Applications:	**Pre-Applied Blindside and Underslab Sheet Membrane Waterproofing and Contaminate Vapor Intrusion Barrier - Hydrostatic and Non-hydrostatic Conditions**
Spec Version:	**EproPreTak.HW.v1.05.20gs**
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Note:	**This specification may be superseded at any time. Check eproinc.com for the most up to date version of this specification.**

SECTION 07 13 24
PRE-APPLIED SHEET WATERPROOFING

PreTak Guide Specification
Underslab & Blindside Waterproofing & Contaminate Vapor Intrusion Barrier
Heat Weld Application

PreTak is a fully adhered, pre-applied HDPE with pressure sensitive adhesive sheet waterproofing and contaminate vapor intrusion barrier membrane intended for underslab and blindside applications in contaminated soil conditions. Concrete adheres to the specially formulated pressure sensitive adhesive forming an integral bond to prevent lateral water migration. Durable, integrally fused, heat welded seams further enhance the waterproofing and vapor mitigation performance of the PreTak system. This guide specification has been prepared according to the principles established in the Manual of Practice published by the Construction Specification Institute.

Separate PreTak guide specifications are also available for the following applications:

Tunnel Lining Waterproofing
Underslab & Blindside Waterproofing

Sections highlighted in red throughout this guide specification are specifier notes intended to provide information about certain optional text or additional information relevant to that section. For additional questions, your local EPRO technical representative can be contacted through: EPRO Services, Inc., Wichita KS; 1.800.882.1896; www.eproinc.com.

PRETAK PRE-APPLIED SHEET MEMBRANE WATERPROOFING SPECIFICATION

SECTION 07 13 24 – PRE-APPLIED SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions, and Division 1 specification section, apply to this section.

1.2 SECTION INCLUDES

A. The Work of this Section includes, but is not limited to, ***PreTak*** pre-applied sheet membrane waterproofing and contaminate vapor barrier membrane that forms an integral bond to concrete for the following construction applications:

1. Underslab: The waterproofing system applied on prepared subbase prior to placement of concrete slabs.

2. Blindside: The waterproofing system applied against a soil retention system prior to placement of concrete walls.

B. Related Sections:

1. Section 02 24 00: Environmental Assessment

2. Section 02 32 00: Geotechnical Investigation

3. Section 03 10 00: Concrete Forming

4. Section 03 15 00: Concrete Accessories

5. Section 03 15 13: Waterstops

6. Section 03 20 00: Concrete Reinforcing

7. Section 03 30 00: Cast-in-Place Concrete

8. Section 03 40 00: Precast Concrete

9. Section 07 90 00: Joint Protection

10. Section 31 30 00: Earthwork Methods

11. Section 31 41 00: Shoring

12. Section 31 60 00: Special Foundations and Load Bearing Elements

13. Section 31 71 23: Tunneling by Cut and Cover

14. Section 33 41 00: Subdrainage

1.3 REFERENCE STANDARDS

A. The following standards and publications are applicable to the extent referenced in the text.

B. American Standard Testing Methods (ASTM):

D 412 Standard Test Methods for Rubber Properties in Tension

D 751 Standard Test Method for Coated Fabrics

D 6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods

D 4068 Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane

D 1434 Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting

D 543 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents

D 1693 Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics

D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds

E 96 Standard Test Methods for Water Vapor Transmission of Materials

E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes

D 71 Standard Test Method for Relative Density of Solid Pitch and Asphalt (Displacement Method)

D 93 Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester

D 1777 Standard Test Method for Thickness of Textile Materials

D 6364 Standard Test Method for Determining Short-Term Compression Behavior of Geosynthetics

D 4716 Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

D 4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

D 6241 Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

D 4751 Standard Test Methods for Determining Apparent Opening Size of a Geotextile

D 4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity

D 4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus

D 1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide a fully-adhered waterproofing and contaminate vapor barrier system that prevents the passage of water under hydrostatic or non-hydrostatic conditions and limits the passage of methane vapor below 40.0 mL (STP) / m2 · day · atm and complies with the physical requirements as demonstrated by testing performed by an independent testing agency.

1.5 SUBMITTALS

A. Product Data: For each type of waterproofing specified submit manufacturer's printed technical data, tested physical and performance properties, instructions for evaluating, preparing, and treating substrates, and installation instructions.

B. Shop Drawings: Project specific drawings showing locations and extent of waterproofing, details for substrate joints and cracks, sheet flashing, penetrations, transitions, and termination conditions.

C. Samples: Submit two standard size samples of the following:

1. Individual components of the specified waterproofing system.

D. Applicator Certification: Submit written confirmation at the time of bid that applicator is currently approved by the membrane manufacturer.

E. Manufacturer's Warranty Requirements: Submit complete documentation of manufacturer's warranty requirements and sample warranty.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: Waterproofing applicator shall be an EPRO Authorized Applicator who is trained and approved for heat weld ***PreTak*** application in accordance with EPRO standards and policies.

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Specifier Note: For projects requiring the manufacturer's special no-dollar-limit labor and material E.Assurance warranty, add the following items B. and C. language to section 1.6 (reference Section 1.9 Warranty):

B. Special Applicator Qualifications: The waterproofing applicator must be E.Assurance Certified at the time of bid.

C. Third Party Inspection: Owner shall make all arrangements and payments for an approved third-party inspection firm participating in the waterproofing manufacturer's Certified Inspection Program to monitor waterproofing material installation compliance with the project contract documents and manufacturer's published literature and site specific details. Inspection reports shall be submitted directly to the waterproofing system manufacturer and made available to other parties per the owners' direction.

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D. Pre-Construction Meeting: A meeting shall be held prior to application of the waterproofing system to assure proper substrate preparation, confirm installation conditions and any additional project specific requirements. Attendees of the meeting shall include, but are not limited to the following:

1. EPRO representative

2. EPRO certified applicator

3. Third party inspector [as required]

4. General contractor

5. Owner’s representative

6. Concrete/Shotcrete contractor

7. Rebar contractor

8. Project design team

9. All appropriate related trades

E. Field Sample: Apply waterproofing system field sample to 100 ft^2 (9.3 m^2) of each assembly to demonstrate proper application techniques and standard of workmanship.

1. Notify waterproofing system manufacturer representative, architect, certified inspector, and other appropriate parties one week in advance of the dates and times when field sample will be prepared.

2. If architect and certified inspector determine that field sample does not meet requirements; reapply membrane system until field sample is approved.

3. Retain and maintain approved field sample during construction in an undisturbed condition as a standard for judging the completed membrane system. An undamaged field sample may become part of the completed work.

F. Materials: Waterproofing system and auxiliary materials shall be single sourced from the waterproofing manufacturer.

1.7 MATERIAL DELIVERY, STORAGE AND DISPOSAL

A. Delivery: Deliver materials to site labeled with manufacturer's name, product brand name, material type, and date of manufacture. Upon the arrival of materials to the jobsite, inspect materials to confirm material has not been damaged during transit.

B. Storage: Proper storage of onsite materials is the responsibility of the certified applicator. Consult product data sheets to confirm storage requirements. Storage area shall be clean, dry, and protected from the elements. Protect stored materials from direct sunlight.

C. Disposal: Remove and replace any material that cannot be properly applied in accordance with local regulations and specification section 01 74 19.

1.8 PROJECT CONDITIONS

A. Substrate Review: Substrates shall be reviewed by the certified applicator and accepted by the certified inspector prior to application. Application without signoff from certified inspector will likely result in voidance of warranty.

B. Penetrations: All plumbing, electrical, mechanical, and structural items to be passing through the waterproofing system shall be properly spaced, positively secured in their proper positions, and appropriately protected prior to system application and throughout the construction phase. Braided grounding rods are not allowed to pass through the membrane in waterproofing applications.

C. Reinforcement Steel: Waterproofing system shall be installed before placement of reinforcing steel. Any anchor bolts, or other methods, of securing reinforcement steel must be in place prior to the application of the waterproofing system. Piano wire, shotcrete wire rods, or similar methodologies, are prohibited from penetrating the system post installation.

D. Weather Limitations: Perform work only when existing and forecast weather conditions are within manufacturer's recommendations.

1. EPRO applicators reserve the right not to install product when application conditions might be within manufactures acceptance, but ambient conditions may limit a successful application.

1.9 WARRANTY

A. General Warranty: The special warranty specified in this section shall not deprive the owner of other rights the owner may have under other provisions of the contract documents, and shall be in addition to, and run concurrent with, other warranties made by the contractor under requirements of the contract documents.

B. Special Warranty: Submit a written warranty signed by waterproofing manufacturer agreeing to replace system materials that do not conform with manufactures published specifications or are deemed to be defective. Warranty does not include failure of waterproofing due to failure of soil substrate prepared and treated according to requirements or formation of new joints and cracks in the specially applied concrete that exceed 1/8 inch (3.175 mm) in width.

1. Warranty Period: 5 years after date of substantial completion. [Longer warranty periods are available upon request.]

2. Coverage: Manufacturer will guarantee that the material provided is free of defect for the warranty period.

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Specifier Note: Additional upgraded warranty options, E.Series L&M and E.Assurance NDL, are available by contacting the manufacturer. These warranties may have additional requirements and approval must be granted in accordance with the manufacturer's warranty requirements.

Insert the following language in 1.9 B for additional Special Warranty options:

3. Labor and Material (E.Series L&M): Manufacturer will provide non-prorated coverage for the warranty term, agreeing to repair or replace material that does not meet requirements or remain watertight.

OR

4. No-Dollar-Limit Labor and Material Warranty (E.Assurance NDL): Manufacturer will provide a non-prorated, no-dollar-limit coverage for the warranty term, agreeing to repair or replace material that does not meet requirements or remain watertight.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: EPRO Services, Inc. (EPRO), P.O. Box 347; Derby, KS 67037; Tel: (800) 882-1896; Email: info@eproinc.com; Web: www.eproinc.com

2.2 MATERIALS

A. Pre-applied fully adhered sheet waterproofing membrane: ***PreTak*** is a 0.046 in. (1.2 mm) thick HDPE membrane with pressure sensitive adhesive. Provide membrane with the following physical properties:

PROPERTIES	TEST METHOD	VALUE
Color		White
Resistance to Hydrostatic Head[1]	ASTM D751	431 ft (131 m)
Elongation	ASTM D412	722%
Tensile Strength, Film	ASTM D412	4742 PSI (32.7 MPa)
Puncture Resistance	ASTM E154	276 lbs (1227 N)
Resistance to Lateral Water Migration[2]	ASTM D5385	Pass at 231 ft (71 m) of hydrostatic head pressure
Peel Adhesion to Concrete[3]	ASTM D903	23 lbs/in. (4028 N/m)
Permeance to Water Vapor Transmission	ASTM E96, method B	0.087 perms (4.97 ng/(Pa x s x m2))
Bonded Seam Strength (Heat Weld)	ASTM D6392	Pass (Break in Sheet)
Dead Load Seam Strength (Heat Weld)[4]	ASTM D751	Pass
Microorganism Resistance (Soil Burial)[4]	ASTM D4068	Pass
Methane Permeability[4]	ASTM D1434	Pass
Oil Resistance[4]	ASTM D543	Pass
Heat Resistance[4]	ASTM D4068	Pass
Environmental Stress Cracking	ASTM D 1693	Pass

Footnotes:

1. The resistance to hydrostatic head test is performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
2. Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the PreTak membrane to hydrostatic head pressure. This test measures the resistance of lateral water migration between the concrete and the PreTak membrane.
3. Concrete is cast against the surface of the PreTak membrane and allowed to cure (7 days minimum).
4. Tested to city of Los Angeles Department of Building and Safety Methane Testing Criteria.

2.3 WATERSTOPS

1. ***e.stop gu*** is a gunnable urethane modified hydrophilic detailing sealant for application around penetrations.

2. ***BentoTak*** is a self-adhesive hydrophilic bentonite waterstop strip for application in non-moving joints and around penetrations with the following physical properties:

PROPERTIES	TEST METHOD	VALUE
Specific Gravity @25C	ASTM D71	1.403
Flash Point	ASTM D93 Pensky-Martens	482 F (250 C)
Hydrostatic Pressure Resistance	ASTM D751 Method A	> 160 ft head, No Flow

B. Adhesive Tapes

1. ***PreTape*** is a single-sided adhesive tape with pressure sensitive adhesive facer for covering cut edges, roll ends, penetrations, and detailing.

2. ***PreTape D*** is a double-sided adhesive tape for adhering end laps and reinforcing side lap seams.

C. Prefabricated Drainage:

1. ***e.drain***: ***e.drain*** features a lightweight three-dimensional, highly flexible high density polyethylene (HDPE) core and a polypropylene geotextile filter fabric. The filter fabric is bonded to the dimples of the HDPE core.

PROPERTIES	TEST METHOD	VALUE
DIMPLED CORE		
Core		HDPE
Core Material Thickness		30 Mil
Color		Brown
Dimple Height	ASTM D1777-96	.31 inches
Compressive Strength	ASTM D6364-06	5,200 lbs./ft²
Flow rate	ASTM D4716	5.1 gal/min/ft
FILTER FABRIC		
Grab Tensile	ASTM D4632-91	130 lbs
CBR Puncture Resistance	ASTM D6241	40 lbs
Apparent Operating Size	ASTM D4751-99	70 sieve size (.0212 mm)
Water Flow Rate	ASTM D4491-99	55 gpm/ ft²
UV Resistance	ASTM D4355-92	70% (500 hrs)
Dimensions: 6' x 65.7', 8' x 65.7'		
Weight: 6' rolls = 60 lbs., 8' rolls = 73 lbs.		

2. ***e.drain 6000***: ***e.drain 6000*** features a lightweight three-dimensional, high-compressive strength polypropylene core and bonded non-woven geotextile fabric. The bonded filter fabric allows water to pass freely into the molded drain while preventing soil particles from entering and clogging the core structure.

PROPERTIES	TEST METHOD	VALUE
DIMPLED CORE		
Core Material		Polypropylene
Color		Black
Dimple Height	ASTM D 1777	0.4" (10.16 mm)
Compressive Strength	ASTM D 6364	16,500 psf (790 kN/m²)
Flow rate	ASTM D 4716	21 gal/min/ft
FILTER FABRIC		
Grab Tensile	ASTM D 4632	100 lbs
CBR Puncture resistance	ASTM D6241	250 lbs
Apparent Operating Size	ASTM D 4751	70 sieve size (.0212 mm)
Water Flow Rate	ASTM D 4491	140 gpm/ft² (5704 l/min/m²)
UV Resistance	ASTM D 4355	70% (500 hrs)
Dimensions: 6' x 5'		
Weight: 63 pounds		

3. ***e.drain 12ds***: ***e.drain 12ds*** features a lightweight three-dimensional, highly flexible polypropylene core and a non-woven geotextile filter fabric. The filter fabric is bonded to the dimples of the polypropylene core to prevent clogging within the drain.

PROPERTIES	TEST METHOD	VALUE
DIMPLED CORE		
Core Material		Polypropylene

Color		Black
Compressive strength	ASTM D1621	9,500 PSF (455 kN/m^2)
Thickness	ASTM D1777	1 Inch
Flow rate	ASTM D4716	30 gpm/ft of width
FILTER FABRIC		
CBR puncture	ASTM D6241	250 lbs
Grab tensile strength	ASTM D4632	100 lbs
AOS	ASTM D4751	70 U.S. sieve
Permittivity	ASTM D4491	2.0 sec^{-1}
Flow rate	ASTM D4491	140 gpm/ft^2
UV resistance	ASTM D4355	70% (500 hrs)
Dimensions: 165' x 12″ x 1″		
Weight: 65 pounds		

2.4 AUXILIARY MATERIALS

A. General: All auxiliary materials shall be provided by the specified waterproofing manufacturer. Auxiliary materials used in lieu of, or in addition to, the manufacturer's materials must be approved in writing by EPRO prior to installation.

1. Detailing Material: ***PM Sealant***, a single component, STPE, 100% solid moisture-cured, elastomeric sealant and ***XT1*** urethane modified asphalt coating.

2. Backer Rod: Closed cell polyethylene foam

3. Fastener: ***e.fastener*** or approved alternate.

4. Shot Pins: Minimum 1-inch (25 mm) galvanized steel pins with ¾ inch (19 mm) aluminum washer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with project documents, manufacturer's product information, including product application and installation guidelines, pre-job punch list, as well as, manufacturer's shipping and storage recommendations.

3.2 SUBSTRATE PREPARATION

A. The general contractor shall engage the certified waterproofing contractor and certified inspector to ensure surfaces are prepared in accordance with manufacturer's instructions. Unless, explicitly stated in the contract documents, the waterproofing contractor is not responsible for surface preparation.

B. It is essential to create a sound and solid substrate to eliminate movement during the concrete placement.

C. Examine all substrates, areas, and conditions under which the membrane system will be installed, applicator and inspector must be present. Do not proceed with installation until unsatisfactory conditions have been corrected and surface preparation requirements have been met. If conditions exist that are not addressed in this section notify inspector and contact EPRO for additional clarification.

3.2.2 BLINDSIDE SUBSTRATE PREPARATION:

1. Wood Lagging: Wood lagging shoring should extend to the lowest level of the waterproofing installation with any voids or cavities exterior of the lagging timbers filled with compacted soil or cementitious grout. Interior surface of lagging boards should be planar, with no greater than 1-inch (25 mm) variance in a 12-inch plane (300 mm) and fit tight together with gaps less than 2 inches (50 mm). Gaps in excess of 2 inches (50 mm) should be filled with cementitious grout, compacted soil, wood, extruded polystyrene (20 psi min.) or EPRO approved polyurethane spray foam. Plywood or other surface treatment may be used over large lagging gaps up to 6 inches (150 mm), if soil conditions permit. All lagging board nails and other mechanical projections shall be removed or flattened. Install a protection material over all soldier piles with raised lagging hanger bolts, form tie rods, or other irregular surface; protection material should extend a minimum 6 inches (150 mm) to both sides of the steel piling. ***e.drain*** and ***e.drain 12ds*** base drain system should be connected to an operative water discharge system.

2. Shotcrete, Secant Pile, Rock Face, or Caisson Shoring Walls: Interior surface of retention walls should be planar without irregular surface conditions and a light trowel finish. Voids and sharp transitions that leave a void space to the outside of the drainage and waterproofing installation need to be filled to create a uniform and planer surface. Irregular rock and concrete, void pockets greater than 3/4 inch (19 mm), cracks, sharp concave transitions should be completely filled or smoothed with cementitious grout, shotcrete, or other solid material approved by EPRO.

3. Sheet Piles: Minimum ½ inch (13 mm) plywood must be butt jointed to form a uniform substrate that spans deviations created by the piles. Voids between the plywood and shoring shall be filled with high strength grout or other suitable material.

4. Negative Side Internal Bracing: Internal shoring bracing, such as rakers, should be uniform and circular when interfacing with the shoring wall. Irregular bracing, such as soldier piles, creates problematic detailing and is not an approved material at the wall interface.

3.2.3 UNDERSLAB SUBSTRATE PREPARATION:

1. Soil Substrates: Native soil and sand substrates shall be uniformly compacted to meet structural and building code requirements. All surfaces shall be free from protrusions and debris that may compromise the membrane system. Free standing water must be removed prior to application.

2. Aggregate Substrates: Aggregate substrates shall be compacted to meet structural and building code requirements and then rolled flat to provide a uniform substrate. 3/4 inch (19 mm) minus aggregate with no more than one fractured face is recommended, but other aggregate substrates may be approved by the manufacturer provided they do not create sharp angular protrusions that may compromise the waterproofing system.

3. Working Slab: Mud slab, rat slab, or other concrete working slab shall have a uniform plane with a light broom or light trowel finish.

3.3 BLINDSIDE INSTALLATION

A. General: The waterproofing membrane system shall be installed under strict accordance with the manufacturer's guidelines and project specifications.

B. Sequencing: The first lift of the waterproofing system shall be installed prior to the placement of any concrete at the perimeter of the excavation and prior to any transition from the underslab system to vertical system. This initial drainage and underslab barrier shall extend a minimum of 4 feet (1.2 m) past the first lift of rebar.

3.3.2 BLINDSIDE INSTALLATION - DRAINBOARD

Note to specifier: Omit this section for projects in constant hydrostatic conditions.

A. Prefabricated strip drain installation:

1. Install ***e.drain 12ds*** horizontally against the shoring wall at specified elevation above the design water table. Allow for positive drainage flow into water discharge system. Attach to shoring using mechanical fasteners with washers.

B. Prefabricated drainage mat installation:

1. Drainage Orientation: Install drainage panels either horizontally or vertically with the geotextile fabric facing the soil retention system.

2. Horizontal Installation: Install ***e.drain*** horizontally along the bottom of the excavation and secure using ***e.fasteners***. Install the next lift of drainage and overlap the next layer of drainage a minimum of 6 inches (150 mm). A shingling effect should be created by making certain the new drainage layer is placed inside the previously installed drainage layer at the overlap.

3. Vertical Installation: Install ***e.drain*** vertically from the top of the excavation and secure using ***e.fasteners***. Install vertically in one direction and overlap the vertical seam a minimum of 6 inches (150 mm). A shingling effect should be created by making certain the new drainage layer is placed inside the previously installed drainage layer at the overlap.

4. Back Lagged Condition: Install ***e.drain*** vertically and overlap onto the soldier pile a minimum of 6 inches (150 mm).

5. Fasten Pattern: Using ***e.fasteners*** secure seam overlaps 12 inches (300 mm) on center. Fasten the field of drain mat using an alternating pattern every 3 feet (1 m). The pattern shall be one fastener every 6 feet (2 m) on center, and two evenly spaced fasteners every 3 feet (1 m).

6. Place anchors or tie backs through the drainage mat by slitting vertically and sliding over the anchor as snug as possible.

3.05 FIELD SEAMS

A. Strictly comply with installation guidelines in manufacturer's published literature, including but not limited to, the following:

1. To the maximum extent possible, orient seams parallel to line of slope (i.e. down, and not across slope).

2. Minimize number of field seams in corners, odd-shaped geometric locations, and outside corners.

3. Align seam overlaps consistent with requirements of welding equipment being used, minimum 4 inches (100mm).

4. Provide at least one Master Seamer with demonstrated minimum of 500,000 square feet of installed experience who shall provide direct supervision over other welders, as necessary.

B. Extrusion Welding

1. Hot air tack adjacent pieces together using procedures that do not damage the membrane.

2. Clean membrane surface by disc grinder or equivalent.

3. Purge welding apparatus of heat-degraded extrudate before welding.

C. Hot-Wedge Welding

1. Welding apparatus shall be self-propelled device equipped with electronic controller that displays applicable temperatures.

2. Clean seam area of dust, mud, moisture, and debris immediately ahead of hot wedge welder.

3. Protect against moisture build-up between sheets

D. Penetrations

1. Provide all necessary details and materials to properly seal any penetrations to the ***PreTak*** membrane (i.e. boots, gaskets and clamps).

2. Install in accordance with manufacturer's recommendations

E. Trial Welds

1. Perform trial welds on ***PreTak*** membrane samples to verify welding equipment is operating properly.

2. Make trial welds under same surface and environmental conditions as production welds, i.e., in contact with subgrade and similar ambient temperature.

3. Minimum of two trial welds per day, per welding apparatus, one made prior to start of work and one completed at mid shift

4. Cut four 1-inch (25 mm) wide by 6-inch (150 mm) long test strips from the trial weld.

5. Quantitatively test specimens for peel adhesion, and then for shear strength.

6. Trial weld specimens shall pass when the results are achieved in both peel and shear test with the following results:

   a. Peel strength (fusion): 98 pounds per inch, ASTM D 6392.

   b. Peel Strength (extrusion): 78 pounds per inch, ASTM D 6392.

   c. Shear Strength: 121 pounds per inch, ASTM D 6392.

   d. The break when peel testing occurs in the liner material itself, not through peel separation.

   e. The break is ductile.

7. Repeat the trial weld, in its entirely, when any of trial weld samples fail in either peel or shear.

8. No welding equipment or welder shall be allowed to perform production welds until equipment and welders have successfully completed trial weld.

9. Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize integrity of installation. Contractor shall demonstrate that completing acceptable trial welds can perform acceptable seaming.

10. Field seams shall be tested using appropriate test standards and manufacturer's recommended and approved methods. The testing of the field seams shall be the responsibility of the Contractor and should meet the QC criteria recommended by the manufacturer. The methods applied for testing field seams or wells shall include non-destructive testing, destructive testing, field vacuum testing, laboratory testing, etc., and other recommended and applicable tests.

11. Upon completed tests on any exposed seams, install a continuous layer of 4.75 inch (120mm) wide ***PreTak*** Tape over tested area.

3.3.3 BLINDSIDE INSTALLATION – PRETAK

A. Strictly comply with installation guidelines in manufacturer's published literature, including but not limited to, the following:

1. Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the clear plastic release liner facing towards the concrete pour.

2. Fasten through the selvedge using a small and low-profile head fastener so that the membrane lays flat and allows firmly rolled overlaps.

3. Immediately remove the plastic release liner.

4. When multiple pours occur, extend the membrane a minimum of 2 feet (600 mm) past the pour joint. In order to ensure a proper tie-in, mask off the 2-foot (600 mm) section past the pour joint and protect it from damage.

5. Ensure the underside of the succeeding sheet is clean, dry, and free from contamination before attempting to overlap.

6. Overlap all roll ends and cut edges by a minimum 3 inches (75 mm) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary.

7. Heat weld seams utilizing appropriate heat weld methods and equipment as directed in manufacturer's heat weld guidelines.

8. Allow to dry and apply ***PreTape*** centered over heat weld lap edges and roll firmly.

9. Immediately remove plastic release liner from the tape.

10. Tie-Back Heads: For all tie-back heads and soil nails, install waterproofing system with appropriately sized tie-back box covers or pre-formed covers in accordance with contract documents and approved shop drawings based on manufacturer's detail for specific project conditions.

11. Penetrations: For all pipe, rebar, structural and other penetrations install waterproofing system in accordance with contract documents and approved shop drawings based on manufacturer's detail for specific project conditions.

12. Transition to Underslab Waterproofing: When transitioning the shoring waterproofing system horizontally to an Underslab waterproofing system, the first layer of drainage shall be installed prior to the placement of any concrete at the perimeter of the excavation, and prior to the placement of any other system materials. The first lift of the membrane system shall extend a minimum of 4 feet (1.2 m) past the first lift of rebar.

3.4 UNDERSLAB INSTALLATION - PRETAK

A. Strictly comply with installation guidelines in manufacturer's published literature, including but not limited to, the following:

1. Roll the membrane out onto the substrate HDPE film side facing up towards the concrete pour. Stagger end laps to prevent a continuous end seam throughout adjacent sheets. Seam seams as depicted in project drawings.

2. Accurately position succeeding sheets to overlap the previous sheet 3 inches (75 mm) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry, and free from contamination before attempting to overlap.

3. Whenever possible roll out the membrane in the same direction over the substrate. When multiple pours will occur, extend the membrane a minimum of 2 feet (600 mm) past the pour joint. In order to ensure a proper tie-in, mask off the 2-foot (600 mm) section past the pour joint and protect it from damage.

4. Completely remove the plastic liner.

5. Heat weld seams utilizing appropriate heat weld methods and equipment as directed in manufacturer's heat weld guidelines.

6. Allow to dry and apply ***PreTape*** centered over heat weld lap edges and roll firmly.

7. Penetrations: For all pipe, rebar, structural and other penetrations install waterproofing system in accordance with contract documents and approved shop drawings based on manufacturer's detail for specific project conditions.

8. Transition to Vertical Walls: When transitioning the horizontal underslab system vertically to a blindside shoring wall, the first layer of drainage shall be installed prior to the placement of any concrete at the perimeter of the excavation, and prior to the placement of any other system materials. The first lift of the membrane system shall extend a minimum of 4 feet (1.2 m) past the first lift of rebar.

3.5 WATERSTOP INSTALLATION

A. Strictly comply with installation guidelines in manufacturer's published literature, including but not limited to, the following:

1. Apply ***BentoTak*** at all cold joints, construction joints, steel penetrations, and steel beams.

2. Properly prepare surface to ensure complete contact to substrate, remove all debris that may prevent the adhesive bond. Wire brush steel surfaces to remove rust and remove any contaminates that would prevent ***BentoTak*** from adhering to surface. Do not install in ponding water if concrete pour is greater than 7 days from installation.

3. Apply continuous strip of ***BentoTak*** no less than 1.25 inch (32 mm) from outside concrete face securely butting ends of strip together without overlap.

4. Apply a continuous bead of ***e.stop gu*** around the circumference of all PVC penetrations, detail areas or to irregular concrete substrates.

5. Inspect for damage just prior to concrete pour and repair as needed.

3.6 FIELD QUALITY CONTROL

A. Contractor shall engage manufacturer's qualified Inspector full-time during the Work to perform tests and inspections, including documenting of waterproofing prior to concealment.

B. Continuous non-destructive testing of all membrane seams in accordance with:

1. Vacuum Test: In accordance with ASTM D 5641, ***PreTak*** membrane Seam Evaluation by Vacuum Chamber

2. Air Pressure Testing: in accordance with ASTM D 5820, Pressurized Air Channel Evaluation of Dual Seamed ***PreTak*** membranes

3. Copper Spark Test: In accordance with ASTM D6365, Testing Extrusion Weld Seams with embedded copper wire

4. Smoke Test (horizontal application): Conduct smoke test on all under slab areas upon installation of the waterproofing system and sealing all penetrations. All deficient areas shall be noted and marked for repair, then the necessary repairs shall be made. Refer to manufactures smoke testing protocol for additional guidance.

C. Provide written report of tests and inspections.

D. Testing Agency (3rd Party Consultant): [Owner will][General Contractor shall] engage a qualified testing agency to inspect substrate conditions, surface preparation, waterproofing application, protection, and drainage components, and to furnish reports to Architect and warranting Manufacturer. Testing Agency shall inspect membrane prior to concrete placement to verify that other trades have not damaged, penetrated the installed membrane. Testing will include but not be limited to the following:

1. Vacuum Test: In accordance with ASTM D 5641, ***PreTak*** membrane Seam Evaluation by Vacuum Chamber.

2. Air Pressure Testing: in accordance with ASTM D 5820, Pressurized Air Channel Evaluation of Dual Seamed ***PreTak*** membranes.

3. Copper Spark Test: In accordance with ASTM D 6365, Testing Extrusion Weld Seams with embedded copper wire

4. Smoke Test (horizontal application): Conduct smoke test on all under slab areas upon installation of the waterproofing system and sealing all penetrations. All deficient areas shall be noted and marked for repair, then the necessary repairs shall be made. Refer to manufactures smoke testing protocol for additional guidance.

E. Coordination of Testing: Cooperate with testing agency. Allow access to work areas and staging. Notify testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection.

F. Do not cover Work until testing and inspection is completed and accepted

G. Contractor shall provide Consultant with all seam samples undergoing testing for trail and destructive testing. Consultant will archive the submitted seam samples for potential destructive testing

H. At minimum, one archived seam sample will be tested by Consultant every 4,500 lineal feet of seam length for peel adhesion and bonded seam strength.

I. Seam strength test results will be evaluated by same criteria specified for Quality Control testing.

J. If deemed necessary by the Consultant, additional seam samples may be tested to verify the GC testing performed by the Contractor.

K. As soon as Consultant GC test data is available, the Contractor will be verbally notified of the test results and Contractor, if necessary, will employ appropriate remedial measures.

L. Reporting: Forward written inspection reports to the Architect within 10 working days of the inspection and test being performed.

M. Correction: Correct deficient applications not passing tests and inspections, make necessary repairs, and retest as required to demonstrate compliance with requirements.

3.7 PROTECTION AND CLEANING

A. Strictly comply with installation guidelines in manufacturer's published literature, including but not limited to, the following:

1. Protect waterproofing system in accordance with manufacturer's recommendations until placement of concrete.

2. Do not allow heavy equipment or machinery on top of unprotected waterproofing system.

3. Inspect for damage just prior to placement of concrete and make repairs in accordance with manufacturer's written guidelines and recommendations.

4. Clean all dirt and debris from the surface of the waterproofing system just prior to concrete pour. Do not use any solvent based cleaning agents. Broom, blower or low-pressure power wash cleaning methods are acceptable. Any adhered debris must be inspected and removed at the direction of a manufacturer's representative.

5. Take care in the placement of concrete. Do not damage with consolidating equipment.

6. Repair areas as needed following manufacturer's written guidelines.

7. Do not leave waterproofing system exposed for longer than 60 days prior to concrete pour.

3.8 DEFECTS AND REPAIRS

A. Examine all seams and non-seam areas of the ***PreTak*** membrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter.

B. Repair and non-destructively test each suspect location in both seam and non-seam areas. Do not cover ***PreTak*** membrane at locations that have been repaired until test results with passing values are available.

C. Remove damaged ***PreTak*** membrane and replace with acceptable ***PreTak*** membrane materials if damage cannot be satisfactorily repaired.

D. Repair any portion of unsatisfactory ***PreTak*** membrane or seam area failing destructive or non-destructive test.

E. Contractor shall be responsible for repair of defective areas.

F. Agreement upon appropriate repair method shall be decided between Manufacturer and Contractor by using one of the following repair methods:

1. Patching – Used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter.

2. Abrading and Re-welding used to repair short section of seam.

3. Spot Welding – Used to repair pinholes or other minor, localized flaws or where ***PreTak*** membrane thickness has been reduced.

4. Capping – Used to repair long lengths of failed seams.

5. Flap Welding – Used to extrusion weld the flap (excess outer portion) of fusion weld in lieu of full cap.

G. Remove unacceptable seam and replace with new material.

H. The following procedures shall be observed when repair method is used:

1. ***PreTak*** membrane surfaces shall be clean and dry at time of repair.

2. Surfaces of polyethylene that are to be repaired by extrusion welds shall be lightly abraded to ensure cleanliness.

3. Extend patches or caps at least 6 inches (150 mm) for extrusion welds and 4-inches (100 mm) for wedge welds beyond edge of defect, and around all corners of patch material.

I. Repair Verification

1. Number and log each patch repair.

2. Non-destructively test each repair using methods specified in this specification.

End of Section