

SECTION 07100

DAMPPROOFING AND MEMBRANE WATERPROOFING

07100.01 GENERAL

A. Description

Dampproofing and membrane waterproofing shall include, but not necessarily be limited to, furnishing and applying asphalt dampproofing and membrane waterproofing on finished concrete surfaces where indicated in accordance with the Contract Documents.

B. Related Work Included Elsewhere

1. Structure excavation; Section 02220.
2. Cast-in-place concrete structures; Section 03300.
3. Precast concrete utility structures; Section 03400.

C. Quality Assurance

1. Inspection and Testing
 - a. The County Engineer will inspect all materials before and/or after installation to ensure compliance with the Contract Documents. When specific materials tests are required by the referenced standards and specifications, the County Engineer will have the option of requiring that any or all of these tests be performed for materials furnished for a specific project. When testing is required, it will be specified herein or in the "Special Provisions."
 - b. The finished surface of dampproofed areas shall be free of dull or porous spots. Membrane waterproofed areas shall be free of cuts, holes, pockets, bulges, wrinkles, folds, or creases. The Contractor shall recoat or repair defective areas to the satisfaction of the County Engineer.
2. Experience

Applicators shall be fully qualified and certified by the manufacturers of the products being applied.
3. Storage

Fabric shall be stored in a dry protected place. The rolls shall not be stored on their ends. Bituminous materials in containers shall be kept closed when not in use.

D. Submittals

1. Shop Drawings

- a. Shop drawings shall be submitted as specified in the "General Provisions" for dampproofing and membrane waterproofing materials furnished. The shop drawings shall include manufacturer's data for all materials including recommended handling, mixing, and application requirements.
- b. Working drawings shall also be submitted which shall include joint, corner, penetration, and anchorage details, and a description of the sequence of operation. The submittal shall also show details of application around expansion and contraction joints, and pipes, sleeves, drains, or other penetrations.

2. Certificates of Compliance

Certificates of compliance shall be submitted in accordance with the "General Provisions" for all dampproofing and membrane waterproofing materials stating that the material furnished meets the requirements specified in Section 07100.02.

07100.02 MATERIALS**A. Materials Furnished by the County**

The County will not furnish any materials for dampproofing and membrane waterproofing.

B. Contractor's Options

None.

C. Detailed Material Requirements

1. Asphalt Primers

Primer for use with asphalt for dampproofing and waterproofing shall meet the requirements of AASHTO M 116.

2. Asphalts

Asphalt for dampproofing and waterproofing shall meet the requirements of AASHTO M 115.

3. Fabric for Waterproofing

Fabrics saturated with asphalt for use in waterproofing shall meet the requirements of AASHTO M 117.

4. Membrane Waterproofing and Dampproofing

Refer to Section 921.12 of the "MSHA Standard Specifications for Construction and Materials, (1993)".

5. Crackfiller

This material shall be a mixture of asphalt and mineral flour of such fineness that no appreciable separation will occur while being maintained in a liquid condition. The mixture shall meet the following requirements when evaluated by test methods noted in AASHTO M 115:

<u>Test</u>	<u>Specification Limit</u>
Penetration at 25 C, 100 g, 5 sec.	5.5 - 7.5mm
Ductility at 25 C, mm, min.	300
Insoluble in trichloroethylene, %	15 - 26
Evaporation loss, % weight, 50 g, 5 hr, 163 C, max.	2

07100.03 EXECUTION**A. General**

It is understood that this section covers the method of protection for concrete work, and the method to be used on the various parts of structures shall be as specified herein, unless otherwise provided for elsewhere in the Contract Documents.

B. Coating for Dampproofing

The coating for dampproofing shall consist of two coats of prime coat and one coat of seal coat, as later described herein, and shall be applied to the following concrete surfaces:

1. entire rear surface of wall that will be in contact with the backfill, except that portion which is poured against undisturbed material;
2. all portions of the outside surface of sidewalls, top of top slabs, rear faces of head walls, slope walls, and wing walls of reinforced concrete box culverts that will be in contact with backfill;
3. all portions of the rear face of retaining walls that will be in contact with backfill;
4. all portions of the rear faces of wing walls and head wall for structural plate pipes, pipe arches, and tunnel liners that will be in contact with the backfill;
5. full face of all contraction joints involved in any of the above;
6. exterior of all manholes and concrete water and sanitary sewer pipe.

C. Coating for Membrane Waterproofing

The coating for membrane waterproofing shall consist of a prime coat, three mop coats, and two layers of fabric, all as later described herein.

Membrane waterproofing shall be applied to the face of all construction joints for a width of 16 inches minimum centered on the joint for concrete structures next to backfill above

normal water surface with backfill on one side and atmosphere on the other side.

D. Surface Preparation

Dampproofing or membrane waterproofing shall not be applied until all provisions have been complied with for curing of concrete, protection against cold weather, and repairing of defective concrete surfaces. All concrete surfaces to receive coatings shall be reasonably smooth and free from projections and holes.

The concrete surfaces shall be dry.

Immediately before application of dampproofing or waterproofing, the surfaces shall be thoroughly cleaned of dust and loose materials.

When dampproofing and membrane waterproofing are specified for joint application, the membrane waterproofing shall be applied first.

When necessary, the County Engineer will require the surfaces to be scrubbed with water and a stiff brush, after which all surfaces shall be allowed to become thoroughly dry before application of materials.

No dampproofing or membrane waterproofing shall be done when the temperature is less than 40°F.

E. Application of Dampproofing

When dampproofing, care shall be taken to confine all coatings to the areas to be covered, and special care shall be observed to prevent disfigurement of any other parts of the structure that will be exposed to view in the completed structure. Dampproofing shall be applied to the full face of all contraction joints.

The cured, cleaned and dry surfaces shall be coated as follows:

1. Paint with two coats of primer for absorptive treatment. The materials may be applied either by brushing or spraying. The amount of each coat shall be not less than 1/8 gallon per square yard of surface. Successive coats shall not be applied until the preceding coat has thoroughly dried. The material shall not be heated.
2. After the last absorptive or prime coat has thoroughly dried, one seal coat shall be applied by brush or roller only. This coating shall consist of at least 1/8 gallon per square yard. When necessary, this material may be heated but not in excess of 150°F.

F. Application of Membrane Waterproofing

When membrane waterproofing, the cured, cleaned, and dry surfaces shall be coated with a prime coat and covered with mop coats and layers of fabric.

1. Coating Procedure

The surfaces shall first be coated with a primer, either by spraying or brushing. The amount of the primer coat shall be not less than 1/8 gallon per square yard of

surface. The priming coat shall be applied 24 hours in advance of applying any mop coats and shall be allowed to become thoroughly dry before the first mopping is applied. The primer shall not be heated.

Asphalt for mop coats shall be heated to a temperature between 300 and 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 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 at least two layers of fabric at all points and three layers with laps not less than 2 inches wide at edges of strips. All laps at ends of strips 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. Immediately following the mopping, the first strip of fabric which shall be carefully pressed into place so as to eliminate all air bubbles and maintain surface configuration. 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 strip, and a full width of the fabric shall be pressed into place as before. The forward or upgrade half of 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. The process shall be continued until the entire surface is covered. The entire surface shall then be given a final mopping of hot asphalt. There shall be a complete coating of asphalt between all layers of fabric.

The completed waterproofing shall be a firmly bonded membrane composed of two layers of fabric and three moppings of asphalt or tar. Under no circumstances shall one layer of fabric touch another layer at any point or touch the surface, as there must be a complete coating of asphalt or tar between all layers of fabric.

In all cases, the mopping on the concrete shall cover the surface so that no gray spots appear, and on cloth it shall be sufficiently heavy to completely conceal the weave. Asphalt shall be applied at rates of 1.2 gallons per square yard on horizontal surfaces and 1.4 gallons per square yard on vertical surfaces. The work shall be so regulated that at the close of a day's work all cloth that is laid shall have received as many coatings as is required for that stage of completion. Special care be taken at all laps to see that they are thoroughly sealed down.

2. Membrane Care

At the edges of the membrane and any points where it is punctured by such appurtenances as drains or pipes, the membrane shall be flashed in a manner acceptable to the County Engineer to prevent water from getting between the waterproofing and the waterproofed surface.

Care shall be taken to prevent injury to the finished membrane by the passage over

it of men or equipment or by throwing any material on it. Any damage which may occur 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.

07100.04 METHOD OF MEASUREMENT

RESERVED FOR FUTURE USE

07100.05 BASIS OF PAYMENT

RESERVED FOR FUTURE USE

SECTION 07130

BENTONITE WATERPROOFING AND SEALER

07130.01 GENERAL

A. Description

Bentonite waterproofing and sealer shall include, but not necessarily be limited to, the furnishing and placing granular bentonite, and bentonite panels, tubes, and gel where indicated and in accordance with the Contract Documents.

B. Related Work Included Elsewhere

1. Structure excavation; Section 02220.
2. Trench excavation, backfill, and compaction; Section 02250.
3. Sanitary sewer manhole installation; Section 02562.
4. Cast-in-place concrete structures; Section 03300.
5. Precast concrete utility structures; Section 03400.

C. Quality Assurance

1. Inspection

The County Engineer will inspect all materials before and/or after installation to ensure compliance with the Contract Documents. Leakage past the bentonite waterproofing and sealer shall be repaired by the Contractor at no additional cost to the County.

2. Containers

Bentonite materials shall be delivered and stored in manufacturer's sealed containers. Prematurely hydrated bentonite in any form, and damaged and underweight panels and tubes, will be rejected.

D. Submittals

1. Shop Drawings

Shop drawings shall be submitted as specified in the "General Provisions" for all bentonite materials furnished. The shop drawings shall include general product information, and storage, handling, and installation procedures.

2. Certificates of Compliance

Certificates of compliance shall be submitted in accordance with the "General Provisions" for all bentonite materials stating that the materials meet the requirements specified in Section 07130.02.

07130.02 MATERIALS

A. Materials Furnished by the County

The County will not furnish any materials for bentonite waterproofing and sealer.

B. Contractor's Options

None.

C. Detailed Material Requirements

1. Bentonite

a. Granular: Free flowing, high swelling, Wyoming type; not less than 90% montmorillonite and not more than 10% either unaltered volcanic ash or other native sediments.

b. Panels: Bentonite sealed between biodegradable kraft paper, distributed within the panel at a ratio of one pound of dry waterproofing per square foot of panel, satisfying the following permeability test rating under 60 feet of static head water pressure:

8 to 78 minutes: 0.0000001 feet per hour.

78 to 122 minutes: 0.0000002 feet per hour.

122 to 172 minutes: 0.0000001 feet per hour.

172 to 1324 minutes: 0.00000005 feet per hour.

c. Tubes: Bentonite contained within biodegradable kraft paper containers, each container being 24 inches long by 1 1/4 inches square.

d. Gel: Worked penetration range of 225 to 275 when tested in accordance with ASTM D 217; containing 10% by weight controlled hydrated bentonite having a pH of not less than 8.8; containing no free water; having a residual swell of not more than 5%; sealed in plastic-line containers.

2. Protection Board

Protection board shall meet the requirements of FSS LLL-B-810, Type II, solid for concrete protection: perforated with 1/8 to 1/4 inch holes uniformly centered on nominal 1 inch centers for permanent backfill protection.

3. Polyethylene Sheet

Polyethylene sheet shall meet the requirements of AASHTO M 171, ASTM C 171 minimum 4 mils thick.

4. Kraft Paper

Kraft paper shall be completely water soluble and anaerobically biodegradable kraft paper or kraft board.

5. Plastic for Tubes

Plastic for tubes shall be completely water soluble polyvinyl alcohol type.

07130.03 EXECUTION**A. Preparation**

1. All surfaces against which waterproofing is to be placed shall be clean and free from loose materials. The Contractor shall inspect surfaces to be waterproofed and remedy defects before starting waterproofing work.
2. The water level shall be maintained below the surface being waterproofed until completion of curing is required; and until concrete has been poured if concrete is to be poured against waterproofing. Bentonite panels and loose bentonite may be placed on damp surfaces, but not in flooded areas.
3. All concrete surfaces to be waterproofed shall be wire brushed and broom cleaned to firm unspalled surface, free from loose materials, laitance, debris, release agents, and other sharp or deleterious contaminants. Surfaces to receive bentonite board membrane-water proofing shall be free from protruding tie wires, sharp protrusions, and voids. Horizontal concrete surfaces shall be wood float finished.

B. Installation

1. Installation of granular bentonite waterproofing around pipe penetrations at sanitary sewer manholes and other structures shall be in accordance with the Plans and/or Standard Details.
2. Installation of bentonite panels, tubes, or gel shall be in accordance with the waterproofing manufacturer's written instructions.

07130.04 METHOD OF MEASUREMENT

RESERVED FOR FUTURE USE

07130.05 BASIS OF PAYMENT

RESERVED FOR FUTURE USE

SECTION 07951

SEALANTS AND CAULKING

07951.01 GENERAL

A. Description

Sealants and caulking shall include, but not necessarily be limited to, furnishing and installing caulking, sealants, and related accessories in accordance with the Contract Documents.

B. Related Work Included Elsewhere

1. Cast-in-place concrete; Section 03300.
2. Unit masonry; Section 04200.

C. Quality Assurance

1. Inspection

The County Engineer will inspect all materials before and/or after installation to ensure compliance with the Contract Documents.

2. Containers

All sealants and caulking shall be furnished and stored in the manufacturer's original containers with labels intact along with specification number, type, and class as applicable.

D. Submittals

1. Shop Drawings

Shop drawing shall be submitted as specified in the "General Provisions" for all sealants and caulking materials. The shop drawings shall include general product information, storage, handling and installation procedures, and technical data.

2. Certificates of Compliance

Certificates of compliance shall be submitted in accordance with the "General Provisions" for all sealants, caulking, and related accessories stating that the materials furnished meet the requirements specified in Section 07951.02.

07951.02 MATERIALS**A. Materials Furnished by the County**

The County will not furnish any materials for sealing and caulking.

B. Contractor's Options

None.

C. Detailed Material Requirements**1. Backup Materials**

Provide backup materials, fillers, and joint packing in accordance with the following:

- a. Use closed cell bead, or rope shaped expanded polyethylene, or polyurethane foam for general applications.
- b. Use glass fiber or untreated jute for non-working joints.
- c. Use semirigid vinyl or polyethylene foam, solid neoprene rod, or similar approved backing for joints subject to horizontal traffic or puncture.
- d. Do not use bituminous or oil product as a backup material.
- e. The width or diameter of backup material shall be 1 1/3 to 1 1/2 times the width of the joint.

2. Primers

Primers where applicable shall be in accordance with the manufacturer's recommendations.

3. Sealants

- a. Acrylic sealant single component water based latex and single component solvent release type with limited amount of fillers and plasticizers shall conform to FSS TT-S-230C.
- b. Polysulfide based sealant shall be either one component or two components types conforming to FSS TT-S-230C and TT-S-00227E respectively except as modified herein. Polysulfide sealants shall not be applied in contact with joint fillers and surfaces coated with asphaltic materials, oil base materials, lacquer or paint or any other sealants in which the bonding properties and adverse effects resulting from the combination are not known.
- c. Polyurethane based sealants shall be either one component or two component types formulated to provide excellent resiliency and resistance to compression and shall conform to FSS TT-S-230C and TT-S-00227E respectively except as modified herein. Polyurethane sealants shall not be applied in contact with joint fillers and surfaces coated with asphaltic

materials, oil base materials, lacquer or paint or any other sealants in which the bonding properties and adverse effects resulting from the combination are not known.

- d. Silicone sealant shall be rubber based with pigments and fillers formulated to provide excellent weather and ultraviolet ray resistance shall conform to FSS TT-S-001543.
4. Caulking
 - a. Oil based caulking compounds consisting of selected oils, fillers, plasticizers, binders and pigments shall conform to requirements of FSS TT-C-598B.
 - b. Butyl rubber based caulking compound shall be single component skinning type conforming to FSS TT-S-001657.
 5. Masking Tape and Bond Breaker

As recommended by the sealant manufacturer.

07951.03 EXECUTION

A. Environmental Conditions

1. Schedule caulking and sealants operations so that joints are normal size.
2. Do not apply caulking and sealants if temperature is below 40°F or above 85°F or when there is ice, frost, or dampness visible on the surfaces to be sealed or caulked.

B. Mixing

Mix in accordance with manufacturer's recommendations.

C. Preparation

1. Inspect all surfaces before starting work. Thoroughly clean all joints of contaminants, oil, grease, bituminous material, bond breakers, water repellent, and release agents.
2. Verify surfaces are dry and meet manufacturer's requirements.
3. Clean and remove foreign matters such as dirt, dust, moisture, frost, rust, paint, mill scale, and lacquer.
4. Unless indicated otherwise by manufacturer of sealants use backup material to control caulking depth as indicated on the Plans.

D. Application

1. Install material in strict adherence to manufacturer's instructions using appropriate approved equipment.
2. When required, apply masking tape to the perimeter of the joint to be sealed in a manner which will prevent the tape's adhesive from contacting the surface to receive the sealant. Remove tape after the sealant or caulking has been applied, but before it has set-up.
3. Apply primer to those joint surfaces against which the sealant or caulking is to be applied, and allow to become tack free before the masking tape is applied.
4. Install back-up filler where indicated, and in accordance with the manufacturer's installation instructions, with visible face of placed back-up filler not further from the face of the joint than one-half the width of the joint.
5. Place sealant or caulking in a manner which will fill the joint and form a smooth surface. For exposed surfaces of gun and knife grade sealant which cannot be made smooth during initial sealing, make smooth with a tool moistened with either water or sealant solvent.
 - a. Apply gun grade sealant or caulking only when it is capable of being discharged in a continuous, uninterrupted flow.
 - b. Apply knife grade sealant or caulking only when it is capable of being applied as a smooth, plastic, homogeneous mixture free from livering, lumps, and impurities.
 - c. Place pouring grade sealant only when it is capable of being placed as a free flowing liquid mixture free from livering, lumps, and free liquids.
 - d. Do not add diluents to sealants or caulking.
 - e. Prepare sealant or caulking mixtures only in those quantities which can be applied within the time period recommended by the manufacturer.
6. Tool all joints to remove excess sealant or caulking and to leave the surface smooth and free of wrinkles and sags.

E. Cleaning

Remove smears and misplaced materials and mixtures resulting from sealing and caulking operations. Use cleansers of the type recommended by the manufacturer.

07951.04 METHOD OF MEASUREMENT

RESERVED FOR FUTURE USE

07951.05 BASIS OF PAYMENT

RESERVED FOR FUTURE USE