

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Sheet membrane waterproofing.
- B. Cant strips and other accessories.
- C. Protection boards.

1.02 RELATED REQUIREMENTS

- A. Section 04 2001 - 2.04A - Masonry Veneer: Self adhering flashing membrane.
- B. Section 04 4301 - 2.03E - Stone Masonry Veneer: Self adhering flashing membrane.
- C. Section 31 2323 - Fill.
- D. Section 33 4600 (33460)-Sub-drainage: Foundation drainage.
- E. Section 07 2100 - Thermal Insulation: Insulation used for protective cover.
- F. Section 07 9005 - Joint Sealers: Sealant for joints in substrates.

1.03 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension; 2006a.
- B. ASTM D751 - Standard Test Methods for Coated Fabrics
- C. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials
- D. ASTM D5084 - Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for membrane, flexible flashings, joint and crack sealants, and others.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- F. Water Test: When hydrostatic conditions exist, include manufacturer's report for laboratory demonstrating the activation of bentonite with the groundwater samples.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.
- B. Water Test: Supply the waterproofing manufacturer with groundwater samples from the project site at marked locations.

1.06 WARRANTY

- A. Provide to Architect signed copies of the Contractor's and Manufacturer's Warranties.
- B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

- C. Provide ten year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.
- D. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Composite HDPE/Bentonite Manufacturers:
1. TegraTite; TegraSeal Products, LLC; www.tegraseal.com
 2. TegraTite Plus; TegraSeal Products, LLC; www.tegraseal.com
 3. TripleSeal; TegraSeal Products, LLC; www.tegraseal.com
 4. Substitutions: See Section 01 6000 and Section 07 1300 2.02 - Product Requirements.

2.02 MEMBRANE PROPERTIES

- A. TegraTite Waterproofing Membrane. Composite HDPE/Bentonite Sheet Membrane: Comprised of green 20 mil HDPE and granular bentonite. Product to be used at all vertical foundation walls, decks, tunnels, or planters.
- | | | |
|---------------------------------------|----------------------------|-----------------|
| 1. Minimum Thickness: | 150-200 mils | |
| virgin resin HDPE | 20 mil | |
| Bentonite | 1 lbs per sf | |
| 2. Sheet Width: | 42 inch, minimum. | |
| 3. Tensile Strength: | 4,000 psi, | ASTM D 412 |
| 4. Ultimate Elongation: | 700 percent | ASTM D 412 |
| 5. Resistance to hydrostatic pressure | 150 feet | ASTM D 751 |
| 6. Water vapor transmission rate | 5×10^{-12} cm/sec | ASTM E96, D5084 |
- B. TegraTite Plus Waterproofing Membrane. The TegraTite membrane with an additional polypropylene non-woven fabric to protect the bentonite layer. Product can be used on all vertical foundation walls, decks, tunnels, or planters, and underslab floor or blindside applications.
- | | | |
|---------------------------------------|----------------------------|-----------------|
| 1. Minimum Thickness: | 150-200 mils | |
| virgin resin HDPE | 20 mil | |
| Bentonite | 1 lbs per sf | |
| 2. Sheet Width: | 42 inch, minimum. | |
| 3. Tensile Strength: | 4,000 psi, | ASTM D 412 |
| 4. Ultimate Elongation: | 700 percent | ASTM D 412 |
| 5. Resistance to hydrostatic pressure | 150 feet | ASTM D 751 |
| 6. Water vapor transmission rate | 5×10^{-12} cm/sec | ASTM E96, D5084 |
- C. TripleSeal Waterproofing Membrane. Composite HDPE/Bentonite membrane comprised of virgin 20 mil HDPE with granular bentonite and a polypropylene non-woven fabric laminated to both sides of the sheet. Product can be used in underslab floor or blindside applications and with extruded polystyrene insulation on all vertical foundation walls, decks, tunnels, or planters.
- | | | |
|---------------------------------------|----------------------------|-----------------|
| 1. Minimum Thickness: | 250-300 mils | |
| virgin resin HDPE | 20 mil | |
| Bentonite | 1.5 lbs per sf | |
| 2. Sheet Width: | 42 inch, minimum. | |
| 3. Tensile Strength: | 4,000 psi, | ASTM D 412 |
| 4. Ultimate Elongation: | 700 percent | ASTM D 412 |
| 5. Resistance to hydrostatic pressure | 150 feet | ASTM D 751 |
| 6. Water vapor transmission rate | 5×10^{-12} cm/sec | ASTM E96, D5084 |

- D. Seaming Materials: 3 inch (75 mm) wide butyl seam tape as recommended by membrane manufacturer.
- E. Self Adhering Flexible Flashings: Type recommended by waterproofing membrane manufacturer
- F. Protection Board (optional): Type recommended by waterproof membrane manufacturer
- G. Drainage board (optional): Filter fabric laminated to free-draining high-density dimpled polystyrene drainage core with HDPE backing or alternative as recommended by the waterproofing manufacturer.
- H. Insulation (optional): Rigid extruded polystyrene insulation as specified in Section 07 2100.

2.03 ATTACHMENT MATERIALS

- A. Mechanical Fasteners:
 - 1. Case-hardened steel nail with fluted shank having a minimum 1" length and a minimum 1" diameter cap for use on green concrete and masonry substrates.
 - 2. Powder shot steel pin having a minimum 3/4" diameter washer for use on hardened concrete and grouted masonry substrates.
 - 3. Steel staples approved by membrane manufacturer for use according to Project conditions.
 - 4. Termination Bars: Aluminum; compatible with membrane as recommended by membrane manufacturer.
- B. Adhesive Fasteners:
 - 1. Spray/roll liquid applied rubberized asphalt
 - 2. Spray/roll liquid applied acrylic adhesive
 - 3. Bituminous tape and primer

2.04 ACCESSORIES

- A. Granular bentonite cant: TegraSeal Bentonite Granular Pack.
- B. Mastic: TegraSeal Mastic
- C. WaterStop: compatible waterstop devices as approved by the waterproofing manufacturer
- D. Waterpellent: spray covering water repellent for TegraTite Plus or TripleSeal. Provides temporary covering for inclement weather.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that the existing conditions meet the manufacturer's requirements before starting work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.
- D. Report unsatisfactory conditions to the Architect in writing.

3.02 PREPARATION

- A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's guidelines and instructions.
- B. All concrete shall be cured a minimum of two (2) days and be 1,500-psi in compressive strength before application of bentonite waterproofing system.

- C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
- D. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.
- E. Repair concrete as required providing proper surfaces for the waterproofing. All surfaces shall be free of voids, spalled areas, loose aggregate and sharp protrusions, with no coarse aggregate visible. "Honeycombs" over 3/8-inch in width and 3/8-inch deep shall be plugged with concrete or bentonite mastic and finished flush with surrounding surfaces. Finish shall be relatively smooth.
- F. Provide two (2) inch bentonite cant at all vertical transitions and fill excess space with granular bentonite and/or bentonite mastic for wall pipe penetrations. Refer to manufacturer's recommendations for typical installation guidelines.

3.03 INSTALLATION – MEMBRANE

- A. Install membrane waterproofing either vertically or horizontally with bentonite facing the concrete according to manufacturer's recommendations and instructions, including proper substrate preparation, job site considerations and weather restrictions.
- B. Roll out membrane. Minimize wrinkles and bubbles. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- C. Seal joints and seams as recommended by the manufacturer.
- D. Installation of self-adhering flashing membrane a minimum 6" over top edge of waterproofing membrane and continue across foundation wall shelf and up vertical face of wall system as indicated on detailed drawings. This will be installed under section 04 2001 and shall be inspected by and approved by this contractor and become part of the warranted system in this section.

3.03.1 Backfilled Walls

1. Concrete Wall/Substrate
 - a. Remove all sharp protrusions, mud, debris, ice or any other materials that would interfere with TegraTite's performance.
 - b. Cover any exposed reinforcing steel.
 - c. In the case of masonry walls, strike flush all joints scheduled to receive TegraTite. (Contact TegraSeal for recommendations on specific projects.)
2. Trowel TegraSeal Mastic into all the holes, honeycombs, voids or irregularities that exceed 3/8" in depth.
3. Penetrations.
 - a. Fill extra space with TegraSeal Granular Pack or TegraSeal Mastic.
 - b. Trowel TegraSeal Mastic to cover penetration.
 - c. Cut TegraTite strip: 6" wide x 2" greater than pipe circumference.
 - d. Every 1", cut a 3" flanges across the TegraTite strip (Figure 1).
 - e. Wrap the strip around the pipe with flanges spreading out on the wall
 - f. Hold the collar with pipe clamp or Seam Tape and/or fasteners.
4. Prepare all expansion joints per manufacture's recommendations.
5. Sweep footing ledge clean.
6. Contact TEGRASEAL whenever conditions of acid, alkali, or salt brine exist.
7. Install a continuous 2" cant of TegraSeal Granular where wall meets footing.
8. Install a continuous 1" vertical cant of TegraSeal Mastic at all vertical corners prior to installing TegraTite.
9. TegraTite is installed from the base of the footing to the grade line with the bentonite side towards the concrete substrate. Securely fasten the membrane every 20" O.C. to the vertical surface just above the footing and to the horizontal surface on top the footing.
10. TegraTite may be installed with a combination of either vertical or horizontal seams.

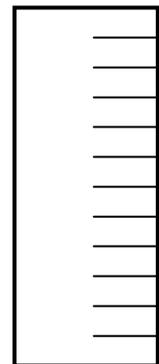


Figure 1

Vertical Installation

- a. Install TegraTite with nails and washers 15" O.C within 1" from horizontal seam.
- b. Overlap vertical seams at least 1-1/2" and secure with nail and washer every 24" to 48" O.C.
- c. Cover the nails and tape all vertical seams with TegraSeal Seam Tape as shown.

Horizontal Installation

- a. Install TegraTite with nails and washers 24" O.C within 1" from horizontal seam.
Note: Shingle overlap the upper sheet over on the lower sheet at least 1-1/2" with staggered vertical seams.
 - b. Overlap vertical seams at least 1-1/2" and secure with a nail and a washer at 20" O.C.
 - c. Cover the nails and tape all vertical seams with TegraSeal Seam Tape.
11. For inside corners:
 - a. Fold overlap in the corner and securely nail to the footing.
 - b. Secure with a nail.
 12. For outside corners:
 - a. In a 8" x 8" square of TegraTite, cut out two triangles leaving a 2" x 4" strip from the center toward one edge and two additional flanges (Figure 2).
 - b. Secure the square at the outside corner.
 - c. Cut vertical slice in the TegraTite membrane at the footing and fold around corner.
 - d. Secure flaps with nails.
 13. Terminate TegraTite at finished grade with a continuous strip of TegraSeal Termination Bar nailed every 12" O.C.
Note: Make certain that waterproofing extends up to or above finish grade.
 14. Complete installation at penetrations by cutting out a circle the diameter of the pipe in the center of a 2' x 2' square of TegraTite. Cover the pipe penetration with the TegraTite square (if necessary, cut slit in center circle) and fasten. Tape the seam and the penetration with TegraSeal Seam Tape.

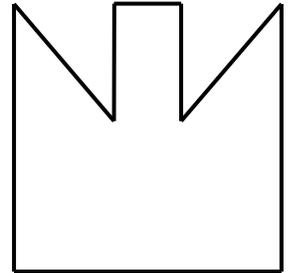


Figure 2

3.03.2 Blindside Lagging-TripleSeal

1. Steel piles and wood lagging
 - a. Remove all sharp protrusions, mud, debris, ice or any other materials that would interfere with TripleSeal's performance.
 - b. Cover any exposed reinforcing steel.
 - c. Flatten the nails from the lagging boards.
 - d. Fill irregularities and voids between the lagging boards with concrete grout, plywood, TegraSeal Mastic or Granular Pack.
 - e. Cover lagging boards and soldier piles vertically with drainage layer or with 20 mil HDPE and 4" overlap.
2. Utility Penetrations.
 - a. Fill voids with concrete grout, TegraSeal Granular Pack and/or Mastic.
 - b. For drainage board, cut circle in barrier the size of utility penetration. For HDPE backing, cut star shape or 8-piece pie shape into membrane. Ensure a tight fit around the utility penetrations.
 - c. Trowel TegraSeal Mastic to fill voids and to cover penetration.
 - d. Cut TripleSeal strip: 6" wide to wrap the pipe with 2" overlap. Every 1", cut 3" flanges across the TripleSeal strip (Figure 1).
 - e. Wrap the strip around the pipe with flanges spreading out on the membrane.
 - f. Hold the collar with pipe clamp, Seam Tape or fasteners.
3. Integrate below-slab, below-footings, and/or other structures waterproofing membranes with lagging wall membrane to create the complete waterproofing envelope.
4. Install TripleSeal horizontally, or as alternative, TegraTite Plus with drainage layer.
 - a. Hang TripleSeal with nails and washers 24" O.C. within 1" from the horizontal seam.
 - b. Stagger and overlap seams at least 4".
 - c. Secure vertical edge every 20" O.C.
 - d. Secure horizontal overlaps with staples every 6".
5. Overlap the seams at least 4". Fasten as described previously.

6. Use double layer of TripleSeal membrane horizontally over construction joints and vertically at the corners, or TegraTite Plus alternative.
7. Complete installation at utility penetrations
 - a. Cut out a circle the diameter of the pipe in the center of a 2' x 2' square of TripleSeal.
 - b. Cover the pipe penetration with the TripleSeal square (if necessary, cut slit in center circle) and fasten.
 - c. Fill voids with TegraSeal mastic or granular packs
8. Lagging Tiebacks.
 - a. Thoroughly coat all tieback penetrations with TegraSeal Mastic.
 - b. Fill TegraSeal Tieback Cover with TegraSeal Mastic.
 - c. Fasten the Tieback Cover over tie-backs with nails.

Note: Contact TegraSeal Technical Service for alternative tieback designs.
9. Soldier Piles
 - a. Cut a hole for each tie-back in the vertical TripleSeal sheet.
 - b. Hang TripleSeal down the soldier pile, matching the Tieback Cover with the holes, while ensuring a 4" overlap with horizontal membranes and a 4" shingle overlap on vertical sheets.
 - c. Secure with nails.
 - d. Fill voids (particularly around the Tieback Covers) with TegraSeal Mastic or Granular Pack.
10. Terminations
 - a. At grade: Finish Tripleseal, TegraTite Plus and the drainage sheet/HDPE layers with a continuous strip of TegraSeal Termination Bar nailed every 12" O.C. and optional flashing. Note: Make certain that waterproofing extends up to or above finish grade.
 - b. Intersecting deck: Finish TripleSeal (or TegraTite Plus alternative) with a 6" overhang of horizontal membrane past the construction joint.

3.03.3 Decks, Tunnels, Planters

1. Concrete deck/wall/substrate
 - a. Remove all sharp protrusions, mud, debris, ice or any other materials that would interfere with TegraTite's performance.
 - b. Cover any exposed reinforcing steel.
 - c. In the case of masonry walls, strike flush all joints scheduled to receive TegraTite. (Contact TegraSeal for recommendations on specific projects.)
2. Trowel TegraSeal Mastic or mortar into all the holes, honeycombs, voids or irregularities that exceed 3/8" in depth. Note: TegraSeal Mastic should not be used as a full-wall trowel grade waterproofing.
3. Penetrations.
 - a. Fill extra space with TegraSeal Granular Pack or TegraSeal Mastic.
 - b. Trowel TegraSeal Mastic to cover penetration.
 - c. Cut TegraTite strip: 6" wide x pipe circumference plus 2" overlap. Every 1", cut 3" flanges across the TegraTite strip (Figure 1).
 - d. Wrap the strip around the pipe with flanges spreading out on the wall
 - e. Hold the collar with pipe clamp or Seam Tape and/or fasteners.
4. Drain Pipes
 - a. Fill any void with TegraSeal Mastic or Bentonite Granular Pack.
 - b. Cut out the inside diameter of the drain bowl in the center of a 2' x 2' square of HDPE. Place over drain bowl.
 - c. Clamp flashing collar into place and bolt down the adjustable strainer.
5. Use double layer of TegraTite membrane over construction joints with backfill cover or with pavers.
6. Sweep deck clean.
7. Contact TEGRASEAL whenever conditions of acid, alkali, or salt brine exist.
8. Pour a 2" cant of TegraSeal Granular Pack at vertical/horizontal transitions.
9. Unroll TegraTite membrane on the deck with the bentonite side towards the concrete substrate, starting from the lowest points and moving to the highest points. Overlap and stagger the seams 1-1/2" to 3".
10. Overhang horizontal to vertical transition with 6" of TegraTite (or past the construction joint).
11. For inside corners:
 - a. Cut vertical slice in the TegraTite at the footing and fold overlap in the corner.

- b. Secure with a nails.
12. For outside corners against the deck:
 - a. In a 8" x 8" square of TegraTite, cut out two triangles leaving a 2" x 4" strip from the center toward one edge and two additional flanges (Figure 2).
 - b. Secure the square at the outside corner.
 - c. Cut vertical slice in the TegraTite membrane at the footing and fold around corner.
 - d. Secure flaps with nails.
13. For outside corners:
 - a. Cut vertical slice in the TegraTite at the corner and fold overlap in the corner.
 - b. Secure with a nails.
14. Tape all seams with TegraSeal Seam Tape as shown.
15. Terminate TegraTite at finished grade with a continuous strip of TegraSeal Termination Bar nailed every 12" O.C.

Note: Make certain that waterproofing extends up to or above finish grade.
16. Complete installation at penetrations by cutting out a circle the diameter of the pipe in the center of a 2' x 2' square of TegraTite. Cover the pipe penetration with the TegraTite square (if necessary, cut slit in center circle) and fasten. Tape the seam and the penetration with TegraSeal Seam Tape.

3.03.4 UnderSlab Floors-TripleSeal

1. Prepare substrate/base/substratum/subgrade
 - a. Level and compact the original earth, or a granular base.
2. HDPE barrier.
 - a. Cover compacted base with 10 or 20 mil HDPE. If aggregate base, use 20 mil HDPE. If clean-earth fill, 10 mil HDPE is acceptable.
 - b. Cut HDPE around any penetrations.
 - c. Over lap seams 3-4".
 - d. Staple the seam every 6"-12".
3. Mud Slab (an alternative installation, if specified)—Install as recommended by the Architect and Engineer.
4. Utility Penetrations
 - a. Pour cant of TegraSeal Granular Pack around the penetration.
 - b. Cut TripleSeal strip: 6" wide to wrap the pipe with 2" overlap. Every 1", cut 3" flanges across the TripleSeal strip (Figure 1).
 - c. Wrap the strip around the pipe with flanges spreading out on the membrane.
 - d. Hold the collar with pipe clamp or Seam Tape and/or other fasteners.
 - e. Trowel TegraSeal Mastic to fill voids and to cover penetration.

Integrate the below-slab waterproofing membrane with other structures waterproofing membranes to enclose the entire waterproofing envelope

5. Tie-in under slab to backfilled wall with footings
 - a. Footings- wrap inside the forms for the footing with 10-20 mil HDPE.
 - b. Wrap TripleSeal membrane up the footing above the form to provide for proper tie-in to vertical membrane. Overlap the seams 4" as a shingle. Or, alternatively, use TegraTite Plus under the footing.
6. Tie-in mud slab to lagging walls
 - a. Extend TripleSeal upward on the lagging wall a minimum 6" or above the cold joint from mud slabs to provide for proper overlaps with the vertical membrane.
7. Tie-in under slab to lagging walls with footings or to piling.
 - a. Footings- hang the 20 mil HDPE down the lagging wall and inside the forms for the footings.
 - b. Concrete pilings- Cut 20 mil HDPE tightly around the piling. Pour cant and fill void area around piling with TegraSeal Granular Pack and/or TegraSeal Mastic. Use waterstop on top of piling.
 - c. Wrap the form with TripleSeal membrane, extending up the vertical surface- above the cold joint and up the footing above the form. Overlap the seams 4"

Cover the entire field with TripleSeal membrane

- 8.1 Over subgrade

- a. Install HDPE vapor barrier over stable, smoothed and compacted subgrade up to the footing. Over lap seam 6" and staple down.
 - b. Pour TegraSeal Granular Pack bentonite cant along vertical to horizontal transition.
 - c. Install TripleSeal membrane along the footings extending up the vertical surface.
 - d. Install TripleSeal membrane over the entire field with minimum 3" overlap, stagger sheets; securely fasten seams with staples every 6" on center. Alternative: Install TegraTite Plus over the entire field with minimum 3" overlap, stagger sheets; securely fasten seams with staples every 6" on center or with TegraSeal Seam Tape.
- 8.2 Over Mud slab
- a. Pour TegraSeal Granular Pack bentonite cant along vertical to horizontal transition.
 - b. Install TripleSeal membrane along the footings extending up the vertical surface.
 - c. Install TripleSeal membrane with minimum 3" overlap, stagger end laps; securely fasten seams with nails every 24" O.C. and staple 6" O.C. Alternative: Install TegraTite Plus over the entire field with minimum 3" overlap, stagger sheets; securely fasten seams with nails every 24" O.C. and staple 6" O.C. and seal the joint with TegraSeal Seam Tape.

Complete details.

9. Expansion Joints
 - a. In addition to the expansion joint system (provide by others), use a double layer of TripleSeal (or TegraTite Plus alternative) at mid-floor expansion joints.
Note: TegraSeal Products does not warranty the expansion joints.
10. Complete installation at utility penetrations and floor drain.
 - a. Cut out a circle the diameter of the pipe in the center of a 2' x 2' square of TripleSeal.
 - b. Cover the pipe penetration with the TripleSeal square (if necessary, cut slit in center circle).
 - c. Fill voids with mastic or granular packs
11. Terminations at vertical surfaces with a continuous strip of TegraSeal Termination Bar nailed every 12" O.C.

3.04 INSTALLATION - PROTECTION BOARD, DRAINAGE BOARD, INSULATION (optional)

- A. Place protection board, drainage board, and insulation directly against membrane; butt joints. Scribe and cut boards around projections, penetrations, and interruptions. Fasten as recommended by the manufacturer.

3.05 FIELD QUALITY CONTROL

- A. Monitor finishing layer installation and backfill operations to assure no damage is done to the waterproofing membrane. Alert all parties concerned of any activities which might adversely affect the performance of the waterproofing system.
- B. General Contractor shall advise waterproofing contractor, if a penetration will be made through the applied waterproofing system and take appropriate steps to waterproof such penetration without jeopardizing the warranty at no additional cost to the Owner.

END OF SECTION