

714-R-748 WATERPROOFING MEMBRANE FOR REINFORCED-CONCRETE BOX STRUCTURES AND THREE-SIDED STRUCTURES

(Revised 01-18-24)

The Standard Specifications are revised as follows:

SECTION 714, AFTER LINE 20, INSERT AS FOLLOWS:

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SECTION 714, AFTER LINE 361, DELETE AND INSERT AS FOLLOWS:

The pipe joint sealant shall be applied to the bell or spigot section of the structure and applied prior to joining segments. The volume of pipe joint sealant applied shall be in accordance with the manufacturer's recommendations.

(b) Exterior Surface Treatment

After sealing with pipe joint sealant and assembling the box sections, the outside surfaces of the top slab and both walls of every joint between structure sections shall be covered with a joint membrane in accordance with 907.07 that is centered on the joint, *unless a waterproofing membrane is shown on the plans or in the Schedule of Pay Items.* The exterior concrete box surface shall be clean and dry before the joint membrane is applied. The outside surfaces of the top slab and both walls of every joint shall be completely covered for the entire length of each joint. Where joining two sections of joint membrane material, or where two ends meet, a 3 in. overlap shall be provided. The overlapping strip shall be firmly pressed onto the end of the underlying strip to seal the joint. Joints between structure sections and wingwalls, between wingwalls and spandrel walls, and between structure sections and headwalls or spandrel walls shall also be covered with joint membrane. The manufacturer's application instructions shall apply in addition to the above requirements.

The joint membrane shall be maintained in its installed location centered on the joint and shall not be damaged or dislodged during the backfilling operation.

714.11 Waterproofing Membrane

When a waterproofing membrane is shown on the plans or in the Schedule of Pay Items, joints, exterior vertical surfaces, and the exterior top horizontal surface shall be covered in their entirety with the membrane. A Type 2 waterproofing membrane shall be installed on all exterior vertical surfaces. If asphalt is placed directly on top of the waterproofing membrane, a Type 3 waterproofing membrane shall be installed otherwise a Type 2 membrane shall be installed.

(a) Preparation

Concrete surfaces shall be prepared in accordance with the waterproofing membrane manufacturer's recommendations and the following. Concrete surfaces shall be smooth and free from projections and holes. All sharp edges and metal protrusions shall be ground smooth. Immediately prior to application, the surface shall be dry and free of dust and loose materials. All joints and exterior corners shall be prepared in accordance with the waterproofing membrane manufacturer's recommendations.

Prior to installing a Type 2 waterproofing membrane a prime coat recommended by the waterproofing membrane manufacturer shall be applied to all exterior surfaces that will receive the waterproofing membrane. Waterproofing membranes shall be installed when the ambient temperature is 40°F or above unless lower temperatures are allowed in accordance with the waterproofing membrane manufacturer's recommendations.

Type 3 waterproofing membranes shall be installed when the ambient temperature is 40°F or above. The surface shall be sufficiently dry so as to prevent the formation of steam when the hot-applied prime coat is applied.

(b) Installation

The waterproofing membrane shall be installed prior to backfilling.

For waterproofing membrane material that does not cover the surface, an overlap of at least 3 in. shall be required on all edges. The Type 2 or Type 3 waterproofing membrane from the top horizontal surface shall overlap the membrane on the vertical surfaces on the outside by at least 12 in. The manufacturer's application instructions shall apply in addition to the above requirements.

1. Type 2 Waterproofing Membrane

For a Type 2 waterproofing membrane, the release liner shall be removed, and the adhesive side shall be placed on the prepared concrete surface. After application, the waterproofing membrane material shall be rolled to avoid wrinkling and ensure adhesion of the membrane to the concrete.

2. Type 3 Waterproofing Membrane

For a Type 3 waterproofing membrane, the prime coat shall be applied no farther than 5 ft in front of the membrane, using a squeegee to fill all voids and imperfections. The waterproofing membrane shall be applied from the low to the high side of the surface. An extra bead of prime coat material shall be applied at the edge of the waterproofing membrane.

Prime coat material and waterproofing membrane shall stop a uniform distance below the top surfaces and shall overlap the Type 2 waterproofing membrane a minimum of 12 in. The prime coat material shall not be splattered over or applied to surfaces or faces of concrete which subsequently are exposed in the finished structure. The waterproofing membrane shall be placed in V-strips at the joints to allow the movement of adjacent concrete sections without tearing the membrane. The waterproofing membrane shall be flashed at all exposed edges and laps sealed down. The waterproofing membrane shall not be damaged when backfill is placed. After installing the waterproofing membrane over the entire surface, all joints in the membrane shall be sealed by applying a prime coat and smoothing with a V-squeegee.

On structures with curbs, the waterproofing membrane shall be placed 3 in. up the curb face and the edge of the membrane shall be sealed in accordance with the waterproofing membrane manufacturer's recommendation.

Tack coat, in accordance with 406, shall be applied to a Type 3 waterproofing

membrane, without damaging the membrane at an application rate of 0.05 to 0.08 gal./sq yd before placing any asphalt pavement.

714.112 Method of Measurement

Precast reinforced concrete box structures or structure extensions, precast coated reinforced concrete box structures or structure extensions, precast headwalls, precast wingwalls, cast-in-place reinforced concrete box structures or structure extensions, cast-in-place coated reinforced concrete box structures or structure extensions, cast-in-place headwalls, and cast-in-place wingwalls will not be measured. The accepted quantities for payment will be the quantities shown on the plans.

Waterproofing membrane will not be measured. The accepted quantities for payment will be the quantities shown in the Schedule of Pay Items, which will be based on nominal surface area to receive the membrane as shown on the plans and described herein. No adjustments in quantities will be made to account of overlapping portions of membrane or changes in surface area due to variations between nominal plan and furnished structure geometry.

SECTION 714, BEGIN LINE 406, DELETE AND INSERT AS FOLLOWS:

714.1213 Basis of Payment

SECTION 714, AFTER LINE 437, INSERT AS FOLLOWS:

*Waterproofing Membrane, _____ SFT
type*

The cost of excavation except as provided in 206.11(a), expansion joint material, perpetuation of existing drains shown on the plans, removal of portions of existing structures, cleaning out old channels or structures, chemical anchor system, precast reinforced concrete structure joints, pipe joint sealant, joint membrane, and necessary incidentals shall be included in the cost of the structure or structure extension.

The cost of the prime coat shall be included in the cost of the waterproofing membrane.

SECTION 723, AFTER LINE 24, INSERT AS FOLLOWS:

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SECTION 723, BEGIN LINE 90, DELETE AND INSERT AS FOLLOWS:

723.03 General Requirements

Excavation and disposal shall be in accordance with the applicable requirements of 206. ~~Waterproofing membranes shall be in accordance with 714.11. Waterproofing of the designated areas shall be in accordance with 702.23.~~ All underground drains encountered during excavation for the structure shall be perpetuated as dictated by field conditions. Drainage openings through masonry shall be in accordance with 702.16. Handling of three-sided structures shall be in accordance with 907.05. Handling of wingwalls and spandrel walls shall be in accordance with 907.06.

SECTION 723, BEGIN LINE 430, DELETE AND INSERT AS FOLLOWS:

(b) Exterior Surface Treatment

After sealing with preformed flexible joint sealant or non-shrink grout as directed

above, and assembly of three-sided structure sections, all butt and keyway joints between structure sections shall be covered with a joint membrane in accordance with 907.07 and centered on the joint, *unless a waterproofing membrane is shown on the plans or in the Schedule of Pay Items.*

The exterior surface of the concrete sections shall be clean and dry before the joint membrane is applied. The outside surfaces of the top slab and both walls of every joint shall be completely covered for the entire length of each joint. Where joining two sections of joint membrane material, or where two ends meet, a 3 in. overlap shall be provided. The overlapping strip shall be firmly pressed onto the end of the underlying strip to seal the joint. Joints between structure sections and wingwalls, between wingwalls and spandrel walls, and between structure sections and headwalls or spandrel walls shall also be covered with a joint membrane.

The joint membrane shall be maintained in its installed location centered on the joint. It shall not be damaged during the backfilling operation.

When shown on the plans or in the Schedule of Pay Items, all joints, exterior vertical surfaces, and exterior top surfaces shall be covered in their entirety with a waterproofing membrane in accordance with 714.11.

SECTION 723, BEGIN LINE 448, INSERT AS FOLLOWS:

723.15 Backfilling

Waterproofing membrane shall be applied prior to backfilling. Structure backfill shall be placed and compacted in accordance with 211. Structure backfill shall be placed and compacted on each side of the structure to the fill line shown on the plans. During the backfill operation, the difference in elevations of the fill on each side of the structure shall not exceed 24 in.

SECTION 723, AFTER LINE 478, INSERT AS FOLLOWS:

Waterproofing membrane will not be measured. The accepted quantity for payment will be in accordance with 714.12.

SECTION 723, AFTER LINE 510, INSERT AS FOLLOWS:

Waterproofing membrane will be paid for in accordance with 714.13.

SECTION 918, BEGIN LINE 114, DELETE AND INSERT AS FOLLOWS:

918.06 Fabric or Membrane for Waterproofing

~~Fabric for~~ *Type 1 waterproofing membrane shall be consist of a Utility Asphalt, UA-1 in accordance with 902.01(d) and a fabric consisting of treated cotton in accordance with ASTM D173, woven glass in accordance with ASTM D1668, or glass fiber mat in accordance with ASTM D2178. A Type C certification in accordance with 916 shall be provided for the fabric Type 1 material.*

Type 2 waterproofing membrane shall consist of a rubberized asphalt and peel-and-stick membrane. Membrane materials shall be stored indoors and at temperatures not to exceed 120°F.

PROPERTY	TEST METHOD	REQUIREMENTS
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<i>Thickness</i>	<i>ASTM D1777 or ASTM D3767</i>	<i>60 mils, min.</i>
<i>Width</i>		<i>24 in., min.</i>
<i>Pliability</i>		<i>Shall be installed over 40 °F</i>
<i>Elongation</i>	<i>ASTM D412 (Die C)</i>	<i>300%, min.</i>
<i>Puncture Resistance – Membrane</i>	<i>ASTM E154</i>	<i>35 lb min.</i>
<i>Permeance</i>	<i>ASTM E96, Method B</i>	<i>0.05 Perms, max.</i>
<i>Water Absorption, % by Weight</i>	<i>ASTM D570</i>	<i>0.2, max.</i>
<i>Adhesion to concrete</i>	<i>ASTM D903</i>	<i>5.0, min.</i>

Type 3 waterproofing membrane shall consist of a hot-applied joint prime coat in accordance with ASTM D6690 and a membrane consisting of a high-density asphalt mastic between two layers of polymeric fabric. The membrane and prime coat materials shall be kept dry prior to installation.

<i>PROPERTY</i>	<i>TEST METHOD</i>	<i>REQUIREMENTS</i>
<i>Thickness, min.</i>	<i>ASTM D1777</i>	<i>0.135 in.</i>
<i>Width, min.</i>		<i>24 in.</i>
<i>Weight, min.</i>		<i>0.8 lb/sq ft</i>
<i>Tensile strength, machine direction</i>	<i>ASTM D882, Modified^[1]</i>	<i>275 lb/in. 2,000 psi</i>
<i>Tensile strength, 90 ° to machine direction</i>	<i>ASTM D882, Modified^[1]</i>	<i>150 lb/in. 1,000 psi</i>
<i>Elongation at break</i>	<i>ASTM D882, Modified^[1]</i>	<i>100% min.</i>
<i>Brittleness</i>	<i>ASTM D517</i>	<i>Pass</i>
<i>Softening point (mastic)</i>	<i>ASTM D36</i>	<i>200 °F min.</i>
<i>Peel adhesion</i>	<i>ASTM D413^[1]</i>	<i>2.0 lb/in.</i>
<i>Cold flex</i>	<i>ASTM D146 2 x 5 in. specimen</i>	<i>180 ° bend over 2-in. mandrel with no cracking</i>
<i>Heat stability</i>	<i>2 x 5 in. specimen</i>	<i>vertically suspended in a mechanical convection oven 2 hr @ 190 °F with no dripping or delamination</i>
<i>[1] 12 in. per minute test speed and 1 in. initial distance between the grips.</i>		

A Type B Certification in accordance with 916 shall be provided for the Type 2 and Type 3 materials.