



VIPER[®]

UNDER-SLAB VAPOR BARRIERS





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UNDERSTANDING UNDER-SLAB



Viper is the first line of defense against damaging water vapor and soil gas threats existing below the concrete slab.

To achieve your moisture control objectives, it is important to know what to look for in a vapor barrier.

Whether it is evident on the surface, water exists, to some degree underneath a building. This water can migrate through the soil and potentially contact the bottom of a concrete slab. A layer of free draining crushed fill between the sub-grade and the slab is typically installed to restrict the capillary rise of water; however, this will not prevent water vapor from reaching the concrete. For this you'll need a high performance under-slab vapor barrier between the sub-base material and slab.

BACKGROUND

Water vapor from sub-slab conditions will pass through the pores of an unprotected concrete slab through vapor diffusion. This vapor transmission creates a conflicted environment for the floor coating or adhesive. Because government regulations were established to reduce volatile organic compounds (VOCs) found in numerous architectural coatings, specifically floor coatings and adhesives, many solvent based flooring materials have been changed to water based. When exposed to water and alkalinity, these water based coatings and adhesives are prone to re-emulsification resulting in costly flooring failures. In addition to flooring failures, moisture migration also creates poor indoor air quality (IAQ), mold, mildew, fungi and damage to the slab and its components.

PURPOSE

The infiltration of water vapor and gas from the earth through concrete slabs is a costly building liability. Under-slab vapor barriers/retarders provide an inexpensive insurance policy to protect floors and other moisture sensitive equipment within the building's interior. The definition of a vapor barrier/retarder, according to ASTM E 1745, is "a material or construction that impedes the transmission of water vapor under specified conditions". By inhibiting moisture and soil gas migration, under-slab vapor barriers/retarders greatly reduce condensation, retard mold growth, provide healthy breathing conditions within a building, prevent flooring failures and aid in controlling structural degradation.

KNOWLEDGE

ASTM E 1745 (Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs) standardizes vapor barriers/retarders according to various performance properties. The three classes (A= highest, B= middle, C= lowest) are based on a membranes resistance to punctures, tears and water vapor. When choosing under-slab vapor barriers/retarders, it is important to look for products that are independently tested and exceed all ASTM E 1745 requirements. Furthermore, vapor barrier/retarder products should be made from virgin (non-recycled) resin to assure long term protection.

SOLUTION

Viper Vapor Barriers are the first line of defense against damaging water vapor and soil gas threats existing below the concrete slab. Viper is a multi-layer, extruded, virgin polyolefin under-slab vapor barrier/retarder. The virgin resin used to manufacture Viper contributes to it's long term stability and prevents the material from breaking down when buried below the slab. Viper is engineered with superior resistance against punctures, tears and water vapor. The high puncture resistance and tensile strength greatly reduce potential damage when exposed to rigorous job site conditions. Furthermore, Viper Vapor Barriers have very low water vapor permeance properties, which are key to preventing water vapor migration.

THE BEST MOISTURE BARRIER FOR PROTECTING CONCRETE SLABS AND FLOORS



ISI Building Products’
Dario Lamberti discusses
common moisture barrier issues
and how to address them.

Protecting the concrete slab and building interior from moisture sources below starts from the ground up. Below slab water vapor remediation after-the-fact is a complicated and costly fix. The small up-front savings when choosing a minimal protection moisture barrier can be appealing, but the result often turns into a long-term problem. Proper planning and design will avert these potential headaches and expenses. Choosing the correct below slab water vapor protection is imperative to your finished floor and overall health and safety. Proper selection and installation of a high-quality under-slab moisture barrier will result in a successful finished flooring system and provide you with long-term security and comfort.

Below Slab Moisture Sources

What should you look for when choosing a below slab vapor barrier? To start, let’s summarize a few moisture sources below the concrete slab and how those moisture sources can affect the finished floor and indoor air quality.

As the building envelope is typically enclosed with the HVAC system active, relative humidity below the slab will near 100%. In search of equilibrium, water vapor is able to diffuse through porous concrete, raising the pH and alkalinity of the slab. High pH and alkalinity at the flooring adhesive to slab interface can compromise the adhesion of the costly finished flooring system. Furthermore, water vapor diffusing through an unprotected slab can cause high relative humidity, mold, mildew and degradation to the slab and its components.

Other causes for moisture related flooring and IAQ issues relate to concrete slab placement and drying time. Historically slabs were placed directly over a layer of sand with the idea to protect the polyethylene sheeting from damage during concrete placement and provide a means for bleed water to exit freshly placed concrete. The problem with this method is that while the sand layer does absorb excess water, the water gets trapped once it reaches the layer of polyethylene sheeting. Similar to water vapor diffusion from the soil, once the building is enclosed and RH below the slab seeks equilibrium, the trapped bleed water has nowhere to go but up. Oftentimes the flooring system is prematurely allowed to be placed as the water within the sand layer goes undetected.

Therefore, in majority of the cases, it is recommended to place concrete slab directly on the under-slab vapor barrier.

The Differences Between Vapor Barriers and Retarders

A foundational step when selecting a vapor barrier is defining the difference between a vapor retarder and a vapor barrier. The industry recognizes a vapor retarder as having a water vapor permeance rating between 0.1 perms and greater than 0.01 perms. Vapor barrier materials are considered to have a water vapor permeance rating below 0.01 perms.

For product comparison purposes, perm results are often reported as grains/(ft²*hr*in Hg). When evaluating products, these terms and performance results will come in to play and can be found by requesting a data sheet from the manufacturer.



High-Performance Vapor Barriers and Retarders

With advancements in plastic film manufacturing, higher performing materials are becoming the norm. It is important to look for moisture barrier products manufactured from 100% virgin resin. They are also typically manufactured in a multi-layer or co-extruded fashion. Co-extruded films are in high demand as they incorporate the best properties of different resins and link them all together into one film structure.

Given the innovative approaches to plastic film, specifiers should note thickness does not always directly correlate to performance. Less robust material such as clear or black polyethylene sheeting, also known as Visqueen, have been used as a minimal approach to protecting against the aforementioned moisture related issues. These types of products are typically manufactured from high levels of

recycled content. The concern with these products is long-term effectiveness and lack of performance in areas such as strength and water vapor resistance.

High-performance vapor retarders and barriers are commonly available in 8-mil, 10-mil, 15-mil and 20-mil thicknesses. As mentioned, increased thickness does not always translate into better performance. Avoid single extruded products made from recycled content. For example, a 10-mil single layer extruded film made from recycled content will not carry near the performance of a thinner 8-mil co-extruded film manufactured from virgin resin. When evaluating vapor retarder and barrier products, it is key to make sure they are made from virgin resin and are co-extruded films.



Properly protect your investment from the ground up with a high-performance under-slab vapor barrier system.

Industry Standards to Know

Industry organizations, such as the American Concrete Institute (ACI) and the American Society for Testing and Materials (ASTM), have produced specific guidelines and testing standards for under-slab water vapor retarders and vapor barriers.

For example, ASTM E 1745 (Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs) is a testing standard used for determining a product's performance. ASTM E 1745 classifies materials as A, B or C based on the products puncture resistance, tensile strength and water vapor permeance. Class A vapor retarders and barriers carry the highest puncture resistance and tensile strength, with Class C being on the lower end of the scale. The water vapor permeance requirement is currently set at 0.1 perms for all three classifications making the separating factors puncture resistance and tensile strength.

In addition to strength and water vapor resistance, materials should also be tested for long-term stability and performance. Such tests include sustainable water vapor permeance after wetting, drying and soaking, permeance after heat conditioning, permeance after low temperature conditioning and permeance after soil organism exposure. These accelerated aging tests shed light on a vapor barrier's ability to perform for the long term. It is important to note most mono-extrusion films made out of recycled content, such as polyethylene sheeting, do not typically pass the Class C rating.

As a best practice, select products meeting the ASTM E 1745 Class A requirements. To take it one step further, ASTM E 1745 Class A vapor barriers (products with less than 0.01 perms) are the best approach to protecting your concrete slab and components, moisture sensitive floor and IAQ from moisture sources below.

How to Install Under-Slab Vapor Barriers and Retarders

Once evaluation and selection of a proper under-slab vapor retarder or barrier is complete, efforts should turn to proper installation. ASTM has created a standard specific to the selection, design, installation and inspection of under-slab vapor retarders and barriers. ASTM E 1643 is the “Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.” ISI Building Products' Viper Vapor Barrier installation guides are based on ASTM E 1643. The basic components of installing an under-slab vapor retarder and barrier are as follows:

1. Be sure to select an appropriate sub-base material taking into consideration the project requirements and the vapor retarder or barrier being installed. Properly level and compact sub-base material to minimize risk of punctures.
2. Create a monolithic membrane between the surface of the slab and moisture sources below the slab as well as at the slab perimeter. In other words, make a vapor barrier “bathtub” for the concrete.

3. Roll out vapor barrier with the longest dimension parallel with the direction of the concrete pour. Face overlaps away from the concrete pour when possible.

4. Extend vapor barrier over footings and seal to foundation wall, grade beam, or slab at an elevation consistent with the top of the slab or terminate at impediments, such as water stops or dowels. Extend vapor barrier over the tops of pile caps and grade beams to a distance acceptable to the structural engineer.

5. Lap all joints a minimum of 6 inches and seal laps in accordance with manufacturer's recommendations.

6. Seal all penetrations, such as utilities and columns, per the manufacturer's recommendations.

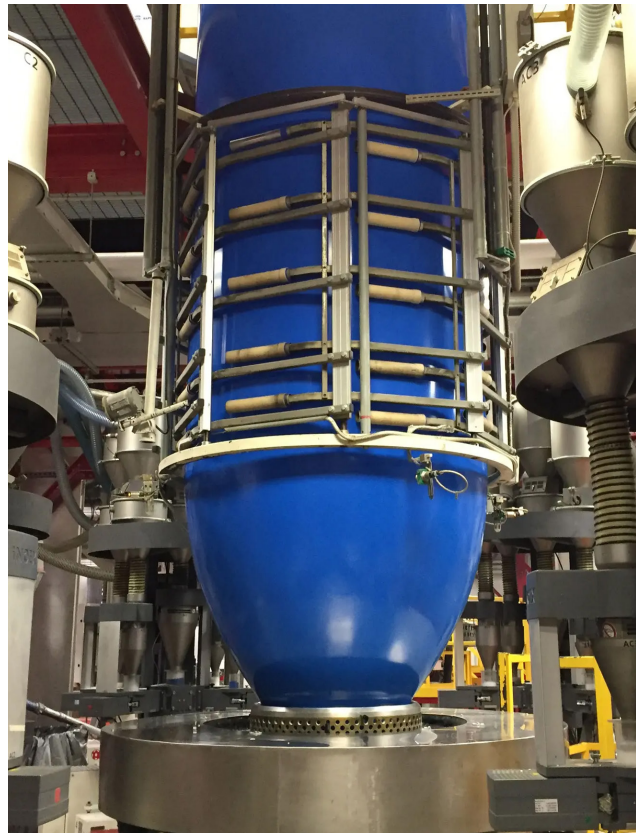
These instructions are paraphrased from ASTM E 1643. Remember that every project presents its own unique challenges and specific moisture barrier needs. Always review architectural and structural details, local building codes and manufacturers recommendations prior to install.

Clinch the best shot at properly protecting your investment from the ground up with a high-performance under-slab vapor barrier system. Whether you are installing an expensive finished flooring system or simply planning for the future, I highly recommend getting the moisture barrier right the first time to avoid much larger expenses and potential health concerns down the road. In summary, choosing the best products for below slab protection should include products:

- Made from virgin resin
- Made using co-extrusion technology
- Exceeding ASTM E 1745 Class A
- Meeting vapor barrier criteria
- Tested for long term performance
- Accompanied by detailed installation instructions



ISI Building Products has all the necessary accessories to go along with a successful vapor barrier installation. ISI Building Products has specialized in below slab water vapor and soil gas protection for over 20 years. Our Viper vapor barrier line has become an industry recognized brand for commercial and residential applications. Our track record supports our knowledge in this field and we take great pride in providing solutions for all of your vapor retarder and barrier needs.



Dario Lamberti

General Manager, Engineered Films Division

Dario leverages 20 years of expertise with vapor barrier membranes and materials engineering to promote best practices in slab design and moisture control. An extensive network of architects, supply chain partners, and contractors inform ISI's approach to support the industry as it evolves to meet the demands of sustainable construction.

www.ViperVaporBarriers.com



HIGH-PERFORMANCE VAPOR BARRIERS

Viper II 20-mil Class A

WEIGHTS & MEASURES

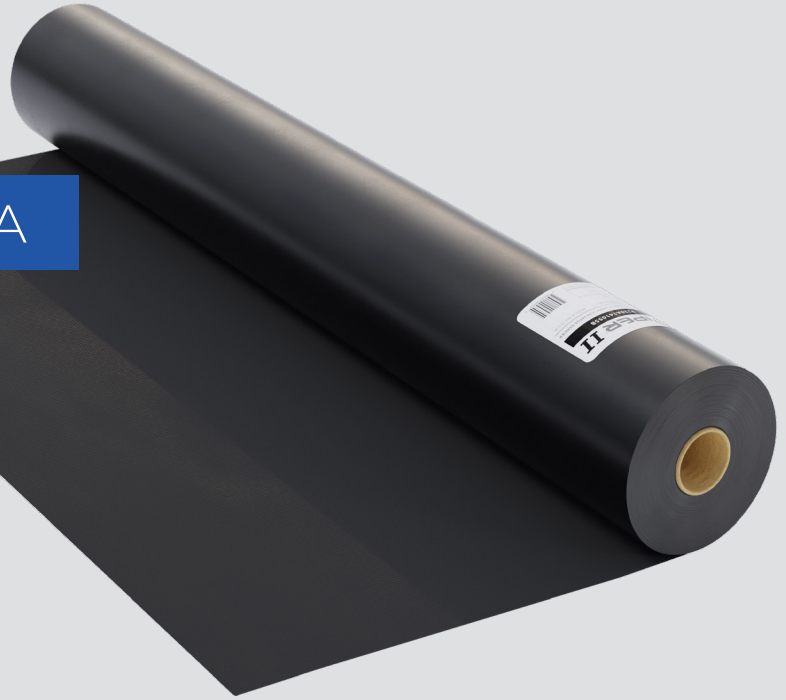
Roll Size: 14' x 105'

SF Per Roll: 1,470

Roll Weight: 142 lbs

Rolls Per Pallet: 20

Color: Silver / Black



Where To Use

HEAVY-DUTY APPLICATIONS

Viper II 20-mil is a robust 7-layer vapor barrier manufactured from virgin resin. It provides excellent protection against water vapor diffusion through concrete slabs. Both strong and durable with an ASTM E 1745 Class A rating, Viper II 20-mil is used in heavy-duty commercial and residential applications requiring water vapor and radon diffusion protection.

DOCUMENTS & DOWNLOADS

Technical Data



Safety Data



Submittal Form



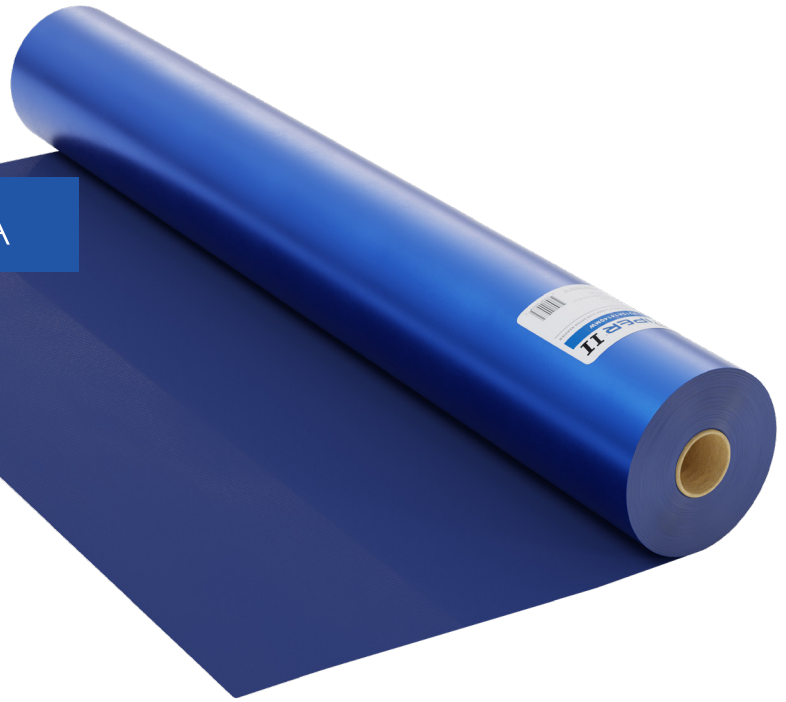
Warranty



Viper II 15-mil Class A

WEIGHTS & MEASURES

Roll Size: 14' x 140'
SF Per Roll: 1,960
Roll Weight: 140 lbs
Rolls Per Pallet: 20
Color: Blue



Where To Use

HEAVY-DUTY APPLICATIONS

Viper II 15-mil is our most popular under-slab vapor barrier. It is manufactured using co-extrusion technology from virgin resin and exceeds all ASTM E 1745 Class A requirements. Viper II 15-mil carries an excellent balance of high puncture resistance and tensile strength while maintaining low water vapor transmission rates. Viper II 15-mil protects against water vapor and radon diffusion for heavy-duty commercial and residential applications..

DOCUMENTS & DOWNLOADS

Technical Data



Safety Data



Submittal Form



Warranty



HIGH-PERFORMANCE VAPOR BARRIERS

Viper II 10-mil Class A

WEIGHTS & MEASURES

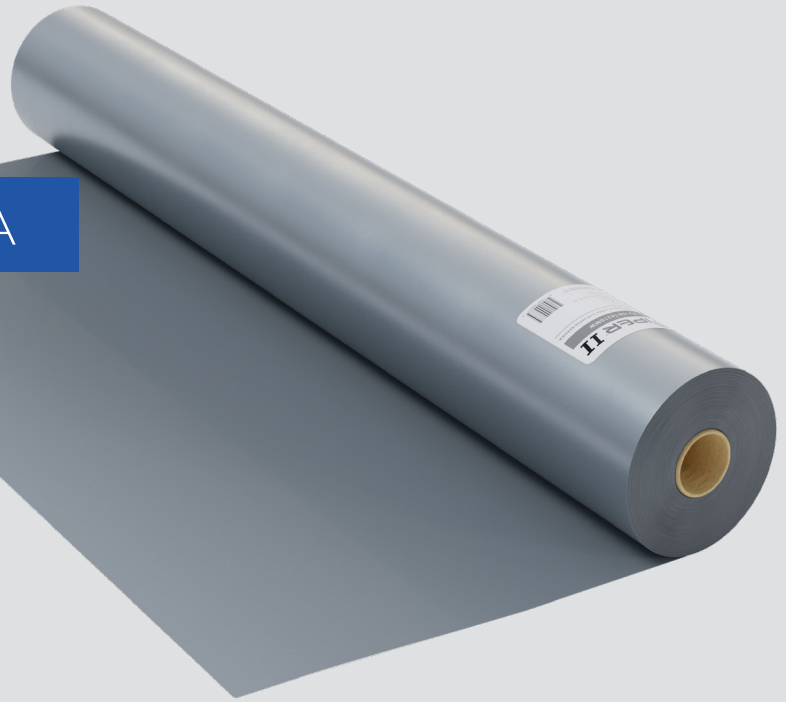
Roll Size: 14' x 210'

SF Per Roll: 2,940

Roll Weight: 140 lbs

Rolls Per Pallet: 20

Color: Gray



Where To Use

MODERATE-DUTY APPLICATIONS

Viper II 10-mil Class A is manufactured using co-extrusion technology from virgin resin. Exceeding ASTM E 1745 Class A requirements for impact resistance and tensile strength, Viper II 10-mil offers excellent protection against water vapor diffusion. It is ideal for common commercial and residential applications requiring protection against water vapor and radon diffusion.

DOCUMENTS & DOWNLOADS

Technical Data



Safety Data



Submittal Form



Warranty



Viper II Platinum

8-mil Class A

WEIGHTS & MEASURES

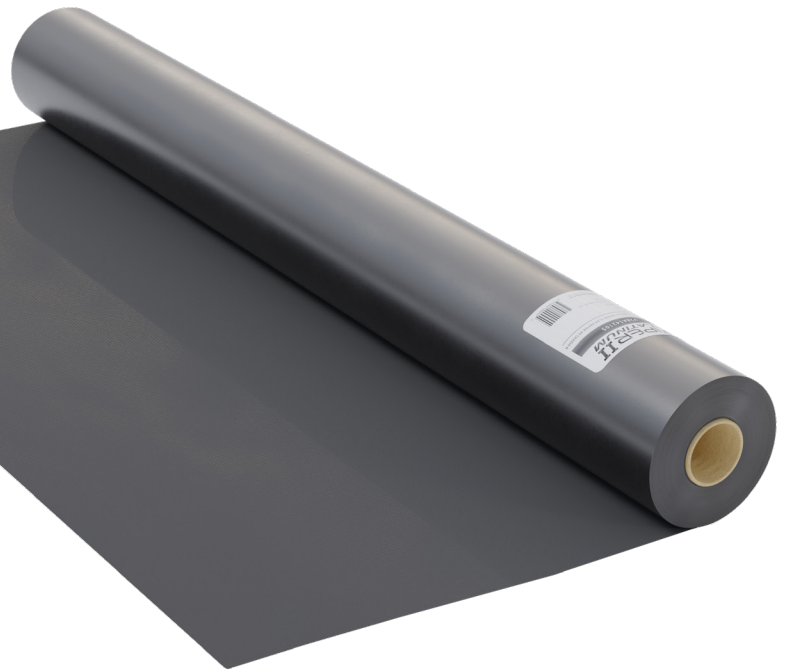
Roll Size: 14' x 210'

SF Per Roll: 2,940

Roll Weight: 113 lbs

Rolls Per Pallet: 20

Color: Silver



Where To Use

MODERATE-DUTY APPLICATIONS

Viper II Platinum is the first of its kind able to achieve ASTM E 1745 Class A status for blown films under 10-mils thick.

Viper II Platinum is manufactured from virgin resin using multi-layer, co-extrusion technology. Common uses include residential applications and moderate-duty commercial applications.

DOCUMENTS & DOWNLOADS

Technical Data



Safety Data



Submittal Form



Warranty



HIGH-PERFORMANCE VAPOR BARRIERS

Viper II 10-mil Class C

WEIGHTS & MEASURES

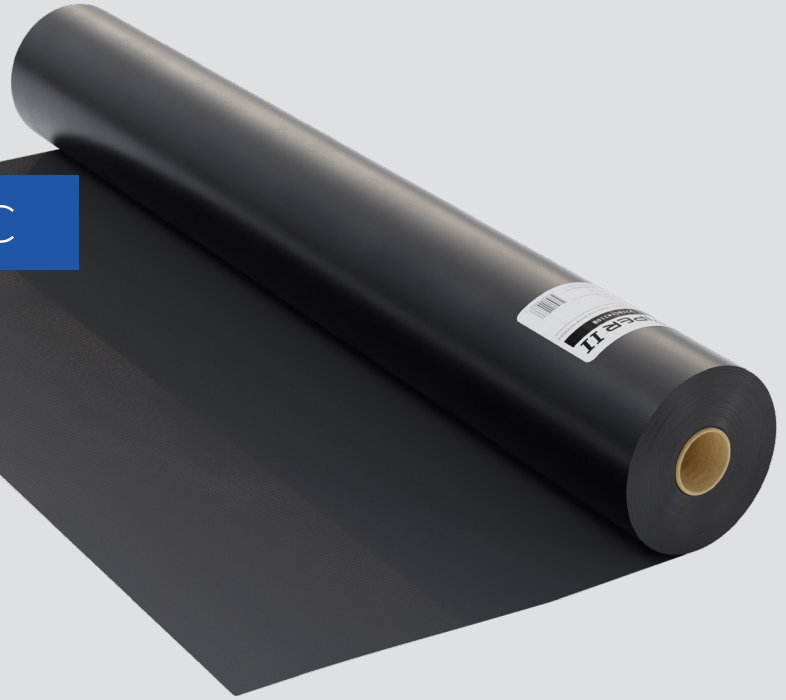
Roll Size: 14' x 210'

SF Per Roll: 2,940

Roll Weight: 140 lbs

Rolls Per Pallet: 20

Color: Black



Where To Use

LIGHT-DUTY APPLICATIONS

Viper II 10-mil Class C is a light-duty co-extruded blown film. It exceeds all ASTM E 1745 Class C properties and provides great water vapor diffusion protection. Viper II 10-mil Class C is a step up from conventional 10-mil clear or black polyethylene vapor retarders. Common applications include residential and light duty commercial construction where an economical vapor retarders is required.

DOCUMENTS & DOWNLOADS

Technical Data



Safety Data



Submittal Form



Warranty



Viper II 6-mil Class C

WEIGHTS & MEASURES

Roll Size: 14' x 210'

SF Per Roll: 2,940

Roll Weight: 84 lbs

Rolls Per Pallet: 20

Color: White



Where To Use

LIGHT-DUTY APPLICATIONS

Viper II 6-mil Class C is the optimal choice for residential and light commercial applications requiring a 6-mil polyethylene vapor retarder. Viper II 6-mil Class C is manufactured using virgin resin, opposed to recycled content, preventing long term material decomposition. It provides an economical solution while exceeding performance properties when compared to traditional 6-mil vapor retarders.

DOCUMENTS & DOWNLOADS

Technical Data



Safety Data



Submittal Form



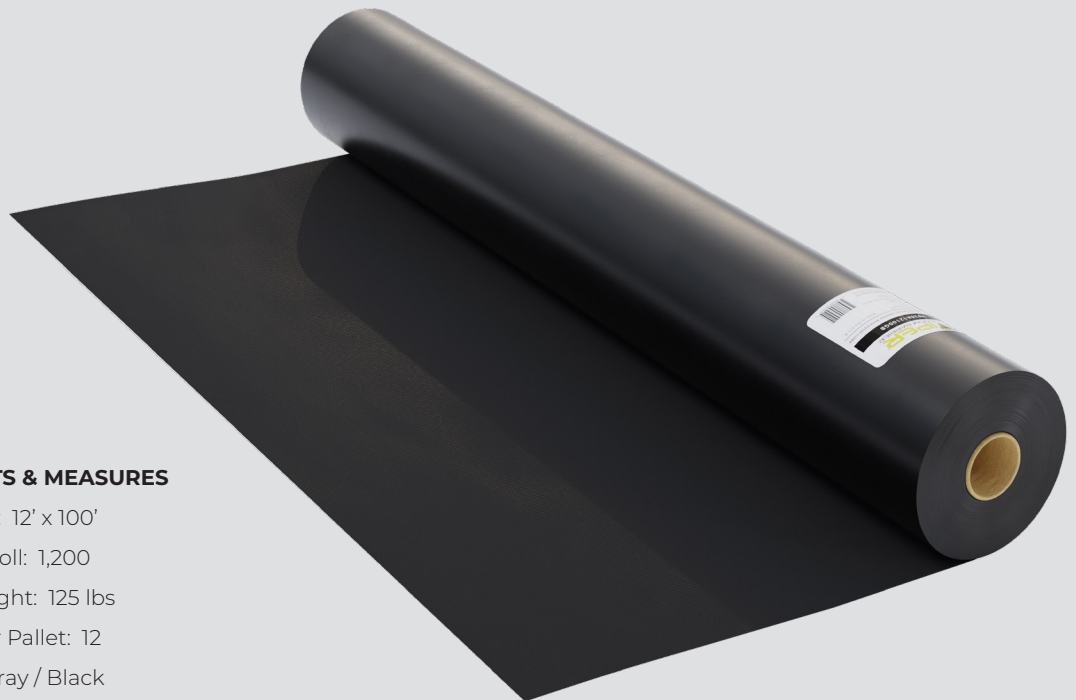
Warranty



SPECIALTY VAPOR BARRIERS

Viper Venom Soil Gas & Water Vapor Barrier

SUPERB PROTECTION FOR COMPROMISED SOIL ENVIRONMENTS



WEIGHTS & MEASURES

Roll Size: 12' x 100'

SF Per Roll: 1,200

Roll Weight: 125 lbs

Rolls Per Pallet: 12

Color: Gray / Black



Premium Protection

DESIGNED FOR BROWNFIELD SITES

Viper Venom Barrier boasts superior resistance against harmful soil gas on compromised sites. Brownfield reclamation is critical for efficient use of land and resources. Viper Venom Barrier was specifically designed to help create safe structures and promote building health and longevity in the toughest brownfield environments.



Advanced Engineering

HEAVY-DUTY APPLICATIONS

Viper Venom Barrier 20-mil is a water vapor and soil gas barrier. It offers superb protection against hazardous soil gas vapors through its enhanced formulation. Composed of a 7-layer film utilizing EVOH (Ethylene Vinyl Alcohol), Viper Venom Barrier safeguards against radon, methane and other harmful VOC's.

DOCUMENTS & DOWNLOADS

Technical Data



Safety Data



Warranty



VAPOR BARRIER ACCESSORIES

Viper Vapor Tape



Viper Vapor Tape is a white polyethylene film coated with an aggressive adhesive designed for seaming, splicing, sealing and patching vapor barrier materials.

Technical Data



Viper Double Bond



Viper Double Bond Tape is a double-sided butyl tape used for seaming and as a gasket material between the vapor barrier membrane and foundation walls.

Technical Data

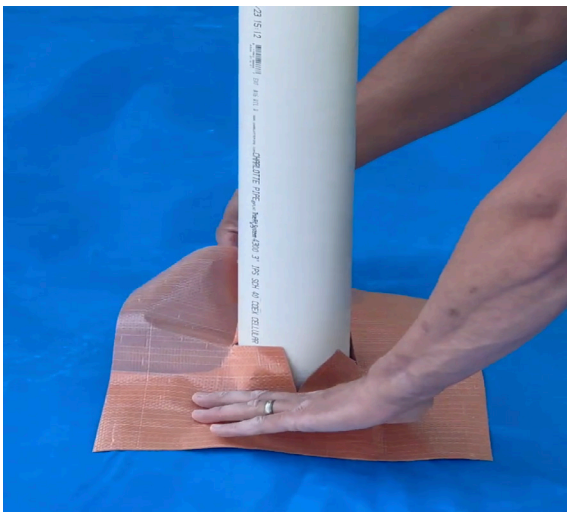


Viper VaporPatch



Viper VaporPatch is an all-weather vapor barrier pipe boot/collar and multi-purpose self adhering patch used for seaming, sealing, patching and hanging vapor barrier materials.

Technical Data



VaporCheck Mastic

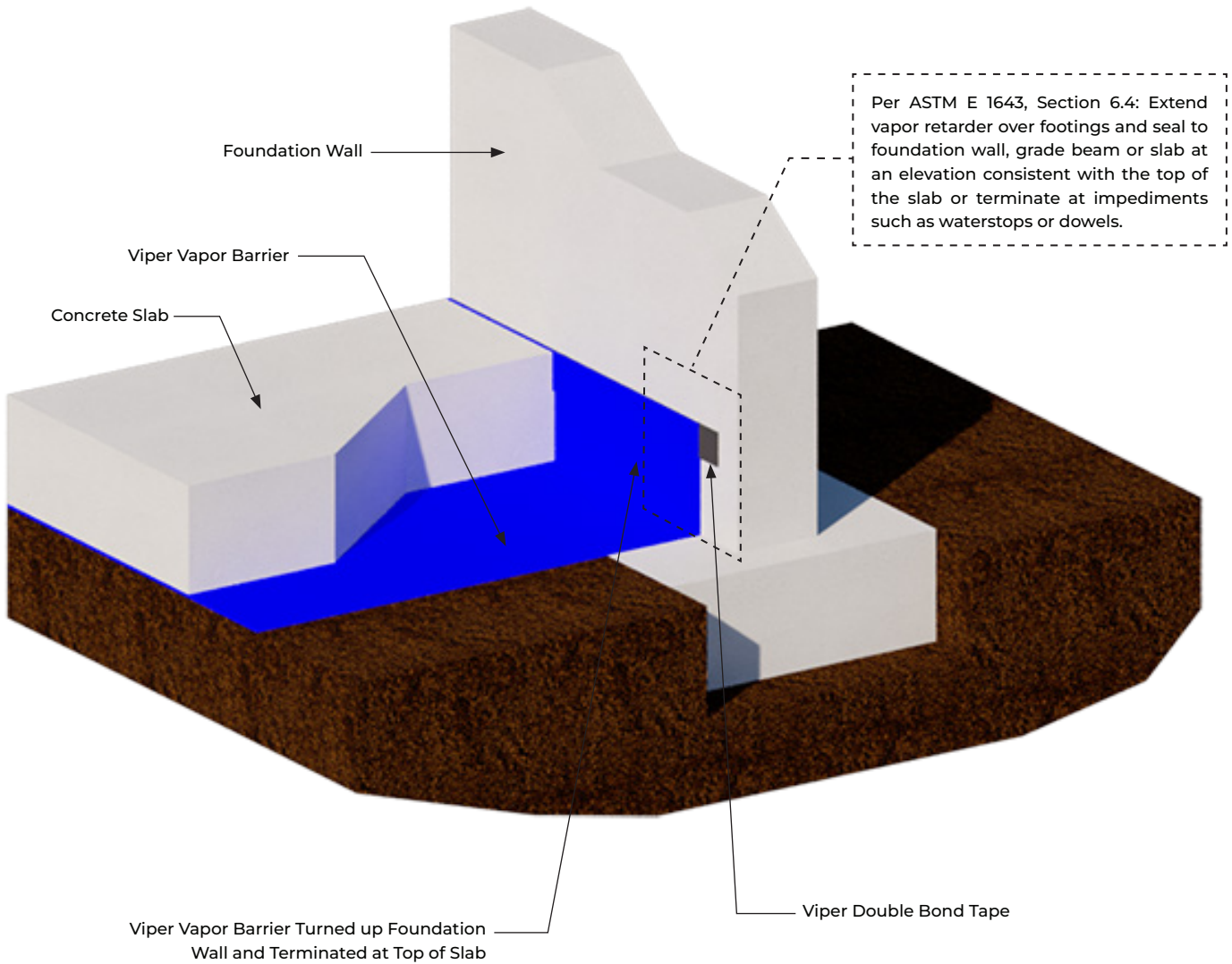


VaporCheck Mastic is a single component, trowel grade, polymer modified, water-based emulsion designed as a vapor and water-proofing barrier.

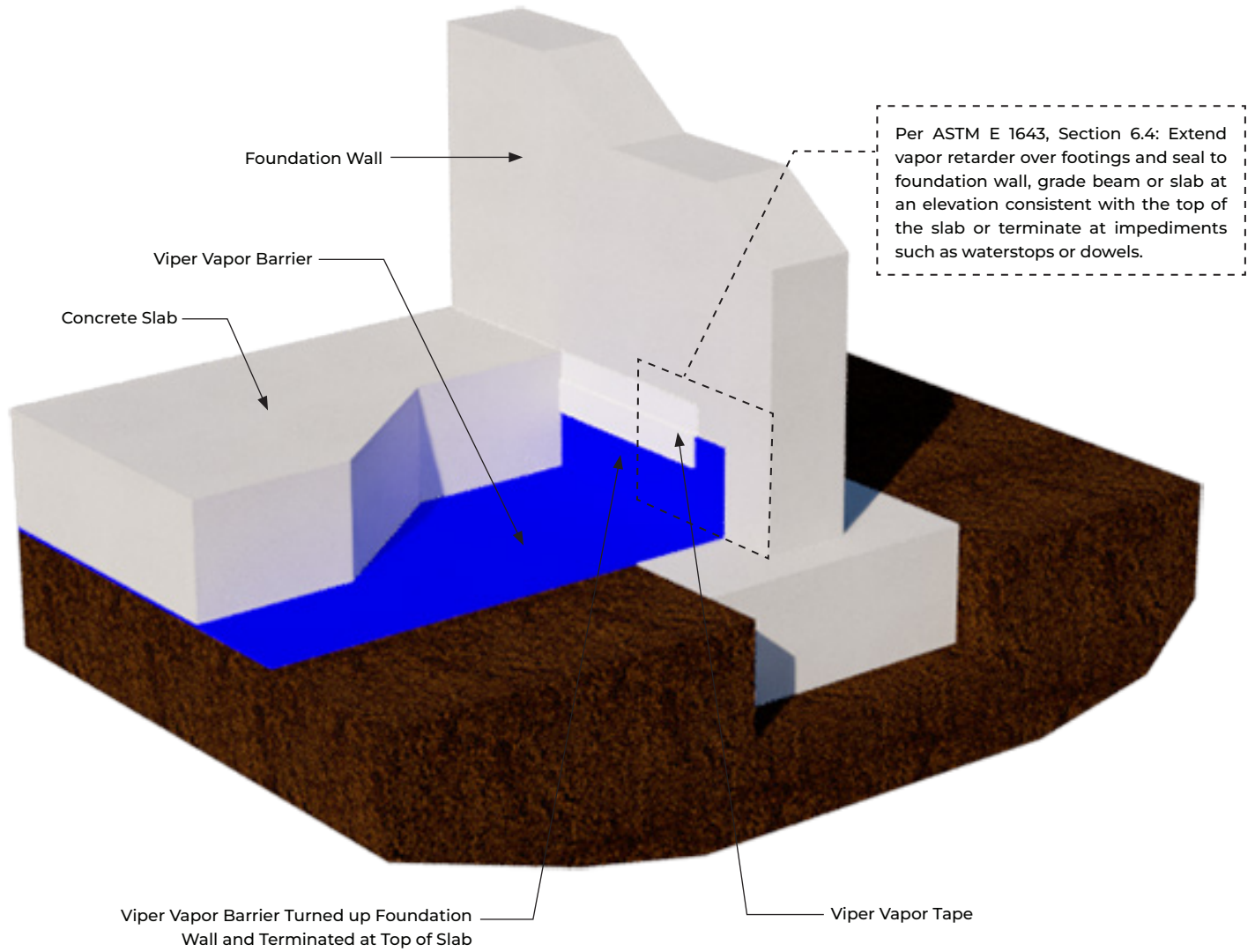
Technical Data



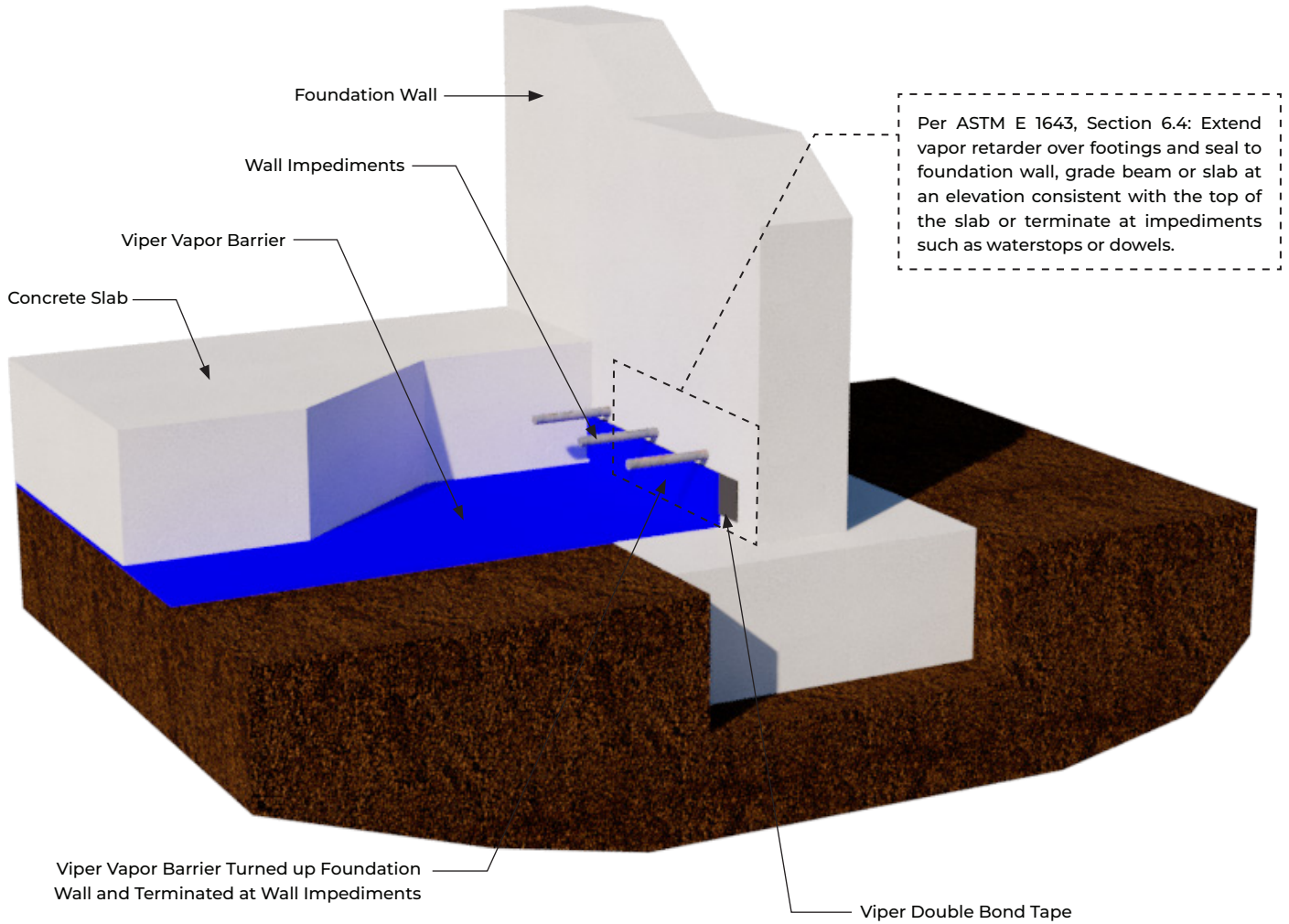
Foundation Wall Option 1



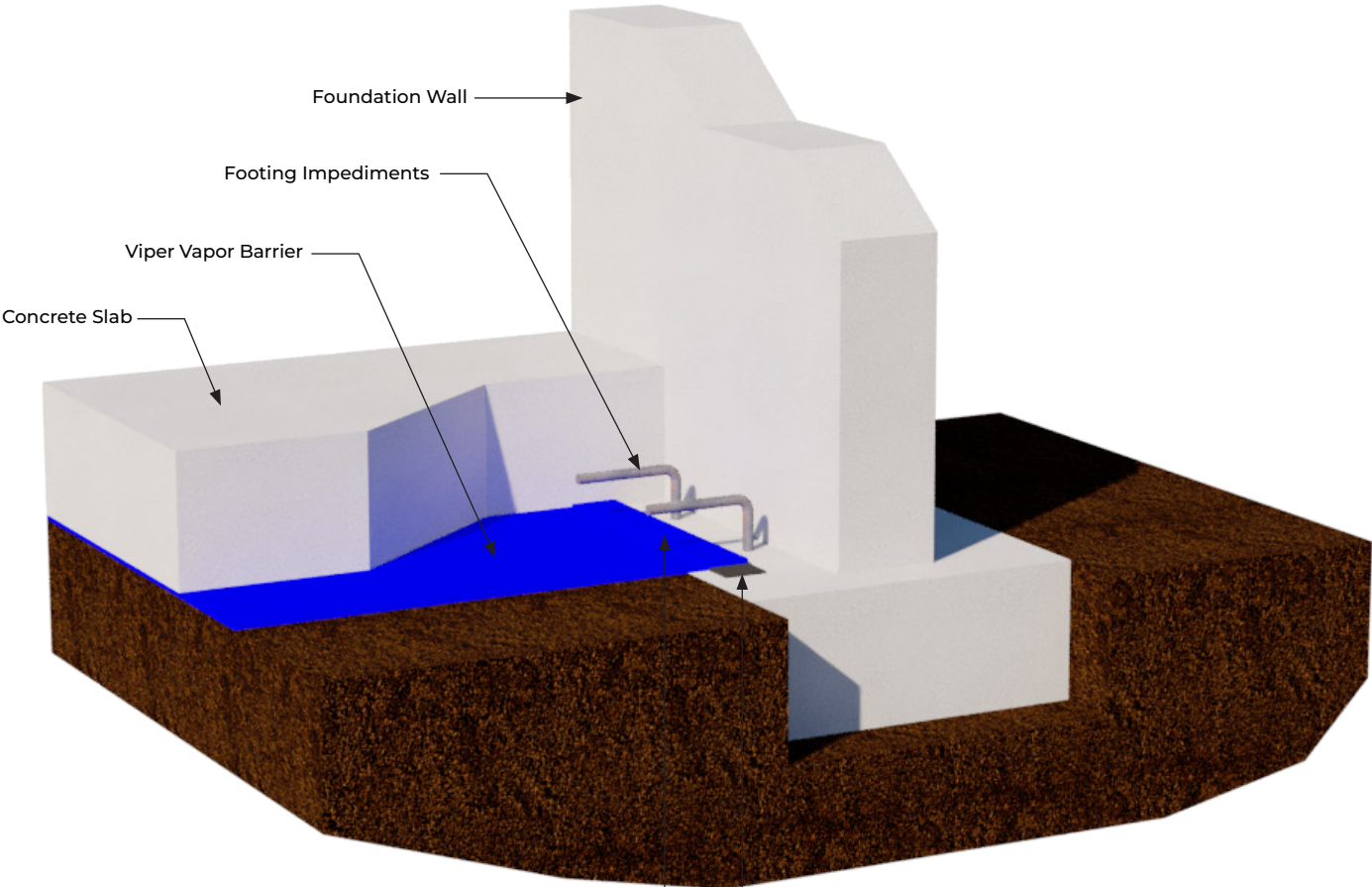
Foundation Wall Option 2



Wall Impediment



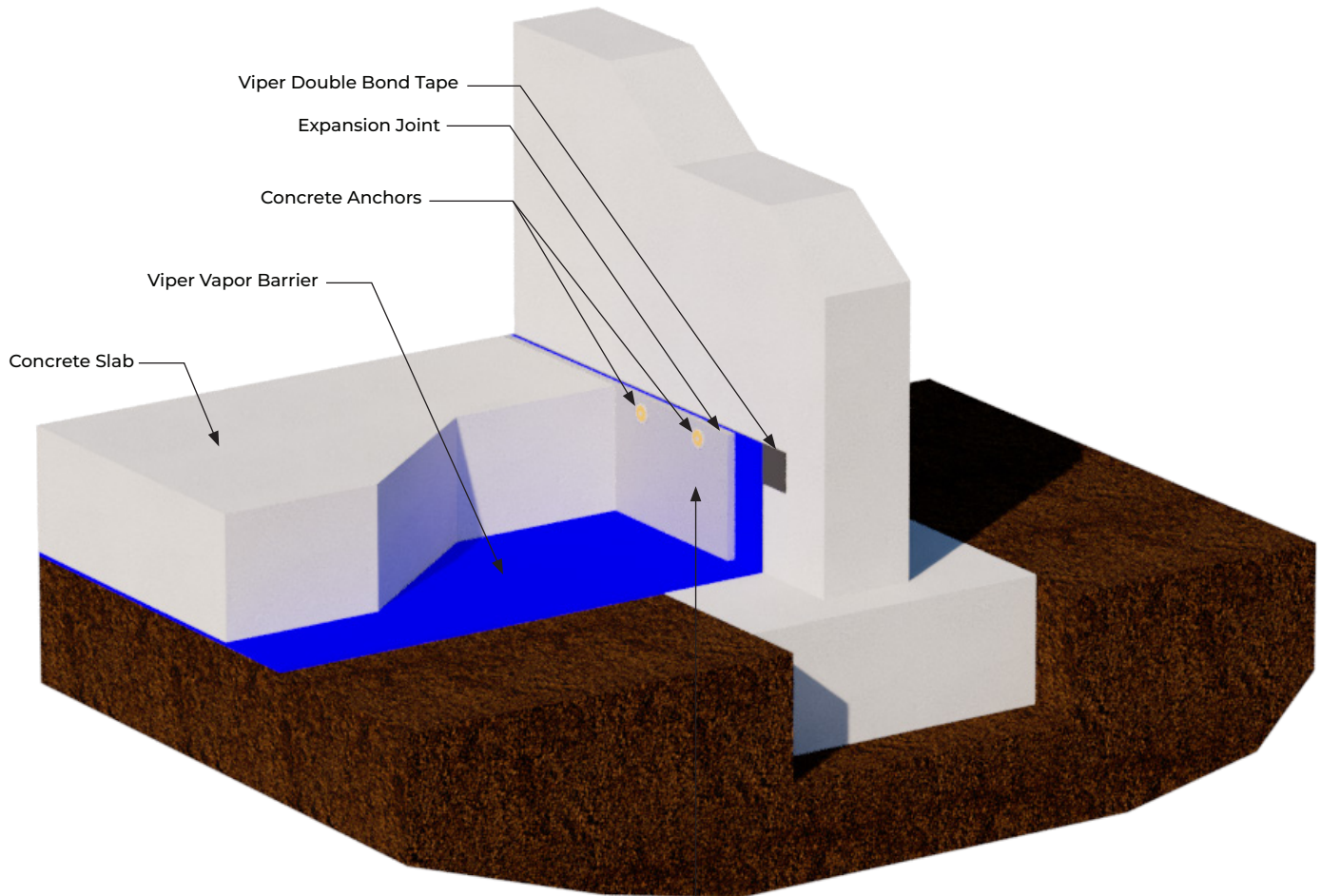
Footing Impediment



Viper Vapor Barrier Terminated at Footing Impediments. Per ASTM E 1643, Section 6.4: Extend vapor retarder over footings and seal to foundation wall, grade beam or slab at an elevation consistent with the top of the slab or terminate at impediments such as waterstops or dowels.

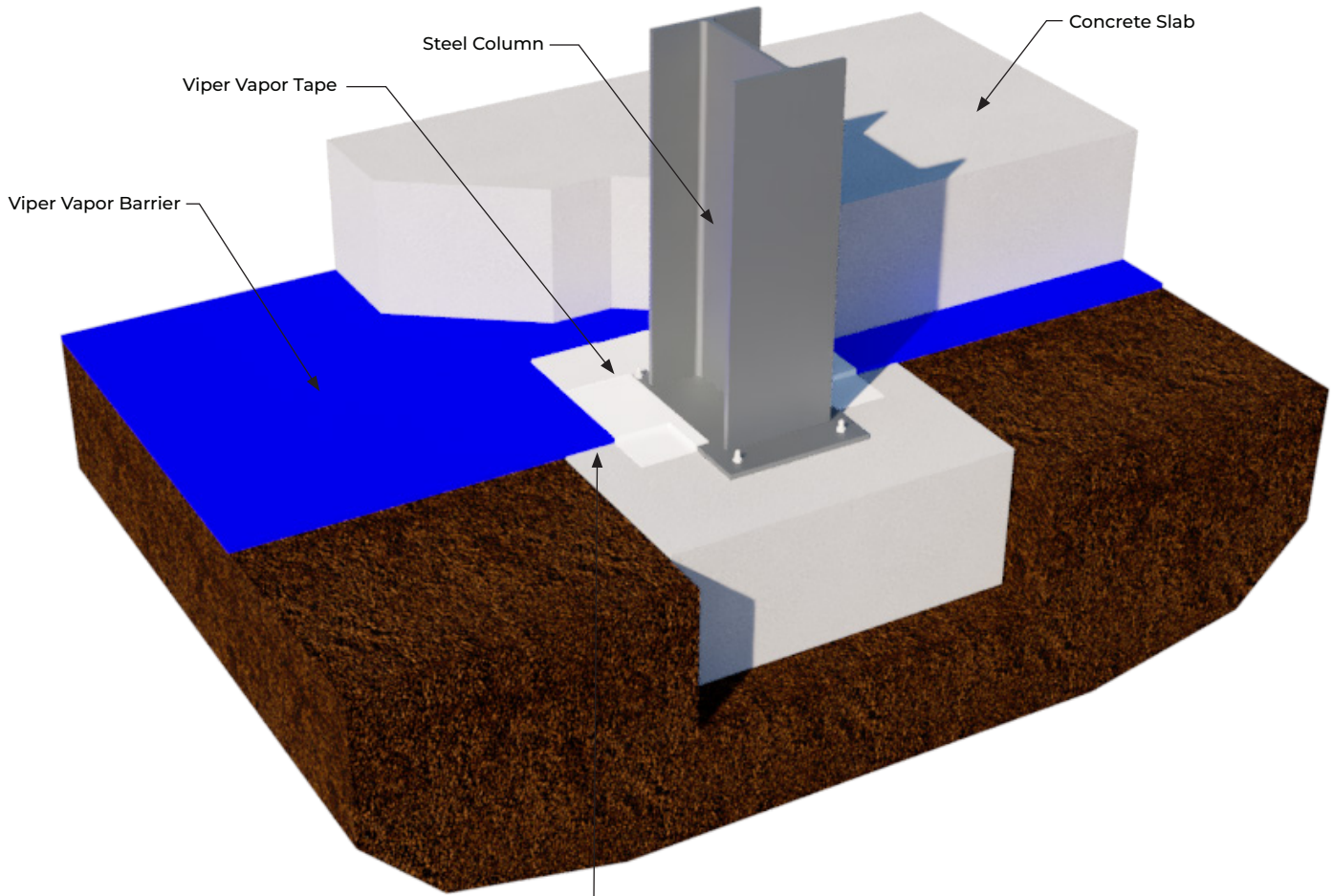
Viper Double Bond Tape

Foundation Wall Seal With Expansion Joint



Viper Vapor Barrier turned up foundation wall and terminated at top of slab. Per ASTM E 1643, Section 6.4: Extend vapor retarder over footings and seal to foundation wall, grade beam or slab at an elevation consistent with the top of the slab or terminate at impediments such as waterstops or dowels.

Steel Column



Per ASTM E 1643, Section 6.6: Extend vapor retarder over the tops of pile caps and grade beams to a distance acceptable to the structural engineer and terminate as recommended by the manufacturer.

Concrete Column Option 1

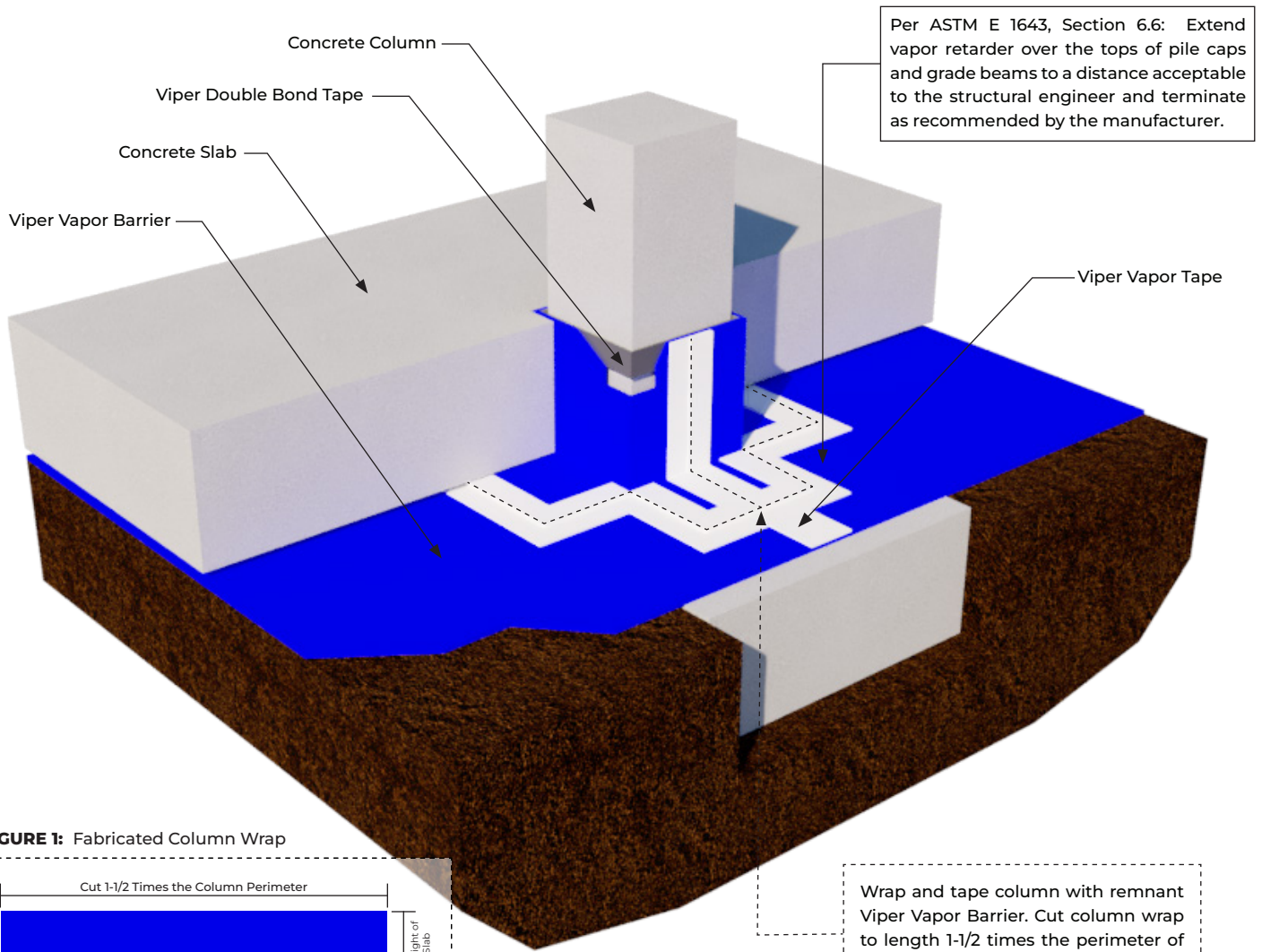
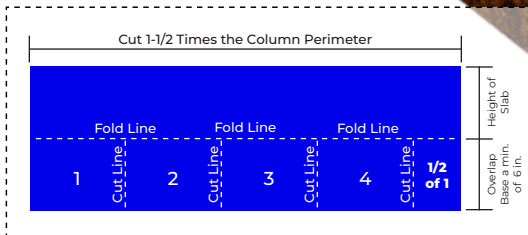


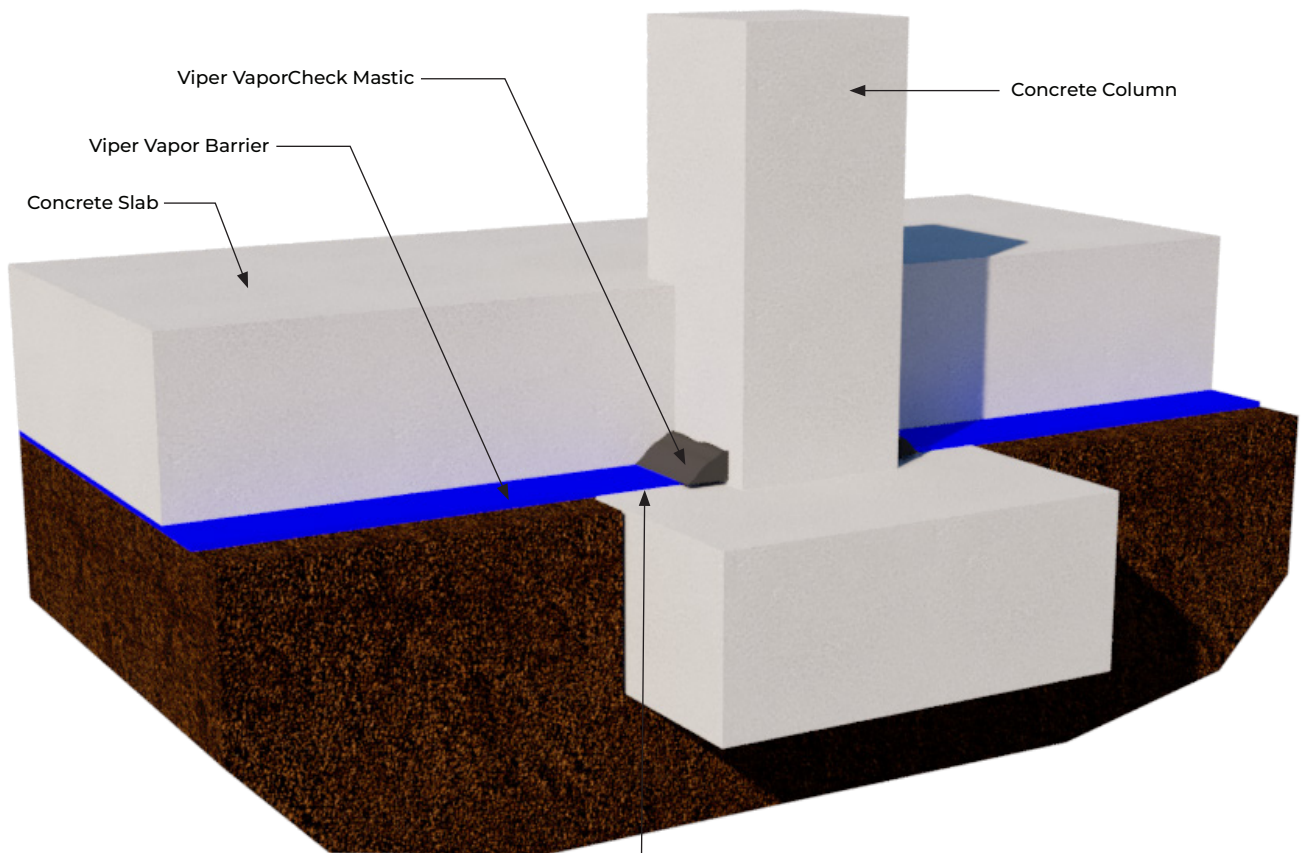
FIGURE 1: Fabricated Column Wrap



Fabricated Column Wrap

Wrap and tape column with remnant Viper Vapor Barrier. Cut column wrap to length 1-1/2 times the perimeter of column. Cut column wrap to height of slab plus a minimum of six inches to overlap field layer of Viper Vapor Barrier. **SEE FIGURE 1:** *Fabricated Column Wrap.*

Concrete Column Option 2



Per ASTM E 1643, Section 6.6: Extend vapor retarder over the tops of pile caps and grade beams to a distance acceptable to the structural engineer and terminate as recommended by the manufacturer.

Form Edge Option 1

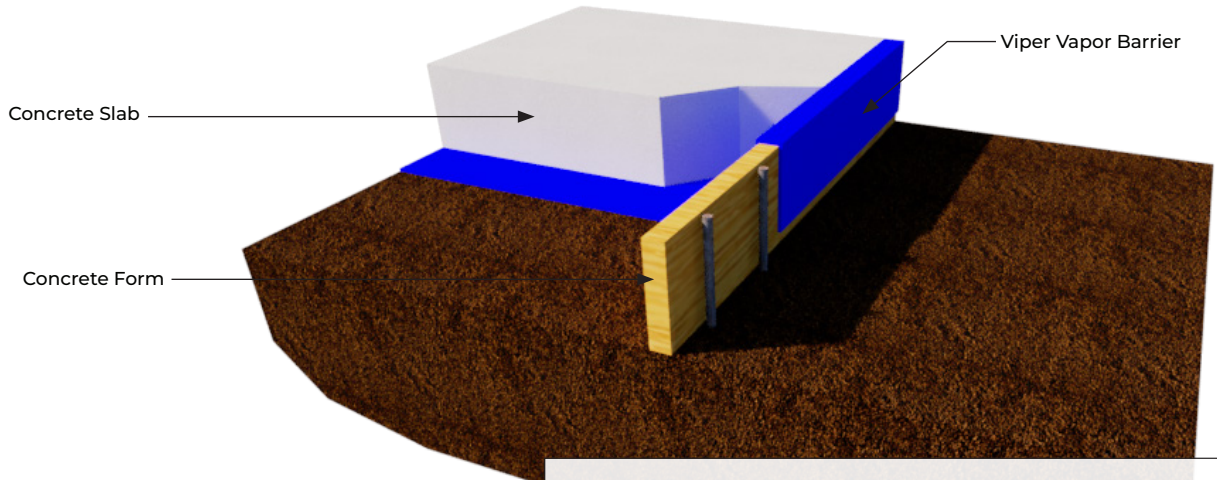


FIGURE 1:

1. Install Viper Vapor Barrier up and over form work.
2. Extend Viper Vapor Barrier a minimum of 12 inches beyond form.
3. Allow for slack on inside of form prior to concrete placement.

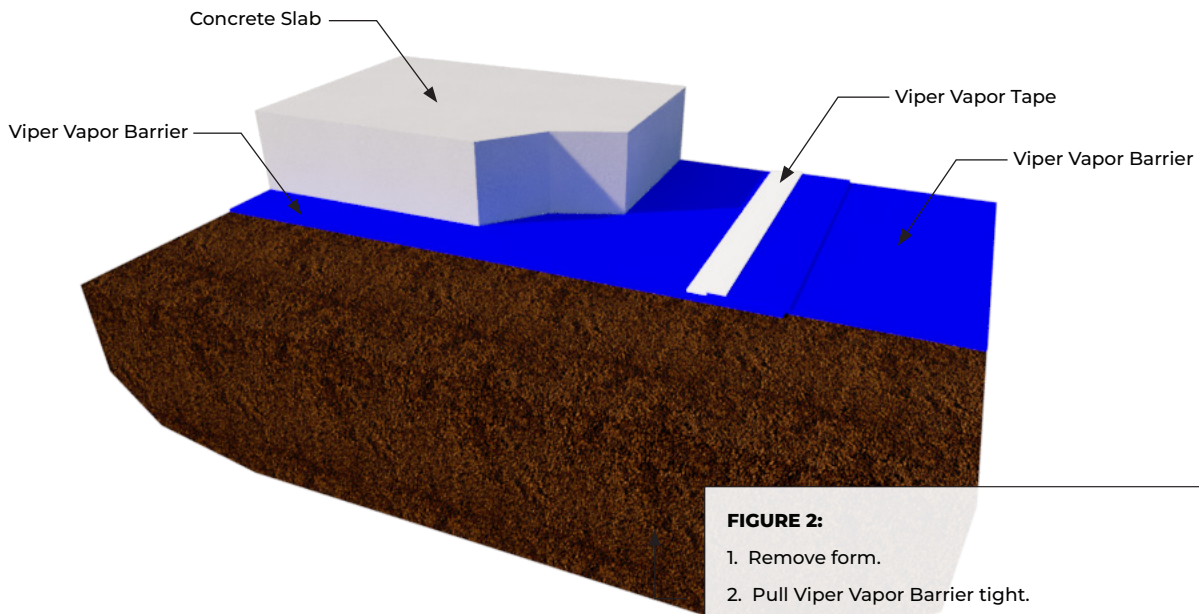


FIGURE 2:

1. Remove form.
2. Pull Viper Vapor Barrier tight.
3. Overlap new layer of Viper Vapor Barrier a minimum of 6 inches.
4. Tape seam with Viper Vapor Tape.

Form Edge Option 2

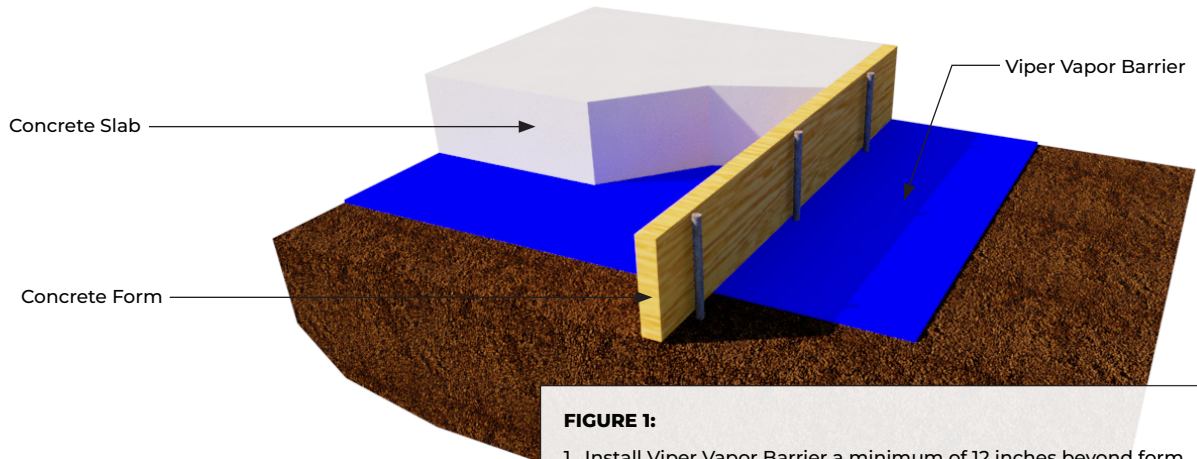


FIGURE 1:

1. Install Viper Vapor Barrier a minimum of 12 inches beyond form.
2. Set form work at terminating slab edge over Viper Vapor Barrier.
3. Place concrete slab.

NOTE: *Form Edge - Option 1* is the preferred method to avoid puncturing the Viper Vapor Barrier. In the event *Option 1* is unavailable, this method is acceptable.

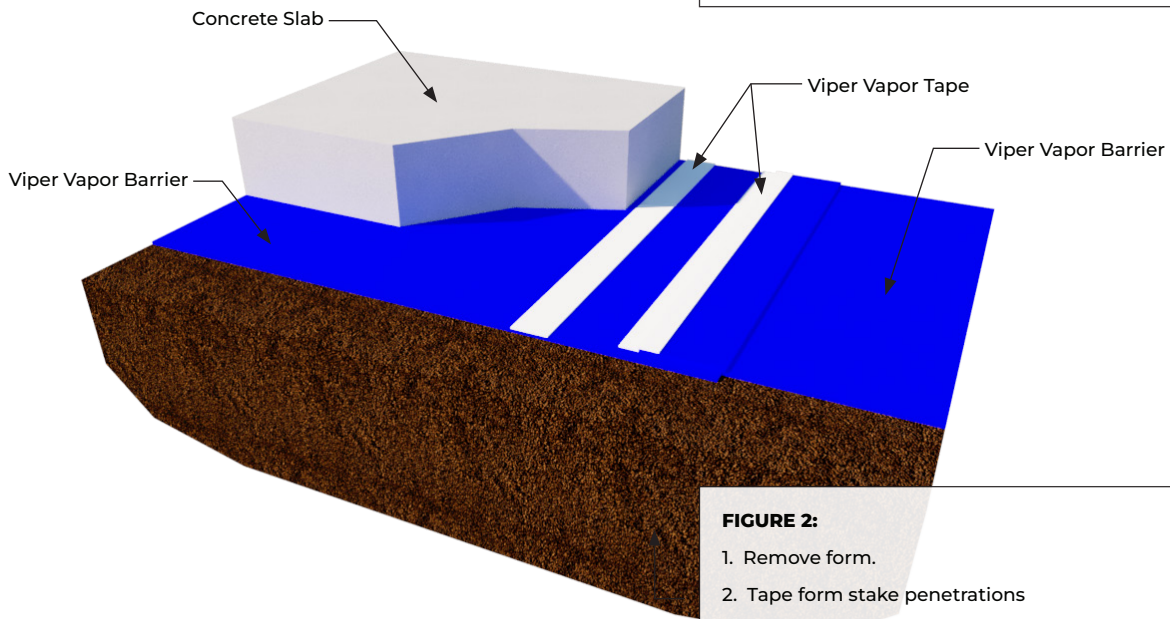
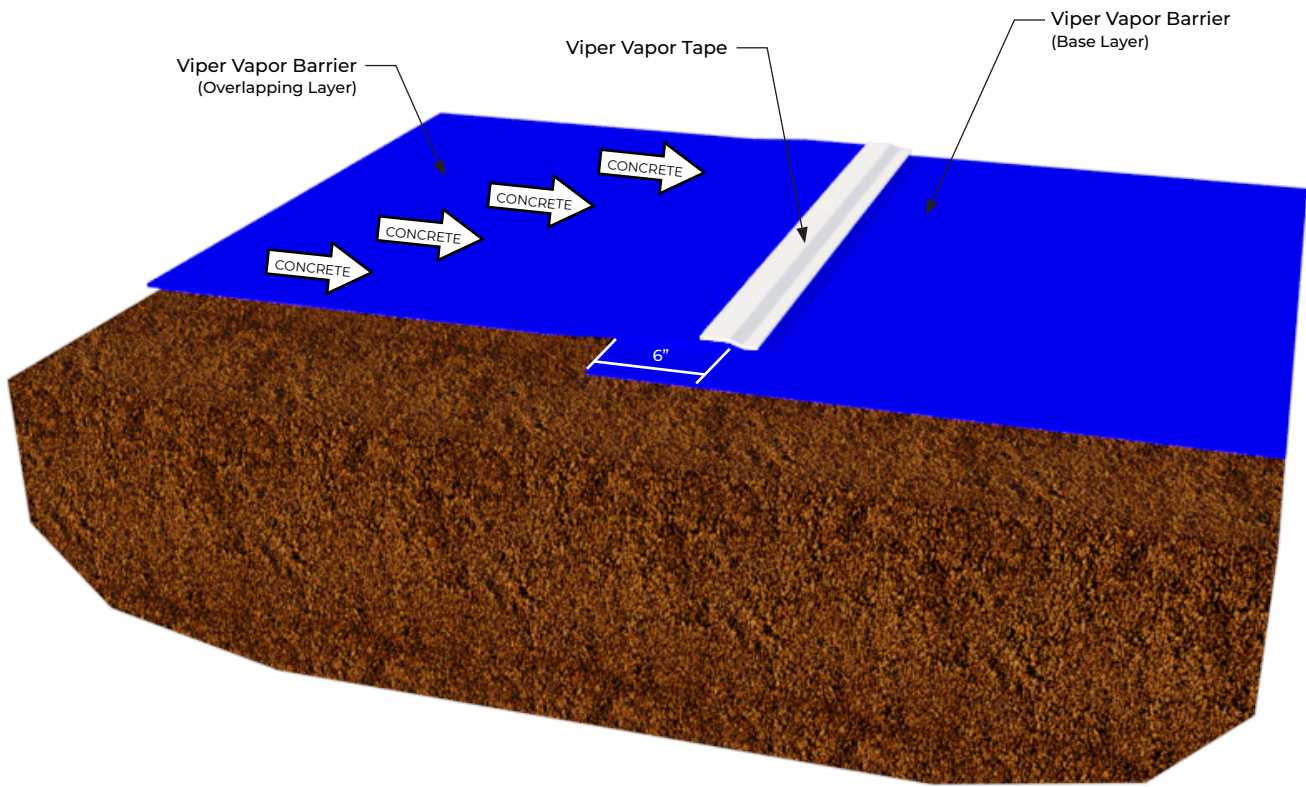


FIGURE 2:

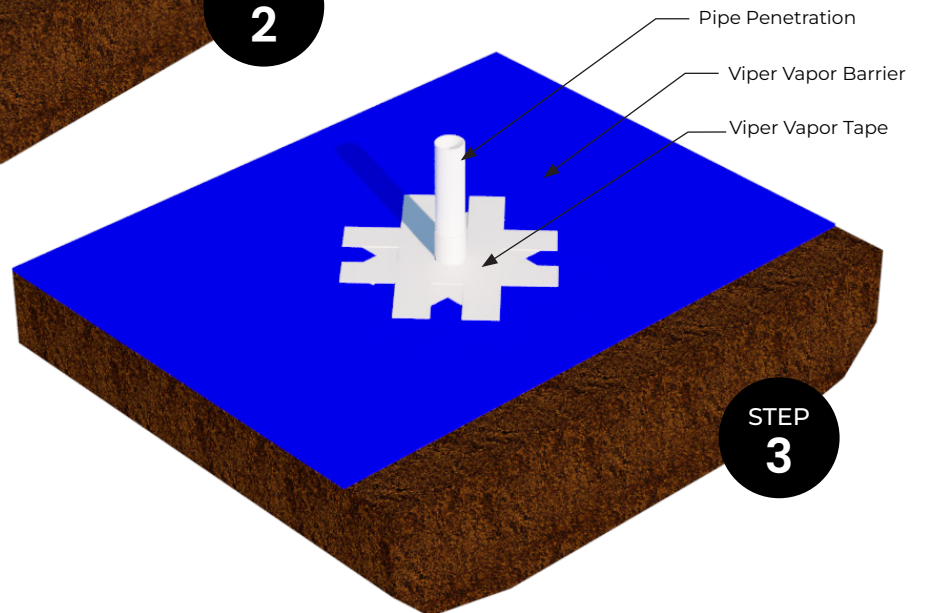
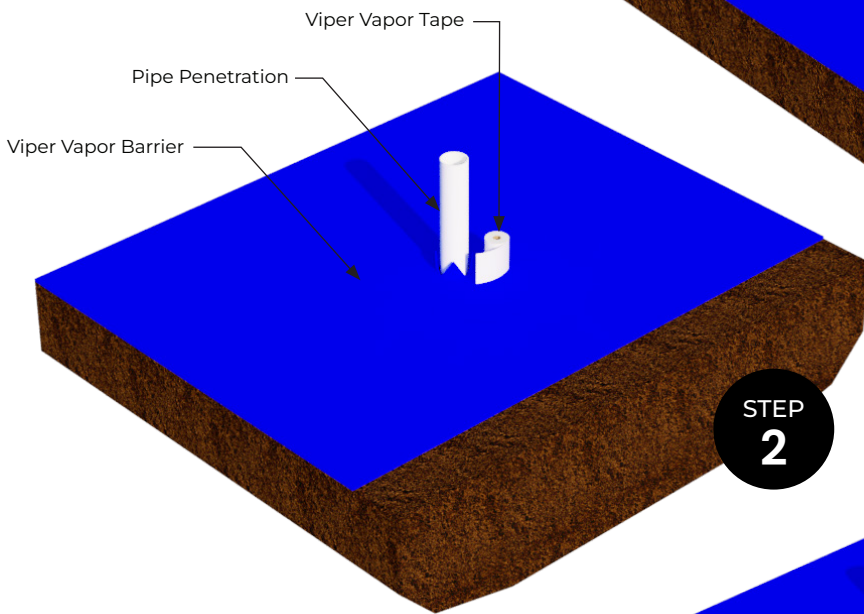
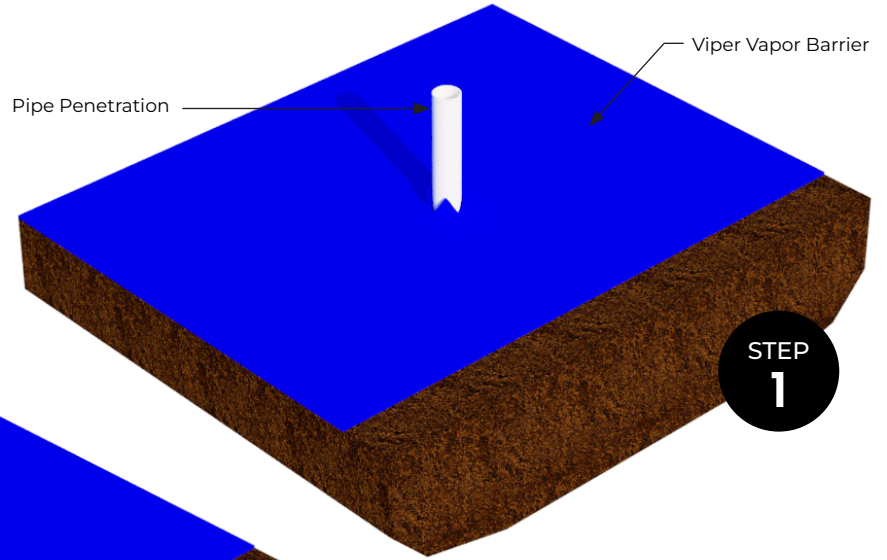
1. Remove form.
2. Tape form stake penetrations
3. Overlap new layer of Viper Vapor Barrier a minimum of 6 inches.
4. Tape seam with Viper Vapor Tape.

6" Overlap



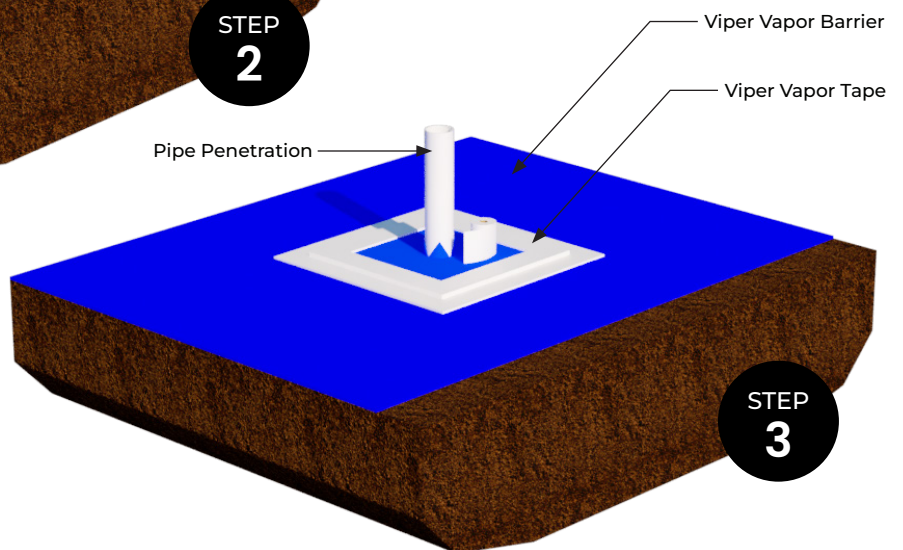
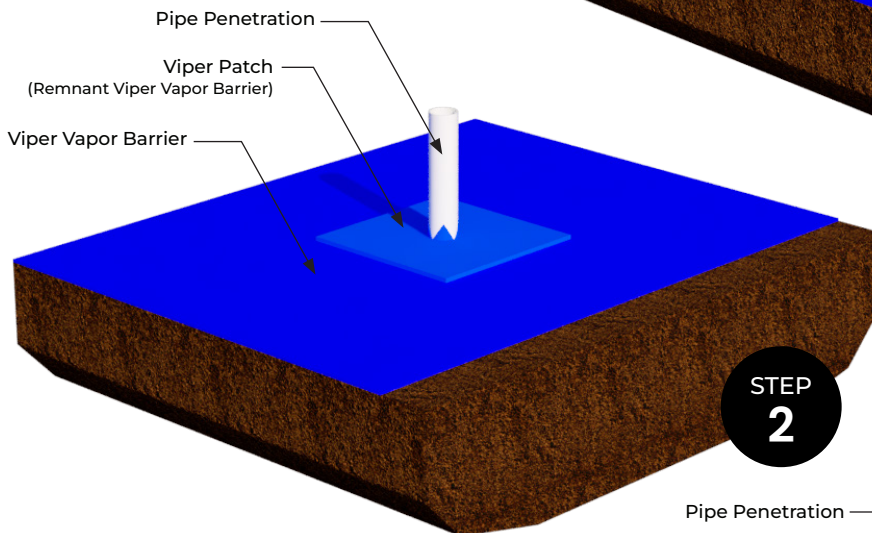
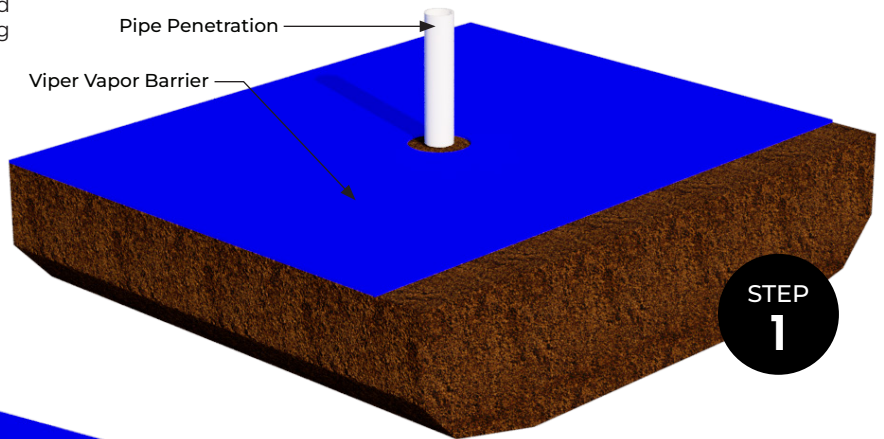
Pipe Penetration Seal (Tape)

INSTALLER NOTE: Best practice is to fit base layer of Viper Vapor Barrier tightly around pipe penetration to minimize voids. Cut a small slit in Viper Vapor Barrier and slide tightly over pipe penetration. Seal exposed areas around pipe penetration using Viper Vapor Tape.



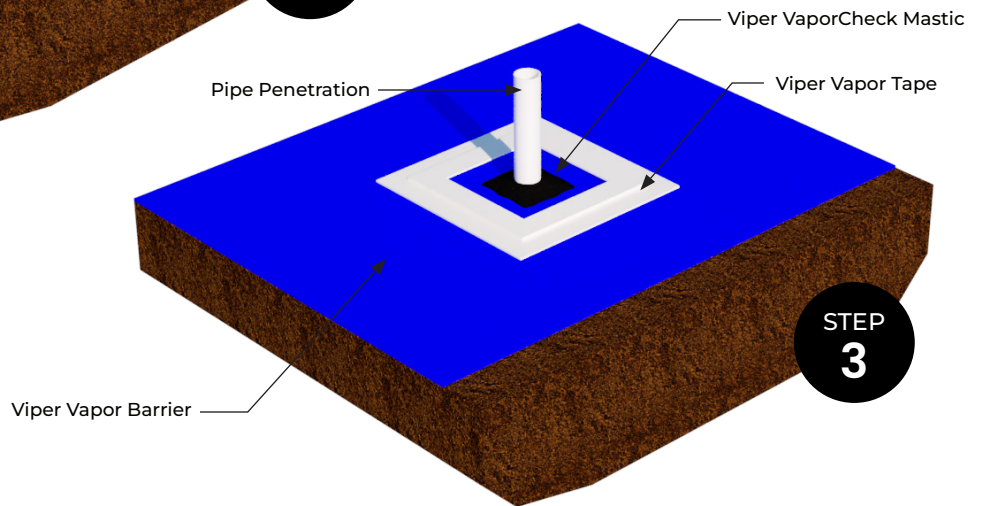
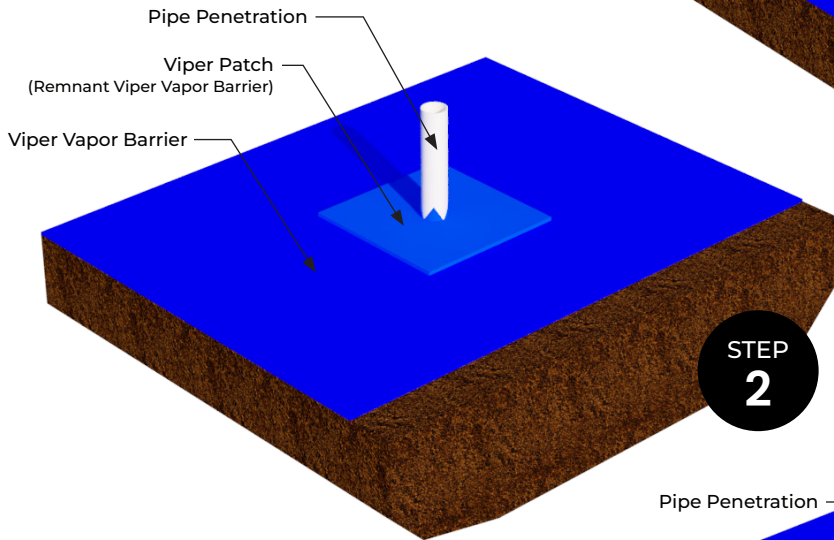
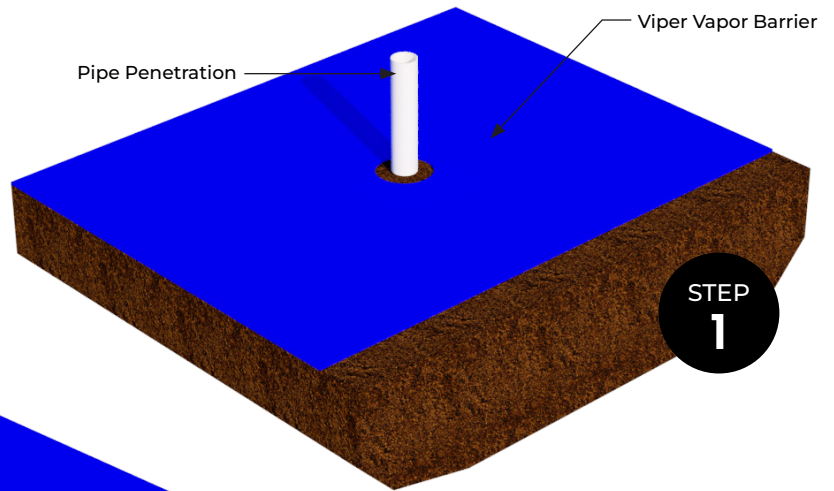
Pipe Penetration Seal (Patch)

INSTALLER NOTE: If large openings are present around base of pipe penetration, create patch/boot using remnant Viper Vapor Barrier and slide tightly over pipe penetration. Seal all edges and exposed areas around pipe penetration using Viper Vapor Tape.



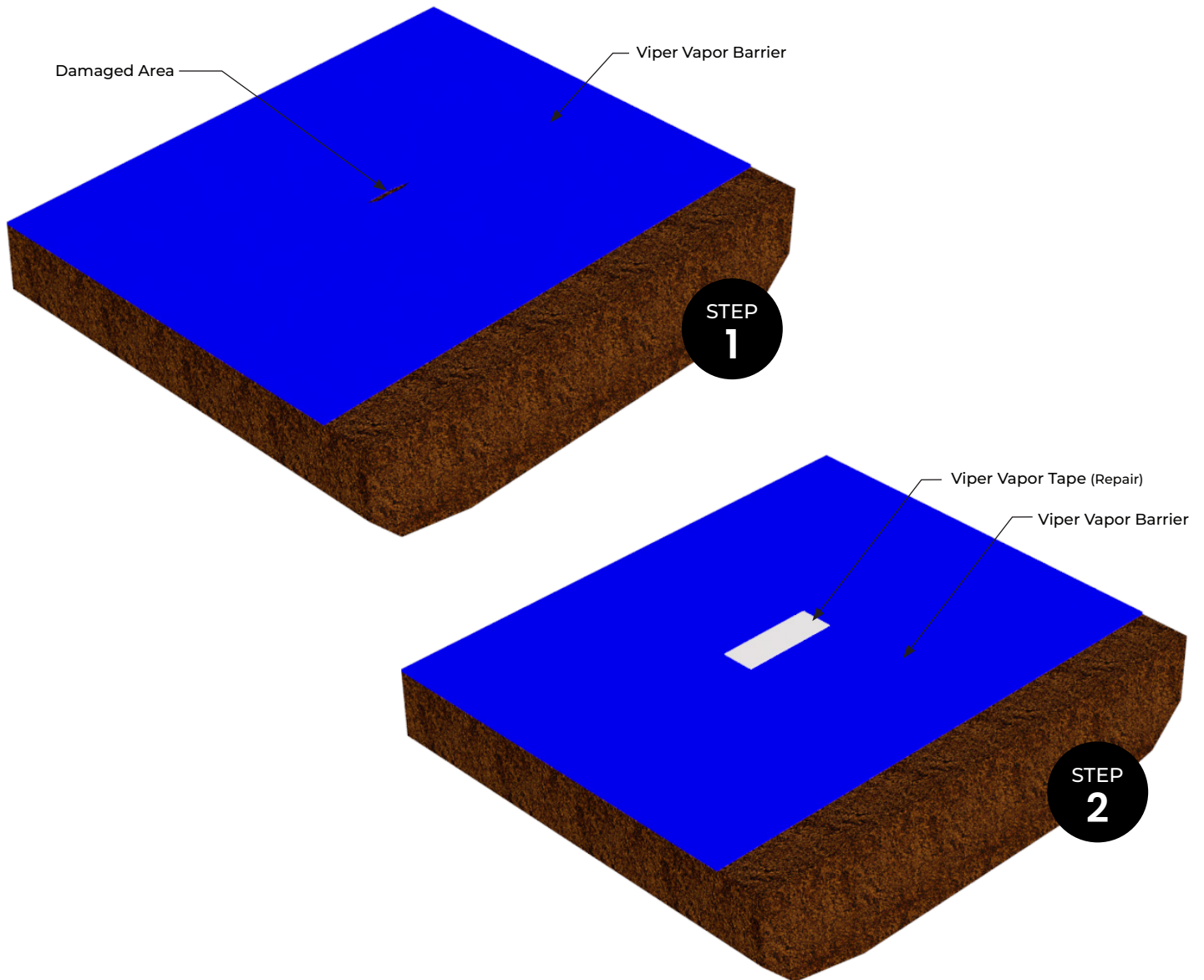
Pipe Penetration Seal (Mastic)

INSTALLER NOTE: If large openings are present around base of pipe penetration, create patch/boot using remnant Viper Vapor Barrier and slide tightly over pipe penetration. Seal edges of patch with Viper VaporTape and seal base of pipe penetration with Viper VaporCheck Mastic.



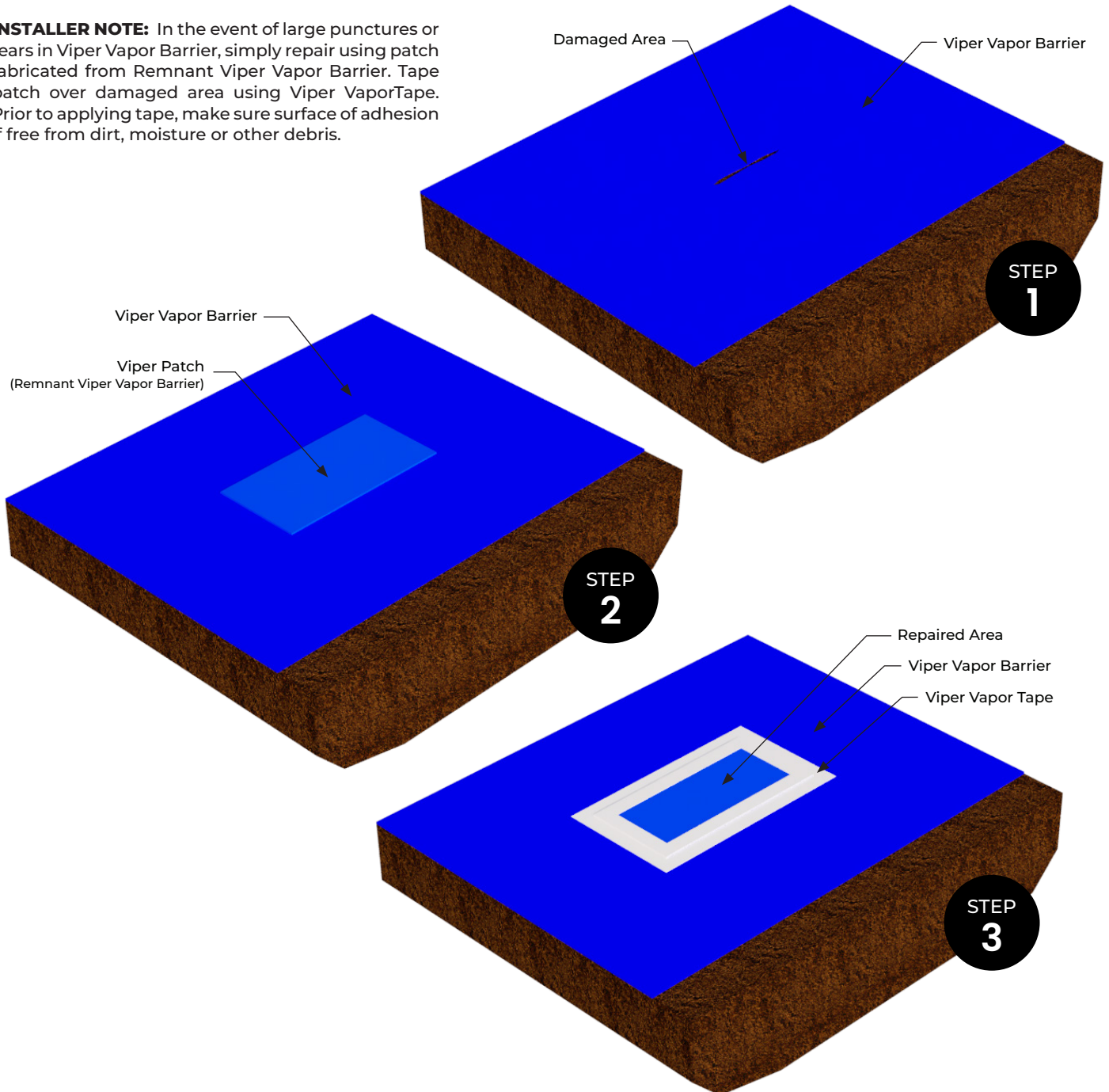
Repair Using Tape

INSTALLER NOTE: In the event of small punctures or tears in Viper Vapor Barrier, simply repair using Viper VaporTape. Prior to applying tape, make sure surface of adhesion is free from dirt, moisture or other debris.



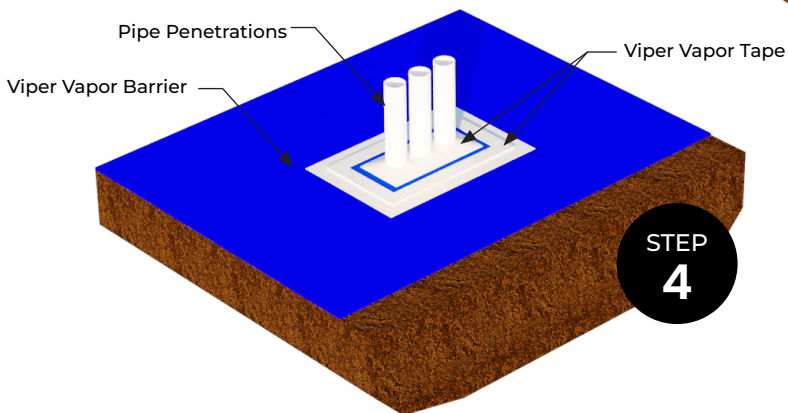
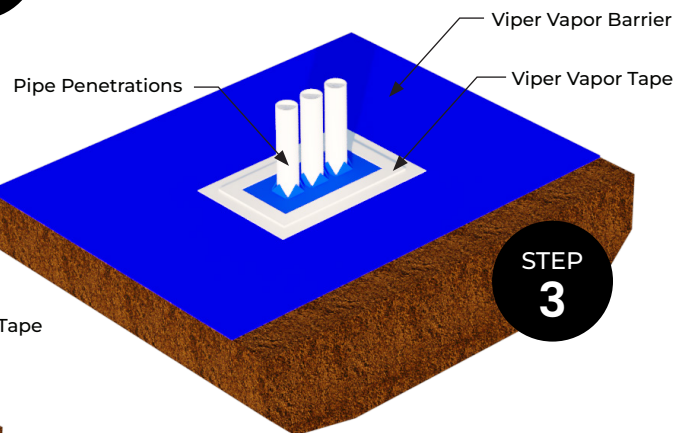
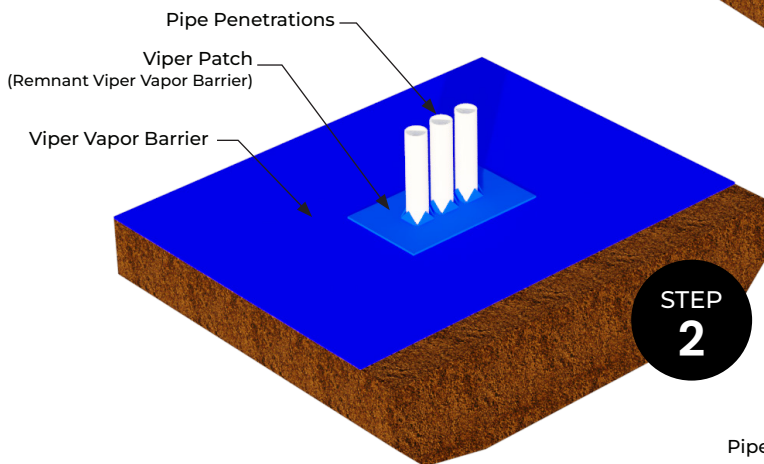
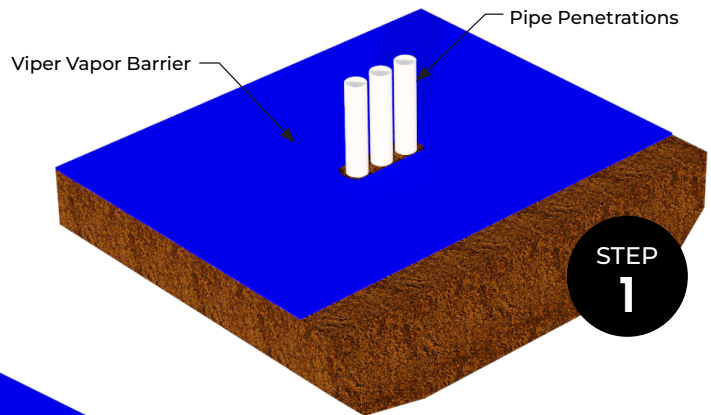
Repair Using Patch

INSTALLER NOTE: In the event of large punctures or tears in Viper Vapor Barrier, simply repair using patch fabricated from Remnant Viper Vapor Barrier. Tape patch over damaged area using Viper VaporTape. Prior to applying tape, make sure surface of adhesion is free from dirt, moisture or other debris.



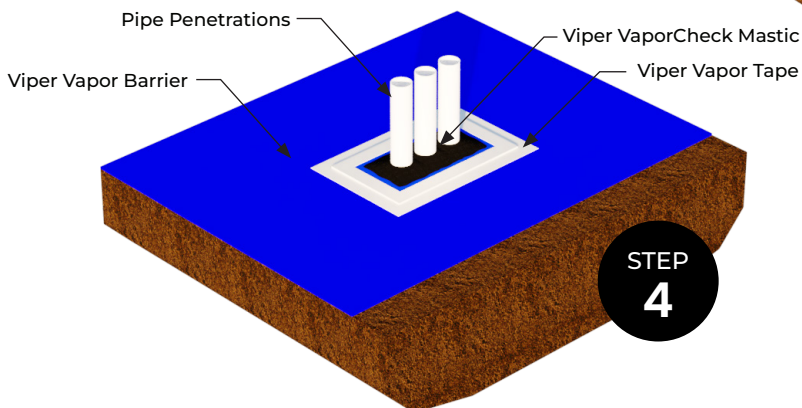
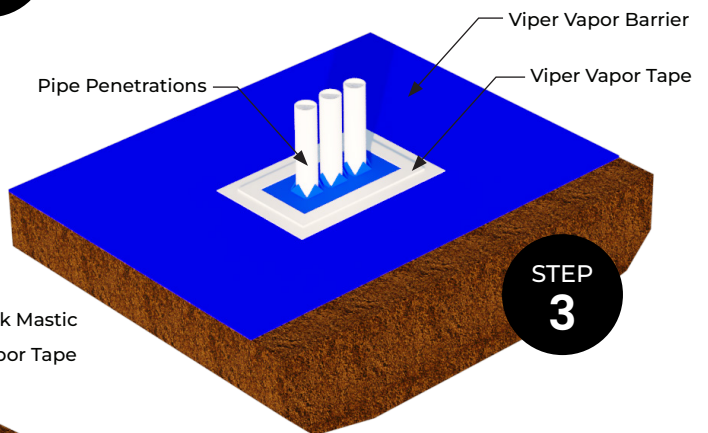
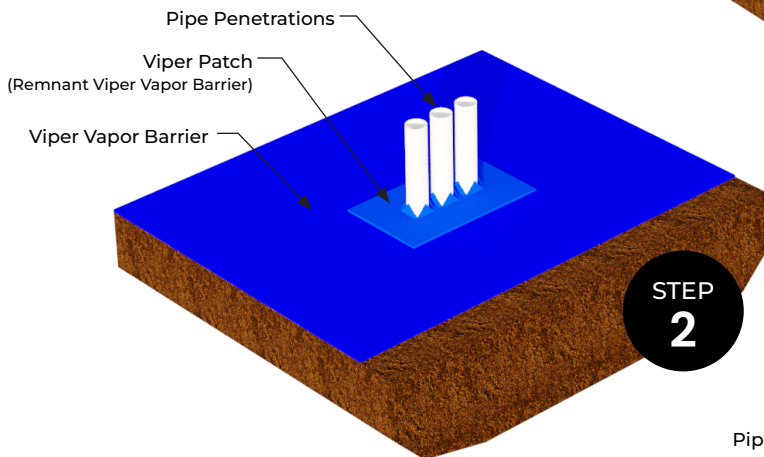
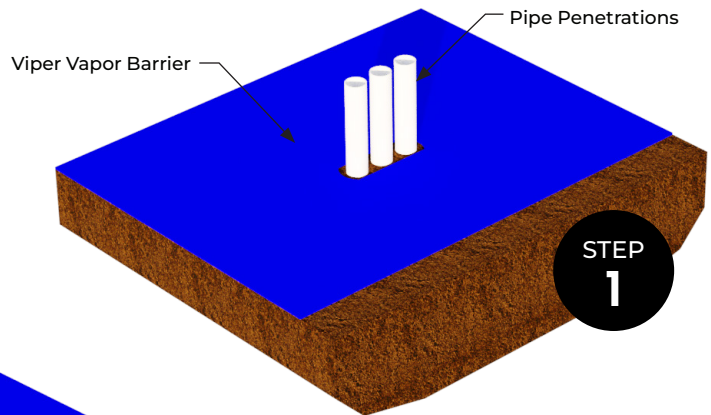
Gang Pipe Seal (Tape)

INSTALLER NOTE: If large openings are present around base of pipe penetrations, create patch/boot using remnant Viper Vapor Barrier and slide tightly over pipe penetrations. Seal all edges and exposed areas around pipe penetrations using Viper Vapor Tape.



Gang Pipe Seal (Mastic)

INSTALLER NOTE: If large openings are present around base of pipe penetrations, create patch/boot using remnant Viper Vapor Barrier and slide tightly over pipe penetrations. Seal edges of patch with Viper VaporTape and seal base of pipe penetration with Viper VaporCheck Mastic.



RESOURCES



AEC Daily Course



This course reviews the causes and consequences of moisture and soil gas problems.

Architectural Drawings



Scan to download all Viper II detailed architectural drawings or visit www.viper2.com.



Installation Instructions



Scan to download the Viper II installation instruction guide or visit www.viper2.com.



EXCEEDING INDUSTRY STANDARDS



Viper II products are tested and engineered to meet and exceed the Class A, B and C requirements outlined in ASTM E 1745, the most recognized industry standard for under-slab vapor retarders.



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