet flooring. If existing concrete substrates are badly cracked, crumbling, punky, or deeply contaminated with oil or fat, a new concrete topping of proper thickness and strength should be shown and

specified. Wood floors that are poorly supported, badly worn, splinter, grease or oil soaked should be renovated prior to application of resinous flooring.
****

[Completely remove existing resilient flooring and adhesive by scraping.] [Remove all dirt, dust, debris, and other loose particles by sweeping or vacuum cleaning.] Protect adjacent surfaces not scheduled to receive the flooring by masking, or by other means, to maintain these surfaces free of the flooring material.

[3.1.1 Concrete Surfaces

****
NOTE: Proper preparation of substrate is essential for satisfactory performance of resinous floor systems. Existing concrete floors should be carefully inspected to determine condition. Based on inspection, select most suitable surface treatment:

Surface Condition	**Surface Preparation Required**
New Concrete	**Acid etching and air drying**
Old Concrete	
Acid contaminated	**Neutralize with hot alkaline cleaner, acid etching, and air drying**
Oil, fat or wax contaminated	**Mechanical cleaning or steam cleaning**
Alkali contaminated	**Acid etching and air drying**
Painted	**Mechanical cleaning or paint stripping**
Adhesive and asphalt contaminated	**Mechanical cleaning**
Dust and dirt contaminated	**Mechanical cleaning**
Form oil, sealer or curing compound contaminated	**Mechanical cleaning**

NOTE: Select the applicable paragraph(s) from the following:
****

[3.1.1.1 Mechanical Cleaning

Completely remove dirt, wax, paint, laitance, and [_____] by grinding with a terrazzo machine, sanding with coarse open grid sandpaper, sand blasting, chipping, bush hammering, or wire brushing.

][3.1.1.2 Steam Cleaning

Completely remove all animal fats, grease, oil, wax, and [_____] using a high pressure steam cleaner equipped with a soap injection system. Scrape the surface to remove any build-up of debris. Then thoroughly saturate

the surface with hot caustic solution. Allow the solution to remain on the floor for 15 to 20 minutes. Apply steam, with caustic, over the presoaked area until all contamination is removed. Leach the caustic residue from the surface using one or more applications of steam without caustic. Flush the floor with warm water.

][3.1.1.3 Paint Stripping

Brush or spray on a paint stripping material that has been demonstrated to effectively remove the paint. Leave the stripping material on the surface until the paint has softened or blistered. Remove paint by scraping, brushing, or wiping. Rinse the surface in accordance with the stripping material manufacturer's recommendations. Avoid strippers containing toxic methylene chloride.

][3.1.1.4 Acid Etching

Apply a 10 percent solution of muriatic acid at a rate of one L/square meter one quart/each 10 square feet of concrete surface. Allow the solution to stand until it stops bubbling but not less than 5 minutes. Remove the acid and wash the surfaces several times, as required, to remove all traces of the acid. Always dilute acid by pouring into water. Use face shield rubber gloves, and other safety equipment when using acids, alkalis, or solvents.

][3.1.1.5 Air Drying

After cleaning, allow concrete surface to air dry thoroughly prior to application of surfacing. Blowers or oil free compressed air may be used. Do not use flame-drying methods. Prior to application of surfacing, test concrete surface for excessive moisture in at least two locations. Place rubber mats at each location with smooth side against concrete and place weight on top of mat to hold in position and ensure contact with concrete. Polyethylene with all edges taped may be used in lieu of mats. After 8 hours remove mat or sheeting and examine floor surface for moisture accumulation. If tests indicate accumulation of moisture at either location, perform additional air drying until additional tests show no moisture accumulation.

]]3.1.2 Plywood

For new plywood substrates, provide exterior grade plywood with exterior grade glue nailed with annular ring or spiral nails. Sand the plywood to remove all latent contaminants. Sweep or vacuum surfaces to remove all sanding debris. Tape joints with 100 mm 4 inch wide glass fiber reinforced tape.

3.1.3 Ceramic Tile

Remove all fats, oils, grease, or soap scum using a caustic solution of one kg one pound of caustic soda to 8.3 L one gallon of water. Allow the solution to stand on the surface for at least one hour then scrub with steel brushes or steel wool. Mop up the caustic solution, neutralize it with a 10 percent muriatic acid solution, and thoroughly rinse the residue from the surface. Test glazed tile a deglazing agent as recommended by the flooring manufacturer and sanded or acid etched to roughen the surface sufficiently to obtain a good bond. Sweep or vacuum surfaces to remove all sanding debris. Use face shield, rubber gloves, and other safety equipment when using acids, alkalis, or solvents.

3.1.4 Substrate Cracks, Spalls, Joints, and Depressions

Fill all cracks, joints, spalls, and other depressions in the substrate with a latex underlayment, as recommended by the manufacturer compatible with the floor surfacing material.

3.2 MIXING

Proportion and mix the floor surfacing components in accordance with the manufacturer's instructions. Submit flooring manufacturer's descriptive data, mixing, proportioning, and installation instructions. Include maintenance literature for resinous flooring.

3.3 APPLICATION

Submit complete instructions for application of flooring system including any precautions or special handling instructions required to comply with OSHA 29 CFR 1910-Subpart Z. Apply primer, floor surfacing, and seal coat in accordance with the manufacturer's recommendations and the following requirements.

3.3.1 Primer

Apply primer uniformly over the entire area to receive floor surfacing using clean rubber squeegees or clean steel trowels. Do not allow primer to collect in depressions. Allow primer to dry thoroughly before the next coat is applied. Reprime porous areas or areas where primer has dried.

3.3.2 Floor Surfacing

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NOTE: Specify desired thickness of resinous flooring. Latex and resinous emulsion matrix flooring should be installed 6, 10 and 13 mm 1/4, 3/8, and 1/2 inch thick for light, medium, and heavy duty traffic. Epoxy and polyester matrix flooring should be installed 3, 5 and 6 mm 1/8, 3/16, and 1/4 inch thick for light, medium, and heavy duty traffic.

Use first bracketed option requiring continuous floor installation only if structural floor control joints have been located out of floor area.

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Apply mixed surfacing material to provide a finish floor surfacing not less than [_____] mm inch thick. The entire surfacing in any one room or area must be [placed in one continuous operation without use of cold joints or divider strips] [one continuous operation except for placement of divider strips at structural floor control joints or as indicated]. All surfaces must be flush, true to plane and line, and level within 2 mm in one meter 1/4 inch in 10 feet.

3.3.3 Seal Coat

Apply seal coat uniformly covering all surfaces after floor surfacing has cured and as recommended by the supplier.

3.4 TESTING

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NOTE: For explosive and ammunition facilities and other facilities requiring conductive sparkproof industrial resinous flooring, edit the following paragraphs. Omit when not required.

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Submit reports of tests for conductive sparkproof flooring, including analysis and interpretation of test results. Properly identify each report. Identify and record the test methods used.

3.4.1 Electrical Resistance

Test the flooring between 30 and 45 days after flooring installation is completed, and prior to its use, in accordance with paragraph 12-4.1.3.8(b)(7) of NFPA 99. The resistance of the floor at any one location must be more than 5,000 ohms in areas with 110 volts service, more than 10,000 ohms in areas with 220 volt service, and average less than 1,000,000 ohms and more than 25,000 ohms in all areas. Perform tests using a technician experienced in such work.

3.4.2 Spark Resistance

Test the floor for spark resistance by stroking the floor vigorously with a 300 mm 12 inch hardened steel file in a 914.4 mm 3 foot arc. Perform the test for each 7.43 square meters 80 square feet of floor area. Perform the tests in a darkened space and only when the relative humidity of the atmosphere within the space does not exceed 50 percent. The floor must not produce a spark when tested under these conditions.

3.5 PROTECTION

Allow surfacing to set for a minimum period of 48 hours before traffic is allowed on the floor. Protect finished flooring from traffic by covering with 13.5 kg 30 pound building paper or other equally effective means until final acceptance of the project.

-- End of Section --