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USACE / NAVFAC / AFCEA / 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 2009

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## SECTION 07 13 53

### ELASTOMERIC SHEET WATERPROOFING 04/06

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

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).

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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.

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

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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.

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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 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 D 1004	(2009) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D 1149	(2007) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D 1204	(2008) Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
ASTM D 146	(2004) Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
ASTM D 2136	(2002; R 2007) Coated Fabrics - Low-Temperature Bend Test

ASTM D 2240	(2005) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D 297	(1993; R 2006) Rubber Products - Chemical Analysis
ASTM D 3045	(1992; R 2003) Practice for Heat Aging of Plastics Without Load
ASTM D 41	(2005) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D 412	(2006aele2) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D 429	(2008) Rubber Property-Adhesion to Rigid Substrates
ASTM D 471	(2006; R 2008) Standard Test Method for Rubber Property - Effect of Liquids
ASTM D 5385	(1993; R 2006) Hydrostatic Pressure Resistance of Waterproofing Membranes
ASTM D 570	(1998; R 2005) Standard Test Method for Water Absorption of Plastics
ASTM D 573	(2004) Standard Test Method for Rubber - Deterioration in an Air Oven
ASTM D 624	(2000; R 2007) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D 638	(2008) Standard Test Method for Tensile Properties of Plastics
ASTM D 746	(2007) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 751	(2006) Coated Fabrics
ASTM D 903	(1998; R 2004) Peel or Stripping Strength of Adhesive Bonds
ASTM E 154	(2008a) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
ASTM E 96/E 96M	(2005) Standard Test Methods for Water Vapor Transmission of Materials

## 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 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.

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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 01 33 00 SUBMITTAL PROCEDURES:

#### SD-03 Product Data

Elastomeric waterproofing sheet material[; G][; 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

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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.  
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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.

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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.

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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.

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## 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 D 412: Plus or minus 10 percent;
- b. Specific Gravity, ASTM D 297: 1.20, plus or minus 0.05;
- c. Tensile Strength, ASTM D 412: 7.7 MPa 1200 psi minimum;
- d. Tensile Stress at 300 percent elongation, ASTM D 412: 3.85 MPa 600 psi minimum;
- e. Elongation, ASTM D 412: 300 percent minimum;
- f. Tear Resistance, Die C, ASTM D 624: 26.3 newtons per millimeter (N/mm) 150 pound force per inch (lbf/inch) minimum;
- g. Shore A Hardness, ASTM D 2240: Five-second interval before reading; 60 plus or minus 10;
- h. Ozone Resistance, ASTM D 1149: No cracks, 7 days - 50 pphm - 37.8 degrees C 100 degrees F, 20 percent elongation;
- i. Heating Aging-Accelerated, ASTM D 573: 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 D 471, Tricresyl Phosphate Immersion: Maximum volume swell 10 percent, 70 hrs, 100 degrees C 212 degrees F;
- k. Low Temperature Flexibility, ASTM D 746: No failure at -40 degrees C -40 degrees F;
- l. Water Absorption, ASTM D 471: +1 percent maximum. 7 days, 70



degrees C 158 degrees F;

- m. Exposure to Fungi and Bacteria in Soil, ASTM E 154, Minimum 16 Weeks: Unaffected; and
- n. Water Vapor Transmission, 26.7 Degrees C 80 Degrees F Permeance, ASTM E 96/E 96M, Procedure B or BW:  $8.58 \times 10^{-7}$  g/Pa.s.m<sup>2</sup> 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 D 751:, 1.50 mm .059 inches min.;
- b. Tensile strength ASTM D 638:, 11.03 MPa, 1600 psi min.;
- c. Elongation at break, ASTM D 638:, 250 percent minimum;
- d. Seam strength, ASTM D 638:, 90 percent minimum of tensile strength;
- e. Retention of properties after heat aging, ASTM D 3045;
- f. Tensile strength, ASTM D 638:, 95 percent of original;
- g. Elongation, ASTM D 638:, 95 percent of original;
- h. Tear resistance, ASTM D 1004:, 7.7 Kilogram Force;, 17 Pound Force
- i. Low Temperature Bend , ASTM D 2136:, -40 C; -40 F;
- j. Liner Dimensional Change, ASTM D 1204: 0.002 percent; and
- k. Weight Change After Immersion in Water, ASTM D 570:, 2.0 percent maximum.

##### 2.3.2 Adhesives

- a. Adhesive for thermoplastic flashings as recommended by manufacturer.
- b. Adhesive for Sub-Membrane Grid: 100% solids, two-part urethane, with minimum tensile strength of 1.04 MPa, 150 psi, in accordance with ASTM D 412 and adhesion to concrete of 12 ply in accordance with ASTM D 429 as recommended by manufacture.

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**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.

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### 2.3.3 Accessories

- a. Securement Strip: 14 gauge stainless steel metal bar, 1 inch 2.54 cm wide, pre-punched 1 inch 2.54 cm 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 D 412, Die C: 1.6 MPa 250 psi minimum;
- b. Ultimate Elongation, ASTM D 412, Die C: 200 percent minimum;
- c. Water Vapor Transmission, ASTM E 96/E 96M 26.7 Degrees C 80 Degrees F Permeance, Procedure B:  $5.72 \times 10^{-7}$  g/Pa.s.m<sup>2</sup> 0.1 perm maximum;
- d. Pliability Degrees F, ASTM D 146: (180 Degrees Bend Over 25 mm One Inch Mandrel): No cracks at minus -32 degrees C -25 degrees F;
- e. Cycling Over Crack at Minus -26 degrees C 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 E 154: 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 D 903: Modified, 1576 N/m, 9 lbs/n;
- i. Resistance to Hydrostatic Head, ASTM D 5385:, 70 m, 231 ft of water
- j. Water Absorption, ASTM D 570; 0.1% maximum.

### 2.4.2 Primer

Asphalt composition, ASTM D 41, 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

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**NOTE: Always require protection material seperating 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

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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.

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[ 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

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NOTE: A paragraph should be added to Section 03 31 00.00 10, CAST-IN-PLACE STRUCTURAL CONCRETE, 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.

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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

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

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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 5 inches, 127 mm. 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 57 13 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 57 13 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 --