
USACE / NAVFAC / AFCEA / NASA UFGS-09 67 23.16 (August 2009)

Preparing Activity: NAVFAC Superseding
 UFGS-09 67 23.16 (August 2008)
 UFGS-09 62 50.12 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2009

SECTION TABLE OF CONTENTS

DIVISION 09 - FINISHES

SECTION 09 67 23.16

FUEL RESISTIVE RESINOUS FLOORING, 5-COAT SYSTEM

08/09

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 QUALITY ASSURANCE
 - 1.3.1 Test Reports
 - 1.3.1.1 Joint Sealant
 - 1.3.1.2 Epoxy Mortar Flooring System
 - 1.3.1.3 Primer
 - 1.3.1.4 Grout Coat
 - 1.3.1.5 Urethane Topcoat
 - 1.3.1.6 Daily Inspection Report
 - 1.3.2 Certificates
 - 1.3.2.1 Work Plan
 - 1.3.2.2 Flooring System Applicator Qualifications
 - 1.3.2.3 Joint Sealant
 - 1.3.2.4 Epoxy Mortar Flooring System
 - 1.3.2.5 Warranty
 - 1.3.3 Manufacturer's Instructions
 - 1.3.3.1 Joint Sealant
 - 1.3.3.2 Epoxy Mortar Flooring System
 - 1.3.3.3 Water-Based Alkaline Degreaser
- 1.4 DELIVERY, STORAGE, AND HANDLING
- 1.5 COATING HAZARDS
- 1.6 JOB SITE REFERENCES
- 1.7 PATCH TEST DEMONSTRATION

PART 2 PRODUCTS

- 2.1 JOINT SEALANT
- 2.2 EPOXY MORTAR FLOORING SYSTEM
 - 2.2.1 Primer Coat
 - 2.2.2 Grout Coat
 - 2.2.3 Urethane Topcoat
- 2.3 WHITE ALUMINUM OXIDE NON-SKID GRIT

2.4 PREAPPROVED MATERIALS

PART 3 EXECUTION

- 3.1 COATING SAMPLE COLLECTION
- 3.2 TILE AND TILE ADHESIVE REMOVAL
- 3.3 JOINT MATERIAL REMOVAL, RE-SAW CUTTING, CRACK CHASING
- 3.4 DEGREASING
- 3.5 COATING SYSTEM REMOVAL
- 3.6 SURFACE PREPARATION
 - 3.6.1 CMU Surface Preparation
- 3.7 COVE STRIP INSTALLATION
- 3.8 KEY-IN TERMINATIONS
- 3.9 CRACK REPAIRS
 - 3.9.1 Install Bondbreaker
 - 3.9.2 Repair Cracks
- 3.10 PRE-APPLICATION TESTING FOR CONTAMINATION
- 3.11 COATING APPLICATION
 - 3.11.1 Isolation (Expansion) and Construction Joint Treatment
 - 3.11.2 Contraction Joint Treatment
 - 3.11.3 Primer Application
 - 3.11.4 Epoxy Mortar Application
 - 3.11.5 Primer Application to CMU Walls
 - 3.11.6 Epoxy Mortar Application to CMU Walls
 - 3.11.7 Grout Coat Application
 - 3.11.8 Grout Coat Sanding
 - 3.11.9 Saw Cutting and Sealing Joints
 - 3.11.9.1 Saw Cut Contraction Joints
 - 3.11.9.2 Saw Cut Isolation (Expansion) and Construction Joints
 - 3.11.9.3 Install Backer Rod
 - 3.11.9.4 Joint Sealant Application
 - 3.11.10 Application of Topcoats
 - 3.11.10.1 Non-Skid Grit Broadcast
 - 3.11.10.2 Grout Coat Cleaning
 - 3.11.10.3 First Topcoat
 - 3.11.10.4 Second topcoat
 - 3.11.10.5 Walkway Stripes
- 3.12 CURING
- 3.13 FIELD TESTS AND INSPECTION
 - 3.13.1 Coating Inspector
 - 3.13.2 Inspection
 - 3.13.2.1 Daily Inspection Report
 - 3.13.2.2 Inspection Logbook
 - 3.13.2.3 Inspection Equipment
 - 3.13.3 Adhesion Testing
- 3.14 Final Cleanup

-- End of Section Table of Contents --

USACE / NAVFAC / AFCEA / NASA UFGS-09 67 23.16 (August 2009)

Preparing Activity: NAVFAC Superseding
 UFGS-09 67 23.16 (August 2008)
 UFGS-09 62 50.12 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2009

SECTION 09 67 23.16

FUEL RESISTIVE RESINOUS FLOORING, 5-COAT SYSTEM 08/09

NOTE: This guide specification covers the requirements for a five-coat, epoxy mortar flooring system with reflective urethane topcoats, slip resistance, and joint work.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

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

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

NOTE: The epoxy mortar flooring system is appropriate for use in: aircraft maintenance hangars, equipment maintenance shops, jet engine test cells, and all other industrial floors where resistance to impact, abrasion, and fuel is required. Installation costs: \$5.00 to \$10.00 per 0.1 square meters square foot. Nominal thickness: 6.25 mm 1/4 inch. Benefits: Tolerates high Moisture Vapor Emission (MVE) rates, produces a level surface over coarse concrete, high impact resistance, good chemical resistance, and may provide a suitable topcoat base for more than 10 years service. Can be rejuvenated by replacing urethane topcoats, and non-skid, only. Approximate service life: Urethane topcoating with non-skid grit at three or more

years. The flooring system is neither conductive nor Electro-Static Dissipative (ESD), however, either formulation is easily designed upon request. This specification is not for use in overcoating existing sound coating systems.

NOTE: Prior to the flooring systems installation, a concrete condition assessment in accordance with the Naval Facilities Engineering Service Center's (NFESC) Users Guide (UG)-2036-SHR is highly recommended. The condition assessment is designed to identify problem floors and eliminate premature flooring failures produced by: 1) Coating concrete with low surface strength, 2) coating concrete with high surface contamination levels (oils, fuels, fats, waxes, etc.), and 3) coating concrete with a high Moisture Vapor Emission (MVE) rate. The thin film flooring system is suitable for application to: A) "Smooth" or "Coarse" concrete surface textures, B) concrete with a MVE rate no more than 254 micrograms moisture per second, square meter 4.5 pounds moisture per 24 hours, 1000 square feet (ASTM F 1869), C) concrete with surface strength greater than 1.34 MPa 200 psi (ASTM D 4541), and D) concrete with fuel/oil contamination to a depth no more than 6.25 mm 1/4 inch.

NOTE: If a concrete floor has a Moisture Vapor Emission (MVE) rate more than 254 micrograms moisture per second, square meter 4.5 pounds moisture per 24 hours, 1000 square feet (ASTM F 1869), apply a layered Moisture Reducing System (MRS) prior to the epoxy mortar flooring system application. Use MRS compatible with the submitted flooring system and approved / warranted by the epoxy mortar flooring system manufacturer. Apply the MRS to shot blasted concrete and reduce the MVE rate to less than 254 micrograms moisture per second, square meter 4.5 pounds moisture per 24 hours, 1000 square feet. MRSs can employ combinations of concrete sealers, specific epoxies, and moisture insensitive grouts, with or without mesh. MRSs are available from the following partial list of epoxy mortar flooring system vendors: Tennant (800) 553-8033, Stonhard (856) 779-7500, General Polymers (800) 543-7694, Crawford Labs (800) 356-7625, Floor Seal (800) 295-0221. Moisture Vapor Emission Test Kits (MVETK) are available from the following partial list of vendors: Crawford Labs (800) 356-7625, Floor Seal (800) 295-0221, Sinak (619)231-1771, General Polymers (800)534-7694.

NOTE: Include Section 03 01 30.71 CONCRETE

REHABILITATION for minor spalls and surface deterioration repair to depths less than three inches. Specify epoxy mortar for repairs to depths no more than 50 mm 2 inches. Specify epoxy concrete for repairs to depths from 25 to 75 mm 1 to 3 inches. Saw cut repairs to depths greater than 25 mm 1 inch to a rectangular geometry. Finish repairs to resemble surrounding concrete using a stainless steel trowel.

Include Section 32 01 19.61 RESEALING OF JOINTS IN RIGID PAVEMENT for large spalls and severe deterioration repair to depths from 75 to 150 mm 3 to 6 inches. Specify Portland Cement Concrete (PCC) with less than 0.45 water-cement ratio, light steel trowel finish, and cure using plastic coated burlap. Use rectangular geometry for repairs with saw cut edges to a nominal repair depth of 150 mm 6 inches. Cure PCC repair for approximately 30 days prior to the application of the flooring system. Do not cure repairs using liquid membrane-forming compounds.

For repairs to spalls and severely distressed concrete to depths greater than 150 mm 6 inches, seek material guidance from Section 03 30 00 CAST-IN-PLACE CONCRETE and procedural guidance from the American Concrete and Pavement Association (ACPA) Guideline TB-002.02P "Concrete Paving Technology - Guidelines for Full Depth Repair." Fill repair base with a minimum of 50 mm 2 inches of clean, non-reactive concrete sand over a suitable vapor retarder (0.25 mm 10 mils polyethylene sheeting). Finish repairs by light steel trowel and cured using plastic coated burlap. Cure repairs for approximately 30 days, or more, prior to the the flooring system application. Do not cure repairs using liquid membrane-forming compounds.

Scarify level any curled and/or settled slab ends with joint surfaces displaying more than 3.2 mm 1/8 inch difference in vertical height. Resulting surfaces shall contain a height difference no more than 1.5 mm 1/16 inch and a surface texture equal to ICRI-CSP 4.

NOTE: Include Section 03 30 00 CAST-IN-PLACE CONCRETE for new concrete slab construction. Empty measures to control the base, subbase, and subgrade moisture Moisture Vapor Emission (MVE) rates to total no more than 169.0 micrograms moisture per second, square meter 3.0 pounds moisture per 24 hours, 1000 square feet when measured on the slab's surface (ASTM F 1869). Improper MVE controls have produced numerous premature coating failures. In addition to appropriate subbase drainage, specify a minimum of 50 mm 2 inches of clean, non-reactive concrete sand over no less than 0.25 mm 10 mils of

polyethylene sheeting (ASTM D 4397) with sealed lap joints. Specify concrete mix to be free of accelerators containing calcium chloride and other sources of chloride ion contamination. Specify two passes of a light power troweled finish and cure using plastic coated burlap or equal method. Do not cure concrete using liquid membrane-forming compounds. Do not specify surface hardeners or dry shake finish (Section 09 97 23 METALLIC TYPE CONDUCTIVE/SPARK RESISTANT CONCRETE FLOOR FINISH). Approximately 60 days following the concrete pour and prior to the flooring system installation, test concrete for the MVE rate and confirm rate is no more than 254 micrograms moisture per second, square meter 4.5 pounds moisture per 24 hours, 1000 square feet (ASTM F 1869). Consult ACI 224.3R "Joints in Concrete Construction," ACI 302.1R "Guide for Concrete Floor and Slab Construction," ACI 360R "Design of Slabs on Grade," and other appropriate construction guidance.

NOTE: Where tile is to be removed prior to the flooring system application, test both tile and mastic for the presence of asbestos. If asbestos is detected, include Section 02 82 16.00 20 ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS for removal and disposal.

NOTE: If flooring system is to be applied to warehouse floors with heavy forklift traffic, a semi-flexible joint sealant is required in lieu of the specified flexible sealant. Use a semi-flexible epoxy sealant with approximately 90 percent elongation. Do not use semi-flexible sealants in areas exposed to exterior temperatures.

NOTE: Include Section 01 45 02 NAVFAC QUALITY CONTROL or 01 45 01 USACE QUALITY CONTROL as applicable.

NOTE: Include Section 01 57 19.00 20 TEMPORARY ENVIRONMENTAL CONTROLS. This section defines fugitive dust, generated waste, hazardous materials, hazardous substance, hazardous waste, solid waste, construction and demolition (CD) debris, and liquid waste, and contains documentation for dangerous waste profile, waste information sheet, waste identification document, waste generation record, landfill disposal form, and hazardous material reporting.

PART 1 GENERAL

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 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 C 307	(2003; R 2008) Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing
ASTM C 531	(2000; R 2005) Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing, and Polymer Concretes
ASTM C 579	(2001; R 2006) Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
ASTM C 679	(2003e1; R 2009) Tack-Free Time of Elastomeric Sealants
ASTM C 884/C 884M	(1998; R 2005) Thermal Compatibility between Concrete and Epoxy-Resin Overlay
ASTM D 1308	(2002; R 2007) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D 2240	(2005) Standard Test Method for Rubber Property - Durometer Hardness

ASTM D 2621	(1987; R 2005) Infrared Identification of Vehicle Solids from Solvent-Reducible Paints
ASTM D 2697	(2003; R 2008) Volume Nonvolatile Matter in Clear or Pigmented Coatings
ASTM D 3335	(1985a; R 2009) Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
ASTM D 3718	(1985a; R 2005) Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy
ASTM D 3925	(2002) Sampling Liquid Paints and Related Pigmented Coatings
ASTM D 412	(2006a) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D 4541	(2009) Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D 6237	(2009) Painting Inspectors (Concrete and Masonry Substrates)
ASTM D 638	(2008) Standard Test Method for Tensile Properties of Plastics
ASTM E 11	(2009) Wire Cloth and Sieves for Testing Purposes
ASTM F 1869	(2004) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)

ICRI 03732	(1997) Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
------------	--

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC-TU 2	(1997) Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment
-----------	--

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-595	(Rev B; Am 1) Colors Used in Government Procurement
-------------	---

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

29 CFR 1910.1000	Air Contaminants
------------------	------------------

29 CFR 1910.134

Respiratory Protection

29 CFR 1926.59

Hazard Communication

1.2 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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.

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

SD-04 Samples

Joint Sealant[; G][; G, [_____]]

Epoxy Mortar Flooring System[; G][; G, [_____]]

White Aluminum Oxide Non-Skid Grit[; G][; G, [_____]]

SD-06 Test Reports

Joint Sealant[; G][; G, [_____]]

Epoxy Mortar Flooring System[; G][; G, [____]]
Primer[; G][; G, [____]]
Grout Coat[; G][; G, [____]]
Urethane Topcoat[; G][; G, [____]]
White Aluminum Oxide Non-Skid Grit[; G][; G, [____]]
Patch Test Demonstration[; G][; G, [____]]
Daily Inspection Report[; G][; G, [____]]
Adhesion Testing[; G][; G, [____]]

SD-07 Certificates

Work Plan[; G][; G, [____]]
Flooring System Applicator Qualifications[; G][; G, [____]]
Joint Sealant[; G][; G, [____]]
Epoxy Mortar Flooring System[; G][; G, [____]]
Warranty[; G][; G, [____]]

SD-08 Manufacturer's Instructions

Joint Sealant[; G][; G, [____]]
Epoxy Mortar Flooring System[; G][; G, [____]]
Water-Based Alkaline Degreaser[; G][; G, [____]]

SD-11 Closeout Submittals

Inspection Logbook[; G][; G, [____]]

1.3 QUALITY ASSURANCE

1.3.1 Test Reports

1.3.1.1 Joint Sealant

Submit test results that confirm sealant complies with Table Ia requirements. Samples must have been tested within the last three years.

1.3.1.2 Epoxy Mortar Flooring System

Submit test results that confirm the epoxy mortar flooring system complies with Table Ib requirements. Samples must have been tested within the last three years.

1.3.1.3 Primer

Submit test results that confirm the primer complies with Table Ic

requirements. Samples must have been tested within the last three years.

1.3.1.4 Grout Coat

Submit test results that confirm grout coat complies with Table Id requirements. Samples must have been tested within the last three years.

1.3.1.5 Urethane Topcoat

Submit test results that confirm urethane topcoat complies with Table Ie requirements. Samples must have been tested within the last three years.

1.3.1.6 Daily Inspection Report

Submit one copy of the daily inspection report to the Contracting Officer within 24 hours of the date recorded.

1.3.2 Certificates

1.3.2.1 Work Plan

Submit schedule to complete work within approximately twelve (12) consecutive calendar days. Submit a written plan describing in detail all phases of coating operations. Address work sequencing, surface preparation, flooring system application, recoat and cure time projections, as well as how each step will be controlled, tested, and evaluated. Address safety measures, work scheduling around weather, and record keeping. Assign one supervisor to the job who is to remain on site throughout all phases of work and who is to act as the contractor's primary point of contact. Identify this person in the submitted schedule.

1.3.2.2 Flooring System Applicator Qualifications

Minimum requirements for the installation contractor are as follows: Completed three or more jobs within the past two years applying the specified materials to concrete surfaces in which the total area exceeds 18 587 square meters 200,000 square feet. Submit documentation listing location of work, point of contact at job site, total square footage of applied materials, listing of both materials and equipment used, and validation from coating manufacturer documenting quality of materials purchased per job for work totaling 18,587 square meters 200,000 square feet within the past two years. In addition to the above requirements, installation contractor shall be certified by the material manufacturer(s) to install the submitted coatings and sealant. Submit copy of certificates.

1.3.2.3 Joint Sealant

Submit literature documenting the sealant's past performance in automotive and/or aircraft maintenance shops. Minimum requirements are two or more maintenance shops with joint work totaling 3048 linear meters 10,000 linear feet whereby the sealant has performed for two years with less than one percent combined sealant failures and defects. Include from sealant manufacturer a list of shop locations, total linear feet of sealant applied per shop, shop point of contact, date sealant was applied, and the name of the installed sealant material.

1.3.2.4 Epoxy Mortar Flooring System

Submit literature documenting the coating system's past performance in

aircraft maintenance shops and over floors with high Moisture Vapor Emission (MVE) rates. Minimum requirements are two or more aircraft maintenance shops totaling 3160 square meters 34,000 square feet where the coating system has performed for two years with less than 0.05 percent combined premature coating failures, material defects and surface discoloration; no more than 0.03 percent discoloration from aviation chemicals, tire plasticizers, and UV exposure. Provide a minimum of two additional case histories where successful installation occurred on floor slabs with no less than 254 micrograms moisture per second, square meter 4.5 pounds moisture per 24 hours, 1000 square feet. Include from flooring manufacturer a list of shop locations, total coated area per shop, shop point of contact, date coating system was applied, successful installation to concrete with high MVE, and the names of the installed coating materials.

1.3.2.5 Warranty

Warrantee materials and workmanship for a minimum of one year following completion of flooring and sealant application. The following terms and conditions form a part of the warranty: If the applied coating system develops blisters (chemical), checks, softening, or lifting within one year following application, rework each area by installation contractor at contractor's expense. The following conditions are excluded from the warranty: A) Concrete cracking, flooring system mirrors cracks in concrete, B) cosmetic imperfections due to scratching and gouging, C) application to metallic concrete finishes (Section 09 97 23 METALLIC TYPE CONDUCTIVE/SPARK RESISTANT CONCRETE FLOOR FINISH), and D) application to concrete with a MVE rate greater than 282 micrograms moisture per second, square meter 5.0 pounds moisture per 24 hours, 1000 square feet. If the coating system's adhesion is in question, perform one adhesion test per 9.3 square meters 100 square feet as described in the Article entitled "ADHESION TESTING." To satisfy the warranty, adhesion testing shall produce cohesive failures within the concrete, concrete removal over 95 percent of each pull-off coupon, and/or adhesion no less than 2.8 MPa 400 psi. Each area failing to meet adhesion requirements shall require two additional adhesion tests to confirm results. Within the warranty period, remove to sound material and rework all areas unable to meet adhesion requirements. Zero percent sealant failures within one year is required. Within the warranty period, remove and rework all sealant material with chemically attacked surfaces and/or lifting from joint walls. Topcoat cracking over sealant is excluded from warranty.

1.3.3 Manufacturer's Instructions

1.3.3.1 Joint Sealant

Submit manufacturer's printed instructions to include detailed application procedures, minimum and maximum application temperatures, and curing procedures. In accordance with 29 CFR 1926.59, include Material Safety Data Sheets (MSDS) for the sealant to be used at the job site.

1.3.3.2 Epoxy Mortar Flooring System

Submit manufacturer's printed instructions to include detailed mixing, minimum and maximum application temperatures, acceptable atmospheric and/or interior climatic conditions, application procedures, curing procedures, and procedures for flooring system maintenance cleaning. Provide explicit instructions detailing surface preparation, recoat windows and remedial actions in case recoat windows are missed, and, if applicable, solvent-wiping between coats with acceptable types and grades of solvents.

In accordance with 29 CFR 1926.59, include MSDSs for the coatings to be used at the job site.

1.3.3.3 Water-Based Alkaline Degreaser

Submit manufacturer's printed instructions to include detailed mixing, dilution rate, application procedures, and rinsing procedures. In accordance with 29 CFR 1926.59, include MSDSs for the water-based alkaline degreaser to be used at the job site.

1.4 DELIVERY, STORAGE, AND HANDLING

Store coatings and sealant in spaces with temperatures from 5 to 24 degrees C 40 to 75 degrees F. Inspect materials on site for damage prior to use. Return to manufacturer any packaged materials in dented, rusty, or leaking containers. Return to manufacturer materials with an expired shelf life for testing, and if compliant, reissuing of shelf life extension.

1.5 COATING HAZARDS

NOTE: Include either Section 01 35 26 GOVERNMENTAL
SAFETY REQUIREMENTS or prepare instructions
detailing each safety element for use with this
section.

Ensure that employees are trained in all safety plan aspects. Follow the coating manufacturer's written safety precautions throughout mixing, application, and curing of coatings. Comply with respiratory protection requirements in 29 CFR 1910.134 and safe levels of airborne contaminants in 29 CFR 1910.1000.

1.6 JOB SITE REFERENCES

Make available to the Contracting Officer at least one copy each of ASTM D 4541, ASTM D 6237, SSPC-TU 2, and ICRI 03732, including replica standards ICRI-CSP 1 through ICRI-CSP 9, at the job site.

1.7 PATCH TEST DEMONSTRATION

NOTE: This is a very important part of the
submittal process. While it is unusual to require a
test patch prior to the submitted materials'
approval, this flooring system is unusual in that it
is required to perform significant tasks for a long
time. Proof of contractor claims, especially under
conditions to be encountered in the specific
project, is considered necessary.

If customer dislikes non-skid grit level,
adjustments to the specification can be made. Grit
coarser than #60 aluminum oxide is not recommended.
On architectural floors, non-skid grit broadcast
rates can range from none to approximately half the
specified level. To confirm grit broadcast is
acceptable, walk on cured patch test under both dry
and wet conditions. Water can be used to simulate

the wet condition.

Prior to the submitted flooring system's approval, apply the complete flooring system to a 3 meter by 3 meter 10 foot by 10 foot square concrete section as prepared in accordance with Part 3 "EXECUTION." Within this area, perform three adhesion tests using procedures as detailed in the Article entitled "ADHESION TESTING." If adhesion testing produces cohesive failures within the concrete, no less than 1 mm 40 mils concrete removed over 95 percent of each pull-off coupon, and/or adhesion more than 2.75 MPa 400 psi, patch test adhesion is acceptable. If concrete surface preparation was insufficient, apply an additional coating system patch to properly prepared concrete followed by the above adhesion testing. If adhesion results are unacceptable for both the topcoat and the coatings below the grout coat, submit a new coating system manufactured by a different coating vendor. Apply new coating system to a patch and subject this patch to the above requirements for adhesion prior to approval. If customer dislikes non-skid grit application, adjustments to the specifications can be made. Grit coarser than #60 aluminum oxide is not recommended. Immediately following "passing" adhesion results, remove urethane topcoats and grout coat by sanding, repair patch test holes using epoxy mortar, and place a "Key-In Termination" adjacent patch test perimeter. Coarse scarification and/or pneumatic scabbling can be required to remove patch tests failing to meet adhesion requirements.

PART 2 PRODUCTS

NOTE: The specified materials are not appropriate for use in primary chemical containment, secondary chemical containment, or on floors subjected to spills from concentrated acids, bases, and organic solvents. Consult with the Naval Facilities Engineering Service Center's (NFESC) Paints and Coatings Center of Expertise for alternative coating systems to suit specific Navy needs.

NOTE: Tables Ia, Ib, Ic, Id, Ie, and II, are presented at the end of Part 3 "EXECUTION."

2.1 JOINT SEALANT

Formulate the joint sealant to exhibit the properties as listed in Table Ia.

2.2 EPOXY MORTAR FLOORING SYSTEM

A five-coat flooring system consisting of primer, epoxy mortar, grout coat, and two urethane topcoats. Apply the system at a nominal thickness of 6.25 mm 1/4 inch and contain an aluminum oxide non-skid grit broadcast. Formulate the complete flooring system to exhibit the properties listed in Table Ib. Additional requirements for primer coat, grout coat, and urethane top coat are contained in the following sub-paragraphs.

2.2.1 Primer Coat

In addition to the epoxy mortar flooring system requirements, formulate the primer coat to exhibit the properties as listed in Table Ic.

2.2.2 Grout Coat

In addition to the epoxy mortar flooring system requirements, formulate the grout coat to exhibit the properties as listed in Table Id.

2.2.3 Urethane Topcoat

In addition to the epoxy mortar flooring system requirements, formulate the urethane topcoat to exhibit the properties as listed in Table Ie.

2.3 WHITE ALUMINUM OXIDE NON-SKID GRIT

Size #60, dust-free (washed and dry), minimum 99 percent pure, having the following sieve analysis when tested using a 1000 gram 2.2 pound sample (ASTM E 11):

Sieve No. 40	100 percent passing
Sieve No. 50	15-30 percent retained
Sieve No. 60	70-85 percent retained
Sieve No. 70	0-15 percent retained

2.4 PREAPPROVED MATERIALS

Table II is a list of vendors with "preapproved materials."

PART 3 EXECUTION

3.1 COATING SAMPLE COLLECTION

The Contracting Officer and QC Manager shall witness all material sampling. Notify the Contracting Officer a minimum of three days in advance of sampling. Obtain liquid samples of each component (eg., primer, intermediate, grout coat, topcoat) by random selection from sealed containers and in accordance with ASTM D 3925. Samples may be either individual cans of liquid material or 1.0 liter 1.0 quart quantities of properly mixed, extracted, and sealed liquid material. Label samples by designated name, specification number, batch number, project contract number, sample date, intended use, and quantity involved. When the applied epoxy mortar system has met the requirements defined in the Article entitled "ADHESION TESTING," return coating samples to the installation contractor for proper disposal.

[3.2 TILE AND TILE ADHESIVE REMOVAL

**NOTE: Delete "Tile and Tile Adhesive Removal" if
concrete is not tiled.**

Remove tile 100 percent, employing one or more of the following techniques: chipping, scraping, sanding, scarification, high-pressure water, and various hand tools. Remove tile adhesive 100 percent, using solvents and power scrubbing. Remove residual contamination using hot potable water under a minimum of 27.6 MPa 4,000 psi. Resulting surfaces shall appear

clean and display the gray color of concrete.

]3.3 JOINT MATERIAL REMOVAL, RE-SAW CUTTING, CRACK CHASING

Remove existing material 100 percent in all joints including material bonded to joint walls and base. Rigid material may require saw cutting equipment to remove. Joints may be widened up to 3.2 mm 1/8 inch when re-saw cutting. Chase concrete cracks identified for repair and open to a minimum depth of 12.5 mm 1/2 inch below crack surface, resulting in crack(s) with smooth vertical walls.

3.4 DEGREASING

On both previously coated and uncoated concrete, degrease entire floor by scrubbing using a hot potable water solution, 49 to 77 degrees C 120 to 170 degrees F, and a concentrated water-based alkaline degreaser. Perform two complete degreasing cycles on the entire floor surface. Allow solution to soak into surfaces prior to scrubbing and remove using hot potable water under a minimum of 27.6 MPa 4,000 psi. Rinsing shall be complete when the rinse water appears clear. If the industrial detergent is not biodegradable, collect all rinse water and dispose of as hazardous waste. Squeegees and shop vacuums may be used to collect pooling rinse water. Fans may be used to aid drying of floor surfaces.

[3.5 COATING SYSTEM REMOVAL

NOTE: Delete "Coating System Removal" if concrete is uncoated.

Remove existing coating system 100 percent employing one or more of the following techniques: shot blasting, chipping, scraping, sanding, scarification, high pressure water blasting, and various hand tools. Impact tools such as scabblers may be used to remove unsound epoxy mortar flooring systems. In general, a coating system cannot be completely removed by shot blasting and, to attain 100 percent coating removal, requires a combination of the above techniques.

]3.6 SURFACE PREPARATION

Shot blast entire floor to produce a level of coarseness equal to ICRI 03732 CSP 3. Overlap each shot blasting pass by 6.25 to 12.5 mm 1/4 to 1/2 inch. Add new shot to shot blasting equipment prior to blasting. Prepare concrete surfaces inaccessible to shot blasting, perimeter wall bases and under secured equipment, using a diamond disk grinding and/or light scarification to produce a level of coarseness equal to ICRI 03732 CSP 2, ICRI 03732 CSP 4, respectively. Resulting surfaces shall appear clean and contain the appropriate surface coarseness level. If the resulting cleanliness level cannot be determined, place numerous drops of water on surfaces that appear contaminated. If the water drops soak into concrete, the surfaces are hydrocarbon contamination free (oils, grease, skydrol). If the water drops bead up and do not flatten out, surfaces require additional degreasing as detailed in the Article entitled "DEGREASING." Shot blasting coarse concrete and/or broom finished concrete can produce a coarseness level equal to ICRI 03732 CSP 5: employ a best effort attempt to minimize excessive removal of coarse concrete material. If coarse concrete is encountered, shot blasting to a level of coarseness equal to ICRI 03732 CSP 5 is acceptable: however, extremely coarse concrete can require

resurfacing prior to the flooring system's installation. Sweep, vacuum, and run a high powered magnet over all surfaces to be coated, including joints.

3.6.1 CMU Surface Preparation

NOTE: Delete paragraph if epoxy mortar is not to be applied to the CMU wall bases.

A minimum remove 100 percent of coatings 100 mm 4 inches up the base of CMU walls adjacent the flooring space, and prepare surface by power grinding to a resulting level of coarseness equal to ICRI 03732 CSP 2. If oils/grease are present, degrease in accordance with the Article entitled "DEGREASING."

3.7 COVE STRIP INSTALLATION

NOTE: Delete paragraph if epoxy mortar is not to be applied to the CMU wall bases.

Install a continuous cove strip at a nominal height of 100 mm 4 inches up each CMU perimeter wall base. Install a solvent resistant cove strip using a solvent resistant adhesive.

3.8 KEY-IN TERMINATIONS

NOTE: If the epoxy mortar flooring system is to be applied up the CMU wall bases, a Key-In termination is not required adjacent these walls.

Place the "Key-In" termination as detailed in SSPC-TU 2 Figure 8 at transition surfaces, directly below doorways, and adjacent walls, floor drains, drain grates (interior side), and all other obstructions embedded into the floor slab. The Key-In termination shall contain one vertical wall at a depth from 9.4 to 15.6 mm 3/8 to 5/8 inch and, leading down to the resulting vertical depth, a sloped surface from 37.5 to 50 mm 1-1/2 to 2 inches. A hand held concrete saw can be used to cut the correct vertical depth followed by power tool grinding to create a sloped surface. Remove concrete dust by vacuuming.

3.9 CRACK REPAIRS

Use the "Elastomeric Underlayer Crack-Bridging Design" as detailed in SSPC-TU 2 Figure 7 over the surface of epoxy mortar filled cracks.

3.9.1 Install Bondbreaker

Install bondbreaker, either solvent resistant bondbreaker tape or a 3.2 to 6.25 mm 1/8 to 1/4 inch #20-#40 mesh silica sand layer, to the base of previously chased cracks identified for repair. For cracks without a rigid base, install suitably sized fiberboard to a depth of 12.5 mm 1/2 inch below floor level and with bondbreaker over exposed fiberboard. Install bondbreaker to cover the crack's horizontal base and continuously span the entire crack length. Bondbreaker application prevents epoxy mortar from

penetrating deep into cracks. Use bondbreaker tape no more than 150 microns 6 milsthick. In this application, the use of backer rod is prohibited.

3.9.2 Repair Cracks

Using the specified materials, prime interior crack walls and apply epoxy mortar directly into wet primer. Finish epoxy mortar level with floor and without feathered edges. When cured, remove mortar imperfections by sanding flush with adjacent concrete. Apply solvent resistant tape parallel to each side of the mortar filled crack(s) at a minimum inner width of 100 mm 4 inches between tape. A 100 mm 4 inch inner tape width is generally suitable for cracks less than 12.5 mm 1/2 inch wide whereas cracks more than 12.5 mm 1/2 inch wide can require an inner tape width of 150 mm 6 inches. Apply 1 mm 1/24 inch of the specified sealant, in one coat, directly over filled crack(s) and spread flush with inner tape edges: a stiff bristled paintbrush can be used to spread the sealant. Use a Wet Film Thickness (WTF) gage to confirm sealant application is between 875 to 1125 microns 35 to 40 mils wet. Remove tape and allow sealant to cure a minimum of 24 hours prior to the epoxy mortar flooring system application. Sealant application above 1250 microns 50 mils dry will require removal and reapplication.

3.10 PRE-APPLICATION TESTING FOR CONTAMINATION

Spot check surfaces for oil/grease contamination using the water break test. At a rate of 5 tests per 95 square meters 1000 square feet place one to two water drops onto surfaces and observe for beading. Test all other surfaces that show visible signs of potential contamination. Perform additional degreasing to surfaces displaying water beading in accordance with the Article entitled "DEGREASING."

NOTE: At this point in the installation sequence, minor spalls and surface deterioration to depths less than 75 mm 3 inches can be repaired. Use epoxy mortar for repairs to depths no more than 50 mm 2 inches. Use epoxy concrete for repairs to depths from 25 to 75 mm 1 to 3 inches. Contain repairs to depths greater than 25 mm 1 inch in a rectangular geometry with saw cut edges. Finish repairs to resemble surrounding concrete using a stainless steel trowel. Include Section 03 01 30.71 CONCRETE REHABILITATION if concrete repairs of this nature are required.

3.11 COATING APPLICATION

Prior to the flooring system application, vacuum flooring space and mark all joints.

3.11.1 Isolation (Expansion) and Construction Joint Treatment

Install into each isolation (expansion) and construction joint, a continuous length of round polyethylene backer rod flush with the floor's surface and under 30 percent compression. Backer rod placement prevents epoxy mortar from penetrating into isolation and construction joints.

3.11.2 Contraction Joint Treatment

Apply primer and epoxy mortar directly into all contraction joints. This quantity is in addition to the specified 6.25 mm 1/4 inch epoxy mortar thickness. This step may be performed either prior to, or during, the full epoxy mortar application.

3.11.3 Primer Application

Apply primer to flooring space at a minimum of 250 microns 10.0 mils wet. Do not prime previously installed patch test.

3.11.4 Epoxy Mortar Application

Apply epoxy mortar at 6.25 mm 1/4 inch directly into wet primer using a screed box or equal equipment. Finish open areas using a power trowel with stainless steel blades. Perimeter edges and adjacent equipment footings may require finishing by stainless steel hand trowel. Directly above areas with Key-In terminations and at a distance from 25 to 37.5 mm 1 to 1-1/2 inches away from the mortar's outer edge, slope the mortar down and flush with the concrete's surface. Terminate the resulting angle flush with the each Key-In termination vertical cut. Apply epoxy mortar flush with previously installed patch test. Do not apply epoxy mortar onto patch test surface. When sufficiently cured, sand entire mortar surface. Resulting surface shall appear level, contain uniform thickness, and be free of surface imperfections including trowel marks.

3.11.5 Primer Application to CMU Walls

NOTE: Delete paragraph if epoxy mortar is not to be applied to CMU wall bases.

When the epoxy mortar has sufficiently cured, prime approximately 100 mm 4 inches up base of CMU walls to cove strip and 50 mm 2 inches adjacent the wall's base using the specified primer.

3.11.6 Epoxy Mortar Application to CMU Walls

NOTE: Delete paragraph if epoxy mortar is not to be applied to CMU wall bases.

Apply epoxy mortar directly into wet primer at 4.5 mm to 6.25 mm 3/16 to 1/4 inch. Use a cove trowel to create a rounded transition between floor surfaces and perimeter wall bases. When sufficiently cured, sand the base and 100 mm 4 inches up perimeter walls. Resulting finish shall contain a rounded transition of uniform thickness between flooring surfaces and CMU walls. When sufficiently cured, sand mortar surfaces. Resulting surface shall be free of surface imperfections including trowel marks.

3.11.7 Grout Coat Application

NOTE: Select a grout coat color identical to the selected topcoat color, either white or ultra-light gray. Ultra-light gray is preferred to white.

Sweep and vacuum up residual dust from epoxy mortar sanding. Apply grout coat to epoxy mortar at a minimum of 250 microns 10 mils wet. Apply grout coat to previously install patch test. If applicable, up CMU wall bases. If the cured grout coat feels oily/greasy, an amine blush has occurred which requires removal. Consult the coating manufacturer to recommend an appropriate blush removal procedure. Epoxy amines can blush during cool temperatures with high humidity.

3.11.8 Grout Coat Sanding

Sand grout coat using 100 grit or finer sandpaper to a dull appearance with visible scratches. Resulting surface shall appear 100 percent absent of gloss with zero shiny spots. Lightly sand perimeter edges and around equipment footings.

3.11.9 Saw Cutting and Sealing Joints

Use the "Conventional Sealed Joint" as detailed in Figure 1 of SSPC-TU 2 to seal each contraction and expansion joint. Take care to reduce contamination from saw cutting equipment and foot traffic. Limit floor access to essential contractor personnel. When performing joint work, including saw cutting, suggest placing clean rolled cardboard adjacent joint surfaces to reduce coating system contamination.

3.11.9.1 Saw Cut Contraction Joints

Place saw cuts directly in the middle of each contraction joint 6.25 mm 1/4 inch wide, placed to a minimum depth of 31.2 mm 1-1/4 inches, and span the joint's entire length.

3.11.9.2 Saw Cut Isolation (Expansion) and Construction Joints

Place saw cuts to the isolation (expansion) and construction joint's original width and to a minimum depth of 31.2 mm 1-1/4 inches. Completely remove the epoxy mortar across the joint's width and further remove the previously installed backer rod.

3.11.9.3 Install Backer Rod

Install a continuous length of round, closed-cell polyethylene backer rod into each saw cut. For 12.5, 9.4 and 6.25 mm 1/2, 3/8 and 1/4 inch wide saw cuts, place backer rod to a depth of 9.4 mm 3/8 inch below the grout coat's surface the highest point on the backer rod. For expansion joint saw cuts greater than or equal to 18.8 mm 3/4 inch wide, place backer rod to a depth of 15.6 mm 5/8 inch below the grout coat's surface. Fit backer rod tight between joint walls under 30 percent compression and place using a backer rod tool. Remove and reinstall all backer rod that is the incorrect size or at the incorrect depth. Following backer rod installation, apply painter's tape to surfaces adjacent joints to protect from sealant.

3.11.9.4 Joint Sealant Application

Apply sealant directly into joints using a bulk-caulking gun. At room temperature, the resulting sealant application shall exhibit a concave recess between 3.2 to 1.0 mm 1/8 to 1/24 inch below the grout coat's surface. Remove and reapply cured sealant remaining either flush or

greater. Following sealant application, remove painter's tape and sealant drips on grout coat. Prior to topcoating, cure sealant a minimum of 24 hours.

3.11.10 Application of Topcoats

Apply two coats of urethane topcoat. Broadcast #60, white, aluminum oxide non-skid grit into the second urethane topcoat.

3.11.10.1 Non-Skid Grit Broadcast

NOTE: Aircraft hangars servicing light aircraft with weight less than 18 140 kg 40,000 pounds may require a higher non-skid grit loading. The additional grit will assist in towing aircraft under wet conditions; however, the additional grit will decrease coating aesthetics. Up to 450 grams 1.0 pounds per 9.3 square meters 100 square feet of additional non-skid grit can be required.

On either warehouse or architectural floors, considerably less non-skid grit may be appropriate. Broadcast rates can range from none to less than 450 grams 1.0 pound per 93 square meters 1000 square feet.

Broadcast non-skid grit at a rate of 680 grams 1.0 pound per 9.3 square meters 100 square feet into the second urethane topcoat and backroll. Map floor into 55.8 square meters 600 square foot sections where 4080 grams 9.0 pounds of non-skid grit is pre-weighed, placed into clean buckets and used in its entirety per marked 55.8 square meter 600 square foot section.

3.11.10.2 Grout Coat Cleaning

Inspect floor for shiny grease spots and, if detected, spot degrease using manufacturer approved solvent(s) with clean, lint-free rags. Sweep and vacuum up all residual dirt and dust. Solvent wipe all surfaces using solvent(s) and procedures as recommended by manufacturer of epoxy mortar flooring system.

3.11.10.3 First Topcoat

Apply a full coat of urethane topcoat at a spreading rate from 62.5 to 80 microns 2.5 to 3.2 mils Dry Film Thickness (DFT). Stripe coat perimeter edges and around equipment footings. Monitor and record a minimum of one Wet Film Thickness (WFT) reading per 55.8 square meters 600 square foot section of floor surface. Sealant is to be lightly coated.

3.11.10.4 Second topcoat

Apply a second coat of urethane topcoat at a spreading rate from 62.5 to 80 microns 2.5 to 3.2 mils DFT. Stripe coat perimeter edges and around equipment footings. Monitor and record a minimum of one WFT reading per 55.8 square meters 600 square foot section of floor surface prior to broadcasting non-skid grit. When the correct WFT has been applied per 55.8 square meters 600 square feet of area, immediately and evenly broadcast non-skid grit into the second urethane topcoat and backroll in two directions. Test the adhesion of the epoxy mortar flooring system in accordance with the Article entitled "ADHESION TESTING."

3.11.10.5 Walkway Stripes

Place the walkway stripe and grounding rod marker, if applicable, according to Government drawings. When the second topcoat is within its recoat window, apply a walkway stripe of the red/orange urethane topcoat at 75 microns 3.0 mils DFT. Lightly broadcast non-skid grit into the wet walkway stripe. Use solvent resistant tape to protect the floor coating against stripe coat bleed. A thin clear coat of either epoxy or urethane may be required to prevent stripe coat bleed prior to the full application of the colored stripe coat. Completely hide the topcoat color with the red/orange stripe, in one coat. If insufficient hiding occurs, apply one additional walkway stripe coat. Apply grounding rod markings using similar procedures, urethane topcoat, and colors and size according to Government drawings.

3.12 CURING

Installed materials shall cure and display performance equal to manufacturer's product literature. Remove and reapply improperly cured material.

3.13 FIELD TESTS AND INSPECTION

3.13.1 Coating Inspector

NOTE: Insert directly into Section 01 45 02 NAVFAC
QUALITY CONTROL or 01 45 01 USACE QUALITY CONTROL,
as applicable, requirement for NACE Coating
Inspector. See Appendix A for instructions on
modifying Section 01 45 02 NAVFAC
QUALITY CONTROL and 01 45 01 USACE QUALITY CONTROL,
as applicable. The NACE Coating Inspector will act
as QC Specialist.

Consider the Coating Inspector a QC Specialist, working for the QC Manager, and be qualified in accordance with Section [01 45 02 NAVFAC QUALITY CONTROL][01 45 01 USACE QUALITY CONTROL]. The Coating Inspector will be present during all field tests, surface preparation, flooring application, initial cure of the flooring system, and during all flooring repair work. The Coating Inspector will provide all tools/equipment necessary to perform field tests and inspection. The Coating Inspector will be responsible for field tests and specified level of inspection.

3.13.2 Inspection

Document weather conditions, job site occurrences, and report conditions and occurrences potentially detrimental to the flooring system. The listed inspection requirements are in addition to the QC inspection and reporting requirements defined in Section [01 45 02 NAVFAC QUALITY CONTROL][01 45 01 USACE QUALITY CONTROL]. The Coating Prepare a project reference sheet outlining all requirements, tests, test methods, and evaluation criteria, and hold regular meetings with contractor personnel, including shot blasting operators and applicators, to review requirements/evaluation criteria for upcoming work prior to execution. At the start of coating operations and every 1.0 hour following until daily work is complete, record air temperature, substrate temperature, and relative humidity. Following each coat application, inspect surfaces for improperly cured

material, blisters, inadequate and/or excessive coating thickness, and other defects. Document each inspection, test, non-compliant area, and location of each non-compliant area. List evaluation method, evaluation criteria, areas requiring rework, and all other pertinent observations.

3.13.2.1 Daily Inspection Report

Submit to the Contracting Officer one copy of the daily inspection report completed each day when performing work under this Section. Use Appendix X1 "Inspection Checklist" of [ASTM D 6237](#) to monitor daily activity and to assist in preparing the daily inspection report. Note each non-compliant issue and each issue identified for rework in accordance with the QC documentation procedures in Section [\[01 45 02 NAVFAC QUALITY CONTROL\]](#)[\[01 45 01 USACE QUALITY CONTROL\]](#). Use of forms containing entry blocks for all required data is encouraged. Present the data in a legible and professional format. Submit report within 24 hours of the report date.

3.13.2.2 Inspection Logbook

Record all daily activity related to this Section in the Inspection Logbook. Record the daily inspection reports, as well as all other pertinent observations and information, in the logbook. Use a hard or spiral bound book with consecutively numbered pages. Prior to final payment, submit original Inspection Logbook to the Contracting Officer upon completion of project.

3.13.2.3 Inspection Equipment

Use equipment in good condition, operational within its design range, and calibrated as required by the specified standard for each device.

3.13.3 Adhesion Testing

Perform a minimum of three modified adhesion tests ([ASTM D 4541](#)) on the topcoat no less than forty-eight hours following application. Select three random flooring locations spaced a minimum of [6 meters 20 feet](#) between each location. Vertically core completely through the epoxy mortar flooring system and a minimum of [9.4 mm 3/8 inch](#) into concrete using a suitable drill fitted with a [25 mm 1 inch](#) diameter core bit. Throughout coring, employ a best effort attempt to avoid fracturing and/or overheating both the mortar system and concrete: improper coring can affect adhesion results. Adhere directly to each cored surface's center a [18.75 mm 3/4 inch](#) diameter pull-off coupon. Lightly sand test area flooring surface prior to attaching pull-off coupons containing a grit-blasted anchor profile. When pull-off coupon adhesive has sufficiently cured, test adhesion and evaluate results. If testing produces cohesive failures within the concrete, no less than [1 mm 40 mils](#) concrete removal over 95 percent of each pull-off coupon, and/or adhesion more than [2.75 MPa 400 psi](#) mortar system's adhesion is acceptable. If the above requirements are not satisfied, then perform one adhesion test per [9.3 square meters 100 square feet](#) using the above procedures. Two additional tests will confirm results for each non-compliant area. Remove and rework all areas unable to meet adhesion requirements to sound material. Fill core holes using primer, sand-filled epoxy mortar, grout coat, and urethane topcoats. Finish resulting repairs flush with adjacent coatings, displaying an equivalent appearance.

3.14 Final Cleanup

Following work completion, remove debris, equipment, and materials from site. Remove temporary connections to Government or contractor furnished water and electrical services. Restore existing facilities in and around the work areas to their original condition.

TABLE I
MATERIAL REQUIREMENTS

Table Ia - Sealant

Test	Minimum Requirement (maximum where indicated)

Sealant System (two-pack: self-leveling)	Polysulfide (Manganese Cure; MnO ₂) or Urethane
Percent Volume Solids	100 percent
Chemical Resistance to JP-8 plus 100 Fuel at 21 degrees C (ASTM D 1308) (see note 1)	48 hours immersion: 2.0 percent (max) weight increase, 5.0 percent (max) volume increase, 2.0 percent (max) weight loss
Chemical Resistance to Motor Oils at 21 degrees C (ASTM D 1308) (see note 1)	48 hours immersion: 2.0 percent (max) weight increase 5.0 percent (max) volume increase 2.0 percent (max) weight loss
Chemical Resistance to Skydrols at 21 degrees C (ASTM D 1308) (see note 1)	48 hours immersion: 2.0 percent (max) weight increase 5.0 percent (max) volume increase 2.0 percent (max) weight loss
Hardness (ASTM D 2240: Shore A)	20
Tensile Strength (ASTM D 412) (or ASTM D 638)	1.0 MPa
Percent Elongation (ASTM D 412) (or ASTM D 638)	500 percent
Tack Free at 18.3 degrees C (ASTM C 679)	12 hours maximum
Adhesion to Sand Filled Epoxy Polyamine	0.96 MPa
Adhesion to Urethane Topcoats (paintable sealant)	0.96 MPa
NOTES:	
(1) Immerse and test a minimum of three - 50 by 12.5 by 12.5 mm section of cured sealant.	

TABLE I
MATERIAL REQUIREMENTS

Table Ia - Sealant

Test	Minimum Requirement (maximum where indicated)

Sealant System (two-pack: self-leveling)	Polysulfide (Manganese Cure; MnO ₂) or Urethane
Percent Volume Solids	100 percent
Chemical Resistance to JP-8 plus 100 Fuel at 70 degrees F (ASTM D 1308) (see note 1)	48 hours immersion: 2.0 percent (max) weight increase, 5.0 percent (max) volume increase, 2.0 percent (max) weight loss
Chemical Resistance to Motor Oils at 70 degrees F (ASTM D 1308) (see note 1)	48 hours immersion: 2.0 percent (max) weight increase 5.0 percent (max) volume increase 2.0 percent (max) weight loss
Chemical Resistance to Skydrols at 70 degrees F (ASTM D 1308) (see note 1)	48 hours immersion: 2.0 percent (max) weight increase 5.0 percent (max) volume increase 2.0 percent (max) weight loss
Hardness (ASTM D 2240: Shore A)	20
Tensile Strength (ASTM D 412) (or ASTM D 638)	150 psi
Percent Elongation (ASTM D 412) (or ASTM D 638)	500 percent
Tack Free at 65 degrees F (ASTM C 679)	12 hours maximum
Adhesion to Sand Filled Epoxy Polyamine	140 psi
Adhesion to Urethane Topcoats (paintable sealant)	140 psi
NOTES:	
(1) Immerse and test a minimum three - 2 by 1/2 by 1/2 inch section of cured sealant.	

Table Ib - Epoxy Mortar Flooring System

Test	Minimum Requirement (maximum where indicated)
-----	-----
Compression Strength)ASTM C 579)	51.7 MPa
Tensile Strength (ASTM C 307)	9.0 MPa
Adhesion to Concrete (ASTM D 4541) (see note 1)	2.75 MPa or 100 percent failure in concrete
Heat Resistance, continuous exposure	60 degrees C
Heat Resistance, intermittent exposure	93.3 degrees C
Coefficient of Thermal Expansion minus 17.7 minus 99 degrees C (ASTM C 531)	9.0 minus 59.4 times 10 ⁻⁶ mm/mm degrees C
Thermal Compatibility between Concrete (ASTM C 884/C 884M)	"pass"
Chemical Resistance to JP-8 plus 100 Fuel at 21 degrees C (ASTM D 1308)(see note 2)	48 hours immersion: 2.0 percent (max) weight increase 2.0 percent (max) volume increase 2.0 percent (max) weight loss
Chemical Resistance to Motor Oils at 21 degrees C (ASTM D 1308) (see note 2)	49 hours immersion: 2.0 percent (max) weight increase 2.0 percent (max) volume increase 2.0 percent (max) weight loss
Chemical Resistance to Skydrols at 21degrees C (ASTM D 1308) (see note 2)	48 hours immersion: 2.0 percent (max) weight increase 2.0 percent (max) volume increase 2.0 percent (max) weight loss
Lead (ASTM D 3335)	0.06 percent (max)
Cadmium (ASTM D 3335)	0.06 percent (max)
Chromium (ASTM D 3718)	0.00 percent

NOTES:

(1) When tested for adhesion, mortar system shall display 2.75 MPa adhesion and/or remove no less than 1.0 mm of concrete over 95 percent of each pull-off coupon throughout service.

(2) Immediately following immersion, in addition to the listed requirements, mortar system shall be evaluated for blisters, checks, discoloration, softening, and lifting. Mortar system shall be visually free of blisters, checks, and discoloration, and display both substrate and intercoat adhesion no less than 2.4 MPa (ASTM D 4541).

Table Ib - Epoxy Mortar Flooring System

Test	Minimum Requirement (maximum where indicated)
Compression Strength (ASTM C 579)	7,500 psi
Tensile Strength (ASTM C 307)	1,300 psi
Adhesion to Concrete (ASTM D 4541) (see note 1)	400 psi or 100 percent failure in concrete
Heat Resistance, continuous exposure	140 degrees F
Heat Resistance, intermittent exposure	200 degrees F
Coefficient of Thermal Expansion 0 - 210 degrees F (ASTM C 531)	5.0 minus 33.0 times 10 ⁻⁶ in/in degrees F
Thermal Compatibility between Concrete (ASTM C 884/C 884M)	"pass"
Chemical Resistance to JP-8 plus 100 Fuel at 70°F (ASTM D 1308) (see note 2)	48 hours immersion: 2.0 percent (max) weight increase 2.0 percent (max) volume increase 2.0 percent (max) weight loss
Chemical Resistance to Motor Oils at 70 degrees F (ASTM D 1308) (see note 2)	49 hours immersion: 2.0 percent (max) weight increase 2.0 percent (max) volume increase 2.0 percent (max) weight loss
Chemical Resistance to Skydrols at 70 degrees F (ASTM D 1308) (see note 2)	48 hours immersion: 2.0 percent (max) weight increase 2.0 percent (max) volume increase 2.0 percent (max) weight loss
Lead (ASTM D 3335)	0.06 percent (max)
Cadmium (ASTM D 3335)	0.06 percent (max)
Chromium (ASTM D 3718)	0.00 percent

NOTES:

(1) When tested for adhesion, mortar system shall display 400 psi adhesion and/or remove no less than 40 mils of concrete over 95 percent of each pull-off coupon throughout service.

(2) Immediately following immersion, in addition to the listed requirements, mortar system shall be evaluated for blisters, checks, discoloration, softening, and lifting. Mortar system shall be visually free of blisters, checks, and discoloration, and display both substrate and intercoat adhesion no less than 350 psi (ASTM D 4541).

Table Ic - Primer

Test	Minimum Requirement (maximum where indicated)

Resin System (ASTM D 2621)	Epoxy Polyamine (two-pack)
Percent Volume Solids (ASTM D 2697)	100 percent
Color	Clear to Amber
Hydrolytic Stability (see note 1)	No effect: 30 days immersion in Sodium Hydroxide solution with pH no less than 13.5
Moisture Insensitivity Throughout Service (ASTM F 1869, ASTM D 4541) (see note 2)	No effect: Insensitive to moisture vapor emission at rates no more than 254 micrograms moisture per second, square meter
Adhesion to Concrete Throughout Service (ASTM D 4541) (see note 3)	2.75 MPa or 100 percent failure in concrete

NOTES:

(1) Immediately following immersion, evaluate primer for blisters, checks, discoloration, softening, and substrate lifting. Primer shall be visually free of blisters, checks and moderate discoloration, and display wet adhesion no less than 2.4 MPa (ASTM D 4541).

(2) During and following application, primer shall remain unaffected by Moisture Vapor Emission (MVE) at rates no more than 254 micrograms moisture per second, square meter: primer shall meet the requirements of note 3. Signs of moisture sensitivity include blisters, softening, lifting, and discoloration (whitening).

(3) When tested for in-situ adhesion, primer shall display 400 psi adhesion and/or remove no less than 1.0 mm of concrete over 95 percent off each pull-off coupon.

Table Ic - Primer

Test	Minimum Requirement (maximum where indicated)
Resin System (ASTM D 2621)	Epoxy Polyamine (two-pack)
Percent Volume Solids (ASTM D 2697)	100 percent
Color	Clear to Amber
Hydrolytic Stability (see note 1)	No effect: 30 days immersion in Sodium Hydroxide solution with pH no less than 13.5
Moisture Insensitivity Throughout Service (ASTM F 1869, ASTM D 4541) (see note 2)	No effect: Insensitive to moisture vapor emission at rates no more than 4.5 pounds moisture/24 hours, 1000 square feet
Adhesion to Concrete Throughout Service (ASTM D 4541) (see note 3)	400 psi or 100 percent failure in concrete

NOTES:

(1) Immediately following immersion, evaluate primer for blisters, checks, discoloration, softening, and substrate lifting. Primer shall be visually free of blisters, checks and moderate discoloration, and display wet adhesion no less than 350 psi (ASTM D 4541).

(2) During and following application, primer shall remain unaffected by Moisture Vapor Emission (MVE) at rates no more than 4.5 pounds moisture per 24 hours, 1000 square feet: primer shall meet the requirements of note 3. Signs of moisture sensitivity include blisters, softening, lifting, and discoloration (whitening).

(3) When tested for in-situ adhesion, primer shall display 400 psi adhesion and/or remove no less than 40 mils of concrete over 95 percent off each pull-off coupon.

Table Id - Grout Coat

Test	Minimum Requirement (maximum where indicated)

Resin System (ASTM D 2621)	Epoxy Polyamine (two-pack)
Percent Volume Solids (ASTM D 2697)	100 percent
Color	17925 (white), or 17875 (ultra-light gray)
Hardness (ASTM D 2240: Shore D)	80
Adhesion to Epoxy Mortar (ASTM D 4541)	2.75 MPa

Table Id - Grout Coat

Test	Minimum Requirement (maximum where indicated)

Resin System (ASTM D 2621)	Epoxy Polyamine (two-pack)
Percent Volume Solids (ASTM D 2697)	100 percent
Color	17925 (white), or 17875 (ultra-light gray)
Hardness (ASTM D 2240: Shore D)	80
Adhesion to Epoxy Mortar (ASTM D 4541)	400 psi

Table Ie - Urethane Topcoat

Test	Minimum Requirement (maximum where indicated)

Resin System (ASTM D 2621)	Aliphatic Urethane (two-pack)
Percent Volume Solids (ASTM D 2697)	51 percent
Topcoat Color (FED-STD-595)	17925 (white) or 17875 (ultra-light gray)
Walkway Strip Color: Red/Orange, semi-gloss (FED-STD-595)	22197 (red/orange)
Application Thickness per Coat	62.5 to 80 microns Dry Film Thickness(DFT)
Hiding Power: Red/Orange	Complete hiding of white coatings at 80 microns DFT (one coat)
Sunlight Resistance	Non-yellowing
Heat Resistance, continuous exposure	60 degrees C
Heat Resistance, intermittent exposure	93.3 degrees C
Chemical Resistance to JP-8 plus 100 Fuel at 21 degrees C (ASTM D 1308)(see note 1)	48 hours immersion: 1.0 percent (max) weight increase 1.0 percent (max) volume increase 1.0 percent (max) weight loss
Chemical Resistance to Motor Oils at 21 degrees C (ASTM D 1308) (see note 1)	48 hour immersion: 1.0 percent (max) weight increase 1.0 percent (max) volume increase 1.0 percent (max) weight loss
Chemical Resistance to Skydrols at 21 degrees C (ASTM D 1308) (see note 1)	48 hours immersion: 1.0 percent (max) weight increase 1.0 percent (max) volume increase 1.0 percent (max) weight loss

NOTES:

(1) Immediately following immersion, in addition to the listed requirements, evaluate urethane topcoat for blisters, checks, discoloration, softening, and lifting. Urethane topcoat shall be visually free of blisters, checks, and discoloration, and display adhesion no less than 2.4 MPa (ASTM D 4541).

Table Ie - Urethane Topcoat

Test	Minimum Requirement (maximum where indicated)

Resin System (ASTM D 2621)	Aliphatic Urethane (two-pack)
Percent Volume Solids (ASTM D 2697)	51 percent
Topcoat Color (FED-STD-595)	17925 (white) or 17875 (ultra-light gray)
Walkway Strip Color: Red/Orange, semi-gloss (FED-STD-595)	22197 (red/orange)
Application Thickness per Coat	2.5 to 3.5 mils Dry Film Thickness(DFT)
Hiding Power: Red/Orange	Complete hiding of white coatings at 3.2 mils DFT (one coat)
Sunlight Resistance	Non-yellowing
Heat Resistance, continuous exposure	140 degrees F
Heat Resistance, intermittent exposure	200 degrees F
Chemical Resistance to JP-8 plus 100 Fuel at 70 degrees F (ASTM D 1308)(see note 1)	48 hours immersion: 1.0 percent (max) weight increase 1.0 percent (max) volume increase 1.0 percent (max) weight loss
Chemical Resistance to Motor Oils at 70 degrees F (ASTM D 1308) (see note 1)	48 hour immersion: 1.0 percent (max) weight increase 1.0 percent (max) volume increase 1.0 percent (max) weight loss
Chemical Resistance to Skydrols at 70 degrees F (ASTM D 1308) (see note 1)	48 hours immersion: 1.0 percent (max) weight increase 1.0 percent (max) volume increase 1.0 percent (max) weight loss

NOTES:

(1) Immediately following immersion, in addition to the listed requirements, evaluate urethane topcoat for blisters, checks, discoloration, softening, and lifting. Urethane topcoat shall be visually free of blisters, checks, and discoloration, and display adhesion no less than 350 psi (ASTM D 4541).

TABLE II
PREAPPROVED MATERIALS*

Vendors	Materials	
Stonhard (856) 779-7500	Primer:	Standard Primer
	Epoxy Mortar:	Stonclad GS
	Grout Coat:	Stonkote GS4
	Topcoat:	Stonseal GS6
	Sealant:	Vulkem 245
Polyspec (281) 397-0033	Primer:	300EX
	Epoxy Mortar:	Tuffrez 200
	Grout Coat:	Tuffrez 203
	Topcoat:	Tuffrez 235
	Sealant:	T-2235SL
Tennant (800) 553-8033	Primer:	Eco-MPE)
	Mortar Coat:	Eco-PT 250
	Grout Coat:	Eco-PT
	Topcoat:	VOC-CRU
	Sealant:	N/A **
Crawford Labs (800) 356-7625	Primer:	Florock 4700
	Epoxy Mortar:	Florock 4700
	Grout Coat:	Florock 4700
	Topcoat:	Florock Super CRU
	Sealant:	N/A **
General Polymers (800) 543-7694	Primer:	#3578, Universal Primer
	Epoxy Coat:	#3562, Mortar Binder Resin
	Grout Coat:	#3744GP, Novo-Flo
	Topcoat:	#4618, Polyurethane Enamel
	Sealant:	Cor-Seal PS

NOTES:

* Other products may meet specification requirements. Up to specification's date of issue, preapproved materials met specification requirements. It is the users' responsibility to confirm preapproved material formulations have not changed and specification requirements will be met. **Polyspec T-2235SL sealant may be used.

APPENDIX A

INSTRUCTIONS FOR MODIFYING SECTION 01 45 02 NAVFAC
QUALITY CONTROL and 01 45 01 USACE QUALITY CONTROL
to add NACE INSPECTOR.

A> Modify Section 01 45 02 NAVFAC
QUALITY CONTROL to include NACE Coating Inspector as
follows:

1. In the Article entitled "Submittals," add
submittal requirement "SD-07 Certificates," add
"NACE Coating Inspector; G" and add the following
paragraph below the addition of "NACE Coating
Inspector; G."

Submit documentation confirming each coating
inspector is classified no less than "Intermediate"
Coating Inspector under the National Association of
Corrosion Engineers (NACE) Coating Inspector Program
(NACE CIP). Include successfully completed, as a
minimum, "Session III" of NACE CIP. Include NACE
Coating Inspector identification number, date of
qualification, expiration date, and copy of "Session
III" certificate or copy of "NACE Certified"
certificate. The NACE Coating Inspector shall work
directly for the prime construction contractor as
part of the prime's Quality Control (QC)
Organization. Automatically disqualify NACE Coating
Inspectors with prior and/or current business
relations to job site subcontractors, material
suppliers, and equipment suppliers. Submit
documentation confirming NACE Coating Inspectors
have met the aforementioned requirements over the
past two years.

2. Add the following to the table in the Article
entitled "QC Specialists Duties and Qualification:"
under the heading "Qualification/Experience in Area
of Responsibility, add "NACE Coating Inspector;"
under the heading "Area of Responsibility," add
"Surface preparation, flooring system installation,
field tests, and field inspection;" and under the
heading "Frequency" add "Full-time during surface
preparation, flooring system installation, field
tests, and field inspection."

3. Use NACE Coating Inspector on all flooring
projects or, as a minimum, on flooring projects with
greater than 232.25 square meters 2,500 square feet.

B. Modify Section 01 45 01 USACE
QUALITY CONTROL to include NACE Coating Inspector as
follows:

Add NACE Coating Inspector to paragraph CQC

PERSONNEL and it's associated Experience Matrix.
The NACE Coating Inspector should be directly
employed by the prime contractor. Use the following
for the Qualifications column:

"Intermediate Coating Inspector under the National
Association of Corrosion Engineers (NACE) Coating
Inspector Training and Certification Program
(NCITCP)"

-- End of Section --