

ITEM 558.5001--25 - MEMBRANE WATERPROOFING SYSTEM FOR STRUCTURAL SLABS

1. DESCRIPTION:

- 1.01 This work shall consist of furnishing and applying a membrane waterproofing system where indicated on the Contract Plans. The work shall include the preparation of concrete surfaces. The Contractor shall select, furnish, and apply one of the membrane waterproofing systems included in this specification on each structure designated to receive Membrane Waterproofing System for Structural Slabs.

The Contractor has the option of using any one of the membrane waterproofing systems included in this specification, as desired. Also, substitution of one system for another may be done at will. However, only a single system may be used on any one structure, regardless of the length or design of that structure. No system may be substituted for any system which is already in any stage of installation.

2. MATERIALS:

- 2.01 **Membrane Waterproofing System.** The membrane waterproofing system shall consist of one of the proprietary sheet systems plus wire mesh if required. No substitutions of the proprietary portions of the applied system shall be allowed.

- 2.02 **Membrane Waterproofing Materials.** The membrane waterproofing shall be one of the following:

A. PREFORMED SHEET MEMBRANE MATERIALS

1. Bituthene Preformed System - shall consist of Bituthene Highway and Bridge Deck Conditioner, Bituthene 5000 Deck Membrane, and Bituthene Mastic; all as manufactured by W.R. Grace and Company, Cambridge, Massachusetts.
2. Protecto-Wrap Preformed System - shall consist of Protector-Wrap No. 80 Primer, Protecto-Wrap M-400A Membrane, and Protecto-Wrap 160H Mastic; all as manufactured by Protecto-Wrap Company, Denver, Colorado.
3. Royston Preformed System - shall consist of Royston Bridge Membrane No. 10 AN EP ER, Royston Bridge Membrane Primer 713 and, all as manufactured by Royston Laboratories, Inc., Pittsburgh, Pennsylvania.
4. Or equal as approved by the New York State Thruway Authority.

- 2.03 **Wire Mesh.** Wire mesh for use over subdrainage openings shall be 6mm (1/4-inch) mesh, 23 gauge hot-dipped galvanized cloth.

3. CONSTRUCTION DETAILS:

- 3.01 **General.** Work shall not begin on existing structural slabs until seven (7) curing days have passed subsequent to the placement of portland cement concrete, portland cement mortar or epoxy mortar for structural slab repair. There are various other types of concrete repair materials which have different required periods of waiting prior to safe loading. If one of these is used, the Manufacturer's instructions for allowable loading shall be followed subject to the concurrence of the Engineer.

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3. CONSTRUCTION DETAILS: (cont'd)

3.01 General. (cont'd)

On new structural slabs, the provisions of 557.3.14B, The Minimum Curing Period for Loading Structural Slabs, shall be met prior to membrane system placement.

Work shall not be done during inclement weather conditions nor when atmospheric conditions are such that unsatisfactory results will be produced. The Engineer shall be the sole determiner of favorable atmospheric conditions. No work shall be done when the concrete structural slab temperature is below 50°F, or ambient temperatures are below 50°F. The concrete structural slab shall be surface dry at the time of application of the membrane waterproofing system.

3.02 Structural Slab Cleaning. All structural slab surfaces and any other surfaces against which the membrane waterproofing system is to be placed shall be cleaned as follows:

- A. All loose material, including dirt, gravel, and concrete laitance shall be removed by vacuuming or blowing with oil-free compressed air.
- B. All excess laitance (surface film of concrete), road oil, other bituminous based materials, previous membrane treatments, and other foreign materials including concrete curing compounds, shall be removed by sandblasting or wire brushing and washing with water or a combination of these methods. To confirm the adequacy of the cleaning, small test patches of primer and membrane shall be applied to all area(s) in question. These test patches shall then be evaluated by the Engineer. Additional cleaning may be ordered where the Engineer determines that adhesion is not adequate.
- C. Immediately prior to application of the membrane system, surface to be coated shall be recleaned of dust and other loose material by vacuuming or blowing with oil-free compressed air.

3.03 Application of Preformed Sheet Membrane Systems.

- A. **Primer Application.** After cleaning, all surfaces to be waterproofed shall be primed with the primer required for the selected preformed system. The primer shall be thoroughly mixed prior to application. Mixing shall be done with mechanical mixers or by hand mixing using clean paddles or other suitable instruments. Hand mixing shall be required for the Royston Primer.

The primer shall be applied, without dilution, using brushes, squeegees, rollers, or a combination of these methods. Spray application of the primer shall not be allowed. The primer shall be applied at the rate given in the following table so as to thoroughly and uniformly cover the surfaces. Areas of concrete which are porous and appear dry shall be given a second coat of primer.

<u>Membrane System</u>	<u>Primer Application Rate</u>
Bituthene System	200-400 sq.ft./gal.
Protecto-Wrap System	80-150 sq.ft./gal.
Royston System	Approx. 90 sq.ft./gal.

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3. CONSTRUCTION DETAILS: (cont'd)

3.03 Application of Preformed Sheet Membrane Systems. (cont'd)

On vertical curb, concrete barrier, and header surfaces, the primer shall be applied and finished off, in a neat line, to a height that will be one inch higher than the height of the completed asphalt overlay. The outside face of metal scuppers shall not be primed. The inside surfaces of subdrainage outlets (weep tubes) shall be primed to a depth of at least 3 inches.

The primer shall be allowed to dry to a "tack free" condition prior to application of the preformed membrane. Excess primer, occurring as puddles or wet areas, shall be removed by brushes, or as directed by the Engineer. The appearance of bubbles in the primer is normal, due to outgassing of air and moisture in the concrete. After the primer has dried to a "tack free" condition, these bubbles shall be broken with squeegees or brooms. Unless otherwise directed by the Engineer, it shall not be necessary to repair the areas where bubbles have been broken.

Primed surfaces which the Engineer determines have become contaminated by dust or dirt shall be reprimed. Primed areas which have not been covered with preformed membrane within 24 hours of primer application shall be reprimed. All such repriming work shall be done at no additional cost to the Authority.

B. Preformed Sheet Membrane Installation.

1. **General.** The manufacturer's installation instructions shall become part of this specification. The preformed membrane sheets and "flashing strips" shall be placed longitudinally on the structural slab so that both the longitudinal and transverse overlaps are formed in the direction of water drainage (See Plates 1, 2, and 3). "Flashing strips" shall be defined to mean sections of membrane which are used to waterproof vertical surfaces and seal the intersection of the vertical surface with the structural slab. At those locations where no cross slope exists on the structural slab, the transverse water drainage shall be assumed to be from the center of the roadway toward the curbs (See Plate 1).

Rolls of preformed sheet membrane may be applied by hand or mechanical means. The sheet shall be placed on the structural slab, sticky side down. Preformed sheet membrane flashing strips shall be placed and turned up the vertical faces of curbs, headers, scuppers, joints, and concrete barriers to a height equal to the thickness of bituminous overlay. Rolls of sheet membrane shall be placed in such a manner as to minimize wrinkles and bubbles. Stiff bristled brooms or other suitable implements shall be used at the time of application to smooth the sheet at its point of contact with the structural slab. Adjacent rolls of sheet shall overlap a minimum of 2 inches along longitudinal laps and 8 inches along transverse laps.

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3. CONSTRUCTION DETAILS: (cont'd)

3.03 Application of Preformed Sheet Membrane Systems. (cont'd)

The application of the sheet membrane shall proceed as follows:

- a. Before the rolls of sheet membrane are applied to the slab, flashing strips shall be applied to the vertical faces where the direction of water drainage is toward the vertical face. The "flashing strips" shall be placed so that their overlaps are formed in the direction of water drainage.

The flashing strips shall extend up the vertical face to the depth of the bituminous overlay and a minimum of 6 inches onto the structural slab. Where required, the vertical faces shall be coated with mastic to ensure adhesion of the flashing strip (See Plate 4).

- b. At subdrainage openings (weeps), mastic shall be applied to that area of the structural slab within 6 inches of the drain opening.
- c. Rolls of preformed sheet membrane shall then be aligned parallel to the centerline of the structure and applied directly to the structural slab. The preformed sheet shall be placed within one inch of abutting vertical faces. At subdrainage openings, the membrane shall be pierced and the edges turned down and adhered to the inside of the drain. If necessary, mastic shall be used to ensure adhesion and to prevent seepage under the membrane (See Plate 4).
- d. After the rolls of sheet membrane have been applied to the slab, flashing strips shall be applied to the vertical faces where the direction of water drainage is away from the vertical face, so the flashing strip is on top of the sheet membrane.
- e. The vertical termination of the flashing strips shall be sealed with a bead of mastic (See Plate 4). The completed membrane shall be free of large wrinkles, "fish mouths", air bubbles, and other placement defects. These shall be corrected in a manner satisfactory to the Engineer. Where patches are used, the area shall be coated with mastic sealer and pieces of membrane pressed into the sealer over the defective area. The patches shall extend at least 6 inches in every direction beyond the edge of the defect. Bubbles of one inch diameter and greater shall be vented by piercing with an ice pick, or other suitable instrument, and expelling the air. Vented bubbles need not be repaired.

To insure adhesion to the structural slab, the preformed membrane shall be rolled with the appropriate roller for the system utilized. Laps which have not been thoroughly sealed by rolling operations shall be sealed with mastic.

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3. CONSTRUCTION DETAILS: (cont'd)

3.03 Application of Preformed Sheet Membrane Systems. (cont'd)

A 5 inch square piece of wire mesh shall be pressed in to mastic applied to the membrane at each subdrainage opening.

When only a portion of the membrane application is completed in one day, the exposed edge of the membrane shall be sealed with mastic. The termination edge of the membrane at slab ends and expansion joints constructed without headers shall be sealed with mastic sealer.

2. **Bituthene System.** Rolls of preformed membrane shall be placed on the structural slab, sticky side down, by removing the release sheet as the work progresses. The membrane shall not be stretched or otherwise placed in tension during the installation.

On granite and other rough vertical faces, mastic shall be applied to the vertical face to ensure bonding of the flashing strips.

Rolling shall be done with a 100-200 lb. hand roller.

3. **Protecto-Wrap System.** Rolls of preformed membrane shall be placed on the structural slab, sticky side down. To minimize wrinkles and bubbles, the rolls of membrane shall be stretched into place. The membrane is interwound with polyethylene release film on the top surface. Except for the perforated edge strip, the film shall be left-in-place until the day the bituminous overlay is placed. The perforated edge strip of the polyethylene film shall be removed at the time of placement of an overlapping roll of membrane. Spliced rolls of membrane have released film on the bottom (sticky) side, so care shall be taken to ensure removal of the release film from spliced areas at the time of membrane application.

All vertical surfaces shall be coated with mastic, to the depth of the asphalt overlay, before placement of the flashing strips.

4. **Royston System.** Rolls of membrane shall be placed on the structural slab, adhesive side down, by removing the release paper as the work progresses. The polyester film on the surface of the membrane shall not be removed.

The narrow bands of release paper which acts as an edge strip shall be removed at the time of placement of an overlapping roll of membrane. End laps shall be sealed by heating the membrane surface to be covered with a propane torch, melting the polyester film and fusing the melted surface to the underside of the covering roll.

Flashing strips shall be adhered to vertical surfaces by the heat-fusion method: by heating the sticky side of the membrane and pressing the heated surface into contact with the vertical face. The heat-fusion method shall be used to adhere the membrane to the inside of subdrainage outlets.

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3. CONSTRUCTION DETAILS: (cont'd)

3.03 Application of Preformed Sheet Membrane Systems. (cont'd)

Mastic shall not be used to adhere the flashing strips to the membrane sheets.

Rolling shall be done with a 100-200 lb. hand roller.

Wrinkles in the membrane may be repaired by slitting the membrane and heat-fusing the overlapping pieces.

4. METHOD OF MEASUREMENT:

4.01 The work shall be measured as a planar projection of the number of square feet of surface area as shown on the plans covered with the complete membrane waterproofing system. No separate measurement of the vertical faces of curbs, joints, concrete barriers, headers, and scuppers, or for the inside surfaces of subdrainage outlets, shall be made. No deductions will be made for holes less than one (1) square foot in area.

5. BASIS OF PAYMENT:

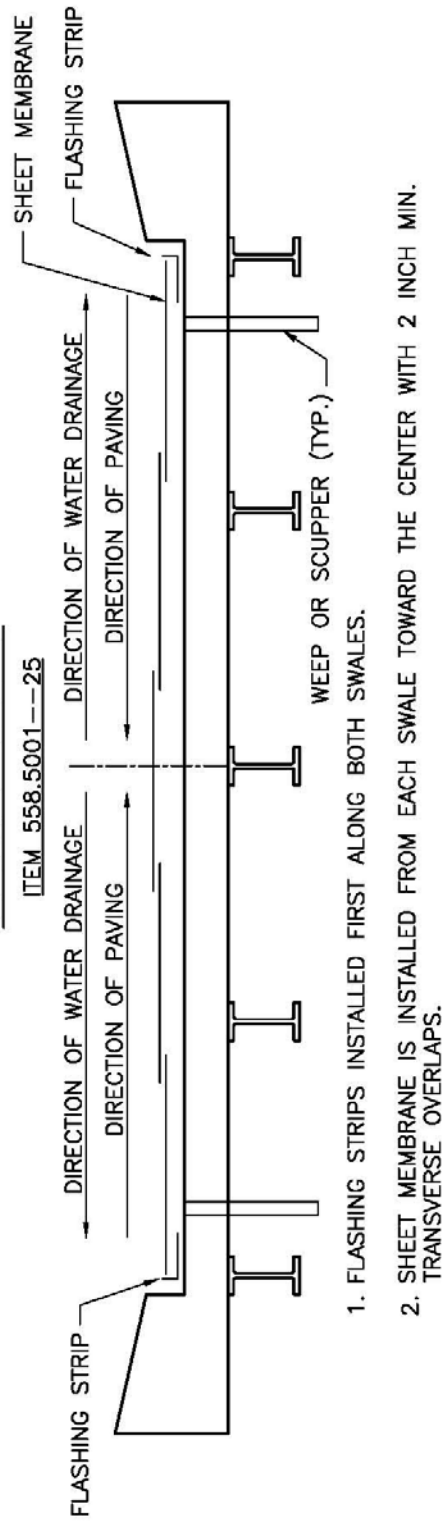
5.01 The unit price bid per square foot for this item shall include the cost of furnishing all labor, materials, (including wire mesh), and equipment necessary to complete the work.

5.02 No payment will be made for any work necessitated by damage or defacement attributable to the Contractor's operations.

5.02 No additional payment will be made for any repriming done in conformance with the requirements of Application of Preformed Sheet Membrane Systems, Subsection A, Primer Application. No additional payment will be made for patching damaged areas of a membrane system.

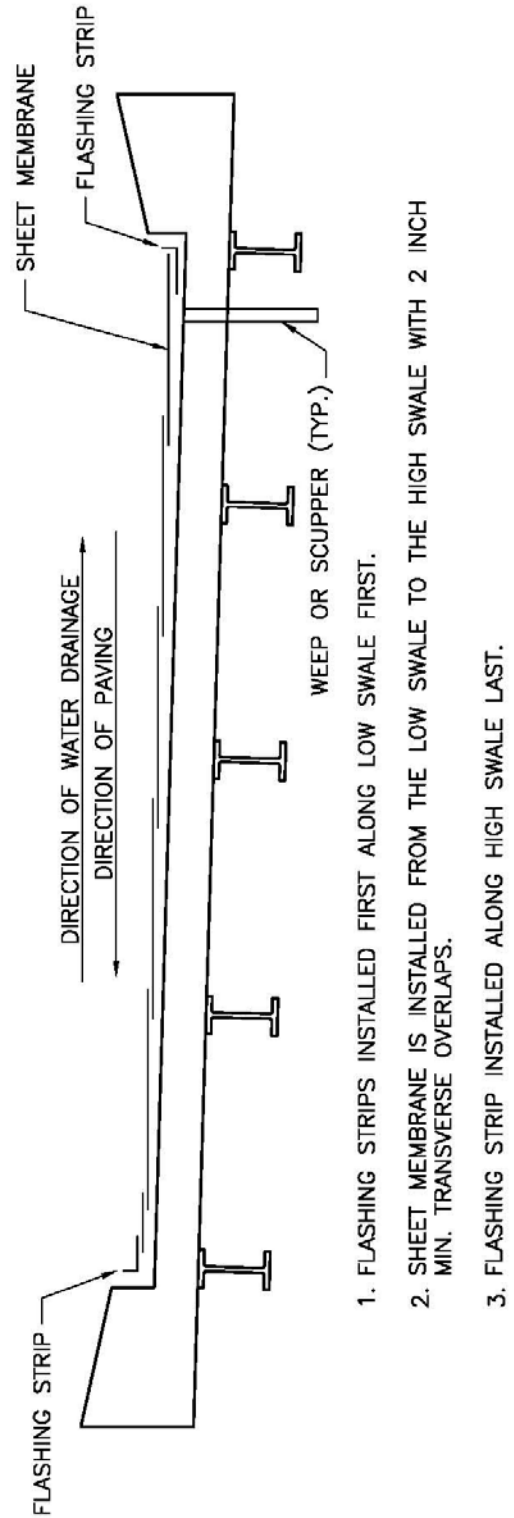
PLATE NO. 1

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TRANSVERSE SECTION - LEVEL DECK - NO CROSS SLOPE OR NORMAL CROWN

N.T.S.

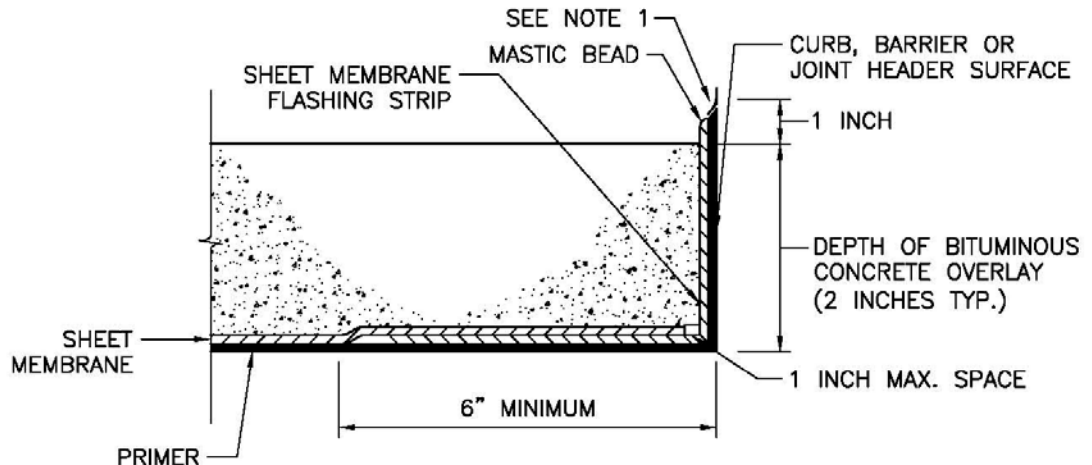


TRANSVERSE SECTION - SUPERELEVATED

N.T.S.

PLATE NO. 2

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NOTES:

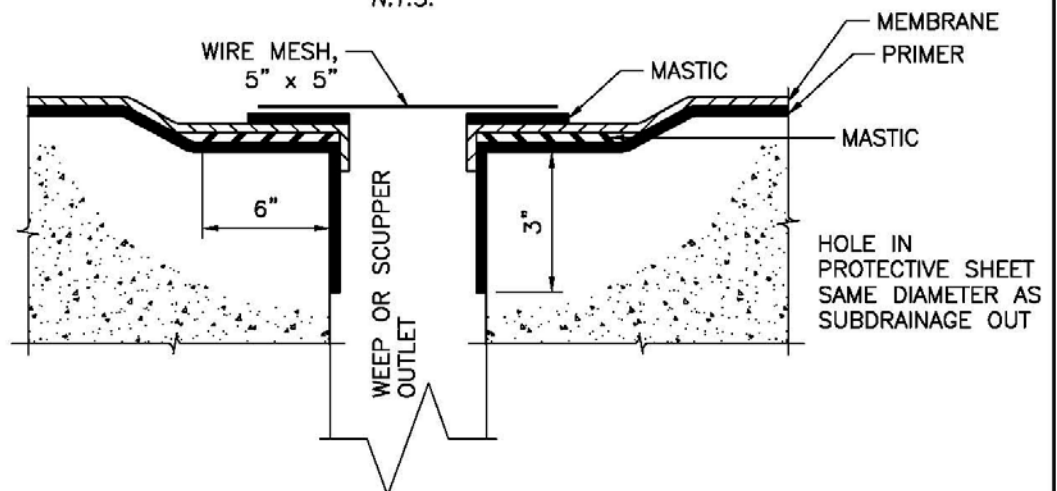
1. BITUTHENE MEMBRANE - FLASHING STRIPS SHALL BE ADHERED TO ROUGH VERTICAL SURFACES SUCH AS GRANITE CURB WITH BITUTHENE MASTIC. NO ADDITIONAL TREATMENT IS REQUIRED FOR SMOOTH SURFACES.

PROTECTO-WRAP M-400A - FLASHING STRIPS SHALL BE ADHERED TO ALL VERTICAL SURFACES WITH PROTECTO-WRAP 160 H MASTIC.

ROYSTON BRIDGE MEMBRANE No. 10A - FLASHING STRIPS SHALL BE ADHERED TO ALL VERTICAL SURFACES USING THE HEAT FUSION METHOD.

TYPICAL SHEET MEMBRANE DETAIL

N.T.S.



NOTES

1. PRIMER EXTENDS DOWN OUTLET 3 INCH MIN.
2. APPLY MASTIC WITHIN 6 INCH OF OUTLET.
3. PIERCE MEMBRANE AT CENTER OF OUTLET AND TURN EDGES DOWN.
4. APPLY MASTIC WITHIN 3 INCH OF OUTLET.
5. PRESS 5" x 5" PIECE OF WIRE MESH INTO MASTIC.

SHEET MEMBRANE DETAIL-SUBDRAINAGE OUTLET

N.T.S.

pw:\STRUCTURES\STRUCTURES TECHNICAL COMMITTEE\SHEET MEMBRANE PLATE 2.DWG