ITEM 458
WATERPROOFING MEMBRANES FOR STRUCTURES

458.1. Description. Furnish and place waterproofing membranes on concrete and steel bridge decks of railroad and other types of structures.


A. Materials to be Furnished. Furnish waterproofing materials listed below in accordance with DMS-6300, “Waterproofing”:

- asphalt for mopping above ground,
- asphalt for mopping below ground
- asphaltic primer,
- treated cotton fabric,
- self-adhering polyethylene,
- coal-tar-modified urethane,
- rubberized asphalt with preformed board membrane,
- asphalt plank,
- asphalt mat,
- rubberized asphalt with plastic film,
- asphaltic panels,
- plastic cement, and
- cold asphalt base emulsion.

Furnish butyl rubber membrane and ethylene-propylene-diene terpolymer (EPDM) sheeting in accordance with ASTM D 6134.

Deliver materials requiring sampling and testing to the work site a minimum of 3 weeks before use. When authorized, materials for waterproofing may be tested and approved before delivery to the worksite.

B. Types. Provide the following types of waterproofing as shown on the plans or as directed.

1. Type 1. Butyl rubber membrane applied to a surface with a proper adhesive without protective planking and in accordance with the details shown on the plans. Provide a minimum thickness of 1/16 in. unless otherwise shown on the plans.

2. Type 2. A single asphaltic primer coat and 1 mopping of asphalt.

3. Type 3. A single asphaltic primer coat and 2 mopplings of asphalt. When shown on the plans, supplement with 2 layers of treated cotton fabric with a third mopping of asphalt placed over the outer layer of fabric at construction joints of foundation structures.

4. Type 4. Self-adhering polyethylene with a rubberized asphalt mastic material.

5. Type 5. Single-component, coal-tar-modified urethane coating.

6. Type 6. Self-adhering built-up membrane of rubberized asphalt formed on a preformed board with cold-applied asphaltic primer.

7. Type 10. Any of Type 1, Type 4, Type 5, or Type 6 waterproofing.
8. **Type RR-1.** Butyl rubber or EPDM membrane with a protective course of asphalt plank or asphalt mat of the specified thickness.

458.3. **Construction.**

A. **General.** Store waterproofing material in a manner that will prevent damage. Keep material dry at all times, and store in a warm area before using in cold weather and out of direct sunlight in hot weather. Store asphalt planks, asphalt mats, and asphaltic panels in a manner that will prevent warping and breaking.

Provide a wood float finish to concrete decks and other unformed concrete surfaces to be waterproofed. Cure concrete surfaces to be waterproofed for at least 7 days before applying waterproofing.

Ensure that steel or concrete deck surfaces to be waterproofed are clean, dry, smooth, and free of fins, sharp edges, and loose material. Use grinders, if necessary, to remove protrusions that would puncture waterproofing membrane. Ensure surfaces are free of contaminants such as form release agents, wax base curing compounds, oil, and grease. If these contaminants are present, remove them by abrasive blast cleaning. Ensure that there are no depressions or pockets in horizontal surfaces of finished waterproofing.

Unless otherwise required in the plans, fill expansion joints and other grooves with plastic cement conforming to the requirements of DMS-6300, “Waterproofing.” Ensure that joints are dry and clean when filled. Overfill slightly to allow for shrinkage in drying.

Sweep, vacuum, or air-blow the area to be waterproofed thoroughly to remove dust, dirt, and loose foreign material. After the deck is clean, maintain it in a clean condition until completion of waterproofing.

Do not allow vehicular or equipment traffic on the bridge after the deck waterproofing work has started until after the work is complete and an adequate ballast cushion has been placed on the deck. Protect the waterproofing against damage from any source.

Use asphalt for mopping below ground as defined in DMS-6300, “Waterproofing,” when asphalt waterproofing is shown as a protection for back of abutments, retaining walls, or footings. Use asphalt for mopping above ground as defined in DMS-6300 for waterproofing on bridge decks.

B. **Type 1.** Do not apply waterproofing in wet weather or when the ambient temperature is below 50°F. Ensure that the rubber membrane is free from punctures, pockets, or folds.

Turn the membrane into drainage holes and castings without break. Take special care to make the waterproofing effective along the sides and ends of members to be waterproofed.

Install the butyl rubber membrane by first applying the adhesive as recommended by the membrane manufacturer. Install the adhesive to the surface to be waterproofed and at necessary splices, in a solid area extending approximately 36 in. back from the edges. Apply the membrane by pressing it firmly and uniformly in place against the previously applied adhesive, avoiding wrinkles and buckles. Make splices, laps, and flashing in accordance with the membrane manufacturer's recommended procedures.
C. **Type 2.** Place the asphalt primer at least 24 hr. before the asphalt mopping. Ensure that the primer is dry before the mopping. Work in the primer to give a uniform coating. Heat the asphalt for mopping in kettles equipped with armored thermometers, but do not heat above 350°F. Stir the asphalt frequently while heating. Apply the mop coating at a rate of at least 4 gal. per 100 sq. ft. of surface. If imperfections appear in the coating, apply additional coatings until the imperfections are corrected.

D. **Type 3.** Place the asphalt primer at least 24 hr. before the asphalt mopping. Ensure that the primer is dry before the mopping. Work in the primer to give a uniform coating. Heat the asphalt for mopping in kettles equipped with armored thermometers, but do not heat above 350°F. Stir the asphalt frequently while heating. Use a minimum coverage rate for each mop coating of 4 gal. per 100 sq. ft. of surface. If imperfections appear in the coating, apply additional coatings until the imperfections are corrected.

At construction joints, mop the surfaces to be waterproofed in sections. Lay a 15-in.-wide strip of cotton fabric on the first mopping while the asphalt is still hot and press into place. Apply subsequent moppings to completely cover and seal the cotton fabric. Do not make the end laps of the cotton fabric less than 12 in. unless otherwise shown on the plans.

E. **Type 4.** Unwrap the roll of waterproofing and press the adhesive surface into contact with the concrete horizontally. Secure the free end and then unroll slowly, using hand pressure to smooth the membrane into place and to help make a tight bond with the concrete. Overlap adjacent strips a minimum of 1 in. over the previously laid strip. Backfilling may be started as soon as the initial horizontal strip has been applied.

F. **Type 5.** Apply waterproofing in 2 coats to produce a minimum cured film thickness of 1/16 in. Unless otherwise shown on the plans, the application may be made using a roller, squeegee, brush, or spray equipment. Apply the second coat within 16 hr. after the initial coat. Follow the manufacturer’s instructions with regard to the maximum time allowed between coats and any treatment of the initial coat required if this maximum time is exceeded. The minimum ambient temperature at the time of application of the waterproofing is 40°F. Do not begin backfilling until the second coat of waterproofing has cured sufficiently to prevent damage by the backfilling operation.

G. **Type 6.** Apply the primer at a rate of 1 gal. per 100 sq. ft. of surface or at the rate recommended by the manufacturer if different. Allow to dry to a tacky surface before placing the waterproofing membrane. Apply the primer and waterproofing membrane board panels only when the substrate temperature is above 50°F.

Seal joints by centering 6-in. gusset tape over the joint and pressing firmly into position. Roll in the panels and jointing tape with sufficient pressure to assure maximum adhesion, conformance to substrate, and elimination of air bubbles. Follow the manufacturer’s recommendations for installation.

Begin backfilling as soon as the application of the waterproofing is complete. Complete backfilling within 48 hr. after the waterproofing material is applied to a non-horizontal surface.
H. **Type RR-1.** Apply waterproofing to dry surfaces and only when the ambient temperature is above 50°F. Ensure that the butyl rubber or EPDM membrane is free from punctures, pockets, or folds. Turn the membrane into drainage castings without break. Take special care to make the waterproofing effective along the sides and ends of girders and at stiffeners, gussets, etc. Fill grooves with plastic cement.

Install the butyl rubber or EPDM membrane by first applying the adhesive as recommended by the membrane manufacturer to ballast retainers, ends of deck, and at necessary splices in a solid area extending from the edges back about 36 in. or as shown on the plans. Apply the membrane and press it firmly and uniformly in place against the previously applied adhesive, avoiding wrinkles and buckles. Make splices, laps, and flashing in accordance with the membrane manufacturer’s recommended procedures.

Place the protective cover as soon as practicable after placement of the membrane. Clean the membrane surface of dirt and other foreign material before placing the cover material. Apply a coating of cold asphalt emulsion over the membrane at a minimum rate of 4 gal. per 100 sq. ft. of surface. Place the asphalt plank or mat on the coating of cold asphalt emulsion.

Unless otherwise specified in the plans, provide a minimum thickness of protection of 1 in., consisting of asphalt plank or asphalt mat. Coat the edges and ends of adjacent planks already laid with cold asphalt emulsion as successive planks are laid. Lay the planks tightly against those previously laid so the emulsion will completely fill the joints and be squeezed out the top. Fill any joints not completely full after planks have been laid with emulsion. When 2 layers of planks are used to obtain the required 1-in. cover thickness, offset the vertical joints of the second layer at least 4 in. transversely and 1 ft. longitudinally from the joints in the lower layer.

Apply asphalt mat protection in the same manner except stagger the longitudinal butt joints in a single layer by approximately 2 ft. When more than 1 thickness of asphalt mat is required, follow the same procedure with all vertical joints offset by at least 1 ft. Place a follow-up coating of asphalt emulsion approximately 6 in. wide over all joints of the top layer.

Use asphalt for mopping above ground as defined in DMS-6300, “Waterproofing,” where deck waterproofing is carried over the back wall and down the back of the abutment for only several feet to provide a proper flashing for the deck waterproofing.

**458.4. Measurement.** When waterproofing is shown on the plans to be a pay item, measurement will be by the square yard.

**458.5. Payment.** Unless otherwise specified on the plans, the work performed, materials furnished, equipment, labor, tools, and incidentals will not be paid for directly but will be considered subsidiary to pertinent Items.

When waterproofing is specified as a pay item, the work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Waterproofing,” of the type specified. This price is full compensation for materials furnished, equipment, labor, tools, and incidentals.