

**SECTION 07110
SHEET MEMBRANE WATERPROOFING**

PART I - GENERAL

1.01 DESCRIPTION

- A. Scope: Work of this Section shall include all materials and installation necessary to provide Sheet Membrane Waterproofing as shown and detailed on the Drawings and specified herein, including:

(CONSULTANT TO SELECT APPLICABLE ITEMS FROM LIST**)**

1. Preapplied fully adhered sheet membrane waterproofing system under concrete slabs.
 2. Preapplied fully adhered sheet waterproofing membrane against soil retention system prior to placement of concrete foundation walls.
 3. Rubberized asphalt sheet membrane waterproofing system.
 4. Asphaltic Hardboard
 5. Liquid Membrane
 6. Drainage Composite
- B. Related Sections: Other specification sections which directly relate to the work of this section include, but are not limited to, the following:
1. Division 2 – EARTHWORK
 2. Division 3 – CONCRETE
 3. Division 7 – THERMAL and MOISTURE PROTECTION

(*LIST OTHER DIVISIONS AS APPLICABLE TO PROJECTS***)**

1.02 REFERENCE STANDARDS

- A. The following standards and publications are applicable to the extent referenced in the text.
- B. American Society for Testing and Materials (ASTM)
1. C 836-89 Standard Specification for High solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
 2. D 412-87 Standard Test Methods for Rubber Properties in Tension.
 3. D 146-90 Sampling and Testing Felted and Woven Fabrics Saturated with Bituminous substances for Use in Waterproofing and Roofing.

4. D 570-88 Standard Test Method for Water Absorption of Plastics.
 5. D 882-91 Test Methods for Tensile Properties of Thin Plastic Sheeting.
 6. D 903-83 Standard Test Method for Peel or Stripping Strength of Adhesive bonds.
 7. D 1970-94 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 8. D 3767-83 Practice for Rubber – Measurement of Dimensions.
 9. D 5385-93 Standard Test Methods for Hydrostatic Pressure Resistance of Waterproofing Membranes.
 10. E 96-80 Standard Test Methods for Water Vapor Transmission of Materi Materials.
 11. E 154-88 Testing Materials for Use as Vapor Barriers Under concrete Slabs and as Ground Cover in Crawl Spaces.
- C. General Services Administration, Public Building Service GSA-PBS-07115: Guide Specification for Elastomeric Waterproofing.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations. Include certification of data indicating VOC (Volatile Organic Compound) content of all component of waterproofing system.
- B. Samples: Submit representative samples of the following for approval:
1. Sheet membranes.
 2. Protection Board.
- C. Manufacturers Installation Instructions: Indicating special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of self-adhesive sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.
- B. Installer: A firm which has a least 3 years experience in work of the type required by this section.
- C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.
- E. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during membrane waterproofing work to review installation procedures.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
 - 1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
 - 2. Protect mastic and adhesive from moisture and potential sources of ignition.
 - 3. Store protection board flat and off the ground. Provide cover on top and all sides.
 - 4. Protect surface conditioner from freezing.
- B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.06 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.
- B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.07 WARRANTY

- A. Sheet Membrane Waterproofing: Provide written 10 year material warranty issued by the membrane manufacturer upon completion of work.

PART II - PRODUCTS

2.01 MATERIALS

- A. Preapplied Sheet Waterproofing Membrane: Bituthene® Preprufe™ 160.
 - 1. Waterproofing Membrane by Grace Construction Products, a three-layer composite sheet membrane consisting of 0.41 mm (0.016") of high-density polyethylene film, 0.64 mm (0.025") of specially formulated synthetic adhesive and 0.03 mm (0.001 in.) of protective coating.
 - 2. Preapplied Sheet Waterproofing Membrane.

PHYSICAL PROPERTIES FOR BITUTHENE PREPRUFE 160 MEMBRANE:

<u>Property</u>	<u>Test Method</u>	<u>Typical Value</u>
Color		Black with white protective coating
Thickness Method A	ASTM D 3767	1.07 mm (0.042") nominal
Low Temperature Flexibility	ASTM D 1970	Unaffected at -23°C (-10°F)
Elongation	ASTM D 412	300% minimum
Crack Cycling	ASTM C 836	Unaffected at -23°C (-10°F), 100 Cycles
Tensile Strength, Film	ASTM D412	27 600 kPa (4,000 lb/in ² .) minimum
Peel Adhesion to Concrete	ASTM D 903 Modified	880 N/m (5.0 lb/in.) minimum
Lap Adhesion	ASTM D 1876	440 N/m(2.5 lb/in.) modified minimum
Resistance to Hydrostatic Head	ASTM D 5385 Modified	70m (231 ft.) minimum
Permanence Method B	ASTM E 96 maximum	0.6 ng/m ² sPa (0.01 perms)
Water Absorption	ASTM D 570	0.5% maximum

B. Preapplied sheet Waterproofing Membrane: Bituthene® Preprufe™ 300

1. Waterproofing Membrane by Grace Construction Products, a four-layer composite sheet membrane consisting of 0.8 mm (0.030") of high-density polyethylene film, 0.6 mm (0.025") of specially formulated synthetic adhesive and 0.03 mm (0.001") of protective coating and surface treatment.
2. Preapplied Sheet Waterproofing Membrane

PHYSICAL PROPERTIES FOR BITUTHENE PREPRUFE 300 MEMBRANE:

<u>Property</u>	<u>Test Method</u>	<u>Typical Value</u>
Color Protective coating and white Surface treatment.		Black with white
Thickness Method A nominal	ASTM D 3767	1.42 mm (0.056")
Low Temperature Flexibility	ASTM D 1970	Unaffected at -23°C (-10°F)
Elongation	ASTM D 412	300% minimum

Crack Cycling	ASTM C 836	Unaffected at -23°C (-10°F), 100 Cycles
Tensile Strength, Film	ASTM D412	27 600 kPa (4,000 lb/in. ²) minimum
Puncture Resistance	ASTM E154	800 N (180 lb) minimum
Peel Adhesion to Concrete	ASTM D 903 Modified	880 N/m (5.0 lb/in.) minimum
Lap Adhesion Modified	ASTM D 1876	440 N/m(2.5 lb/in.) minimum
Resistance to Hydrostatic Head	ASTM D 5385 Modified	70m (231 ft.) minimum
Permanence Method B	ASTM E 96 maximum	0.6 ng/m ² sPa (0.01 perms)
Water Absorption	ASTM D 570	0.5% maximum

C. Sheet Membrane Waterproofing System: Bituthene® System 4000 by Grace Construction Products:

1. A self-adhesive, cold-applied Composite sheet consisting of a thickness of 1.4 mm (0.056") of rubberized asphalt and 0.1 mm (0.004") of cross-laminated, high-density polyethylene film specially formulated for use with water-based surface conditioner. Provide rubberized asphalt membrane covered with a release sheet which is removed during installation. No special adhesive or heat shall be required to form laps.
2. Sheet Membrane Waterproofing.
3. Protection Board:
 - a. Drainage Composition: Hydroduct 2 by Grace Construction Products. Use Drainage Board over Bituthene 4000 in our vertical applications. Drainage composite to meet the following criteria:

<u>Property</u>	<u>Test Method</u>	<u>Typical Value</u>
DRAINAGE CORE Polymer Thickness	ASTM C 366 Method B	High Impact Polystyrene 9.5 mm (0.375") nominal
Compressive Strength	ASTM D 1621	718 kPa (15,000 lb/ft ²)
Flow Rate (gradient 0.1,37.9 kPa)	ASTM D 4716	0.003 m ² /s (15 gal/min./ft)

GEOTEXTILE

PROJECT NO. #####
 PROJECT TITLE
 CONTRACT TITLE

Type		Nonwoven
Polymer		Polypropylene
Weight	ASTM D 3776	136 g/m ² (4.0 oz/yd ²)
Tensile Strength	ASTM D 4632	445 N (100 lb)
Trapezoidal Tear	ASTM D 4533	222 N (50 lb)
Apparent Opening Size	ASTM D 4751	0.150-0.212 mm (70-100 U.S. sieve)
Permittivity	ASTM D 4491	6095 L/min./m ² (150 gal/min./ft ²)
Mullen Burst	ASTM D 3786	1860 kPa (270 lb/in. ²)
Puncture Strength	ASTM D 4833	35 kg (75 lb)

b. Asphaltic Hardboard: Bituthene Asphaltic Hardboard by Grace Construction Products; a premolded semi-rigid protection board consisting of bitumen, mineral core and reinforcement. Provide 3 mm (0.125") thick hardboard on horizontal surfaces not receiving steel reinforced slab. Where steel reinforcing bars are to be used, apply two layers of 3 mm (0.125") thick hardboard. Use Hardboard over Bituthene 4000 at horizontal applications.

4. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing.

PHYSICAL PROPERTIES FOR BITUTHENE SYSTEM 4000:

<u>Property</u>	<u>Test Method</u>	<u>Typical Value</u>
Color		Dark gray-black
Thickness Method A	ASTM D 3767	1.5 mm (0.060") nominal
Flexibility, 180° Bend over 25 mm (1 in.) Mandrel at -43°C (-45°F)	ASTM D 1970	Unaffected
Tensile Strength, Membrane Die Modified	ASTM D412	2240 KN/m ² (325 lb/in ²) minimum
Tensile Strength Film	ASTM D882	34 500 KN/m ² (5000 lb/in ²) minimum

Elongation Ultimate Failure of Rubberized Asphalt	ASTM D 412	300% minimum
Cycling Over 6 mm (0.25 in.)Crack at -32°C (-25°F,) 100 Cycles	ASTM C 836	Unaffected
Lap Adhesion at Minimum Application Temperature	ASTM D 1876	880 N/m (5.0 lb/in.)
Peel Strength	ASTM 903	1576 N/m (9 lb/in.)
Puncture Resistance Membrane	ASTM E 154	222 N/m (50 lb) minimum
Resistance to Hydrostatic Head	ASTM D 5385	70 m (231 ft.) of water
Exposure to Fungi in Soil, 16 Weeks	GSA-PBS 07115	Unaffected
Permanence Method B	ASTM E 96 maximum	2.9 ng/m ² sPa (0.05 perms)
Water Absorption	ASTM D 570	0.1% maximum

D. Sheet Membrane Waterproofing: Bituthene® 5000 by Grace Construction Products.

1. A self adhesive, cold-applied composite sheet consisting of a total thickness of 1.6 mm (0.065"). It is composed 1.4 mm (0.056") of rubberized asphalt and a layer of high-strength, heat resistant woven polypropylene mesh. Provide rubberized asphalt membrane covered with a sheet which is removed during installation. No special adhesive or heat shall be required to form laps.

PHYSICAL PROPERTIES FOR BITUTHENE 5000:

<u>Property</u>	<u>Test Method</u>	<u>Typical Value</u>
Thickness	ASTM D 3767	1.77 mm (0.065") nominal
Tensile Strength	ASTM D 882	345 kN/m ² (50 lb/in ²)
Elongation, Mesh	ASTM D 882	25% minimum
Puncture Resistance, Mesh	ASTM E 154	890 N (200 lbs)
Flexibility, 180° bend over 0.25"	ASTM D 1970	Unaffected

mandrel at -4°C
 (25°F)

Crack Cycling at -4°C (25°F), 100 cycles	ASTM C 836	Unaffected
Permanence	ASTM E 96	58 ng/m ² sPa (1.0 perms)
Peel Adhesion	ASTM D 903	880 N/m (5 lbs/in.)

E. Bituthene Liquid Membrane

1. A two component, elastomeric, cold applied, trowel grade material. Physical properties for Bituthene Liquid Membrane:

<u>Property</u>	<u>Test Method</u>	<u>Typical Value</u>
Color		
Component A		Black
Component B		Clear
Component Mixture		Black
Solids Content	ASTM D 1644	100%
Elongation	ASTM D 412	250% minimum
Peel Strength minimum	ASTM D 903	880 N/m (5 lb/in.)
Flexibility, 180° bend over 25 mm (1") mandrel at -32°C (-25°F)	ASTM D 1970	Unaffected

2. Use fillet material at inside corners, sealing material at terminations and repair material for defects on concrete surfaces.

F. Drainage Composite: Hydroduct 2® Drainage Composite

1. Consists of a nominal 10mm (0.375") thick drainage core, a high performance geotextile and a high strength backing film Compressive strength 718 kPa (15,000 lb/ft²), drainage flow rate .003 m²/s (15 gal/min/ft.).

PHYSICAL PROPERTIES FOR HYDRODUCT 2 DRAINAGE COMPOSITE

<u>Property</u>	<u>Test Method</u>	<u>Typical Value</u>
DRAINAGE: CORE		
Polymer	ASTM C366	High Impact Polystyrene
Thickness	Method B	9.5mm (0.375") nominal
Compressive Strength	ASTM D 1621	718 kPa (15,000 lb/ft ²)

Flow Rate (gradient 0.1, 37.9kPa)	ASTM D 4716	0.003 m ² /s (15 gal/min/ft)
GEOTEXTILE Type		Nonwoven
Polymer		Polypropylene
Weight	ASTM D 3776	136 g/m ² (4.0 oz/yd ²)
Tensile Strength	ASTM D 4632	455 N (100 lb)
Trapezoidal Tear	ASTM D 4533	222 N (50 lb)
Apparent Opening size	ASTM D 4751	0.150-0.212mm (70-100 U.S. sieve)
Permittivity	ASTM D 4491	6095 L/min/m ² (150 gal/min/ft ²)
Mullen Burst	ASTM D 3786	1860 kPa (270 lb/in ²)
Puncture Strength	ASTM D 4833	35 kg (75 lb)

- G. Miscellaneous Materials: Primer, mastic, and accessories specified or adaptable to manufacturer of sheet membrane waterproofing.

PART III - EXECUTION

3.01 EXAMINATION

- A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 PREPARATION OF SUBSTRATES

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.
- B. Cast-In-place Concrete Substrates:
1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).
 2. Fill form tie rod holes with concrete and finish flush with surrounding surface.

3. Repair bugholes over 13 mm (0.5") in length and 6 mm (.25") deep and finish flush with surrounding surface.
 4. Remove scaling to sound, unaffected concrete and repair exposed area.
 5. Grind irregular construction joints to suitable flush surface.
- C. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.03 INSTALLATION OF 160 MEMBRANE AND 300 MEMBRANES

- A. Refer to manufacturer's literature for recommendations on installation, including but not limited to the following:
1. Apply membrane with the HDPE film facing the existing conditions. Remove the release liner and fasten membrane to existing condition. Hydrostatic applications, apply membrane over substrate.
 2. Apply succeeding sheets by overlapping the previous sheet 75 mm (3") along the uncoated edge of the membrane.
 3. Overlap the ends of the membrane 75 mm (3"). Apply Bituthene® Preprufe™ Tape centered over the end lap and roll firmly. Remove release liner.

3.04 INSTALLATION OF 4000 MEMBRANE AND 5000 MEMBRANE

- A. Refer to manufacturer's literature for complete installation instructions, but not limited to the following:
1. Apply surface conditioner treatment at dilution and rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner/primer.
 2. Delay application of membrane until surface conditioner is completely dry. Dry time will vary with weather conditions.
 3. Seal daily terminations with troweled bead of mastic.
 4. Apply protection board and related materials in accordance with manufacturer's recommendations.
 5. The asphalt concrete pavement shall be placed as soon as possible after the installation of the Bituthene 5000 membrane. A minimum of 50 mm (2") compacted overlay is recommended. The temperature of the asphalt concrete shall be a minimum of 120°C (250°F) at time of compaction.

3.05 INSTALLATION OF BITUTHENE LIQUID MEMBRANE

- A. All surfaces must be dry and free from dirt, grease, oil, dust or other contaminants.
- B. Bituthene liquid membrane may be applied at temperatures of -40°C (-25°F) or above.
- C. Bituthene Liquid Membrane must be applied at a minimum thickness of 2.3 mm (0.090").

- D. In fillet applications the face of fillet should be a minimum of 20 mm (0.75")

3.06 INSTALLATION OF HYDRODUCT 2 DRAINAGE COMPOSITE

- A. In vertical applications, Hydroduct 2 Drainage Composite can be applied to the substrate vertically or horizontally but, in either case, should extend from the perimeter discharge pipe to a point approximately 150 mm (6") below the anticipated grade line.
- B. When Adhering Hydroduct 2 Drainage Composite directly to Bituthene waterproofing membranes, Bitustik Tape should be used. When using Bitustik Tape, press firmly to ensure good adhesion. Substrate and job site conditions will determine the attachment pattern. Abut adjacent rolls with excess fabric overlapping in shingle fashion.
- C. For inside and outside corners, abut adjoining drainage composite at the corner. Cover open core with extra geotextile filter fabric.
- D. The exposed core along the top terminations should be covered with a strip of geotextile to prevent intrusion of soil into core. At the bottom termination extend the Hydroduct 2 Drainage Composite out from the structure so that it passes behind and under the perimeter discharge pipe. Additional geotextile should be wrapped over the pipe to prevent soil intrusion.
- E. To secure Hydroduct 2 Drainage Composite around protrusions, apply Bitustik Tape around the protrusion in a picture frame configuration. Cut Hydroduct 2 Composite to fit snugly around the protrusion. Press the cut edge firmly into the Bitustik Tape.
- F. Hydroduct 2 Drainage Composite should be covered promptly. Do not leave Hydroduct 2 Drainage Composite exposed to sunlight for more than two weeks. Motor vehicles, construction equipment or other trades should not be allowed directly on the Hydroduct 2 Drainage Composite.

3.07 CLEANING AND PROTECTION

- A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.
- B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION 07110