Preparing Activity: NAVFAC Superseding
UFGS-03 53 14.00 20 (February 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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USACE / NAVFAC / AFCEC / NASA	**UFGS-03 53 14 (August 2021)**

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SECTION 03 53 14

LIGHT REFLECTIVE NONFERROUS METALLIC AGGREGATE FLOOR SYSTEM
08/21

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NOTE: This guide specification covers the requirements for light reflective, non-oxidizing, metallic (not silica or quartz) dry shake surface hardener for concrete floor finish. This is intended to be an interior application utilized in warehouses, maintenance facilities and hangars in which a light colored, dense, hard, low-dusting concrete surface is desired. This system should not be used in locations subjected to acids.

Other concrete floor hardeners with silica or quartz additives are located within products of Section 03 33 00 CAST-IN-PLACE CONCRETE. This nonferrous metallic aggregate is greatly more robust for abrasion resistance when compared to silica or quartz additives.

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).

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PART 1 GENERAL

1.1 REFERENCES

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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.

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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.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 305R	(2020) Guide to Hot Weather Concreting
ACI 308.1	(2011) Specification for Curing Concrete
ACI 308R	(2016) Guide to External Curing of Concrete

ASTM INTERNATIONAL (ASTM)

ASTM C109/C109M	(2021) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
ASTM C309	(2019) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C779/C779M	(2019) Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces
ASTM C1315	(2019) Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

1.2 PRE-INSTALLATION MEETING

Upon approval of preconstruction submittals and before placing concrete, conduct a meeting to review the quality control requirements specifically

for the application of the floor hardener. This meeting may be conducted in coordination with the Preparatory Meeting required for Section 03 30 00 CAST-IN-PLACE CONCRETE. Attendees must include the Quality Control Manager and other Contractor personnel directly responsible for the application of the floor hardener material, Contracting Officer's Representative, the Designer of Record and a representative of the floor hardener system manufacturer. Include discussion points specific to the floor hardener system in the notes to document Preparatory Meeting. Notify the Contracting Officer at least 10 days in advance of the scheduled meeting date.

1.3 SUBMITTALS

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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.

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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-01 Preconstruction Submittals

Application Plan; G[, [_____]]

SD-03 Product Data

Non-oxidizing Metallic Aggregate surface hardener; G[, [_____]]

SD-04 Samples

Initial Application

Material Sample

SD-11 Closeout Submittals

Video Recording

1.3.1 Application Plan

Submit a written plan describing in detail all phases of floor hardener system application. Address work sequencing, floor hardener system application, cure time projections, curing activities, protection of surfaces during the curing period, as well as how each step will be controlled, tested, and evaluated. For each process, provide procedures that include appropriate work instructions, material and equipment to be used, controls, and process verification procedures. Address safety measures, work scheduling around weather, and record keeping. Plan must adhere to the manufacturer's instructions and Contract requirements outlined herein. Assign one supervisor to the job who is to remain at the 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 plan.

1.3.2 Initial Application

Finish a minimum of 9.3 square meters 100 square feet of the [hangar] [_____] floor slab in a location approved by the Contracting Officer. The initial application must be witnessed by the manufacturer's representative and may become part of the permanent structure with written approval by the manufacturer's representative and Contracting Officer. Color, texture and installation procedures must be approved by the manufacturer's technical representative and Contracting Officer before proceeding with additional application. Upon approval, the initial application will be used as the standard for workmanship for future work.

1.3.3 Material Sample

Submit samples of materials, color, and finish type to the Contracting Officer for approval.

1.4 DELIVERY AND STORAGE

Deliver product in sealed moisture-resistant packages. Protect packages from damage. Store in an enclosed area. Replace damaged packages with new packages. Provide manufacturer's information regarding date of manufacture, shelf life and date of purchase no later than the date delivered on site. Products must be identifiable by lot numbers.

1.5 WARRANTY

Provide a manufacturer's standard warranty stating that the material is

free of defects and that when applied in accordance with the manufacturer's instructions, the product will perform as specified herein. The manufacturer's standard warranty must not contain any disclaimers, limiting their responsibility to the purchase price of the material. The manufacturer must state in the warranty that they will contribute to replacing defective materials, as determined by accepted test methods.

PART 2 PRODUCTS

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NOTE: Coordinate with Section 03 30 00, CAST-IN-PLACE CONCRETE to ensure requirements of ACI 117, ACI 212.3R, ACI 301, ACI 302.1R, ACI 304R, ACI 318 and ACI 318M are included.
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2.1 CONCRETE

Provide concrete materials as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE, in addition to items required by this section and the following:

The concrete mix, including admixtures and plasticizers, must be in strict compliance with the aggregate surface hardener manufacturer's recommendations and must be approved in conjunction by both the Contracting Officer and the manufacturer's technical representative prior to the placement of concrete.

2.2 NON-FERROUS, NON-OXIDIZING METALLIC AGGREGATE, DRY-SHAKE SURFACE HARDENER

Provide a surface hardener system consisting of specially processed, non-ferrous, malleable, non-oxidizing, metallic aggregates, specially graded cementitious binder, plasticizer, and water-reducing admixtures, formulated and processed under the stringent quality control of the manufacturer. Provide hardener that is proportioned and sealed in standard moisture-resistant bags. The manufacturer must guarantee the aggregate to be free of rust, corrosive materials, oil, petroleum, or other water-based materials, when delivered. The manufacturer must replace any material found to contain any such materials, or any other material which is deemed unsatisfactory. The manufacturer must provide a technical representative, qualified in designing and adjusting concrete mixes, to assist in the application of the aggregate surface hardener system.

Provide floor hardener system with minimum compressive strength at 28 days of 75.6 MPA 11,000 psi in accordance with ASTM C109/C109M. System must also achieve minimum relative abrasion resistance at 28 days (abrasion at 60 minutes) of 0.8 mm 0.03 inches in accordance with ASTM C779/C779M.

2.3 SURFACE EVAPORATION RETARDANT

Provide a mono molecular surface evaporation retardant film, as recommended by ACI 305R and ACI 308R, for use under drying conditions, due to high concrete or ambient temperatures, low humidity, or high winds. This includes work in heated interiors during cold weather, to aid in the maintaining of concrete moisture during the early placement stages of plastic concrete. Provide a retarder certified by the manufacturer to be compatible with the surface hardener and provide in accordance with the

manufacturer's recommendations.

2.4 CURING AND SEALING

Curing and sealing materials and procedures must be as recommended by the manufacturer of the aggregate surface hardener system and must comply with ASTM C309 or ASTM C1315.

PART 3 EXECUTION

3.1 CONCRETE PLACEMENT

For concrete placement, refer to Section 03 30 00 CAST-IN-PLACE CONCRETE in addition to items required by this section and the following:

a. Maximum slump must be 89 mm 3.5 inches, when peak ambient temperatures are anticipated to be in excess of 18.33 degrees Celsius 65 degrees Fahrenheit, and must be no greater than 96.2 mm 4 inches, when such temperatures are below 29.4 degrees Celsius 85 degrees Fahrenheit. Water reducing admixtures compatible with the surface hardener's written product information and instructions can be used to aid in workability without affecting dry shake hardener.

b. Maximum total air content must not exceed 3 percent.

c. As previously noted, water-reducing additives can be used. Provider must certify that the water reducer will not contribute to or cause increased air content.

d. Do not use calcium chloride or set accelerating admixtures, containing calcium chloride.

Place base slab between screed points to minimize handling. Move concrete into place with square-tipped shovels; do not use rakes. Vibrators, when used, must be inserted and withdrawn vertically. Strike concrete to the specified level. Further level and consolidate concrete with wood bull float or wood darby. Complete floating before free moisture rises to the surface (bleeding). Begin floating adjacent to columns, forms, and walls.

3.1.1 Application of Surface Hardener

Apply first shake to floated concrete adjacent to forms, entry ways, columns and walls, where moisture will be lost first. Apply two-thirds of the specified total shake immediately following the floating of total area. Apply material at a minimum rate of 9.76 kg/square meter 2 pounds per square foot of slab. Bleed water must not be present during or following the application of this shake. Distribute Evenly. Apply by means of calibrated mechanical spreader except small areas not accessible to mechanical spreader may be hand applied. Wood bull floats can be used as soon as the shake has absorbed moisture (indicated by the darkening of the surface). Float just sufficiently to bring moisture from base slab through the shake. Use finishing machines with float blades to "open" the surface, prior to the application of the remaining one-third of the total specified shake, and also use to incorporate this second shake. Provide further surface compaction by a second mechanical floating, if time and setting characteristics of the concrete will allow, without removing the cement surface paste from the metallic aggregate system. AT NO TIME MUST WATER BE ADDED TO THE SURFACE. As surface further stiffens, indicated by loss of sheen, hand or mechanically trowel with blades relatively flat.

Run trowel blades as slowly as possible, to achieve the desired finish. Excessive trowel blade speed will "burn" or darken the floor surface resulting in a possible loss of the desired even surface color. Remove all marks and pinholes in the raised trowel operation. DO NOT OVER FINISH. Do not burnish trowel. Type or texture of surface must conform to job mock-up.

3.1.2 Field Quality Control

Provide a manufacturer's representative at the job site a minimum of three times during the application of the floor hardener for the purposes of monitoring the quality of the application process and floor hardener materials to ensure proper application. Site visits must occur during the initial (sample) application, at mid-point of the overall application and the final application. After each site visit, submit a report signed by the manufacturer's representative within 3 working days. The report must document that all work was completed satisfactorily in accordance with the manufacturer's instructions.

[3.1.3 Video Recording

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NOTE: Include this paragraph to require digital video recording of the application when the project is at a remote location or when a Government representative will not be present during construction.
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As directed by the Contracting Officer, provide a digital video recording of the actual application of the floor surface hardener material and finishing process. Video must clearly show the material being applied with an even distribution and the concrete being finished. Provide a separate video recording for each day the floor surface hardener is applied and finished. Submit the videos to the Contracting Officer electronically as directed.

]3.1.4 Curing and Protection (Water Based Wax Emulsion)

Refer to ACI 308.1. Cure floors, finished with the non-rusting, metallic-aggregate surface hardener, as recommended by the manufacturer of the surface hardener. When high efficiency membrane curing compound is recommended, apply the membrane curing compound immediately after the floor surface has hardened sufficiently, so surface will not be marred by the application. Apply compound uniformly over the entire surface, to meet the required moisture retention of ASTM C1315, at a maximum rate of 6.136 square meters per liter250 square feet per gallon. When dry, protect the coating from droppings of plaster, paint, dirt, and other debris, by a covering of scuff-proof building paper. Make provisions for maintaining the concrete temperature at 10 degrees Celsius 50 degrees Fahrenheit, or above during the curing period. Floor must remain covered and be kept free of traffic and loads for at least 10 days after completion. At the direction of the Contracting Officer, remove the curing compound between 2 and 4 weeks after placement.

3.2 CURTAIL SURFACE ACTIVITY

After installation of the product, the slab and hardener must cure for 28 days in which construction equipment, hoists, overhead access equipment,

and material storage must remain off the slab. Follow specific instructions given by the manufacturer's representative at the pre-installation conference.

3.3 Cleaning and Surface Preparation

After the aggregate surface hardener system has cured for 28 days, clean and buff the floor surfaces in accordance with the manufacturer's recommendations. Perform the cleaning and surface preparation to remove projections that permit soil and foreign bodies to embed into the floor and to permit easier cleaning of a less porous, more densified concrete surface.

-- End of Section --