
USACE / NAVFAC / AFCEC / NASA UFGS-07 13 53 (April 2006)

Preparing Activity: NAVFAC Replacing without change
UFGS-07131 (March 2002)

UNIFIED FACILITIES GUIDE SPECIFICATION

References are in agreement with UMRL dated October 2015

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SECTION 07 13 53

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04/06

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SECTION 07 13 53

ELASTOMERIC SHEET WATERPROOFING
04/06

NOTE: This guide specification covers the requirements for sheet-applied elastomeric waterproofing.

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 items(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).

NOTE: This guide specification is intended for use where local practice and experience indicates that protection against hydrostatic pressure or conditions of excessive dampness can be achieved by using elastomeric waterproofing. Typical applications include but are not limited to wall and foundation waterproofing, waterproofing promenades and parking decks, waterproofing beneath shower pans, kitchens, toilet facilities, janitorial rooms, and indoor swimming pools.

NOTE: Where concrete vault magazines are designed below ground, provide butyl rubber, or elastomeric composite, thermoplastic waterproof sheeting.

NOTE: On the drawings, show:

1. Extent of membrane waterproofing, substrates, termination details, flashing, and counterflashing, pipe and conduit penetrations, and junctions at walls and floors.

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 D1004	(2013) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D1149	(2007; R 2012) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D1204	(2014) Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
ASTM D146/D146M	(2004; E 2012; R 2012) Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
ASTM D1876	(2008; R 2015; E 2015) Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)

ASTM D2136	(2002; R 2012) Coated Fabrics - Low-Temperature Bend Test
ASTM D2240	(2005; R 2010) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D297	(2015) Rubber Products - Chemical Analysis
ASTM D3045	(1992; R 2010) Practice for Heat Aging of Plastics Without Load
ASTM D41/D41M	(2011) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D412	(2006a; R 2013) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D429	(2014) Rubber Property-Adhesion to Rigid Substrates
ASTM D471	(2012a) Standard Test Method for Rubber Property - Effect of Liquids
ASTM D5385	(1993; R 2006) Hydrostatic Pressure Resistance of Waterproofing Membranes
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D573	(2004; R 2010) Standard Test Method for Rubber - Deterioration in an Air Oven
ASTM D624	(2000; R 2012) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D746	(2014) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D751	(2006; R 2011) Coated Fabrics
ASTM D903	(1998; R 2010) Peel or Stripping Strength of Adhesive Bonds
ASTM E154/E154M	(2008a; R 2013; E 2013) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

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..

The Guide Specification technical editors have designated 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 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.

An "S" following a submittal item indicates that the submittal is required for the Sustainability Notebook to fulfill federally mandated sustainable requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

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.] Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Elastomeric waterproofing sheet material; G[, [_____]]

Protection board

Primers, adhesives, and mastics

SD-04 Samples

Materials

Submit material samples showing resolution of corner and field conditions[, attachment to existing waterproof sheeting].

SD-06 Test Reports

Elastomeric waterproofing sheet material

Certify compliance with performance requirements specified herein.

Field Quality Control

Verification Of Conditions

Protective Covering

SD-08 Manufacturer's Instructions

Primers, adhesives, and mastics

Submit Manufacturer's material safety data sheets for primers, adhesives and mastics.

1.3 QUALITY ASSURANCE

1.3.1 Shop Drawing Requirements

Include description and physical properties; termination details; application details; recommendations regarding shelf life, application procedures; requirements for protective covering; and precautions for flammability and toxicity.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver and store materials out of the weather, in manufacturer's original packaging with brand name and product identification clearly marked. Do not permit uncertified materials in the work area.

1.5 ENVIRONMENTAL CONDITIONS

NOTE: When waterproofing will be installed indoors protected from the weather, delete the bracketed requirements for outdoor environmental conditions. Also, in geographical areas where the specifier determines it is routine to utilize artificial means of maintaining the surface and ambient temperatures above 4 degrees C 40 degrees F, include the conditions for waiver in the project specifications.

Do not apply waterproofing during inclement weather or when there is ice, frost, surface moisture, or visible dampness on the surface to receive waterproofing and when ambient and surface temperatures are 4 degrees C 40 degrees F or below. [The restriction on the application of waterproofing materials when ambient and surface temperatures are below 4 degrees C 40

degrees F will be waived if the Contractor devises a means, approved by the Contracting Officer, of maintaining the surface and ambient temperatures above 4 degrees C 40 degrees F.]

PART 2 PRODUCTS

2.1 MATERIALS

Provide one of the types of elastomeric waterproofing sheet material and related primers, adhesives, and mastics as specified herein. Ensure compatibility of waterproofing materials within a specific type, with each other, and with the materials on which they will be applied. Materials shall conform to the applicable performance requirements cited below when tested in accordance with the referenced ASTM publications.

NOTE: Where concrete vault magazines are designed below ground, specify membrane sheeting. Do not apply primer or mastic until concrete has cured not less than 7 days, or as required by the manufacturer, remove all moisture, form oil and non-fungi curing agents.

NOTE: Specify a higher puncture resistance if the waterproofing will be subject to abuse. Commercial membranes are available which will exceed 890 N 200 pounds in puncture resistance.

2.2 BUTYL RUBBER SHEETING

Not less than 1.5 mm 60 mils minimum thickness.

2.2.1 Butyl Rubber Sheeting Performance Requirements

- a. Thickness Tolerance, ASTM D412: Plus or minus 10 percent;
- b. Specific Gravity, ASTM D297: 1.20, plus or minus 0.05;
- c. Tensile Strength, ASTM D412: 7.7 MPa 1200 psiminimum;
- d. Tensile Stress at 300 percent elongation, ASTM D412: 3.85 MPa 600 psi minimum;
- e. Elongation, ASTM D412: 300 percent minimum;
- f. Tear Resistance, Die C, ASTM D624: 26.3 Newtons per millimeter (N/mm) 150 pound force per inch (lbf/inch)minimum;
- g. Shore A Hardness, ASTM D2240: Five-second interval before reading; 60 plus or minus 10;
- h. Ozone Resistance, ASTM D1149: No cracks, 7 days - 50 pphm - 37.8 degrees C 100 degrees F, 20 percent elongation;
- i. Heating Aging-Accelerated, ASTM D573: Tensile retention, 60 percent of minimum original elongation retention; 60 percent of minimum original

requirement; 7 days, 115.6 degrees C 240 degrees F;

- j. Butyl Identification, ASTM D471, Tricresyl Phosphate Immersion: Maximum volume swell 10 percent, 70 hrs, 100 degrees C 212 degrees F;
- k. Low Temperature Flexibility, ASTM D746: No failure at minus 40 degrees C minus 40 degrees F;
- l. Water Absorption, ASTM D471: plus 1 percent maximum. 7 days, 70 degrees C 158 degrees F;
- m. Exposure to Fungi and Bacteria in Soil, ASTM E154/E154M, Minimum 16 Weeks: Unaffected; and
- n. Water Vapor Transmission, 26.7 Degrees C 80 Degrees F Permeance, ASTM E96/E96M, Procedure B or BW: 8.58 by 10⁻⁷ g/Pa.s.m² 0.15 perms maximum.

2.2.2 Adhesive, Cement, and Tape for Use with Butyl Rubber

As recommended by the butyl rubber waterproofing membrane manufacturer.

2.3 THERMOPLASTIC MEMBRANE: POLYVINYL CHLORIDE (PVC)

Polyvinyl chloride (PVC) flexible sheets with non-woven fiberglass reinforcing not less than 1.5 mm 60 mils minimum thickness.

2.3.1 Thermoplastic Membrane Performance Requirements

- a. Overall thickness, ASTM D751:, 1.50 mm .059 inches min.;
- b. Tensile strength ASTM D638:, 11.03 MPa 1600 psi min.;
- c. Elongation at break, ASTM D638:, 250 percent minimum;
- d. Seam strength, ASTM D638:, 90 percent minimum of tensile strength;
- e. Retention of properties after heat aging, ASTM D3045;
- f. Tensile strength, ASTM D638:, 95 percent of original;
- g. Elongation, ASTM D638:, 95 percent of original;
- h. Tear resistance, ASTM D1004:, 7.7 Kilogram Force 17 Pound Force
- i. Low Temperature Bend , ASTM D2136:, minus 40 C minus 40 F;
- j. Liner Dimensional Change, ASTM D1204: 0.002 percent; and
- k. Weight Change After Immersion in Water, ASTM D570:, 2.0 percent maximum.

2.3.2 Adhesives

- a. Adhesive for thermoplastic flashings as recommended by manufacturer.
- b. Adhesive for Sub-Membrane Grid: 100 percent solids, two-part urethane, with minimum tensile strength of 1.04 MPa 150 psi, in accordance with ASTM D412 and adhesion to concrete of 12 ply in accordance with ASTM D429 as recommended by manufacture.

NOTE: Where recommended by the manufacturer for
below ground membrane sheeting, provide securement
strip at perimeter and at any penetrations(s) as
well as any elevation changes.

2.3.3 Accessories

Securement Strip: 14 gauge stainless steel metal bar 2.54 cm 1 inch wide,
pre-punched 2.54 cm 1 inch on center for securement.

2.4 COMPOSITE, SELF-ADHERING MEMBRANE SHEETING

Cold applied composite sheet consisting of rubberized asphalt and cross
laminated, high density polyethylene film. Not less than 1.5 mm 60 mils
minimum thickness is required.

2.4.1 Composite, Self-Adhering Sheeting Performance Requirements

- a. Tensile Strength, ASTM D412, Die C: 1.6 MPa 250 psi minimum;
- b. Ultimate Elongation, ASTM D412, Die C: 200 percent minimum;
- c. Water Vapor Transmission, ASTM E96/E96M 26.7 Degrees C 80 Degrees F
Permeance, Procedure B: 5.72 by 10⁻⁷ g/Pa.s.m² 0.1 perm maximum;
- d. Pliability Degrees F, ASTM D146/D146M: (180 Degrees Bend Over 25 mm
One Inch Mandrel): No cracks at minus 32 degrees C minus 25 degrees F;
- e. Cycling Over Crack at minus 26 degrees C minus 15 Degrees F: Membrane
is applied and rolled across two primed concrete blocks with no
separation between blocks. Crack opened and closed from zero to 6 mm
1/4 inch. No effect at 100 cycles;
- f. Puncture Resistance, ASTM E154/E154M: 18 kg 40 lb. minimum;
- g. Lap Adhesion at Minimum Application Temperature, ASTM D1876 Modified,
880 N/m (5 lbs/in.);
- h. Peel Strength, ASTM D903: Modified 1576 N/m 9 lbs/n;
- i. Resistance to Hydrostatic Head, ASTM D5385: 70 m 231 ft of water
- j. Water Absorption, ASTM D570; 0.1 percent maximum.

2.4.2 Primer

Asphalt composition, ASTM D41/D41M, or synthetic polymer in solvent as
recommended by the membrane manufacturer.

2.4.3 Mastic

Polymer modified asphalt in suitable solvent of trowel-grade consistency
and as recommended by the membrane manufacturer.

2.5 Protection Board

NOTE: Always require protection material separating waterproofing from fill material. Delete protection board option and require the polymeric grid option for earth covered magazines or facilities with routine ground water exposure

NOTE: NOTE: The fiberboard will not provide protection after it becomes wet. Bituminous-impregnated protection board must not be used in contact with polyvinyl chloride (PVC), which may be in composite membranes. Polystyrene is not compatible with petroleum products. The membrane and protection board must be compatible.

[Provide protection board that is compatible with the waterproofing membrane. Use a minimum 13 mm 1/2 inch thick fir bituminous - impregnated board 25 mm 1 inch for polystyrene 3 mm 1/8 inch thick for vertical and 6 mm 1/4 inch for horizontal premolded bituminous protection board as recommended by the manufacturer.]

[Three-dimensional, high impact resistant polymeric grid with woven monofilament drainage fabric bonded to the grid.]

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

Before starting the work, verify that surfaces to be waterproofed are in satisfactory condition. Notify the Contracting Officer of defects or conditions that will prevent a satisfactory application. Do not start application until defects and conditions have been corrected.

3.2 SURFACE PREPARATION

NOTE: A paragraph should be added to Section 03 30 00.00 10 CAST-IN-PLACE CONCRETE and Section 03 30 00 CAST-IN-PLACE CONCRETE, to the effect that curing compound containing wax or oil should be removed prior to application of waterproofing.

Ensure surfaces to be treated are clean, dry, smooth, and free from deleterious materials and projections. [Thoroughly wet holes, joints, cracks, and voids in [masonry] [concrete] with water and fill with Portland cement mortar, strike flush, and permit to dry.] Cut off high spots or grind smooth. Finish top surfaces of projecting masonry or concrete ledges below grade, except footings, to a steep bevel with Portland cement mortar. Sweep surfaces to be covered before applying waterproofing to remove dust and foreign matter. Cure concrete by a method compatible with the waterproofing system.

3.3 APPLICATION

NOTE: Delete requirements for cant strips if cant strips are not required.

Follow manufacturer's printed installation instructions. [Where indicated, mop continuous cant strips in place at vertical and horizontal corners before installing the waterproofing membrane. Do not use untreated wood or wood fiber cants.] When using solvent welding liquid, avoid prolonged contact with skin and breathing of vapor. [Provide adequate ventilation.] Carry waterproofing of horizontal surfaces up abutting vertical surfaces as indicated and adhere solid to the substrate. Avoid wrinkles and buckles in applying membrane and joint reinforcement.

- a. Non-Self-Adhering Membrane: Unroll membrane and allow to remain flat for at least one-half hour before application. Apply an asphalt concrete primer prior to application of asphaltic adhesive. Where solvent adhesive is applied, allow major portion of solvent to evaporate so that bonding adhesive does not stick to a dry finger touching it. Apply elastomeric waterproofing membrane in a full bed of adhesive at a uniform coverage rate in accordance with the recommendations in the membrane manufacturer's printed instructions. [Where membrane on horizontal surfaces are to receive concrete fill, apply adhesive in 100 mm 4 inch wide strips at 600 mm 2 feet on center.] Pull membrane tight without stretching. As soon as adhesive is fully set and dry, recheck lap splices. Where openings or fishmouths appear, reseal and reroll lap splices.
- b. Self-Adhering Membrane: Apply composite, self-adhering membrane on surfaces primed at a uniform coverage rate in accordance with membrane manufacturer's printed instructions. Remove release sheet and apply with tacky surface in contact with dried primer.
- c. Protection: Protect membrane over horizontal surfaces from abnormal traffic during installation. Use only equipment with rubber tires. Provide walkway protection where heavy traffic from other trades is expected. Do not store material on membrane.

3.3.1 Butyl Rubber

Lap sheets at sides and ends a minimum of 150 mm 6 inches over the preceding sheet. Apply lap splicing cement over entire 150 mm 6 inches splice area prior to application of sealant. Sealant shall be continuous along the entire length of the splice. Maintain a continuous bead of sealant at all membrane splices or as required by the manufacturer. When membrane will be below water table, provide a tongue and groove cemented splice a minimum of 150 mm 6 inches with factory made heat vulcanized seam not less than 50 mm 2 inches or as required by the manufacturer.

3.3.2 Thermoplastic Membrane (PVC)

Deck shall be clean, smooth and dry without surface irregularities. Consult with membrane manufacturer prior to grid application. Install 30.48 cm 12 inches wide sub-membrane containment grid as required by manufacturer. Provide and install the containment grid at intervals across the width and length of the substrate, at the base of all transitions, walls, curbs, penetrations, and at the perimeter of each deck/substrate

section. Fully adhere strips to the deck in a full bedding of two-part urethane adhesive medium. Adjacent sheets shall be welded in accordance with manufacturer's instructions. All side and end lap joints shall be hot-air welded. Lap area shall be a minimum of 7.62 cm 3 inch wide when machine welding, and a minimum of 10.16 cm 4 inch wide when hand welding but not less than recommended by the manufacturer. Overlaps shall be with the flow of water.

3.4 Composite, Self-Adhering Membrane

Lap sheets at edges and ends a minimum of 65 mm 2-1/2 inches over the preceding sheet. All side laps shall be minimum 65 mm 2-1/2 inches and end laps shall be 127 mm 5 inches. Laps shall be self adhesive, mastic as per manufacturer's recommendation. Roll or firmly press to adhere membrane to substrate. Cover corners and joints with two layers of reinforcement by first applying a 300 mm 12 inch width of membrane centered along the axis. Flash drains and projections with a second ply of membrane for a distance of 150 mm 6 inches from the drain or projection. Finish exposed, terminated edges of membrane on horizontal or vertical surfaces with a trowelled bead of mastic. Apply mastic around edges of membrane, and drains and projections. Apply mastic at end of each work day.

3.5 FLASHING

Flash penetrations through membrane. Ensure that where reinforcing bars penetrate a waterproofing membrane, each of those penetrations be sealed with the appropriate sealant or mastic flashing component. Embed elastomeric membrane in a heavy coat of adhesive, except for self-adhering membrane. Continuous metal reglets shall be installed, horizontally on footing and vertically on intersecting and connecting walls, and as specified in Section 07 60 00 FLASHING AND SHEET METAL. Metal reglets shall receive exposed edges of membrane waterproofing. Secure membrane into reglets by lead wedges and fill with cement as recommended by manufacturer of waterproofing materials. Counterflash upper edge of membrane waterproofing and protective covering as specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.6 FIELD QUALITY CONTROL

Notify the Contracting Officer one day prior to date of performing tests. Before concealment, cover elastomeric waterproofing on horizontal surfaces over finished spaces with [75][100] mm [3][4] inches of ponded water for 24 hours. Do not add water after start of 24 hour period. Carefully measure water level at beginning and end of 24 hour period. If water level falls, remove water and inspect waterproofing membrane. Make repairs or replacement as directed, and repeat test. Do not proceed with work that conceals membrane waterproofing before receiving approval and acceptance of Contracting Officer.

3.7 PROTECTIVE COVERING

After installation has been inspected and approved by the Contracting Officer, apply a protective covering to the membrane waterproofing prior to backfilling. Protect vertical membrane waterproofing with a 13 mm 1/2 inch minimum thickness of asphalt plank; 13 mm 1/2 inch minimum thickness of fiberboard; or 3 mm 1/8 inch minimum thickness of compatible water-resistant bitumen type protection board with edges abutting adjacent

edges and exposed surfaces covered by a taping system recommended by manufacturer of protection board. Cover horizontal membrane waterproofing with similar protection board and Portland cement mortar not less than 20 mm 3/4 inch thick; place uniformly and allow to set before installing subsequent construction.

-- End of Section --