Preparing Activity: NAVFAC

Superseding
UFGS-07 16 19 (January 2007)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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08/23

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SECTION 07 16 19

METALLIC OXIDE WATERPROOFING
08/23

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NOTE: This guide specification covers the requirements for metallic oxide waterproofing for application on interior face of concrete walls and floors below grade, to provide a barrier impervious to passage of water under hydrostatic pressure.

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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NOTE: Surfaces other than concrete may be waterproofed by this method; consult manufacturer's literature or approved applicators.
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1. Metallic waterproofing is rigid and susceptible to cracking during settlement or shrinkage of surfaces to which it is applied. On interior surfaces, it is readily accessible for repair by cutting out defective areas and applying new material.

2. Metallic waterproofing can be applied to exterior wall surfaces; however, more flexible materials may be more suitable and effective.

3. Metallic waterproofing compound consists of pulverized metallic (gray cast iron) aggregate, factory mixed with oxidizing agents. It is field mixed with portland cement, sand, and water and applied in two coats with stiff bristle brushes, wedging particles into, and filling, pores and apertures.

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NOTE: On the drawings, show:

1. Location and extent of metallic waterproofing. If not shown, designate surfaces to be waterproofed in a paragraph entitled "Surfaces to be Waterproofed," inserted in Part 3.

2. Details of pipe and conduit penetrations through treated walls or floor.

3. Continuous groove or cove at juncture of floor and walls and at juncture of floor and columns 38 mm 1-1/2 inches in cross section, cut into floor, walls and columns. Indicate that groove is to be filled with metallic oxide waterproofing mortar.

4. Details of expansion and control joints.

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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.

ASTM INTERNATIONAL (ASTM)

ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C144	(2018) Standard Specification for Aggregate for Masonry Mortar
ASTM C150/C150M	(2022) Standard Specification for Portland Cement

1.2 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-04 Samples

Metallic Waterproofing

SD-06 Test Reports

Iron Content of metallic waterproofing

Oxidizing Agent Content of metallic waterproofing

SD-08 Manufacturer's Instructions

Mixing

1.3 TESTING OF SAMPLES

Prepare a 100 gram sample. Using a magnet over a watch glass, transfer magnetic portion into separate pile leaving nonmagnetic behind. Weigh nonmagnetic portion.

a. Total iron content: Determine total iron by percentage of sample weight using standard qualitative chemical analysis procedures.

b. Oxidizing agent content: Determine percentage of oxidizing agent by standard qualitative chemical analysis technique. Provide certified statement attesting that chemical and physical composition of metallic waterproofing material have been determined by specified testing methods and material has been found to conform with specification requirements.

1.4 SAMPLE INSTALLATION

After submittals are approved and before work is started, apply metallic waterproofing to a test area not less than [10] [100] [_____] square meters feet, using methods and materials specified herein. Location to be selected by Contracting Officer. Waterproofing must be visually and physically examined for bonding and loose materials by waterproofing materials manufacturer or their representative. A wide-blade putty knife or similar tool will be used for inspection of bond. Failure of waterproofing to bond or appearance of excessive loose materials will be cause for disapproval of proposed material and method of application. Clean disapproved test area free of applied finish, leaving base clean and acceptable for new application. If test area is disapproved, make an additional test area. Do not apply waterproofing in other areas until application of test area has been approved by waterproofing materials manufacturer or their representative, and accepted by Contracting Officer. Approved installation must remain in place and open to observation as criteria for all metallic waterproofing under Contract.

1.5 DELIVERY AND STORAGE

Deliver materials to project site in original sealed containers with manufacturer's name and brand clearly identified. Store in dry locations with adequate ventilation and handle in a manner to prevent damage or contamination.

1.6 ENVIRONMENTAL CONDITIONS

Enclose or protect surfaces to be treated from excessive temperature changes. Ambient temperature must be above 10 degrees C 50 degrees F during application and for duration of curing period. Keep water level below location of surfaces being treated until completion of the treatment and curing period. Provide adequate ventilation to properly oxidize metallic waterproofing.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT

ASTM C150/C150M, Type I.

2.2 FINE AGGREGATE

ASTM C144 (sand) for waterproofing coats and ASTM C33/C33M for protective coat.

2.3 WATER

Potable and free from injurious amounts of oil, alkalis, acids, organic matter, and other deleterious substances.

2.4 METALLIC WATERPROOFING COMPOUND

Clean, commercial, pulverized cast iron mixed in dust-confining container with chemical oxidizing agent such as sodium peroxide, potassium peroxide, or ammonium chloride.

2.4.1 Pulverized Cast Iron

85 percent minimum by weight of metallic iron of magnetic portion. Chemical oxidizing agent content must be a minimum of 3 percent and a maximum of 5 percent by weight of compound. Presence of dirt, paraffin, bitumen, or other foreign substances in excess of one percent by weight of waterproofing compound will be cause for rejection.

2.4.2 Iron Oxide Content

Do not exceed 5 percent by weight of magnetic iron. The magnetic portion of iron must not contain more than 0.05 percent by weight of oil.

2.4.3 Magnetic Iron Particles

Graded as follows:

Sieve size	Percent passing
No. 20 screen	100
No. 35 screen	95 to 100
No. 40 screen	90 to 100

Sieve size	Percent passing
No. 60 screen	65 to 100
No. 100 screen	45 to 70
No. 200 screen	10 to 25

2.5 CAULKING

Polyurethane foam sealant.

PART 3 EXECUTION

3.1 SURFACE CONDITION

Examine all surfaces to be waterproofed to ensure that concrete has properly cured, all shrinkage has occurred, laitance has been removed, cracks and honeycombs have been cut out and filled, and surfaces have been roughened to provide bond for waterproofing material. Correct all defects that will adversely affect proper completion of waterproofing.

3.2 SURFACE PREPARATION

3.2.1 Concrete Surfaces

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NOTE: Coordinate with: (1) Division 3, CONCRETE, for surface preparation requirements, continuous grooves of junction between horizontal and vertical surfaces, cutting out of wire ties, honeycombs, and porous areas, installation of anchoring devices, built-in water stops, and concrete floor toppings; (2) Division 7, THERMAL AND MOISTURE PROTECTION, for resilient-joint caulking and plastic and metallic flashings; (3) Division 9, FINISHES, for plaster or similar wall finish; (4) Division 22, PLUMBING, for watertight connections, for piping sleeves, and drains; and (5) Division 26, ELECTRICAL, to provide that no wiring devices be installed in recesses until waterproofing work is complete. Similar notes may be required in other specification divisions for recessed anchor devices and other related work.

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Roughen concrete wall and floor surfaces by light bushhammering, sandblasting, acid etching, or high-pressure water cleaning to provide firm, unspalled granular surface, clean and free from loose materials, debris, and detrimental substances such as dust, dirt, oil, grease, or other coatings.[Cut out wire ties to depth of 38 mm 1-1/2 inches. Cut out holes, honeycombs, open joints, and porous areas. Make all cuts square to a depth of 25 to 38 mm 1 to 1-1/2 inches. Do not cut V-grooves or cone-shaped recesses.]

3.2.2 Walls

Clean wall areas that have been cut out, moisten with water, and fill flush with a stiff mortar mix composed of one 42.6 kilogram 94 pound sack

of portland cement, 85.3 kilograms 188 pounds of sand, and 6.8 kilograms 15 pounds of metallic oxide waterproofing compound. Apply filling and patching in layers not exceeding 19 mm 3/4 inch thickness, worked into voids, compacted, and finished flush with adjacent surfaces. Roughen patched areas to provide level, firm, granular surface.

3.2.3 Grooves, Joints, and Intersections

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NOTE: Insert appropriate Section number and title in the blank below using format per UFC 1-300-02, "Unified Facilities Guide Specifications (UFGS) Format Standard".
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Strip, clean, and remove all loose material from construction joints, grooved recesses, and intersections of vertical and horizontal surfaces. Pack joints with waterproofing mortar mixed in proportions of one 42.6 kilogram 94 pound sack of portland cement and 85.3 kilograms 188 pounds of sand, and 6.8 kilograms 15 pounds of metallic oxide waterproofing compound. Finish compacted mortar flush with adjacent surfaces; finish internal angles to a round cove. Grooves in construction joints, at intersections of horizontal and vertical surfaces, and fillers and water stops for expansion and contraction joints are specified under [_____].

3.2.4 Caulking

Apply caulking around all drains, pipes, and other items which penetrate the surfaces to be waterproofed.

3.2.5 Recesses

Waterproof recesses, but do not fill to a lesser opening than detailed.

3.2.6 Penetrations

Do not apply waterproofing until anchorage items or other items passing through or protruding from the surfaces have been installed. Treatment must be completed and approved prior to attachment of utilities to anchorage items.

3.3 MIXING

Follow mixing instructions supplied by the manufacturer.

3.4 APPLICATION

3.4.1 Limits of Application

Completely coat columns integral with exterior walls. Return wall waterproofing at least 600 mm 24 inches on interior concrete walls and 1200 mm 48 inches onto masonry walls that are in place at the time of the waterproofing application. Return floor waterproofing at least 300 mm 12 inches vertically up on the face of all interior walls, partitions, and interior columns in place at the time of waterproofing application.

3.4.2 Walls and Columns

Thoroughly dampen surfaces to receive waterproofing. Apply two coats of

thick slurry to each 10 square meters 100 square feet of surface: first coat, consisting of 42.6 kilograms 94 pounds of portland cement, 85.3 kilograms 188 pounds of sand, and 4.5 kilograms 10 pounds of metallic oxide waterproofing compound; second coat, same mix as first coat except with 3.6 kilograms 8 pounds of metallic oxide waterproofing for each 42.6 kilograms 94 pounds of cement. Apply each coat by brushing with stiff bristle brushes to seal all pores. Allow sufficient time between coats to permit oxidation of material, but not more than 24 hours before application of subsequent treatment. Periodically spray each coat with fine fog spray during oxidation period to ensure thorough curing. Where air circulation is insufficient to properly oxidize waterproofing, provide fans or other means to ensure adequate circulation.

3.4.3 Floors

After surfaces are roughened and properly prepared, thoroughly wash and clean all surfaces prior to application of waterproofing treatment. Apply two coats of thick slurry as previously specified for walls and columns, each coat thoroughly scrubbed and broomed to completely coat floor surface.

3.4.4 Bond Coat

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NOTE: If wall or floor finishes such as plaster or cement mortar floor toppings are shown on the drawings and specified in other specification sections, delete reference to protective finish coating. Walls and floors not specified or scheduled to receive other finishes must receive the Protective Finish Coating.
****

Prior to application [of plaster, cement mortar topping, or similar wall and floor finishes specified in other sections,] [of protective finish coating specified herein] apply a bond coat of metallic oxide waterproofing mixed in same proportions as specified for second coat on walls and columns. Prior to bond coat application, thoroughly broom previously treated surfaces with thick bristle brooms to remove all traces of unoxidized compound, and dampen with water. Apply bond coat immediately before finish coat to prevent premature curing or setting of bond coat before finish coat is applied.

[3.4.5 Protective Finish Coating

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NOTE: If wall or floor finishes such as plaster or cement mortar floor toppings are shown on the drawings and specified in other specification sections, delete paragraphs PROTECTIVE FINISH COATING, WALLS AND COLUMNS, and FLOORS, as appropriate. Walls and floors not specified or scheduled to receive other finishes must receive the Protective Finish Coating.
****

Waterproofed surfaces which are not to receive plaster, floor topping, or other finish must receive a protective coating applied directly over the bond coat.

[3.4.5.1 Walls and Columns

After application of bond coat, apply protective coating to minimum thickness of 3 mm 1/8 inch. Mix coating in proportions by volume of one part portland cement to two and one-half parts fine aggregate conforming to ASTM C33/C33M. Float to smooth, even surface.

][3.4.5.2 Floors

After application of bond coat, apply protective topping of 38 mm 1-1/2 inch minimum thickness, consisting of one part portland cement, one part sand, and two parts fine aggregate conforming to ASTM C33/C33M and proportioned by volume. Mixing must be done in a mechanical batching-type mixer for not less than 3 minutes after all materials have been included, using not more than 15 liters 4 gallons of water for each bag of cement when floating is done by machine and 19 liters 5 gallons for each bag of cement when floating is done by hand. After screeding to established finish lines and levels, compact and then float with wood floats or power floating machines. After finish has sufficiently hardened to prevent excess fine material from being worked to surface, steel trowel to obtain smooth surface free from defects and blemishes. After topping has set to ring, trowel again to a burnished finish.

][3.4.5.3 Curing

Protect finish coating from loss of moisture and cure by periodic fog spraying and cover with impervious sheeting or other approved method until coating has set.

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