

SECTION 07150

POLYMERIC SHEET WATERPROOFING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes specifications for polymeric waterproofing membrane on bridge decks, as well as for ballast mat over membrane on bridge decks.

1.02 REFERENCE STANDARDS

- A. American Railway Engineering and Association (AREMA):
 - 1. Manual for Railway Engineering (Manual)
- B. American Society for Testing and Materials (ASTM International):
 - 1. D146 Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
 - 2. D882 Test Method for Tensile Properties of Thin Plastic Sheeting
 - 3. D1970 Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - 4. D4258 Standard Practice for Surface Cleaning Concrete for Coating
 - 5. D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
 - 6. E96 Test Methods for Water Vapor Transmission of Materials
 - 7. E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.03 SUBMITTALS

- A. Product Data: Technical data and general recommendations for types of waterproofing required.
 - 1. Data for surface primer, flexible flashings, joint cover sheet, and joint and crack sealants, with temperature range for application of waterproofing membrane.
 - 2. Installation instructions indicating special procedures and perimeter conditions requiring special attention. Include preparation instructions for existing deck surfaces.
- B. Shop Drawings: Indicate special joint or termination conditions and conditions of

interface with other materials.

- C. Sample:
 - 1. Membrane waterproofing and auxiliary materials mounted on plywood
 - 2. Ballast mat

1.04 DELIVERABLES

- A. Certifications of Compliance:
 - 1. Certification by waterproofing materials manufacturer stating products supplied comply with local VOC and environmental regulations.
 - 2. Certifications by ballast mat materials manufacturer that materials meet specified requirements.
- B. Written statement from manufacturer's representative that bridge deck is suitable to receive waterproofing.
- C. Test Reports: From a qualified independent testing agency evidencing compliance of waterproofing with requirements and other physical properties reported by manufacturer based on comprehensive testing of products according to current standard test methods within previous 5 years.
- D. Field Quality Control Reports.

1.05 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain primary waterproofing materials from a single manufacturer to the greatest extent possible. Provide secondary materials recommended by manufacturer of primary materials.
- B. Installer Qualifications: Firm with minimum of 5 years documented experience showing satisfactory service performance and acceptable to primary waterproofing materials manufacturer.
- C. The suppliers of ballast mat material shall have successfully furnished such material to Class 1 Freight or Commuter Railroads. This does not include transit or light rail.
- D. Provide services of waterproofing manufacturer's field representative to observe and approve surface preparation.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver primary waterproofing materials to steel fabrication shop or job site, as applicable. Manufacturer's labels shall include the following information:
 - 1. Product name and description (generic product classification)
 - 3. Batch number under which product was produced

- 4. National standards with which the product complies
- 5. Application instructions
- B. Store materials in clean, dry, protected location, and away from direct sunlight.
- C. Asphaltic panels shall be stored so as to prevent warping and breaking.

1.07 PROJECT CONDITIONS

- A. Weather: Proceed with waterproofing and associated work when existing and forecasted conditions permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.
- B. Temperature: Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.
- C. Environmental Conditions: Apply waterproofing within range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate. Do not apply waterproofing in rain, fog, or mist.
- D. Maintain adequate ventilation during preparation and application of waterproofing materials.

PART 2 - PRODUCTS

2.01 WATERPROOFING SYSTEM

- A. Manufacturer: MEL-DEK, Deck Waterproofing System, as manufactured by W. R. Meadows, Inc, or Engineer approved equal. Waterproofing system shall be able to withstand dynamic placement of hot asphalt overlays.
- B. Waterproofing membrane shall be composed of a two layer composite sheet consisting of 53 mil polymeric membrane on a shirk-resistant, heavy duty 12 mil polypropylene woven carrier fabric with an overall thickness of 65 mils. Membrane shall conform to the following properties:

Test Method	Performance
Tensile Strength, ASTM D 882 Warp Fill	90 lbs/in (1.6 kg/mm) 90 lbs/in (1.6 kg/mm)
Elongation, ASTM D 882 Polymeric Membrane Fabric, Warp Fabric, Fill	410 percent 35 percent 45 percent
Puncture, ASTM E 154	275 lbs (122 kN)
Flexibility, ASTM D 146 180 degrees Bend, 1/4 inch (6.35mm) mandrel @ - 26 degrees F (- 32 degrees C)	Pass
Water Vapor Permeance, ASTM E-96, Water Method	0.03 Perms
Water Absorption, ASTM D 1970	0.06 percent

- C. Auxiliary Materials: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing sheet membrane.
1. Primer: Liquid primer recommended by manufacturer of sheet waterproofing material for substrate.
 2. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
 3. Asphaltic panels shall be 3/8 inch thick minimum, not less than three (3) feet wide by six (6) feet long, and shall meet the requirements of AREMA Manual, Chapter 29, Part 2, Article 2.4.7.

2.02 BALLAST MAT

- A. Ballast mat shall consist of natural rubber with fabric reinforcement designed to provide a reduction in the impact on structures of ground or structure-borne vibrations and in the crushing of ballast. The upper surface of the mat shall be textured to permit ballast to nest for track bed stability and shall contain synthetic elastomers for protection against attack by contaminants that may filter through ballast over time. The subsurface shall contain fabric reinforcement for strength and load distribution. Its underside shall provide a regular pattern of projections in the form of truncated cones.
- B. Ballast Mat Material: Materials shall conform to the following requirements:
1. Capacity: Axle load (approximate) 40 Tons
 2. Dimensions:
 - a. Width: 54 inches minimum, not including joint overlaps
 - b. Thickness: 3/4 inch minimum
 - c. Length: 30 feet, maximum

3. Fabric (Fiberglass-coated PVC)
 - a. Tensile Strength: 60 pounds/inch
 - b. Elongation at Break: 10 percent
 4. Elastomer Properties (natural rubber)
 5. Top Layer (synthetic): 3/16 inch, 1-ply fabric
 6. Isolating Layer: 1/2 inch
- C. Ballast Mat: Ballast mat shall conform to the following requirements:
1. Tensile Strength: 2000 psi
 2. Elongation at Break: 100 percent
 3. Tear Resistance: 50 psi
 4. Hardness (Shore A): 50(+/-5)
 5. Dynamics: Dynamic to static stiffness ratio K_d related to a preload of 8.5 psi = 1.86 (+0.1/-free)
 6. Temperature Range: Suitable for service where ballast mat temperatures range between minus 4 degrees F and plus 158 degrees F.
- D. Joint Seal: The material used for sealing of the ballast mat joints shall be an integral extension of the top surface of the mat or a separate material having strength characteristics equal to those of the top layer of the ballast mat.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with requirements. Proceed with work after substrate construction, openings, and penetrating work have been completed and areas are free of standing or running water, and frost. Verify deck is dry, smooth, and free from sharp or rough edges, honeycombing, rock pockets, depressions, and projections.
1. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 2. Correct unsatisfactory conditions prior to proceeding with installation.
- B. Existing Decks: Have the necessary materials, equipment, and personnel on stand-by during the cleaning of deck and for making a rapid assessment and repairs to the deck if found to be in a damaged or deteriorated condition.

3.02 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust free, and dry substrate for waterproofing application.
 - 1. Clean in accordance with the waterproofing manufacturer's recommendation and requirements for the products to be installed.
 - 2. The use of water to clean the deck will not be allowed.
- B. Existing Deck Surfaces: Prepare surface to a smooth, sound, monolithic condition, free of voids, spalled areas, sharp protrusions, and loose aggregate as instructed or approved by the waterproofing manufacturer in writing. Remove old membrane, oil grease or other contaminants.
- C. Mask off adjoining surfaces not receiving primer and waterproofing to prevent spillage affecting other construction.
- D. Remove grease, oil, form release agents, paints, and other penetrating contaminants from surface.
- E. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- F. Prepare, fill, prime, and treat joints and cracks in substrate. Remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Install 28 inch wide additional membrane strip and 20 inch wide 16 gauge galvanized sheet metal cover plate centered over construction, control joints, and expansion joints, and cracks less than 1/4 inch in width.
 - 2. In addition to the requirements specified above for joints and cracks less than 1/4 inch in width, all joints greater than 1/4 inch shall have a 1/2 inch by 10 inch wide galvanized steel plate installed prior to the 16 gauge sheet metal plate and the membrane strip.
- G. Inside Corners: Prepare, prime, and treat inside corners according to waterproofing manufacturer's written instructions.
 - 1. Install membrane strip centered over vertical inside corners. Install 3/4 inch fillets of liquid membrane on horizontal inside corners and as follows:
 - a. At footing to wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
 - b. At deck to wall intersections, extend sheet membrane flashing onto deck waterproofing and to finished height of sheet flashing.
- H. Outside Corners: Prepare and treat outside corners according to waterproofing manufacturer's written instructions.

1. Install strip of membrane 12 inches wide, centered over corner.
- I. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to waterproofing manufacturer's written instructions.

3.03 SHEET APPLICATION

- A. Install waterproofing membrane according to waterproofing manufacturer's written instructions.
1. Apply primer to substrate at required rate and allow to dry. Limit priming to areas covered by waterproofing membrane in same day. Re-prime areas exposed for more than 24 hours.
 2. Apply from low point to high point in both the longitudinal and transverse directions.
 - a. In the transverse direction, overlap in shingle fashion 2-1/2 inch after removing the white polyethylene strip that exposes the 3/4 inch rubberized asphalt.
 - b. In the longitudinal direction, overlap six (6) and seal with manufacturer's recommended mastic.
 3. Once positioned, immediately hand rub waterproofing membrane onto the substrate. Follow by a pressure-applied roll-pressing of the complete surface.
 4. Seal all terminations with manufacturer's recommended pointing mastic.
 5. Install sheet membrane and auxiliary materials to tie in adjacent waterproofing.
 6. Repair tears, voids, and lapped seams in waterproofing not meeting requirements. Slit and flatten fishmouths and blisters. Patch with sheet membrane extending 6 inches (150 mm) beyond repaired areas in all directions.

3.04 APPLICATION OF MEMBRANE PROTECTION

- A. Apply with applicable requirements of the AREMA Manual, Chapter 29, Part 2, for applying membrane protection.
- B. Asphaltic panel membrane protection shall be placed within 24 hours after completion of the membrane application. Install asphaltic panels in accordance with the manufacturer's installation instructions and recommendations, for protection from subsequent construction operations and ballast installation. Asphaltic panels damaged during subsequent construction operations shall be properly repaired or replaced immediately.

3.05 BALLAST MAT

- A. Install ballast mat on waterproofing membrane soon after application according to ballast mat manufacturer's written instructions and before commencing subsequent construction operations.
- B. Install ballast mat directly on the waterproofed deck cleaned of all debris and dust. Remove rough or uneven areas by grinding until the surface is acceptable and re-waterproof as required. Obtain Engineer's inspection and approval of intersections of ballast plate and recesses prior to installing the mats.
- C. Place overlay from low point to high point with caution. Overlap the mat sections as required by the instructions.
- D. Cut the ends of the ballast mat rolls square and in a neat straight line. Seal the joint with repair tape or other material as specified by the ballast manufacturer.
- E. Prevent intrusion of silt and debris into the void space between the cones of the ballast mat. Protect the joints and place the z-fastener strips over the edges of the ballast mat as soon as the mat is installed. At no time allow water, silt, or debris to enter into the newly installed ballast mat from the adjacent track or from other sources. Install temporary positive seals along the open edges of the mat to prevent such intrusion.

3.06 FIELD QUALITY CONTROL

- A. Field inspections and sampling and testing materials to verify that work of this Section conforms to the specified requirements shall be performed by the independent Inspection and Testing Agency hired by the Contractor.
- B. After surface preparation and before commencing waterproofing installation, waterproofing manufacturer field representative shall provide a written statement of the suitability the deck to receive the waterproofing.
- C. Correct deficiencies in or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.
 - 1. Repair defects and make further repairs until waterproofing installation is watertight.
- D. Additional testing shall be performed to determine compliance of corrected work with requirements.

3.07 PROTECTION

- A. Protect waterproofing from damage and wear during application and remainder of construction period, according to manufacturer's written instructions.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

- C. Remove ballast mats contaminated with silt and debris, clean and reinstall or replace with new materials.

END OF SECTION