
USACE / NAVFAC / AFCEA UFGS-07190 (September 1999)

Preparing Activity: NAVFAC Superseding
UFGS-07190N (September 1999)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

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DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07190

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12/03

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SECTION 07190

WATER REPELLENTS 12/03

NOTE: This guide specification covers the requirements for the application of water repellent coatings to above grade concrete, concrete masonry, and plaster surfaces.

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).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

NOTE: Graffiti resistance and glossy surface finish are not obtained with these penetrant-type repellents.

NOTE: On the drawings, show location of each type of water repellent to be used. Designate by code.

PART 1 GENERAL

1.1 REFERENCES

NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is

recommended for projects based on older guide
specifications.

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 ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501 (1994) Methods of Test for Exterior Walls

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 259 (2002) Resistance of Concrete to Chloride Ion Penetration

AASHTO T 260 (1997; R 2001) Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials

ASTM INTERNATIONAL (ASTM)

ASTM C 140 (2003) Sampling and Testing Concrete Masonry Units and Related Units

ASTM C 642 (1997) Density, Absorption, and Voids in Hardened Concrete

ASTM C 672 (1992) Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals

ASTM D 1653 (2003) Water Vapor Transmission of Organic Coating Films

ASTM D 2369 (2003) Volatile Content of Coatings

ASTM D 3278 (1996e1) Flash Point of Liquids by Small Scale Closed-Cup Apparatus

ASTM E 514 (2002) Water Penetration and Leakage Through Masonry

ASTM E 96 (2000e1) Water Vapor Transmission of Materials

ASTM G 53 (1996) Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials

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

29 CFR 1910.1000 Air Contaminants

1.2 SUBMITTALS

NOTE: Submittals must be limited to those necessary

for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

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 projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy 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.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Water repellents

SD-06 Test Reports

Water absorption

Accelerated weathering

Resistance to chloride ion penetration

Moisture vapor transmission

Scaling resistance

Water Penetration and Leakage

SD-07 Certificates

Manufacturer's qualifications

Applicator's qualifications

Evidence of acceptable variation

Warranty

SD-08 Manufacturer's Instructions

Application instructions

Provide manufacturer's instructions including preparation, application, recommended equipment to be used, safety measures, and protection of completed application.

Manufacturer's material safety data sheets

1.3 QUALITY ASSURANCE

1.3.1 Qualifications

- a. Manufacturer's qualifications: Minimum five years record of successful in-service experience of water repellent treatments manufactured for [concrete,] [concrete masonry,] [plaster] application.
- b. Applicator's qualifications: Minimum five years successful experience in projects of similar scope using specified or similar treatment materials and manufacturer's approval for application.

1.3.2 Performance Requirements

- a. Water absorption: ASTM C 140. Comparison of treated and untreated specimens.
- b. Moisture vapor transmission: ASTM E 96. Comparison of treated and untreated specimens.
- c. Water penetration and leakage through masonry: ASTM E 514.

1.3.3 Evidence of Acceptable Variation

If a product proposed for use does not conform to requirements of the referenced specification, submit for approval to the Contracting Officer, evidence that the proposed product is either equal to or better than the product specified. Include the following:

- a. Identification of the proposed substitution;
- b. Reason why the substitution is necessary;
- c. A comparative analysis of the specified product and the proposed substitution, including tabulations of the composition of pigment and vehicle;
- d. The difference between the specified product and the proposed substitution; and

- e. Other information necessary for an accurate comparison of the proposed substitution and the specified product.

1.4 SAMPLE TEST PANEL

The approved Sample Test Panel will serve as the standard of quality for all other water repellent coating work. Do not proceed with application until the sample panel has been approved by the Contracting Officer.

NOTE: Specify sample test panels as a part of the
work included in Division 03, Concrete; Division 04,
Masonry; or in Division 09, Finishes, as applicable.

1.4.1 Sample Test Panel

NOTE: Insert appropriate Section number and title
in the blank below using format per UFC 1-300-02.

Prior to commencing work, including bulk purchase and delivery of material, apply water repellent treatment to a minimum 1200 mm 4 feet high by 1200 mm 4 feet long [concrete,] [concrete masonry,] [plaster] test-panel specified in [_____]. Provide a full height expansion joint at mid-panel length. Prepare and seal joint with materials approved for project use.

1.4.1.1 Testing

AAMA 501 Provide field water testing of water repellent treated surfaces in the presence of the Contracting Officer and the water repellent treatment manufacturer's representative.

- a. Apply water repellent to left side of mock-up and allow to cure prior to application of treatment to right side.
- b. Twenty days after completion of application of treatment, test mock-up with 16 mm 5/8 inch garden hose, with spray nozzle, located 3 meters 10 feet from wall and aimed upward so water strikes wall at 45 degree downward angle. After water has run continuously for three hours observe back side of mock-up for water penetration and leakage. If leakage is detected make changes as needed and retest.
- c. Coordinate testing procedures and modify project treatment application as required to pass mock-up tests for water penetration and leakage resistance.

1.4.1.2 Approval

Proceed with water repellent treatment work only after completion of field test application and approval of mock-up and tests by the Contracting Officer.

1.4.2 Pre-Installation Meeting

- a. Attend pre-installation meeting required prior to commencement of

[concrete,] [concrete masonry,] [plaster] installation.

- b. Review procedures and coordination required between water repellent treatment work and work of other trades which could affect work to be performed under this section of the work.
- c. Convene additional pre-installation meeting prior to water repellent treatment application for coordination with work not previously coordinated including joint sealants.

1.5 REGULATORY REQUIREMENTS

**NOTE: Include these paragraphs as required by
Federal, State, or local jurisdictions.**

1.5.1 Environmental Protection

**NOTE: Include the second bracketed option for work
in the State of California.**

In addition to requirements specified in Section 01575N TEMPORARY ENVIRONMENTAL CONTROLS for environmental protection, provide coating materials that conform to the restrictions of the [Local Air Pollution Control jurisdiction] [CALIFORNIA AIR RESOURCES BOARD (CARB) and local Air Pollution Control District regional jurisdiction]. Notify the Contracting Officer of any water repellent coating specified herein which fails to conform to the local Air Quality Management District Rules at the location of the Project. In localities where the specified coating is prohibited, the Contracting Officer may direct the substitution of an acceptable coating.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver materials in original sealed containers, clearly marked with the manufacturer's name, brand name, type of material, batch number, percent solids by weight and volume, and date of manufacturer. Store materials off the ground, in a dry area where the temperature will be not less 10 degrees C 50 degrees F nor more than 29 degrees C 85 degrees F.

1.7 SAFETY METHODS

Apply coating materials using safety methods and equipment in accordance with Section 01575N TEMPORARY ENVIRONMENTAL CONTROLS, and the following:

1.7.1 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a. The coating manufacturer when using solvents or other chemicals. Use impermeable gloves, chemical goggles or face shield, and other recommended protective clothing and equipment to avoid exposure of skin, eyes, and respiratory system. Conduct work in a manner to minimize exposure of building occupants and the general public.

- b. 29 CFR 1910.1000.
- c. Threshold Limit Values (R) of the American Conference of Governmental Industrial Hygienists.
- d. Manufacturer's material safety data sheets.

1.8 ENVIRONMENTAL CONDITIONS

1.8.1 Weather and Substrate Conditions

Do not proceed with application of water repellents under any of the following conditions, except with written recommendations of manufacturer.

- a. Ambient temperature is less than 4 degrees C 40 degrees F.
- b. Substrate faces have cured less than one month.
- c. Rain or temperature below 4 degrees C 40 degrees F are predicted for a period of 24 hours before or after treatment.
- d. Earlier than three days after surfaces are wet.
- e. Substrate is frozen or surface temperature is less than 4 degrees C 40 degrees F and falling.

1.8.2 Moisture Condition

Determine moisture content of substrate meets manufacturer's requirements prior to application of water repellent material.

1.9 SEQUENCING AND SCHEDULING

1.9.1 Masonry Surfaces

Do not start water repellent coating until all joint tooling, pointing and masonry cleaning operations have been completed. Allow masonry to cure for at least 60 days under normal weather conditions before applying water repellent.

1.9.2 Plaster Surfaces

Do not start water repellent coating until all shrinkage and stress cracks are repaired and sound, all surfaces are free of defects and cleaning operations have been completed. Allow plaster to cure for at least 30 days under normal weather conditions before applying water repellent.

1.9.3 Concrete Surfaces

Do not start water repellent coating until all patching, pointing and cleaning operations have been completed and concrete has cured a minimum of 30 days under normal weather conditions.

1.9.4 Sealants

Do not apply water repellents until the sealants for joints adjacent to surfaces receiving water repellent treatment have been installed and cured.

- a. Water repellent work may precede sealant application only if

sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.

- b. Provide manufacturers' test results of compatibility.

1.10 INSPECTIONS

Notify the manufacturer's representative a minimum of 72 hours prior to scheduled application of water repellents for field inspection. Inspect surfaces and obtain approval in writing from the manufacturer's representative prior to any application of any water repellent coating.

1.11 SURFACES TO BE COATED

Coat all exterior [concrete,] [masonry,] [or plaster] surfaces. This includes back faces of parapets, top of walls, edges and returns adjacent to windows and door frames and free standing walls.

1.12 WARRANTY

Provide a warranty, issued jointly by the manufacturer and the applicator of the water repellent treatment against moisture penetration through the treated structurally sound surface for a period of five years. Warranty to provide the material, labor, and equipment necessary to remedy the problem.

At the satisfactory completion of the work, complete the warranty sign, notarize, and submit to the Contracting Officer.

PART 2 PRODUCTS

2.1 MATERIALS

Water repellent solution shall be a clear, non-yellowing, deep-penetrating, VOC compliant solution. Material shall not stain or discolor and shall produce a mechanical and chemical interlocking bond with the substrate to the depth of the penetration.

2.2 WATER REPELLENTS

NOTE: Delete following types not required.

2.2.1 Silane, 20 Percent Solids

Penetrating water repellent. A monomeric compound containing approximately 20 percent alkyltrialkoxysilanes with alcohol, mineral spirits, water, and other proprietary solvent carrier.

- a. Composition: Modified alkylalkoxysilane.
- b. Active alkylalkoxysilane content: ASTM D 2369 20 percent by weight, plus or minus 1 percent.
- c. Appearance: White, milky liquid.
- d. Average depth of penetration: Up to 10 mm 3/8 inch depending on substrate.

- e. VOC content: Less than 350 grams per liter.
- f. Flash point, ASTM D 3278.
- g. Specific gravity, at 25 degrees C 78 degrees F: 0.96 to 0.98.
- h. Density: .96 to .98 kilograms per liter. 8.0 to 8.2 pounds per gallon.

2.2.2 Silane, 40 Percent Solids

Penetrating water repellent. A monomeric compound containing approximately 40 percent alkyltrialkoxysilanes with alcohol, mineral spirits, or water.

- a. Composition: Modified alkylalkoxysilane.
- b. Active alkylalkoxysilane content: ASTM D 2369 40 percent by weight, plus or minus 1.5 percent.
- c. Appearance: White, milky liquid.
- d. Average depth of penetration: Up to 10 mm 3/8 inch depending on substrate.
- e. VOC content: Less than 350 grams per liter.
- f. Flash point, ASTM D 3278.
- g. Specific gravity, at 78 degrees F 25 degrees C: 0.94 to 0.97.
- h. Density: .94 to .97 kilograms per liter 7.8 to 8.1 pounds per gallon.

2.2.3 Silane, 85 Percent Solids or Greater

Penetrating water repellent. A monomeric compound containing 85 percent or greater alkyltrialkoxysilanes with alcohol, mineral spirits, or water.

- a. Composition: Modified alkylalkoxysilane.
- b. Active alkylalkoxysilane content: ASTM D 2369 20 percent by weight, plus or minus 1 percent.
- c. Appearance: White, milky liquid.
- d. Average depth of penetration: Up to 10 mm 3/8 inch depending on substrate.
- e. VOC content: Less than 350 grams per liter.
- f. Flash point, ASTM D 3278.
- g. Specific gravity, at 25 degrees C 78 degrees F: 0.96 to 0.98
- h. Density: .96 to .98 kilograms per liter 8.0 to 8.2 pounds per gallon.

2.2.4 Siloxanes

Penetrating water repellent. Alkylalkoxysiloxanes that are oligomeric

with alcohol, ethanol, mineral spirits, or water.

- a. Solids by weight: ASTM D 2369, 7.5-16.0 percent.
- b. Volatile Organic Content (VOC) after blending: Less than 175 grams per liter.
- c. Density, activated: One kilogram per liter 8.4 pounds per gallon, plus or minus one percent.
- d. Flash point, ASTM D 3278: Greater than 100 degrees C 212 degrees F.

2.2.5 Low-Solids Acrylic

Water-clear, breathing coating of acrylic resins, water-based, solvent-based, or acrylic emulsions solution containing less than 15 percent solids by volume.

**NOTE: Below may be used on concrete, exposed
aggregate, stucco, masonry, or stone where wet sheen
appearance or some darkening of surface is acceptable.**

2.2.6 High-Solids Acrylic

Water-clear, breathing coating of acrylic resins, water-based, solvent-based, or acrylic emulsions solution containing 15 percent solids or more by volume.

2.2.7 VOC-Complying Water Repellents

Products certified by the manufacturer that they comply with local regulations controlling use of volatile organic compounds (VOC's).

2.3 PERFORMANCE CRITERIA

2.3.1 Silane, 20 Percent Solids

- a. Water absorption test: ASTM C 642 and ASTM E 514.
- b. Moisture vapor transmission: ASTM D 1653, 28.33 perms or 51.61 percent maximum compared to untreated surfaces.
- c. Scaling resistance: ASTM C 672, non-air-entrained concrete, zero rating, no scaling, 100 cycles treated concrete.
- d. Resistance to chloride ion penetration: AASHTO T 259 and AASHTO T 260.
- e. Water penetration and leakage through masonry, ASTM E 514 percentage reduction of leakage: 97 percent minimum.
- f. Resistance to accelerated weathering, ASTM G 53 testing 2,500 hours: No loss in repellency.
- g. Drying time under normal conditions: Four hours per 24 degrees C 75 degrees F.

2.3.2 Silane, 40 Percent Solids

- a. Average depth of penetration: 10 mm 3/8 inches depending on substrate
- b. Resistance to chloride ion penetration, AASHTO T 259 and AASHTO T 260.
- c. Water absorption test, ASTM E 514: 0.42 percent per 48 hours; 1.2 percent per 50 days.
- d. Moisture vapor transmission: ASTM D 1653, 28.33 perms or 51.61 percent maximum compared to untreated surfaces.
- e. Scaling resistance, ASTM C 672, non-air-entrained concrete: Zero rating, no scaling, 100 cycles treated concrete.
- f. Resistance to accelerated weathering, ASTM G 53. Testing 2,500 hours: No loss in repellency.
- g. Drying time under normal conditions: Four hours per 24 degrees C 75 degrees F.

2.3.3 Silane, 85 Percent Solids or Greater

- a. Average depth of penetration: 10 mm 3/8 inches depending on substrate
- b. Resistance to chloride ion penetration, AASHTO T 259 and AASHTO T 260.
- c. Water absorption test, ASTM E 514: 0.42 percent per 48 hours; 1.2 percent per 50 days.
- d. Moisture vapor transmission: ASTM D 1653, 28.33 perms or 51.61 percent maximum compared to untreated surfaces.
- e. Scaling resistance, ASTM C 672, non-air-entrained concrete: Zero rating, no scaling, 100 cycles treated concrete.
- f. Resistance to accelerated weathering, ASTM G 53. Testing 2,500 hours: No loss in repellency.
- g. Drying time under normal conditions: Four hours per 24 degrees C 75 degrees F.

2.3.4 Siloxanes

- a. Dry time for recoat, if necessary: One to two hours depending on weather conditions.
- b. Penetration: 10 mm 3/8 inch, depending on substrate.
- c. Water penetration and leakage through masonry, ASTM E 514, percentage reduction of leakage: 97.0 percent minimum
- d. Moisture vapor transmission, ASTM E 96: 47.5 perms or 82 percent maximum compared to untreated sample.

- e. Resistance to accelerated weathering, ASTM G 53. Testing 2,500 hours: No loss in repellency.
- f. Resistance to chloride ion penetration, AASHTO T 259 and AASHTO T 260.
- g. Scaling resistance, ASTM C 672, non-air-entrained concrete: Zero rating, no scaling, 100 cycles treated concrete.

PART 3 EXECUTION

3.1 EXAMINATION

Examine [concrete], [plaster], or [masonry] surfaces to be treated to ensure that:

- a. All visible cracks, voids or holes have been repaired.
- b. All mortar joints in masonry are tight and sound, have not been re-set or misaligned and show no cracks or spalling.
- c. Moisture contents of walls does not exceed 15 percent when measured on an electronic moisture register, calibrated for the appropriate substrate.
- d. Concrete surfaces are free of form release agents, curing compounds and other compounds that would prevent full penetration of the water repellent material.

Do not start water repellent treatment work until all deficiencies have been corrected, examined and found acceptable to the Contracting Officer and the water repellent treatment manufacturer. Do not apply treatment to damp, dirty, dusty or otherwise unsuitable surfaces. Comply with the manufacturer's recommendations for suitability of surface.

3.2 PREPARATION

3.2.1 Surface Preparation

Prepare substrates in accordance with water repellent treatment manufacturer's recommendation. Clean surfaces of dust, dirt, efflorescence, alkaline, and foreign matter detrimental to proper application of water repellent treatment.

3.2.2 Protection

Provide masking or protective covering for materials which could be damaged by water repellent treatment.

NOTE: Check manufacturer for items requiring protection.

- a. Protect glass, glazed products, and prefinished products from contact with water repellent treatment.
- b. Protect landscape materials with breathing type drop cloths: plastic covers are not acceptable.

3.2.3 Compatibility

NOTE: Verify requirements below based on
compatibility of treatment and sealants. Use one or
both the second and third following paragraphs as
required.

- a. Confirm treatment compatibility with each type of joint sealer within or adjacent to surfaces receiving water repellent treatment in accordance with manufacturer's recommendations.
- [b. When recommended by joint sealer manufacturer, apply treatment after application and cure of joint sealers. Coordinate treatment with joint sealers.]
- [c. Mask surfaces indicated to receive joint sealers which would be adversely affected by water repellent treatment where treatment must be applied prior to application of joint sealers.]

3.3 MIXING

Mix water repellent material thoroughly in accordance with the manufacturer's recommendations. Mix, in quantities required for that days work, all containers prior to application. Mix each container the same length of time.

3.4 APPLICATION

In strict accordance with the manufacturers written requirements. Do not start application without the manufacturer's representative being present or his written acceptance of the surface to be treated.

3.4.1 Water Repellent Treatment

3.4.1.1 Spray Application

Spray apply water repellent material to exterior [concrete,] [plaster,] [and masonry] surfaces using low-pressure airless spray equipment in strict accordance with manufacturer's printed application, instructions, and precautions. Maintain copies at the job site. Apply flood coat in an overlapping pattern allowing approximately 200 to 250 mm 8 to 10 inch rundown on the vertical surface. Maintain a wet edge at all overlaps, both vertical and horizontal. Hold gun maximum 450 mm 18 inches from wall.

3.4.1.2 Brush or Roller Application

Brush or roller apply water repellent material only at locations where overspray would affect adjacent materials and where not practical for spray applications.

3.4.1.3 Covered Surfaces

Coat all exterior [concrete,] [plaster,] [or masonry] surfaces including back faces of parapets, tops of walls, edges and returns adjacent to window and door frames, window sills, and free-standing walls.

3.4.1.4 Rate of Application

Apply materials to exterior surfaces at the coverages recommended by the manufacturer and as determined from sample panel test. Increase or decrease application rates depending upon the surface texture and porosity of the substrate so as to achieve even appearance and total water repellency.

3.4.1.5 Number of Coats

The sample panel test shall determine the number of coats required to achieve full coverage and protection.

3.4.1.6 Appearance

If unevenness in appearance, lines of work termination or scaffold lines exist, or detectable changes from the approved sample panel occur, the Contracting Officer may require additional treatment at no additional cost to the Government. Apply any required additional treatment to a natural break off point.

3.5 CLEANING

Clean all runs, drips, and overspray from adjacent surfaces while the water repellent treatment is still wet in a manner recommended by the manufacturer.

3.6 FIELD QUALITY CONTROL

Do not remove drums containing water repellent material from the job site until completion of all water repellent treatment and until so authorized by the Contracting Officer.

3.6.1 Field Testing

AAMA 501. At a time not less than twenty days after completion of the water repellent coating application, subject a representative wall area of the building to the Navy Hose Stream Field Test similar to AAMA 501 hose test to simulated rainfall for a period of three hours. Use a minimum 5/8 inch diameter hose and a fixed lawn sprinkler spray head which will direct a full flow of water against the wall. Place the sprinkler head so that the water will strike the wall downward at a 45 degree angle to the wall. If the inside of the wall shows any trace of moisture during or following the test, apply another coat of water repellent, at the manufacturer's recommended coverage rate to the entire building. Repeat testing and re-coating process until no moisture shows on the inside wall face. Accomplish any required work retesting and re-coating at no additional cost to the Government.

3.6.2 Site Inspection

Inspect treatment in progress by manufacturer's representative to verify compliance with manufacturer instructions and recommendations.

-- End of Section --