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Founder | BPI® Energy Auditor Certified Professional Attic insulation is a significant concern for homeowners in northern areas with frigid winters. You may have noticed that some attics have vapor barriers installed while others don’t. So, are vapor barriers necessary for attic insulation, and should you install one in your house? This article will discuss what a vapor barrier does and when you need to install one in attic the attic. We’ll also discuss how to install a vapor barrier in attic insulation properly. And if you’re looking for a calculator to see what installing a vapor barrier might cost you, try out our Vapor Barrier Cost Calculator here. Attic insulation doesn’t always need a vapor barrier, but if you live in a climate with colder winters, you may need to install one. A vapor barrier can prevent moisture buildup in the attic insulation, preventing the insulation from getting damaged. As the name suggests, a vapor barrier, also known as a vapor retarder, prevents water vapor from building up in your attic insulation. This problem is more common in the winter when the attic is colder than the rest of the house. As the water vapor generated inside rises towards the ceiling, it enters the attic through porous areas. If you don’t have a vapor barrier, the attic will become more humid in the winter, and the insulation may get damp. While most types of fiberglass insulation are waterproof, too much moisture can reduce the lifetime of your ceiling and may damage the drywall in your house. A vapor retarder prevents the water vapor from getting deposited in attic insulation and will circulate it through the ceiling. This application can make your house warmer in the winter since the indoor humidity levels will increase. However, manufacturers didn’t introduce vapor barriers until the arrival of non-porous attic insulation. Previously, water vapor would circulate out of the house through chimneys and air vents since water vapor tends to move toward cold air. However, in modern homes without air vents and fireplaces, the vapor has no other way to exit the house and will get deposited in the attic. This doesn’t mean you shouldn’t have airproof insulation or open a blocked chimney—studies have shown that an open fireplace will lose 70% of its heat and can actually make your house colder in the winter. In such climates, a vapor barrier can prevent moisture buildup in your attic without compromising your house’s insulation system. You should only install a vapor barrier in attic insulation if you live in a climate with more than 8,000 heating degrees days. For example, if you live in the US, you’ll need a vapor barrier in climate zones 6 and 7. This map of US climate zones will show you which zone you’re located in. In rare cases, you may need to install a vapor barrier with attic insulation if you live in climate zone 4 or 5, although it’s usually unnecessary. You’ll only need a vapor barrier with attic insulation if you live in an area where it’s freezing in the winter, and your house is completely insulated. This necessity is because houses in colder climates will produce more indoor water vapor in the winter since doors and windows are rarely opened. While a sound air heating system may circulate the water vapor, it may also make your house more humid. This moisture may get stuck if your attic doesn’t have a vapor barrier. You’ll need to install a vapor barrier before the attic insulation if your ceiling is porous in different spots due to lighting installations or other fixtures. This sequence will prevent the water vapor from going through the ceiling to the attic, and you won’t have an excess moisture problem. You don’t need a vapor barrier if you live in a moderate or hot and humid climate, as it will cause more harm than good. In the US, this will be anywhere in climate zones 1-3, although houses in climate zone 4 often don’t need vapor barriers either. Installing a vapor barrier in a hot climate will only cause your house to heat up significantly during the summer, and you’ll have to deal with more humidity indoors. Homes in warmer climates rely more on proper air circulation to lower indoor temperatures in the summer. So while these houses still benefit from attic insulation, they don’t need vapor barriers. Another downside of installing a vapor barrier in a hot and humid climate is that it may damage your walls. The excess humidity won’t be able to circulate through the ceiling properly, and it will damage your drywall over time. This consideration is one of the reasons why houses in humid areas need more circulation and vents. Faced insulation also doesn’t usually require a retarder since it traps moisture. However, you’ll have to consult your local laws to check whether houses with faced insulation are exempt from having vapor barriers. If you have to install something to prevent moisture buildup in a humid climate, you can install an air filter instead of a barrier. Never install a vapor barrier over existing insulation, as it will only damage the ceiling. The correct way to install one is first to remove the existing insulation and then install a vapor retarder. Then, you can install a new layer of insulation over the barrier to completely seal your attic. If your old insulation is damp because of the absence of a vapor retarder, it’s best to replace the insulation when installing a barrier. While this may be expensive, it’s an excellent long-term investment, and you shouldn’t have to replace your insulation for at least 10-20 years. Unfortunately, you can’t really seal the attic completely, so you’ll have to install a vapor barrier over the ceiling drywall. This process is only effective if you paint the drywall with permeable paint (like latex paint) to allow the water vapor to circulate through the ceiling. Always install a vapor retarder in the interior of the insulation if you live in a colder climate since the weather will remain cold or mild for most of the year. Vapor barriers aren’t perfect, and you’ll have to look at other factors before installing one in your attic. These include the type of cladding on your roof and walls and the barrier’s permeability. Houses with absorptive cladding are more likely to retain moisture, so you’ll have to install the retarder on the exterior of the insulation. This application should protect the cladding from getting damp and will prevent structural damage to your house. Another factor to consider is the permeability of the barrier. Vapor barriers with low permeability keep out more water vapor and are more effective at protecting attic insulation in colder climates. However, it would be best if you always compared the indoor and outdoor humidity levels when looking at the permeability of the retarder. For example, if the indoor humidity is much higher and the air is drier outdoors, you should use a vapor barrier with lower permeability. A vapor barrier can protect your attic insulation from getting damp and moist, but you don’t always need it. However, if you live in a cold climate with moderate summers, attic insulation will benefit from a retarder. Always ensure that the barrier is installed correctly and has some permeability to prevent moisture buildup in the ceiling. Best of luck in your endeavors! Infiltration of moisture from the ground through concrete slabs is a major building defect liability. Stego Wrap Vapor Barrier 15-Mil is designed not only for effectiveness but also for longevity. This vapor barrier is manufactured with only the highest grade of prime, virgin, polyolefin resins which allow this product to greatly resist degradation. This product is also engineered for superior strength and durability, never flakes and is resistant to tears, snags, punctures, and cracks.Stego Wrap 15-Mil Vapor Barrier has an extremely low permeance rating, which helps mitigate the risk of water vapor accumulation and the transmission of various soil gases. This helps to maintain the integrity of the building envelope and promotes indoor air quality by avoiding serious moisture-related issues. Engineered Performance – Life of the Building ProtectionStego offers the first-of-its-kind warranty for its line of vapor barriers and retarders. The Stego Life of the Building Warranty reinforces its 20+ year track record without a single claim of product failures, making Stego the construction industry leader in below-slab barriers. The warranty matches the unparalleled Stego Installation Support - a FREE SERVICE designed to help achieve an effective installation and add value for project teams. APPLICABLE STANDARDS American Society for Testing & Materials (ASTM): ASTM E1745: Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs ASTM F1249: Test Method for Water Vapor Transmission Rate through Plastic Film and Sheeting using a Modulated Infrared Sensor ASTM D1709: Test Methods for Impact Resistance of Plastic Film by Free-Falling Dart Method ASTM D882: Test Method for Tensile Properties of Thin Plastic Sheeting ASTM E154: Standard Test Methods for Water Vapor Retarders used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover Physical Properties: Water Vapor Permeance: 0.0086 perms Puncture Resistance: 2,266 grams Tensile Strength: 70.6 lbf/in Thickness: 15-mil Dimensions: 14' x 140' (1,960 ft2) Roll Weight: 147 lbs Additional Benefits: Resists vapor diffusion and moisture intrusion Exceptional durability Resists deterioration Simple, dependable installation Reduces migration of soil gases, such as methane or radon Available nationwide Life of the Building Warranty Stego Installation Support In most U.S. climates, vapor barriers, or -- more accurately -- vapor diffusion retarders (vapor retarders), should be part of a moisture control strategy for a home. A vapor retarder is a material that reduces the rate at which water vapor can move through a material. The older term "vapor barrier" is still used even though "vapor retarder" is more accurate.The ability of a material to retard the diffusion of water vapor is measured in units known as "perms" or permeability. The International Residential Code describes three classes of water vapor retarders:Class I vapor retarders (0.1 perms or less):GlassSheet metalPolyethylene sheetRubber membraneClass II vapor retarders (greater than 0.1 perms and less than or equal to 1.0 perms):Unfaced expanded or extruded polystyrene30 pound asphalt coated paperPlywoodBitumen coated kraft paperClass III vapor retarders (greater than 1.0 perms and less than or equal to 10 perms):Gypsum boardFiberglass insulation (unfaced)Cellulose insulationBoard lumberConcrete block Brick15-pound asphalt coated paperHouse wrapVapor retarders can help control moisture in:BasementsCeilingsCrawlspacesFloorsSlab-on-grade foundationsWallsEffective moisture control in these areas and throughout a home must also include air-sealing gaps in the structure, not just the use of a vapor retarder. How, where, and whether you need a vapor retarder depends on the climate and the construction of your home. Vapor retarders are typically available as membranes or coatings. Membranes are generally thin, flexible materials, but also include thicker sheet materials sometimes called "structural" vapor retarders. Materials such as rigid foam insulation, reinforced plastics, aluminum, and stainless steel are relatively resistant to water vapor diffusion. These types of vapor retarders are usually mechanically fastened and sealed at the joints. Thinner membrane types come in rolls or as integral parts of building materials. Common examples include polyethylene sheeting and aluminum- or paper-faced fiberglass roll insulation. Another type is foil-backed wallboard. Most paint-like coatings also retard vapor diffusion. In mild climates, materials like painted gypsum wallboard and plaster wall coatings may be enough to impede moisture diffusion. In more extreme climates, higher-perm vapor diffusion retarders are advisable for new construction. They perform best when installed closest to the warm side of a structural assembly -- toward the interior of the building in cold climates and toward the exterior in hot/wet climates. Vapor retarder installation should be continuous and as close to perfect as possible. This is especially important in very cold climates and in hot and humid climates. Be sure to completely seal any tears, openings, or punctures that may occur during construction. Cover all appropriate surfaces or you risk moist air condensing within the cavity, which could lead to dampened insulation. The thermal resistance of wet insulation is dramatically decreased, and prolonged wet conditions will encourage mold and wood rot. Except for extensive remodeling projects, it's difficult to add materials like sheet plastic as a vapor retarder to an existing home. Obtaining an energy assessment and thoroughly sealing any leaks it reveals is are very effective for slowing moisture movement in and out of your home. Your home may not need a more effective vapor retarder than the numerous layers of paint on its walls and ceilings unless you live in extreme northern climates. "Vapor barrier" paints can be an effective option for existing homes in colder climates. If the perm rating of the paint is not indicated on the label, find the paint formula. The paint formula usually indicates the percent of pigment. To be a good vapor retarder, it should consist of a relatively high percent of solids and thickness in application. Glossy paints are generally more effective vapor retarders than flat paints, and acrylic paints are generally better than latex paints. When in doubt, apply more coats of paint. It's best to use paint labeled as a vapor diffusion retarder and follow the directions for applying it. An air barrier/vapor retarder attempts to accomplish water vapor diffusion and air movement control with one material. This type of material is most appropriate for southern climates where keeping humid outdoor air from entering the building cavities is critical during the cooling season. In many cases, such water resistive barriers consist of one or more of the following materials: Water resistive barriers are generally placed around the perimeter of the building just under the exterior finish, or they may actually be the exterior finish. The key to making them work effectively is to permanently and carefully seal all of the seams and penetrations, including around windows, doors, electrical outlets, plumbing stacks, and vent fans. Missed gaps of any size not only increase energy use, but also increase the risk of moisture damage to the house, especially during the cooling season. A water resistive barrier should also be carefully inspected after installation before it is covered by other work. If small holes are found, they may be repaired with caulk or polyethylene or foil tape. Areas with larger holes or tears should be removed and replaced. Patches should always be large enough to cover the damage and overlap any adjacent wood framing. Founder | BPI® Energy Auditor Certified Professional A vapor barrier can be an effective solution to prevent various problems caused by moisture around, in, and under your house. The most concerning issues are energy inefficiency, humidity damage, and mold. They aren’t the same as house wraps or crawl space encapsulation, which is typically more complex than the typical barrier installation. So, how and where should you use a vapor barrier? Before installing one in your house, there is a lot to know about vapor barriers, so read on for answers to all your critical FAQs in this ultimate guide. A vapor barrier is necessary for several types of flooring and insulation. The crawl space is a significant source of moisture, so it should have an encapsulated vapor barrier. They are also necessary for some external and internal walls. Mold can grow in a crawl space with a vapor barrier, as some moisture will always accumulate underneath it. However, if there’s little to no food or airflow, the mold shouldn’t become a problem. Installing a vapor barrier in a crawl space can prevent mold growth. However, mold might still manage to grow in several scenarios. A crawl space vapor barrier prevents the diffusion of moisture from the ground to your property’s floor or subfloor. Still, there will always be some moisture underneath the barrier, whether you’re dealing with concrete or earth. Since you cannot wholly remedy this moisture problem, mold growth is likely under the crawl space barrier. But the extent or severity of mold growth depends on the airflow over the moist ground. A lack of or minimal airflow will prevent mold from growing unchecked under a vapor barrier. Mold needs air to grow because these fungi are aerobes: they need oxygen to survive. They’ll also find it hard to grow if there isn’t any food—in this case, cellulose. The barrier isn’t the only factor in play here. The encapsulation of the crawl space and the availability of organic matter, such as green plants, paper, wood, etc., will determine the extent of mold growth. A well-encapsulated, organic matter-free crawl space won’t have mold issues. A crawl space should be vented if it isn’t encapsulated. However, an encapsulated crawl space with vapor barriers is better if it isn’t vented. This way, humid air won’t be able to come in. Any moisture that makes its way through can be removed with a dehumidifier or a sump pump. For decades, many building codes mandated that a house crawl space be vented. But a crawl space encapsulated and sealed with a vapor barrier offers more effective protection from moisture. Of course, you must have a dehumidifier and sump pump for the crawl space. Suppose you lay and seal a vapor barrier on the crawl space ground. A vented crawl space will continue to have humid air flowing into and over it, so it won’t protect the area above it from moisture. This is why you should consider encapsulating the crawl space with vapor barriers. Encapsulating differs from laying a barrier on the floor—it covers the entire ground or slab foundation and the load-bearing columns or structural pillars. Encapsulation seals the entire space under your house. Whatever moisture seeps into the sealed crawl space is eliminated using a dehumidifier, and any water runoff during rains or storms is drawn out using a sump pump. In a flood-prone area, homeowners can consider using trench drains to redirect surface water. In case you’re worried about groundwater puddling under the vapor barrier of an encapsulated crawl space, consider installing French drains to channel that stream away from your house. The Dupont Tyvek HomeWrap isn’t a vapor barrier. This bestselling house wrap is a non-woven and breathable material, so it’s permeable. The Tyvek HomeWrap has a permeability of 54 perms. Courtesy of Dupont Vapor barriers or diffusion retarders can have a maximum permeability of 10 perms. Here are the permeability ranges for different types of vapor retarders: Class I: less than or up to 0.1 permClass II: between 0.1 and 1 permClass III: 1 to 10 perms Some house wraps can be vapor barriers if their permeability is lower than ten perms. At 54 perms, it’s clear that the Tyvek HomeWrap doesn’t have the purpose of being a vapor barrier. Fiberglass insulation needs a vapor barrier in most regions of the US. Otherwise, you’ll have problems such as ineffective insulation, mold growth, and rotting frames. Standard fiberglass insulation is unfaced, but you can get kraft-faced fiberglass insulation. The batts have kraft paper on one side, serving as the vapor retarder. You can also install it on exterior walls. However, kraft-faced fiberglass insulation has a few potential issues. Since the kraft paper is part of the batts, any problem with the latter will also affect the efficacy of the barrier. This leads to several common problems: Cracks or gaps in fiberglass insulation due to loose batts or poor framingCompressed or jammed fiberglass batts affect insulation and protection against vaporInstalling more than one layer of kraft-faced fiberglass batts may trap moisture or vapor A more effective and practical option is to get a proper vapor barrier that is not part of the fiberglass insulation in your house. This barrier should be flawlessly sealed or taped at all seams. The thickness of a vapor barrier should be around 10-12 mils (0.25-0.30 mm). You can use a six mil (0.15 mm) vapor barrier if it is a Class I type with a permeability of fewer than 0.1 perms. However, this thickness may not be viable for crawl spaces or extremely humid regions. If budget isn’t a concern, you should go for 15 mils (0.38 mm) thickness for a Class I vapor barrier. Apart from the thickness and permeability, you’re also getting an incredibly reliable material. The proper thickness for your barrier depends on why and where you need it. For example, a vapor barrier in a crawl space is exposed to more moisture without assistance from any other fixture, so you’ll need a thicker and less permeable material. Compare that to a vapor barrier between the insulation and drywall. Again, you may be alright with a bit thinner or more permeable barrier in most areas, although it might not be enough for humid places like bathrooms and kitchens. A good rule of thumb is installing a vapor barrier on the outer face of an exterior wall in hot and humid climates. In colder climates, the vapor barrier should be on the internal side of an exterior wall, typically between the insulation and drywall, plasterboard, or wallboard. This approach needs to be personalized depending on your needs, such as how much moisture and relative humidity you anticipate in your house. The home’s orientation also matters—for example, north-facing exterior walls tend to get more sun in the winter than in the summer. Regardless of the specifics, you should install a vapor barrier on an exterior wall without any air gap. Air gaps can defeat the purpose of vapor retarders by trapping moisture during the installation process. Additionally, it would be best if you considered installing vapor barriers on the interior walls of incredibly humid places, such as: BasementBathroomsKitchensLaundry closetUtility areasWater features The usual way to install a vapor barrier is to call a professional. Expect the price to be between $1000-$1400. Of course, the rate will go up if you have a lot of surface area to cover. If you have the necessary knowledge and tools and only need to cover a small area, you could do it yourself and bring the price down to $500. Stego Industries, LLC. is among the leading brands manufacturing vapor barriers in the US. They offer premium-quality products in different thicknesses. A glimpse of the Stego inventory includes: Stego Wrap Vapor Barrier – it comes in various thicknesses: 10 mils (0.25 mm), 15 mils (0.38 mm), and 20 mils (0.5 mm). The barrier has Class I and II (A and C) variants. The permeance is as low as 0.0086 perms for a Stego wrap.Stego has several barriers made specifically for crawl space encapsulation. The variants range from 6 mils (0.15 mm) to 15 mils (0.38 mm) in thickness. Stego’s Crawl Wrap, Tape, and Term Bar are all you need to encapsulate your crawl space.Industrial-grade below-slab barriers. These are not only effective in preventing moisture permeance but also soil gas. You’ll find at least one Stego barrier for every need. Most Stego products are made of prime virgin resins and additives in a proprietary blend that exceeds all commercial construction standards—most notably, the ASTM E1745. Stego barrier rolls are usually available in two standard sizes. Most plywood subfloors need a vapor barrier. Of course, you can choose a plywood grade less prone to moisture damage, but a barrier is almost always necessary and recommended. Using a vapor barrier on any plywood subfloor isn’t enough, though. The installers should be careful not to cause any damage to the vapor retarder while installing the floor. Puncturing any roll or sheet of vapor barrier will likely defeat the purpose of the preventive fixture. This problem is prevalent for installations that involve nailing the hardwood onto the plywood subfloor. The nails can penetrate the barrier roll or sheet and the sealing tape. Rockwool, also known as mineral wool and steel wool, doesn’t necessarily need a vapor barrier. Generally, Rockwool insulation is moisture-resistant, vapor-permeable, and water-repellent. Rockwool or mineral wool insulation is superior to fiberglass, and that’s not limited to the higher R-value. While Rockwool may get wet if the insulation is exposed to water, the material doesn’t wick. Instead, the water will drain, and any moisture will permeate out. In other words, Rockwool or mineral wool won’t absorb the moisture, and the insulation will work without any degradation once the Rockwool is dry. In addition, this type of insulation can be effective even in ambient humidity, which isn’t the case with fiberglass. However, consistent exposure to a lot of moisture or extreme humidity for most months of the year calls for at least a Class III vapor barrier, if not II. Laminate flooring has an underlayment. This padding-like underlayment is rolled out on the subfloor before the laminate flooring is installed. You don’t need a separate underlayment if your laminate flooring planks have it attached as an integral part. But you will require a vapor barrier. You need a barrier or retarder under laminate flooring regardless of the subfloor, which is usually concrete or plywood—both materials are porous. Moisture problems aren’t the same for every climate or every type of construction. Your house may have its own unique issues, such as exceptionally humid areas that aren’t the usual suspects. This variance is why choosing a suitable vapor barrier is so important. We hope this guide has cleared all your doubts surrounding vapor barriers. From materials to thickness to a couple of brand names, now you’ll know what the installer will be talking about when they come to install barriers in your home. And who knows—maybe you’ll dare to do it yourself! Share — copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution — You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation . No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. A vapor barrier, also called a vapor retarder, is a layer in the building envelope that prevents water vapor from entering the wall cavity. There are three different classes of vapor barriers. The class of vapor required depends on the climate zone and cladding type. In many cases, no vapor retarder is required. Moisture control is critical in today’s airtight and well-insulated homes. In the past, vapor barriers were often installed on the inside of the building envelope to keep moisture from condensing inside the wall cavity during winter, which could encourage mold growth. But this can potentially keep walls from drying out if moisture condenses inside the wall during summer months. Building science research has refined when vapor vapors should be used, depending on both the climate and the type of cladding used. Vapor barriers are classified by their vapor permeance, or perm rating, which is a measure of the rate of moisture diffusion through the material. Class I vapor barriers have a vapor permeance of 0.1 perm or less. Class II vapor barriers have a vapor permeance of between 0.1 and 1.0 perm. Class III vapor retarders have a vapor permeance of 1.0 perm or more. No vapor barrier is required for mild or hot climates. Building code does require them in colder climates (zones 5 through 8), but in many cases a Class III vapor barrier like latex paint or a Class II barrier like Kraft-faced insulation is adequate. I had the honor of speaking at the City of Edgewater Sustainability Board and Residents Meeting on October 10, 2024. As an energy auditor and heat pump installer in the…There are a lot of green and sustainabile organizations throughout Colorado, and it’s hard to find all of them. Until now! Check out 25 or Colorado’s top green organizations.You may know that heat pump water heaters save a lot of energy, but there may be a few downsides to be aware of before installing them. Check out our short list of six potential downsides, and how to solve for them as well.If you’ve ever wondered what it might cost to remove and reinstall solar panels during a reroof, this is your calculator. Enter your own data to find out what the real cost might be. If you’ve ever wondered if the EnergyGuide label you’re looking at is accurate, this is the way to find out. Use our calculator to figure out your true costs and energy savings.If you’re debating replacing your electric conventional tank water heater with a heat pump electric water heater, this calculator will really show what savings you’ll get.Heat pump water heaters are super energy efficient. But what do the actual savings and costs look like for you home when you switch from gas to electric? Use our calculator to find out here.If you’ve ever wondered how much you might actually save by installing solar PV panels, this is it. Use our calculator and your own numbers to dial in a 25-year ROI.Maybe you have an uncomfortable home, with some cold or hot spots, and your HVAC system working on overtime. You’re about to get, or have gotten, some quotes from insulation…