

ding will be paid for at the contract unit price for Sodding, which price and payment shall be full compensation for furnishing all materials (excluding fertilizer, lime and selected material for shoulders or slopes); labor, tools, equipment and incidentals necessary to complete the work.

Fertilizer and lime will be paid for as provided in Subsection **810.28**.

Topsoil will be paid for as provided in Subsection **810.28**.

Payment for each item includes all direct and indirect costs and expenses required to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
8131000	Sodding	Square Yard
8104XXX	Fertilizer (<i>Analysis</i>)	Ton
8105000	Lime	Ton

SECTION 814

WATERPROOFING

814.01 Description. This work shall consist of the application of waterproofing materials for the waterproofing or damp-proofing of cement concrete surfaces in accordance with these specifications and in conformity with indications on the plans or special provisions.

Two methods of substructure waterproofing are given in the following applicable subsections. The first, unless otherwise indicated on the plans or in the special provisions, is to be used for the protection of bents, piers, abutments and other structures to be placed or constructed in salt water, ex-

cluding prestressed concrete piles. The second method is to be used for protecting the inside of spandrel-filled arches, backs of abutments, retaining walls, etc.

Bridge deck waterproofing shall be used when specified on the plans or special provisions. This waterproofing system is to be placed before the placing of an asphalt concrete overlay and shall serve as a barrier against penetration of water, salt solutions, and other contaminants that cause the deterioration of bridge deck concrete.

MATERIALS

814.02 Substructure Waterproofing.

A. First Method. The material following shall be furnished:

1. Creosote Priming Coat. Creosote for priming coat shall conform to the requirements of AASHTO M 121.
2. Coal Tar Pitch Seal Coat. Coal tar pitch shall conform to the requirements of AASHTO M 118.

B. Second Method. The following material shall be furnished:

1. Asphalt Priming Coat. The asphalt priming coat shall conform to the requirements of AASHTO M 116.
2. Asphalt for Mop Coats. The asphalt for the mop coats shall conform to AASHTO M 115, Type A where used below ground level and Type B where used above ground level.
3. Fabric. The waterproofing fabric shall conform to AASHTO M 117, and the asphalt used for saturation shall comply with Type A or Type B as required in Subsection **814.02B2** immediately above.

814.03 Bridge Deck Waterproofing. At the option of the Contractor, one of the following waterproofing systems shall be applied to the concrete bridge deck areas as specified on the plans to serve as a barrier between the concrete and the asphalt concrete wearing course.

Only materials on the Department's approved list shall be used. To be approved, the manufacturer shall submit appropriate test results to the Engineer to verify that the material to be approved meets the requirements of this specification. A certification shall be furnished with each shipment of material to the Engineer stating that the material meets the Department's specifications.

A. Type I: Reinforced Preformed Rubberized Asphalt Membrane. The reinforced preformed rubberized asphalt membrane shall consist of a bottom layer of rubberized asphalt with adhesive qualities and synthetic fabric reinforcement sheet as a top layer. The membrane shall have the following properties:

Physical Property	Required Values	Test Method
Thickness (Minimum)	65 mils	
Tensile Strength	50 pounds per inch width	ASTMD 882, modified for 1 inch opening, or ASTMD 1000 modified for 4 inch grip opening.
Permeance	0.10 perms	ASTME 96, Method B
Puncture Resistance (Min.)	200 lb.	ASTME 154
Pliability	No cracks or splits @ 180° bend. (Select one method)	1/2 in. Mandrel @ 0° F, or 1/2 in. Mandrel @ -10° F, or 1 in. Mandrel @ 125° F

B. Type II: Reinforced Coal-Tar Preformed Membrane. The reinforced coal-tar preformed membrane is composed of coal-tar, modified with synthetic resins and reinforced with synthetic non-woven fabric. The membrane shall have

the following properties:

Physical Property	Required Values		
Thickness	70 mils plus or minus 5		
Water Penetration	Water penetration of the membrane shall be zero when tested under a hydrostatic head of one (1) meter for 24 hours in accordance with ASTM D 583, Method 3.		
Tensile Strength: (ASTM D 882, Crosshead speed 2 in./min., average of three samples)	Temp. at 0°F at 40°F at 120°F	Longitudinal 1500 psi 900 psi 400 psi	Transverse 1400 psi 700 psi 300 psi
Elongation: (ASTM D 882, Crosshead speed 2 in./min., avg. 3 samples, Method A, 1 in. wide strip.)	Temp. at 0°F at 40°F at 120°F	Longitudinal 30% 40% 50%	Transverse 25% 30% 35%
Softening Point	230°F minimum, in accordance with ASTM D 36		
Pliability	The membrane shall pass 1 inch mandrel bend test at minus 10°F when tested in accordance with ASTM D 146		
Density	The material shall not weigh less than 0.45 lb./sq.ft.		

C. Type III: Reinforced Bituminous Resin Preformed Membrane. The reinforced bituminous resin preformed membrane shall consist of a heat modified bituminous resin composition with inner layers of open weave fiberglass mesh and a top surface of polyester to bond to the wearing surfacing. The membrane shall have the following properties:

Physical Property	Required Values
Thickness	60 mils plus or minus 5
Color	Black
Softening Point	Ring & Ball - 240°F minimum, in accordance with ASTM D 36
Needle Penetration	40 to 50 mm at 77°F, 5 sec., 100 g in accordance with ASTM D 5
Weight Per Square Yard	2.6 lbs. min.

CONSTRUCTION REQUIREMENTS

814.04 Substructure Waterproofing.

A. First Method. Concrete surfaces to be waterproofed shall be water-cured for the period described in Section 702 (curing compound not allowed), and then allowed to dry for a period of approximately two (2) days. It shall then be thoroughly coated with 3 coats of tar primer coat for absorptive treatment, applied cold with a brush, and each coat shall be absorbed before the succeeding one is applied. After the absorption of the final coat, a tar seal coat shall be applied at a temperature of approximately 80°F and thoroughly brushed into all surfaces. The seal coat shall be allowed to dry for at least four (4) days, or as long as necessary to harden before any water or earth is allowed to come against it. No coat shall be applied when the concrete or the preceding coat is damp or during any time that moisture may fall on any surface. A drying period of longer than two (2) days after the curing period and before the first application of the tar for absorptive treatment shall be avoided whenever practicable.

B. Second Method.

1. Inspection and Delivery. Factory inspection is preferred but, instead thereof, the Engineer may order that representative samples, properly identified, be sent to him for test before shipment of the materials. After delivery of the materials, representative check

samples will be taken, which shall determine the acceptability of the materials. All materials shall be delivered on the work in original containers, plainly marked with the manufacturer's brand or label.

2. Storage of Fabric. The fabric shall be stored in a dry, protected place. The rolls shall not be stored on end.

3. Preparation of Surface. All concrete surfaces that are to be waterproofed shall be reasonably smooth and free from projections or holes that might cause puncture of the membrane. The surface shall be dry so as to prevent the formation of steam when the hot asphalt is applied, and immediately before the application of the waterproofing, the surface shall be thoroughly cleaned of dust and loose materials. No waterproofing shall be done in wet weather nor when the temperature is below 35°F without special authorization from the Engineer. Should the surface of the concrete become temporarily damp, it shall be covered with a 2-inch layer of hot sand, which shall be allowed to stand from one to two hours, after which the sand shall be swept back, uncovering sufficient surface for beginning work, and the operation repeated as the work progresses.

4. Application of Waterproofing of Large Areas. The surface to be waterproofed shall be given a thorough coat of asphalt primer which shall be permitted to set thoroughly before the first mop coat is applied. If considered desirable by the Engineer, the primer shall be thinned to a suitable consistency with an approved volatile solvent. The asphalt for mop coat shall be heated to a temperature not less than 300°F and not more than 350°F, with frequent stirring to avoid local overheating. The heating kettles shall be equipped with thermometers. In all cases, the waterproofing shall begin at the low point of the surface to be waterproofed so that water will run over and not against or along the laps. The first strip of fabric shall be of half

width; the second shall be full width lapped the full width of the first sheet; and the third and each succeeding strip shall be full width and lapped so that there will be two layers of fabric at all points, with laps not less than 2 inches wide. All end laps shall be at least 12 inches. Beginning at the low point of the surface to be waterproofed, a section about 20 inches wide and the full length of the surface shall be mopped with the hot asphalt and there shall be rolled into it, immediately following the mop, the first strip of fabric, of half width, which shall be carefully pressed into place so as to eliminate all air bubbles and obtain close conformity with the surface. This strip, and an adjacent section of the surface of a width equal to slightly more than half the width of the fabric being used, shall then be mopped with hot asphalt, and a full width of the fabric shall be rolled into this, completely covering the first strip, and pressed into place as before. This second strip, and an adjacent section of the concrete surface, shall then be mopped with hot asphalt and the third strip of fabric "shingled" on so as to lap the first strip not less than 2 inches. This process shall be continued until the entire surface is covered, each strip of fabric lapping at least 2 inches over the last strip. The entire surface shall then be given a final mopping of hot asphalt. The completed waterproofing shall be a firmly bonded membrane, composed of an asphalt prime coat, two layers of fabric, and three moppings of asphalt. Under no circumstances shall one layer of fabric touch another layer at any point or touch the surface, as there must be at least three complete moppings of asphalt. In all cases, the mopping on concrete shall cover the surface so that no gray spots appear, and on fabric it shall be sufficiently heavy to completely conceal the weave. On horizontal surfaces not less than 12 gallons of mopping asphalt shall be used for each 100 square feet of finished work, and on vertical surfaces not less than 15 gallons shall be used. The work shall be so regulated that, at the close of a day's work, all fabric that is laid shall have received the final

mopping of asphalt. Special care shall be taken at all laps to see that they are thoroughly sealed.

5. Application of Waterproofing of Small Areas.

Where cracks or construction joints are to be waterproofed, the waterproofing shall be applied essentially as specified above for large areas except that it will not be necessary to lap the fabric as described. The layers of fabric shall be sufficiently wide to extend beyond the joint or crack at least 12 inches each way. Where the strips are lapped at ends, the laps shall be at least 12 inches. The waterproofing shall consist of an asphalt prime coat, and three moppings of hot asphalt alternated with two layers of the asphalted fabric.

6. Details. At the edges of the fabric and at any points where it is punctured by such appurtenances as drains or pipes, suitable provisions shall be made to prevent water from getting between the waterproofing and the waterproofing surface.

All flashing at curbs and against girders, spandrel walls, etc. shall be done with separate sheets lapping the main membrane not less than 12 inches. Flashing shall be closely sealed either with a metal counter-flashing or by embedding the upper edges of the flashing in a groove poured full of joint filler.

Joints that are essentially open joints, but that are not designed to provide for expansion, shall first be caulked with oakum and lead wool and then filled with hot joint filler.

At expansion and contraction joints, the membrane shall be carried across the joint in such manner that movement in the joint will not cause rupture of the membrane.

At the ends of the structure, the waterproofing shall be carried well down on the abutments and suitable provision made for all movement.

7. Damage Patching. Care shall be taken to prevent injury to the finished waterproofing by the passage over it of people or wheelbarrows, or by throwing any material on it. Any damage that occurs shall be repaired by patching. Patches shall extend at least 12 inches beyond the outermost damaged portion, and the second ply shall extend at least 3 inches beyond the first.

814.05 Bridge Deck Waterproofing. Regardless of the system used by the Contractor, the application of the waterproofing system shall be in accordance with the written application procedure as furnished by the manufacturer of the membrane material. Primer shall be applied to clean concrete surfaces from which all asphalt, grease, oil, tar, dirt, sand and gravel have been removed and the surface has been finally cleaned by air blast. The primer and mastic shall be as recommended and applied at the rate as specified by the manufacturer of the membrane.

814.06 Method of Measurement. The work described and specified under Substructure Waterproofing-First Method in this section will not be measured for payment.

The quantity to be paid for under Substructure Waterproofing-Second Method and Bridge Deck Waterproofing shall be the number of square yards of waterproofing complete in place and accepted.

814.07 Basis of Payment. The work and material described and specified under First Method in this section will not be paid for directly, but will be considered as subsidiary work pertaining to the various items of construction on which the waterproofing is applied, and the cost is to be included in the contract price for the item on which the waterproofing is applied.

The accepted quantity of Substructure Waterproofing-Second Method and Bridge Deck Waterproofing, measured as provided above, will be paid for at the contract unit price per square yard. This price and payment shall be full compensation for furnishing all equipment, tools, materials and labor necessary for the satisfactory completion of the waterproofing.

Payment for each item includes all direct and indirect costs and expenses required to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
8142100	Waterproofing (Substructure - Second Method)	Square Yard
8143000	Waterproofing (Bridge Deck)	Square Yard

SECTION 815

EROSION CONTROL

815.01 Description. This work shall consist of temporary erosion control measures as specified in these specifications, as specified in the special provisions, or ordered during the life of the contract to control erosion and water pollution, through the use of berms, sediment basins, sediment dams, fiber roving, erosion control blanket, silt fences, floating turbidity barriers, brush barriers, baled straw erosion checks, temporary flexible pipe slope drains and temporary seeding.

Temporary erosion control measures shall be performed promptly when problem conditions exist or when potential problems are anticipated in certain areas in order to minimize soil erosion and siltation. The temporary erosion control measures shall be properly maintained until permanent erosion control features are functioning properly.