

E.PROTECT+ UNDERSLAB FOR COMPOSITE MEMBRANE SYSTEM FOR HYDROSTATIC WATERPROOFING AND VAPOR INTRUSION MITIGATION

SECTION 02 56 16 – GAS CONTAINMENT

SECTION 02 56 19.13 – FLUID-APPLIED GAS BARRIER

SECTION 07 13 54 – THERMOPLASTIC SHEET WATERPROOFING

SECTION 07 14 16 – COLD FLUID-APPLIED WATERPROOFING

SECTION 07 17 16 – BENTONITE COMPOSITE 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 installation of materials designed to provide below grade waterproofing and vapor intrusion protection when installed per project specification, this section covers the waterproofing and vapor intrusion membrane, along with the following:
- B. Surface preparation and substrate treatment.
- C. Auxiliary materials.
- D. Prefabricated drainage composite.
- E. Foundation drain.

1.3 RELATED SECTIONS

- A. Section 02 24 00: Environmental Assessment
- B. Section 02 32 00: Geotechnical Investigation
- C. Section 03 15 00: Concrete Accessories
- D. Section 03 30 00: Cast-in-Place Concrete
- E. Section 03 40 00: Precast Concrete
- F. Section 07 90 00: Joint Protection
- G. Section 31 30 00: Earthwork Methods
- H. Section 33 41 00: Subdrainage

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide a composite membrane system that prevents the passage of water under hydrostatic conditions, methane gas, contaminant vapor, 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 published 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, manufacturer's typical details for substrate joints and crack treatment, sheet flashing, penetrations, transitions, and termination conditions.
- C. Samples: Submit two standard size samples of each of the following:
 - 1. Individual components of the specified composite membrane system.
- D. Applicator Certification: Submit written confirmation at the time of bid that applicator is currently approved by the composite membrane system manufacturer.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: Waterproofing applicator shall be an EPRO Authorized Applicator who is trained and performs work that in accordance with EPRO standards and policies. For project requiring a no-dollar-limit labor and material warranty, the waterproofing applicator must be E.Assurance Certified at the time of bid.
- B. Third Party Inspection: Independent inspection of the composite system installation may be required based on project conditions and desired warranty coverage. Inspection reports shall be submitted directly to the composite waterproofing manufacturer and made available to other parties per the owners' direction. For projects requiring a no-dollar-limit labor and material warranty, an independent inspector must be E.Assurance Certified and comply with the documentation requirements.
- C. Water Sample: A 2-liter representative ground water sample shall be sent by the installation contractor to the manufacturer, if contaminated groundwater and/or salt water is believed to be present on the site. Email Watersample@eproinc.com to receive shipping instructions.
- D. Pre-Construction Meeting: A meeting shall be held prior to application of the composite 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. EPRO certified third party inspector
 - 4. General contractor
 - 5. Owner representative
 - 6. Concrete/Shotcrete contractor
 - 7. Rebar contractor
 - 8. Project design team
 - 9. All appropriate related trades, i.e. plumbing, electrical, and mechanical contractors.

- E. Field Sample: Apply each assembly of the composite membrane system field sample to 100 ft² (9.3 m²) to demonstrate proper application techniques and establish a standard of workmanship that meets the project and manufacturer's requirements.
1. Notify composite membrane 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 composite 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 composite membrane system. An undamaged field sample may become part of the completed work.
- F. Materials: Composite membrane system and auxiliary materials shall be single sourced.

1.7 MATERIAL DELIVERY, STORAGE AND DISPOSAL

- A. Delivery: Deliver materials to site labeled with manufacturer's name, product brand name, material type, and production number. 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. If ambient air temperatures are expected to fall below 40°F, precautions will need to be taken to protect any polymer modified asphalt product from near freezing temperatures. Protect stored materials from direct sunlight.
- C. Disposal: Remove and replace any material that cannot be properly applied in accordance with local regulations and the general conditions found in specification section 01 74 00.

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 composite membrane 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: Composite membrane 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 polymer modified asphalt. Piano wire, shotcrete wire rods, or similar methodologies, are prohibited from penetrating the system post installation.
- D. Clearance: Minimum clearance of 24 inches is required for application of spray applied polymer modified asphalt membrane, **e.spray**. For areas with less than 24-inch clearance, the **e.spray** membrane may be applied by hand using **e.roll**.
- E. Overspray: Protect all adjacent areas not receiving **e.spray** or **e.roll**. Masking is necessary to prevent unwanted overspray from adhering to, or staining, areas not receiving the membrane. Once **e.spray** or **e.roll** adheres to a surface it is extremely difficult to remove.

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

1. Spray Applied Polymer Modified Asphalt Membrane: Minimum ambient temperature must be 40°F (7°C) and rising. For applications temperatures below 38 degrees, but greater than +19°F/-7°C, special equipment and material handling is needed. Substrate shall be clean and free from standing moisture.
2. 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.
3. Heat Welding: Do not weld seams during rain or periods of moisture. Sheet membranes shall be clean, and free from moisture when welding.
4. Bentonite: Application of bentonite materials to damp surfaces is acceptable provided it is being installed over **e.spray**.

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 defects for the warranty period.
- C. Additional Warranty Options: Upgraded warranties are available by contacting the manufacturer. These warranties may have additional requirements and approval must be granted in accordance to the manufacturer's warranty requirements. Additional warranty options include:
1. Standard 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.
 2. 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.

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

- B. Underslab: E.Protect+ Underslab (196 mils) – **e.base 316**, **e.spray** (100 mils), **e.shield 205b**

2.2 SYSTEM PHYSICAL PROPERTIES

- A. The physical properties listed in this section reflect testing on the entire composite system. Physical properties of the individual system composite can be found in Specification Section 2.3.

1. **E.Protect+ Underslab** maximizes redundancy by combining the benefits of **e.base 316** (16 mil HDPE thermoplastic membrane with heat welded seams), a 100 mil layer of **e.spray** (polymer modified asphaltic membrane), and **e.shield 205b** (HDPE reinforced bentonite sheet). In hydrostatic conditions this system will provide protection against ingress from water, methane gas, and chemical vapor intrusion.

PROPERTIES	TEST METHOD	VALUE
Tensile Strength	ASTM D412	522.7 psi
Elongation	ASTM D412	911%
Adhesion to Concrete	ASTM D903	8 lbf/in
Puncture Resistance	ASTM D1709	319.6 lbf
Hydrostatic Head Resistance	ASTM D5385	100 psi (231 ft)
Water Vapor Transmission	ASTM E96	.007 perms
PCE Diffusion Rate		$4.3 \times 10^{-18} \text{ m}^2/\text{sec}$
TCE Diffusion Rate		$3.4 \times 10^{-18} \text{ m}^2/\text{sec}$

2.3 WATERPROOFING MATERIALS

- A. Polymer Modified Asphalt

1. **e.spray**: **e.spray** is a non-hazardous, low-viscosity, water-based, anionic asphalt emulsion modified with a blend of synthetic polymerized rubbers and proprietary additives. **e.spray** is highly stable during transit and proper storage, but becomes highly reactive during the spray application to form a rapidly cured membrane with exceptional bonding, elongation, and hydrophobic characteristics.

PROPERTIES	TEST METHOD	VALUE
Color		Brown to Black
Solvent Content		No Solvents
Shelf Life		6 Months
Tensile Strength	ASTM D412	32 psi
Elongation	ASTM D412	4140%
Resistance to Decay	ASTM E154 Section 13	4% Perm Loss
Accelerated Aging	ASTM G23	No Effect
Moisture Vapor Transmission	ASTM E96	0.026 g/ft ² /hr
Hydrostatic Water Pressure	ASTM D751	26 psi
Perm Rating	ASTM E96	0.21 perms
Methane Transmission Rate	ASTM D1434	0
Adhesion to Concrete & Masonry	ASTM C836 & C704	20 lbf/inch
Adhesion to HDPE	ASTM C836	28.363 lbf/inch
Adhesion to Polypropylene Fabric	ASTM C836	31.19 lbf/inch
Hardness	ASTM C836	80
Crack Bridging	ASTM C836-00	No Cracking
Low Temp. Flexibility		No Cracking at -20° C
Packaging: 55 gallon drum, 275 gallon tote, 330 gallon tote		

2. **e.roll: e.roll** is a medium viscosity water-based, polymer-modified anionic asphalt emulsion, which exhibits exceptional bonding, elongation and waterproofing characteristics.

PROPERTIES	TEST METHOD	VALUE
Color		Brown to Black
Solvent Content		No Solvents
Shelf Life		6 Months
Tensile Strength	ASTM D412	32 psi
Elongation	ASTM D412	3860%
Resistance to Decay	ASTM E154 SECTION 13	9% Perm Loss
Accelerated Aging	ASTM G23	No Effect
Moisture Vapor Transmission	ASTM E96	0.071 g/ft ² /hr
Hydrostatic Water Pressure	ASTM D751	28 psi
Perm Rating	ASTM E96	0.17 perms
Methane Transmission Rate	ASTM D14334	0
Adhesion to Concrete & Masonry	ASTM C836	1 lbf/inch
Hardness	ASTM C836	85
Crack Bridging	ASTM C836	No Cracking
Low Temp. Flexibility	ASTM C836-00	No Cracking at -20° C
Packaging: 5 gallon bucket		

B. Thermoplastic Membrane

1. **e.base 316: e.base 316** is a 16 mil geomembrane comprised of high density polyethylene (HDPE). While **e.base 316** is always installed as a component of EPRO's E.Series assemblies, it alone exceeds all Class A, B, and C vapor barrier requirements.

PROPERTIES	TEST METHOD	VALUE
Material		HDPE
Color		Green
Thickness		16 mil
Classification	ATSM E1745	Exceeds Class A, B & C
Water Vapor Permeance	ATSM E96	.029 perms
Tensile Strength	ATSM E154 (ATSM D882)	63 lbf/in
Puncture Resistance	ATSM D1709 Method B	2,750 grams
Life Expectancy	ATSM E154	Indefinite
Chemical Resistance	ATSM E154	Unaffected
Dimensions: 12' x 150'		
Weight: 137 pounds		

C. Geocomposite Bentonite Membrane

1. **e.shield 205b: e.shield 205b** is a redundant geocomposite bentonite membrane comprised of three distinct layers, a nonwoven polypropylene geotextile, an HDPE film, and then a chemically bonded layer of sodium montmorillonite bentonite.

PROPERTIES	TEST METHOD	VALUE
Film Material		HDPE

Film Color		Gray
Fabric Material		Non-woven Polypropylene
Fabric Color		White
Bentonite		Sodium Montmorillonite (>90%)
Tensile Strength: Membrane (psi)	ATSM D882	6,100 psi (42 MPa)
% Elongation at break	ATSM D882	100%
Overall Weight		0.6 lb per ft ² (2.44 kg/m ²)
Resistance	ATSM D751 Procedure A	174 ft. (52.9 m) of water
Crack Bridging		1.8" (.032 cm) crack
Water Vapor Permeability	ATSM E96	0.53 x 10 ⁻³ cm/sec
Dimensions: 4' x 32'		
Weight: 75 pounds		

2.4 AUXILIARY MATERIALS

- A. General: All accessory products shall be provided by the specified waterproofing manufacturer. Auxiliary products used in lieu of, or in addition to, the manufacturer's products must be approved in writing by EPRO prior to installation.
- B. Reinforcement Fabric: Manufacturer's polyester fabric, **e.poly** is available in 6 inch, 12 inch, and 40 inch widths.
- C. Detailing Material: **e.roll**, a roller applied water based high viscosity polymer modified asphaltic material OR **e.trowel**, a trowel applied water based high viscosity polymer modified asphaltic material.
- D. Backer Rod: Closed cell polyethylene foam
- E. Water Stop: Water Stop: A double row **e.stop b** shall be placed at all cold joints, construction joints, penetrations, and steel beams in back lagged conditions. Water stop is not required at lift joints. A single row of **e.stop b** is acceptable at elevations above the design water table.
- F. Vertical Membrane Fastener: **e.hanger** with ¼ inch washer
- G. Termination Bar: **e.term hd**, or approved alternate
- H. Shot Pins: Minimum 1-inch galvanized steel pins with ¼ inch 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.

3.1.2 SURFACE 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. Examine all substrates, areas, and conditions under which the composite membrane system will be installed, applicator and inspector must be present. Do not proceed with installation until unsatisfactory conditions have been corrected and a surface prep requirements have been met. If conditions exist that are not addressed in this section notify inspector and contact EPRO for additional clarification.
- C. 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.
- D. Aggregate Substrates: Aggregate substrates shall be compacted to meet structural and building code requirements and then rolled flat to provide a uniform substrate. $\frac{3}{4}$ inch minus aggregate with no more than one fractured face is recommended. Other aggregates substrates may be approved by the manufacturer provided they do not create sharp angular protrusions that may compromise the composite membrane system.
- E. Working Slab: Mud slab, rat slab, or other concrete working slab shall have a uniform plane with a light broom or light trowel finish.

3.2 UNDERSLAB MEMBRANE INSTALLATION– E.PROTECT+ UNDERSLAB

- A. General: The underslab composite membrane system shall be installed under strict accordance with the manufactures guideline and project specifications. The underslab system shall transition to, and overlap the vertical waterproofing membrane as specified.
- B. Termination: The underslab system shall terminate a minimum of 2 feet past the top of the slab, or 2 feet past the design water table, whichever is the higher elevation. Coordination between the applicator, inspector, general contractor and concrete contractor is crucial and necessary to ensure proper installation of the termination detail.
- C. 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 composite membrane system shall extend a minimum of 4 feet past the first lift of rebar.

3.2.1 THERMOPLASTIC BASE COURSE

- A. Whenever possible roll out **e.base 316** base layer in the same direction over the substrate. When multiple pours will occur, extend **e.base 316** a minimum of 2 feet past the pour joint. In order to ensure a proper tie-in, mask off the 2 foot section past the pour joint and protect it from damage.
- B. Overlap **e.base 316** a minimum of 6 inches.
- C. Using a hand held hot air welder similar to Leister Technologies GHIBLI-AW or an automated welder similar to Leister Technologies VARIMAT V2, calibrate equipment welder settings to create a continuous uniform weld free from fish mouths or deficiencies.
- D. Confirm seam overlaps are clean and dry prior to utilizing properly calibrated welding equipment to create a minimum 1 $\frac{1}{2}$ inch welded seam.

- E. Wait for seam to cool and probe prior to smoke testing.
- F. NOTE: In windy conditions secure the **e.base 316** base course a long edges of application area using 6-inch nail with a 2 ½ inch diameter washer. If nails are used to secure the base course, a 6-inch square patch of **e.base 316** shall be centered over the nail head and then hot air welded to create watertight seal.

3.2.2 SEALING OF PENETRATIONS

- A. Sealing of Standard Penetrations: Prepare penetrations so they are free of any material that will inhibit a direct bond to the penetration surface.
 1. Trim the **e.base 316** field base sheet to within 1/8 inch of the penetration.
 2. Cut target piece of **e.base 316** so that it extends a minimum of 6" from the base of the penetration.
 3. On the target piece create two offsetting "x" to the inside diameter of the pipe to create a total of 8 triangular flanges.
 4. Slide target piece over the penetration with the triangular flanges facing up.
 5. Heat weld the **e.base 316** target piece to the underlying **e.base 316** field base sheet.
 6. Apply **e.roll** between the triangular flanges and the penetration.
 7. Place a nylon cable tie around the penetration and firmly tighten around the penetration to reinforce the bond between the **e.roll**, the triangular tabs, and penetration.
 8. Tightly wrap the penetration by pressing **e.stop b** firmly around the base of the penetration.
 9. Apply **e.roll** 3 inches horizontally and 3 inches vertically around the base of the penetration, encapsulating **e.stop b**.
 10. Embed reinforcement fabric 3 inches horizontally and 3 inches vertically around the base of the penetration.
 11. Apply a second layer of **e.roll** to reinforcement fabric until the reinforcement fabric is fully saturated. Secure reinforcement fabric to penetration with a nylon cable tie.
 12. Cut to a target piece of reinforcement fabric to the outside diameter of the penetration.
 13. Place target piece around the penetration and embed into existing saturated reinforcement fabric, saturate fabric with **e.roll**.
 14. Prior to the placement of concrete install additional **e.stop b** at the middle of slab and secure with a cable tie.
- B. Soldier Pile Penetrations: Sealing of soldier piles in the field or in a back lagged condition.
 1. Clean pile to remove any dirt or rust.
 2. Create a uniform collar around each soldier pile penetration by cutting a target piece of **e.base 316** for each interior and exterior face of the soldier pile. Each target piece of **e.base 316** shall extend 6 inches vertically up the soldier pile and 12 inches horizontally from the base of the soldier pile. If applying in a back lagged condition, cut target piece so it also extends minimum 6 inches horizontally from the base of the soldier pile.

3. Heat weld the **e.base 316** target pieces together in order to form a uniform collar.
4. Apply a 30 mil coat of **e.roll** onto all of underlying vertical surfaces and embed **e.base 316** into **e.roll**.
5. Tightly wrap the pile by pressing **e.stop b** firmly around the base of the soldier pile.
6. From the base of the soldier pile apply **e.roll** 3 inches vertically and horizontally onto the **e.base 316** collar while encapsulating the **e.stop b**.
7. Embed reinforcement fabric into the previously applied **e.roll** and then saturate fabric with another 30 mil application of **e.roll**.
8. Trim **e.base 316** base sheet and heat weld to collar piece to form a continuous and uniform transition from the base sheet to the collar.
9. 2 rows of **e.stop b** shall be installed vertically on the interior cross section of the soldier pile and extend from the top of the collar to the top of wall.

3.2.3 POLYMER MODIFIED ASPHALT MEMBRANE

- A. Mask off adjoining surfaces where unwanted **e.spray** polymer modified asphalt membrane may impact other construction trades.
- B. Commence application of **e.spray** when ambient air temperatures are within manufacturer recommendations.
- C. Surfaces that will receive the **e.spray** must be uniform, clean, and free from standing moisture.
- D. Start installing **e.spray** in presence of approved 3rd party inspector.
- E. Moving from the low point to the high point of grade, apply one application of **e.spray** in accordance with manufacturer's instructions in order to obtain a seamless membrane with a minimum dry film thickness of 100 mils (2.5 mm).
- F. Apply **e.spray/e.roll** in and around penetrations and cavities to ensure the formation of monolithic seal around all penetrations.
- G. Apply **e.spray/e.roll** to prepared wall terminations and vertical surfaces to heights indicated according to manufacturer's recommendations and details. (if applicable)
- H. Verify thickness of **e.spray** membrane every 1000 ft² (93 m²) using a non-destructive approved by EPRO.

3.2.4 GEOCOMPOSITE BENTONITE PROTECTION COURSE

- A. Install **e.shield 205b** protection course perpendicular to the direction of base course.
- B. Overlap **e.shield 205b** seams a minimum of 3 inches and seal the seams in order to prevent moisture from prematurely activating the bentonite layer. Either option is acceptable to the manufacturer, however any prematurely activated bentonite may be need to be replaced. The available options are as follows:
 1. Option 1: Secure the seams of **e.shield 205b** by applying 30 mils of **e.spray** in-between the seam overlap. Apply a second 30 mil layer of **e.spray** on top of the seam overlap, completely covering the seam overlap.

2. Option 2: Apply a reinforcement detail over the **e.shield 205b** seam overlap. Apply 30 mils of **e.roll** 3 inches onto both sides of the seam overlap, center and embed 6-inch reinforcement fabric over the seam, and apply 30 mils of **e.roll** to fully saturate the reinforcement fabric.

- C. Do not penetrate or damage the composite membrane system once it has been applied. If the system is penetrated or damaged, contact the applicator immediately. Failure to bring the breach of the system to the applicator's attention and not allowing adequate time to make the necessary repair will result in voiding any warranty.

3.2.5 WATERSTOP INSTALLATION

- A. Surface to receive waterstop shall be clean, dry, and have a smooth finish.
- B. Place two rows of **e.stop b** at minimum of 3 inches with minimum of 2 inches of coverage at all cold joints, and concrete to steel beam connections.
- C. Place a minimum of 2 rows of **e.stop b** around all penetrations, with a minimum of 3 inch spacing, or as directed by manufacturer in specification sections that address penetrations.

3.3 FIELD QUALITY CONTROL

- A. Smoke Test: Conduct smoke test on all under slab areas upon installation of the base sheet 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.
- B. Destructive coupon sampling of the membrane in areas subjected to hydrostatic pressure is not allowed. Refer to manufactures target coupon sampling protocol for additional guidance.
- C. Seam Testing: Probe all welded seams using a seam probe. All deficient areas shall be noted and marked for repair, then the necessary repairs shall be made and noted in inspection reports.
- D. Independent inspectors and certified applicators shall document the gallons of **e.spray** used in the inspection report.

3.4 CURING PROTECTING AND CLEANING

- A. Allow for **e.spray** to fully bond with the substrate, generally this occurs 24 to 48 hours after application depending on ambient weather conditions.
- B. Take care to prevent contamination and damage during application stages and curing. All machinery, other trades, and general construction, shall NOT take place over the composite membrane system until inspection is complete and concrete has been placed.
- C. Prevent damage during the placement of overburden.

3.5 REPAIRS

- A. Underslab:
 1. Inspect damaged area to determine which system components have been damaged.
 2. If the base sheet has not been compromised, patch only the areas that have been damaged by re-installing the damaged materials. The patch should extend 6 inches beyond the damaged area.

3. If the base sheet has been breached but no additional system components have been installed, install a patch below and above the base sheet that extends 6 inches beyond the damaged area. Area shall be sealed using the specified method for sealing the base sheet.
4. If the damaged area has breached the base sheet and additional components have been installed over the base sheet, the area will require removal of the overlying components to expose the base sheet.
5. If the damage is less than 3 inches, the base sheet will need to be opened up to create a minimum 4-inch diameter circle to allow access. Place a minimum 8-inch diameter coupon under the base sheet and seal using the specified method for seaming the base sheet. If heat welding the seam, probe the seam to ensure a uniform seal.
6. Apply a reinforcement detail of **e.roll** and reinforcement fabric 6 inches beyond the edge of the repair area.
7. Apply the remaining layers as specified.

End of Section