

SECTION 680—WATERPROOFING

680.1 DESCRIPTION—This work is the furnishing and placing of adhesive preformed membrane waterproofing systems to concrete or other surfaces as indicated.

680.2 MATERIAL—Unless specified or shown on the plans, select from the waterproofing systems listed in [Bulletin 15](#).

(a) Adhesives, Conditioners, Primers, Mastics, Two-Part Liquid Urethane Membranes and Sealing Tapes. As recommended for use with the respective preformed membrane sheet materials. Contact the membrane manufacturer or its representative for instructions.

(b) Adhesive-Backed Preformed Membrane Sheet. Furnish Adhesive-Backed Preformed Membrane Sheet consisting of a sheet of rubberized asphalt or polymer modified bitumen permanently applied to a polyethylene film, or reinforced with a stitch-bonded polyester/polypropylene fabric, or reinforced with a fiberglass mesh and conforming to the minimum requirements specified in Table A.

(c) Protective Covers. Provide a 3.0 mm (1/8-inch) thick, asphalt protective board or 26.5 kg (65-pound) roofing material without mica coating, or approved equal that furnishes equivalent protection to the membrane from being cut, scratched, or otherwise damaged from the backfill or equipment.

For bridge deck surfaces, the bituminous overlay is the protective cover.

(d) Bonding Material. [Section 460](#) and as recommended by the manufacturer.

(e) Manufacturer Technical Representative. Ensure that a trained Manufacturer's Technical Representative is present during every phase of application, unless applied by a factory trained licensed installer, as indicated by written approval from the material supplier. The Manufacturer's Technical Representative will provide training and technical assistance on surface preparation, equipment, mixing of components, type, and method of application, and finish.

(f) Certification. Certify each shipment as specified in [Section 106.03\(b\)3](#). Visibly label all shipments on the membranes or containers with the manufacturer's name, membrane trade name, lot number, and material quantity.

TABLE A (Metric)
Adhesive-Backed Preformed Membrane Sheet Minimum Requirements

Preformed Membrane Sheets		For Bridge Deck Surfaces		For Surfaces Other Than Bridge Decks	
Property	Test	Rubberized Asphalt Type	Modified Bitumen Type	Rubberized Asphalt Type	Modified Bitumen Type
Tensile Strength, N/mm (minimum) ⁽¹⁾⁽³⁾	ASTM D 882 ⁽²⁾	8.8	7.0	3.5	3.5
% Elongation at Break, (min) ⁽³⁾⁽⁴⁾	ASTM D 882 ⁽²⁾	15	10	25	25
Pliability	ASTM D 146 ⁽⁵⁾	No cracks	No cracks	No cracks	No cracks
Thickness, mm (minimum) ⁽⁶⁾	ASTM D 1000	Polyethylene Film Backed—1.5 Fabric Reinforced Backed—1.7	1.8	1.5	1.5
Softening Point, °C (minimum)	ASTM D 36	87.8	98.9	87.8	98.9
Permeance, kg/(Pa·s·m ²) (maximum)	ASTM E 96 , Method B	5.74 E-12	5.74 E-12	5.74 E-12	5.74 E-12
Puncture Resistance, N (min)	ASTM E 154	110	110	178	178

Notes:

- (1) Breaking factor in machine direction.
- (2) Method A, 25 mm wide strip with 100 mm minimum initial separation and 100 mm gage length at 50 mm per minute. Average 5 samples.
- (3) At 23.0 °C ± 2.0 °C.
- (4) Machine direction.
- (5) 180-degree bend over a 25 mm mandrel at -26°C.
- (6) Total thickness of preformed membrane sheet and polyethylene film or fabric reinforcement.

TABLE A (English)
Adhesive-Backed Preformed Membrane Sheet Minimum Requirements

Preformed Membrane Sheets		For Bridge Deck Surfaces		For Surfaces Other Than Bridge Decks	
Property	Test	Rubberized Asphalt Type	Modified Bitumen Type	Rubberized Asphalt Type	Modified Bitumen Type
Tensile Strength, lbs/in (minimum) ⁽¹⁾⁽³⁾	ASTM D 882 ⁽²⁾	50	40	20	20
% Elongation at Break, (min) ⁽³⁾⁽⁴⁾	ASTM D 882 ⁽²⁾	15	10	25	25
Pliability	ASTM D 146 ⁽⁵⁾	No cracks	No cracks	No cracks	No cracks
Thickness, mils (minimum) ⁽⁶⁾	ASTM D 1000	Polyethylene Film Backed—60 Fabric Reinforced Backed—65	70	60	60
Softening Point, F (minimum)	ASTM D 36	190	210	190	210
Permeance, perms (maximum)	ASTM E 96 , Method B	0.1	0.1	0.1	0.1
Puncture Resistance, lbs. (min)	ASTM E 154	25	25	40	40
Notes: (1) Breaking factor in machine direction. (2) Method A, 1-inch wide strip with 4-inch minimum initial separation and 4-inch gage length at 2 inches per minute. Average 5 samples. (3) At 73.4F ± 3.6F. (4) Machine direction. (5) 180-degree bend over a 1-inch mandrel at -15F. (6) Total thickness of preformed membrane sheet and polyethylene film or fabric reinforcement.					

680.3 CONSTRUCTION—

(a) Limitation of Operations. Apply waterproofing only if protective covering or bituminous overlay can also be placed within a time that ensures that the membrane will not be damaged by personnel, equipment, exposure to weathering, or from any other cause.

Do not install any part of a waterproofing system in wet, humid, or foggy weather conditions, or if the ambient or concrete surface temperature is below 10 °C (50F), unless recommended by the manufacturer and authorized in writing by the Representative. Apply the primer and waterproofing membrane only when the concrete surfaces are completely dry.

(b) Surface Preparation. Prepare the surface to be waterproofed to a condition free from holes or projections that might puncture or otherwise damage the membrane. Round (outside) or chamfer (inside) all sharp corners to be covered.

Thoroughly clean all concrete surfaces that are to be waterproofed. Remove any excess laitance, oil, concrete curing compounds, previous membrane treatments, and other foreign materials by sandblasting. Remove all dirt, dust, loose or unsound concrete, and other extraneous material by vacuuming or blowing with compressed air.

Use a scratch coat of asphalt as a leveling course on decks that have been milled and lack a surface that is acceptable to receive a membrane system. Asphalt paving less than one year old does not require a primer or surface conditioner to achieve proper membrane adhesion.

(c) Applying Conditioners and Primers. Thoroughly mix and continuously agitate all primers and conditioners during application according to the manufacturer's instructions. Uniformly apply primer or conditioner to the entire area to be sealed, at the rate stated in the manufacturer's instructions, by squeegee, brush, or roller. Do not apply the primer by spraying. Apply a second coat of primer to any areas of concrete that appear dry. Brush out primer that tends to puddle in low spots to allow complete drying. Cure the primer according to the manufacturer's instructions. Do not let primed areas stand uncovered overnight.

After the primer has dried to a tack free condition, use squeegees or brooms to break any bubbles in the primer. Unless otherwise directed, do not repair the areas where bubbles were broken. If membrane sheets are not placed over primer or conditioner within the time recommended by the manufacturer, recoat the surfaces at no additional cost to the Department.

Before applying the primer or conditioner on a bridge deck, place an oil resistant protective film, held with an adhesive or tape, to any deck areas that will later be covered by expansion dams or headers. Place membrane seal and asphalt concrete across the protective film. If directed, cut the protective film and the preformed sheet at or near the expansion joint.

(d) Adhesive-Backed Preformed Membrane Waterproofing Systems.

1. Installation on Bridge Decks. Before installing any membrane waterproofing systems, drill drain holes, install the drain pipes and galvanized screens as shown on the [Standard Drawings](#).

Apply the preformed membrane sheets, adhesive side down, to the primed or conditioned surfaces either by hand methods or by mechanical applicators. Start placing the membrane sheets at the low side of the deck and work using a shingle overlap toward the high side of the deck so that a shingled effect is achieved in the direction that the water will drain.

Use either of the two acceptable methods indicated if working from a curb line or barrier railing.

METHOD ONE: As shown on the [Standard Drawings](#) and as follows:

Install a 19 mm x 19 mm (3/4-inch by 3/4-inch) cant strip made of wood, metal, plastic, mastic, or other approved joint sealing material at a 90 degree angle between the curb face or barrier railing and the deck. Next, install a 300 mm (12-inch) wide curb strip with the top edge of the strip kept a minimum of 13 mm (1/2 inch) below the wearing surface of the asphalt overlay. Put the 300 mm (12-inch) wide curb strip into positive contact with the curb face, cant strip and bridge deck. Seal the curb strip at the top edge with a two-part urethane liquid membrane or mastic. Overlap the curb strip that extends onto the deck with the next full width membrane sheet by butting the sheet against the curb face at the gutter line. Lay subsequent membrane sheets longitudinally with 75 mm (3-inch) minimum side laps and 150 mm (6-inch) minimum end laps. Install sheets across the deck until the high side curb line is reached. Install a curb strip along the high side curb line as indicated for the low side curb line.

METHOD TWO: Apply a bead of two-part urethane liquid membrane or mastic, as recommended by the manufacturer, between the low side curb face or barrier railing and the deck, extending from the gutter line 50 mm to 75 mm (2 inches to 3 inches) onto the deck. Butt the edge of the membrane firmly against the curb face at the gutter line and embed into the liquid membrane or mastic. Seal the top edge of the membrane at the curb face with a 50 mm (2-inch) bead of liquid membrane or mastic. Lay subsequent membrane sheets longitudinally and side lap with the adjacent sheets not less than 75 mm (3 inches) and end lap by not less than 150 mm (6 inches). Install sheets across the deck until the high side curb line is reached. Terminate the membrane sheet against the high side curb face. Place a bead of liquid membrane or mastic between the high side curb face and deck. Butt the membrane against the curb face along the gutter line and embed into the bead of liquid membrane or mastic. Seal the top edge of the membrane along the gutter line with a 50 mm (2-inch) bead of liquid membrane or mastic.

After placement, roll the membrane sheets with hand rollers or other apparatus as necessary to develop a firm and uniform bond with the primed or conditioned concrete surfaces. Seal with mastic any laps that were not thoroughly sealed by rolling.

Use procedures that minimize wrinkles and air bubbles. Patch any tears, cuts, or narrow overlaps, using a satisfactory adhesive and by placing sections of membrane sheet over the defective area in a manner that the patch extends at least 150 mm (6 inches) in every direction beyond the edges of the defect. Vent bubbles of 25 mm (1-inch) diameter and larger by piercing with a suitable instrument at a nearly horizontal angle and expel the trapped air. Coat vented bubbles with mastic sealer.

Lay the bituminous overlay the same day as the membrane. If overnight delay is unavoidable, keep the construction traffic off the membrane and make a careful inspection for punctures before placing the bituminous overlay. Provide the bituminous overlay at a mix temperature between 149 °C and 171 °C (300F and 340F). Rubber tired pavers and trucks may be driven on the membrane provided care is taken to prevent sudden starts and stops. Do not allow trucks to turn their front wheels while standing still.

2. Installation of Other Surfaces. Install as shown on the [Standard Drawings](#), and as specified in [Section 680.3\(b\)](#) and as follows:

On vertical surfaces, place preformed membrane material with each successive horizontal sheet lapped top over bottom to the preceding by a minimum of 75 mm (3 inches). Lap horizontal splices by a minimum of 150 mm (6 inches). Seal the exposed edges of membrane sheets after the membrane is placed with a troweled bead of a manufacturer's recommended mastic, or two-part urethane liquid membrane, or with sealing tape.

Provide watertight construction by flashing all projecting pipes, conduits, sleeves, or other facilities passing through the preformed membrane waterproofing with prefabricated or field fabricated boots, fitted coverings, or other approved devices as necessary.

Install protective covers after the application of waterproofing membrane. Apply bonding material, of a type recommended by the waterproofing manufacturer to the surface of the membrane and adjacent concrete surface at a rate, approximately 0.23 L/m² (0.05 gallon per square yard), sufficient to hold the protective covering in position until the backfill is placed. Allow the bonding material to dry until tacky. Place the sheets of protective board or roofing material on the bonding material with edges or ends of the boards either loosely butt-jointed or overlapped.

(e) Nonstandard Applications. For areas not covered in this specification regarding special application techniques of the waterproofing materials, or regarding special application restrictions, follow the manufacturer's recommendations.

(f) Defective Work. Before placing backfill, structural backfill, subbase, or bituminous material, repair or replace damaged membranes or protective coverings according to the manufacturer's recommendations at no additional expense to the Department.

680.4 MEASUREMENT AND PAYMENT—

(a) Membrane Waterproofing Systems Installed on Bridge Deck. Square Meter (Square Yard)

(b) Membrane Waterproofing Systems Installed on Other Surfaces. Square Meter (Square Yard)