SPF FAQs

Versi-Foam® systems

Get to know the materials and installation requirements for a high quality residential spray foam insulation (SPF) installation.

Spray foam insulation (SPF) is growing in popularity as an insulating material for residential building. Today, there are several varieties available with differing applications, R-values, and other properties. These products provide a cost-effective way to create a well-sealed building envelope in both new construction and retrofits—but many installers have questions about which types of SPF to use.

According to Mark Wojtiuk of RHH Foam Systems, a leading manufacturer of spray foam kits, "The type of foam to install will come down to several designing factors. One's region, budget, and local design codes will all play into the decision on which type of foam to install." In this whitepaper, you will find insights into the properties of different types of SPF, the best practices for installation, and answers to frequently asked questions about which types of SPF are best for various applications.

What is spray foam?

Spray polyurethane foam (SPF) is unique in the world of building supplies in that it is one of few products that is “manufactured” onsite. While single-component SPF products are available—and often used in areas where excessive expansion may create problems, such as around windows and door frames, most installers make SPF by mixing chemicals to create the foam. This is why most SPF products come in liquid form using two parts that are mixed at the jobsite in order to set off a chemical reaction that forms the foam.

How is spray foam installed?

On large-scale projects like a whole home installation, installers will bring a truck with a work trailer to the jobsite. The trailer features the equipment needed for installation plus the chemicals. Using a high-pressure spray foam system, the chemicals are mixed and dispensed through long, heated lines and a professional grade spray gun. SPF dispensed in this way expands to over 100 times its original volume.

Smaller applications that require limited amounts of foam often rely on SPF kits like those that RHH Foam Systems offer. These kits include the required chemicals and tools to install the foam.

SYSTEM 50
For larger jobs, this system is complete with two chemical components, each in separate boxes, and produces 600 square feet of cured foam at a 1" thickness, or 50 cubic feet.

SYSTEM 15
For smaller jobs, this system is perfect to carry and spray at the same time as both chemical components are in the same carton. System 15 will produce 198 square feet of cured foam at a 1" thickness, or 16.5 cubic feet.

What are the two components of spray foam?

The two liquids used to create mixed SPF are often referred to as the "A-Component" and "B-Component." The A-Component in an SPF system is most commonly comprised of methylene diphenyl diisocyanate and polymeric methylene diisocyanate while the B-Component is usually a mixture of polyols, catalysts, blowing agent, flame retardant, and surfactant.

What do these chemicals do?

- Polyols are the main building blocks of resins.
- Catalysts control the chemical reaction rate for the initiation and curing time of SPF.
- Blowing agents provide the gas that fills the foam.
- Flame retardants are chemical additives used to meet certain flammability standards set forth by building codes.
- Surfactants allow components in the A and B Components to blend correctly with one another, and they assist in the development of cell structure and surface structure.

A-component rich mixture

B-component rich mixture

What happens when spray foam mixes incorrectly?

Most SPF systems in use today require a one-to-one mixing ratio for the A-Component and B-Component. When following manufacturer instructions, and when working with well-maintained equipment, the application process is generally hassle-free. However, certain factors like pressure and temperature can distort the dispensing ratio within high pressure equipment. In low pressure disposable systems, temperatures that are too low or too high can result in an incorrect ratio.

Clogs can also affect installation. In some cases where spray foam kits are shut down and reused later, proper maintenance is required to prevent blockages in the A-Component side of the gun. These clogs will cause off-ratio application.

One can often tell whether an SPF application was too rich in either the A-Component or the B-Component simply from the look of the foam itself.

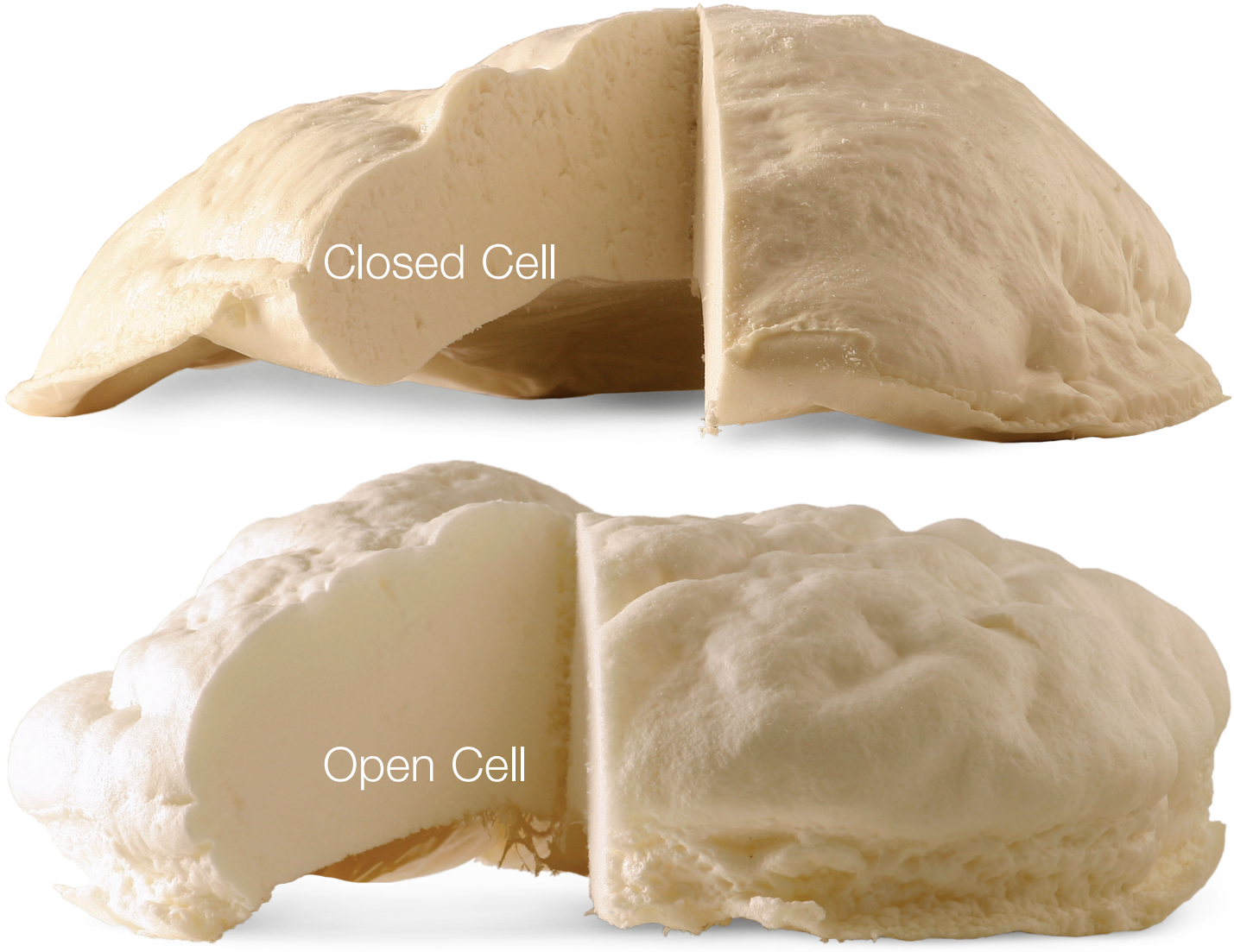
The effects of A-Component rich mixtures include:

- Foam that is dark in shade (brownish) with a smooth, hard surface
- Irregular, glassy cell structure
- Friable, brittle foam
- Improper density
- Improper rise

The effects of B-Component rich mixtures include:

- Foam that is light in shade (whitish)
- Slow or insufficient rise
- Soft or spongy
- Improper cell structure
- Highly mottled or coarse orange peel surface texture
- Blow holes or pinholes
- Foam that shrinks over time
- Off-gassing because the product hasn't fully cured

SPF applied under these conditions will not feature normal density, strength, or insulation value, and it may absorb water.



Closed Cell Foam	Open Cell Foam
Has a higher moisture barrier (which means it has lower moisture permeability)	Has a lower moisture barrier (or higher moisture permeability)
Provides an air barrier at 0.5” thickness	Provides an air barrier at full wall thickness
Provides higher strength and rigidity to the building structure	Provides lower strength and rigidity to the building structure
Resists water	Not recommended for applications in direct contact with water
Absorbs sound	Absorbs sound very well
Lower expansion	Higher expansion

What is the difference between closed and open cell foam?

The basic difference between closed cell and open cell foam is density. Closed cell foam has higher density, which affects how the foam performs. In general, closed cell foam provides a higher R-value, it’s stronger, and it creates a better barrier against moisture and air. Open cell foam proves the better sound barrier.

What is the preferred type of foam for residential building?

The answer to this question is largely based on application. Most builders use closed cell foam for exterior wall applications—especially in the northern US—because closed cell foam features a higher R-value, better vapor barrier qualities, and it provides additional rigidity to structures. “Most of our residential requests have been for closed cell foam,” Mark says. “Our kits are generally used for remodeling projects, small additions, and air sealing within new and old construction.”

When it comes to new home construction, contractors typically install SPF insulation via high pressure equipment using chemicals purchasable in drums rather than kits. In these instances, some contractors only install open cell foam because it produces a much higher yield. Even though the R-value is lower, contractors installing open cell foam are able to install a lot more foam using an equivalent amount of product.

Where sound dampening is a concern—for example, in theater rooms—contractors typically install open cell foam because it features better sound proofing qualities.

Some regions, such as Miami/Dade county, stipulate that if you insulate an

What are the recommended applications for RHH spray foam products?

VERSI-FOAM two-component low-pressure SPF kits are ideal for air sealing the building envelope. This includes area such as:

- Crawlspaces
- Rim joists
- Utility entrances
- Top plates within the attic
- Vents and penetrations into the roof and walls

Other applications, such as sealing around window and door frames, should avoid the use of two-component foams. Instead, use a one-component product like VERSI-TITE. Single component foams feature very little expansion whereas two component foams have a high expansion rate that can potentially bow window and door framing, which may result in windows and doors that are difficult to open and close.

What are the recommended applications for RHH spray foam products?

VERSI-FOAM low pressure polyurethane foam kits are ideal for one-room remodels, small home additions, and smaller insulating jobs where it would not be cost-effective to hire a high-pressure spray foam installer.

Low pressure spray foam kits come with the added benefit that occupants can enter areas where foam has been installed within one hour of application without the need for respiratory protection. This is in contrast to contractor-installed high-pressure spray foam systems, which require avoiding the area for 24 to 48 hours after application. The longer non-occupancy period associated with high pressure SPF systems is a result of how these products are installed: Chemicals atomized in very small particles, which can remain airborne for an extended length of time. Low pressure spray foam kits dispense chemicals in liquid or froth forms. Because it is not atomized, the risk of airborne particles is greatly reduced.

What is the R-value of spray foam?

To calculate the R-value of spray foam, it's important to account for these key factors:

- Different products from different manufacturers may offer varying levels of insulation, so it's always best to check with specific manufacturers before calculating precise R-values.
- Open cell and closed cell foam will have different R-values, with open cell featuring a lower value and closed cell featuring a higher value.
- R-values are based on installed thickness. The R-value rises with higher thicknesses.

Closed cell foam should have an R-value greater than R-6 per inch. Open cell foam usually has an approximate R-value of R-3.5 per inch.

Putting this into practical terms, in 2x6 construction, wall cavities measure the depth of the dimensional lumber used, which is 5.5 inches. Using closed cell foam with an R-value of R-6 per inch will result in a value of R-33 for 5.5 inches of depth. In the same wall assembly, open cell foam's R-value will be approximately R-19.

Products from RHH Foam System's VERSI-FOAM lineup include both closed cell and open cell foams. VERSI-FOAM Systems 1, 9, 15 and 50 all feature closed cell foam with an R-value of 6.7 per 1-inch thickness. VERSI-FOAM Systems 31 and 100 are both open cell foam kits featuring an R-value of 4 per 1-inch thickness.

Is installed spray foam a vapor retarder?

The answer depends on a variety of factors. The unit of measurement most often used to characterize the water vapor permeance of materials is the "perm." Perm ratings vary across manufacturers, and this rating can vary based on the installed thickness of the foam, too. There is also a difference between the perm ratings for open cell and closed cell foam.

Open cell foam typically has a perm rating around 15 for a 2-inch installed depth. Closed cell foam typically features a perm rating less than 1 perm for a 2-inch installed depth. By comparison, unfaced fiberglass typically has a perm rating over 100 for an R-13 batt.

To understand what this means, it's crucial to understand how perm ratings work. The lower the number, the less permeable a material is. Currently, the International Building Code defines vapor retarders as materials with 1.0 perm or less—in other words, materials that can be rated as either Class II or Class I vapor retarders. Closed cell foam at two inches installed thickness can achieve a 1-perm rating, which makes it a Class II vapor retarder. Open cell foam typical has a 15-perm rating at two inches installed thickness. It is therefore not classified as a vapor retarder.

Does spray foam air seal?

Inadequate air barriers allow leakage through holes, cracks and gaps in the thermal envelope. These leaks occur when there is an imbalance in pressure between the exterior of the home and the interior. It's quite a common phenomenon, one that can be caused by:

- Wind pressure on the home's exterior
- The stack effect, in which warm air travels rapidly to the top of the building
- Exhaust systems removing stale air
- The mechanical system operator trying to condition the indoor environment for maximum comfort

Field experience is proving that SPF insulation is making a major contribution to improving the energy efficiency of buildings when they are used as an air leakage control material or as a component in an air barrier system. These products meet all the requirements of an air barrier material.

- SPF can be applied with continuity throughout the building envelope.
- It is self-adhesive, adhering to supporting structures.
- SPF is resistant to common causes of air leaks like peak wind loads, sustained stack effect, and pressurization from ventilation equipment.
- SPF is virtually air permeable.
- It is durable, featuring a long service life.

How do you ensure a quality spray foam installation and avoid common mistakes?

Proper installation procedures differ between manufacturers and between SPF that comes packaged as a kit or in drums to be applied with spray foam equipment. Best practice is to always follow instructions included to prevent faulty installation. As it states in RHH Foam Systems instructions for their VERSI-FOAM products, "Proper function of the product is totally dependent upon strict adherence to the operating instructions included in this manual."

With all types of SPF, there are a few key factors that will ensure proper application. To prevent clogs or an uneven mixture that results in a faulty application, lines, guns and other equipment should be well-maintained. The foam should be applied at manufacturer approved temperatures, and kits or spray equipment should maintain proper application pressure.

- Always operate kits in the upright position and from original cartons to avoid pressure loss.
- Shake tanks or boxes of the chemical mixtures thoroughly to ensure proper mixing.
- Operate kits only at the proper temperatures, as indicated by provided temperature gauges on top of each B-Component. Chemical temperatures should be between 65°F and 90°F and surface temperatures should be above 50°F.
- Check all connections and tighten as needed to make sure there are no leaks.
- Use the application gun properly, pulling the trigger all the way back, keeping the tip 18 to 24 inches away from the surface to be foamed, and moving in a steady back and forth motion to apply the foam.

Unopened VERSI-FOAM kits are guaranteed to the expiration date on the carton, which is 13 months from the date of manufacture. If a kit has been opened, it should be used completely within 30 days. To keep lines from clogging, the gun from an opened kit should be used briefly once per week.

What safety precautions do installers need to take?

For installers, there are a few precautions to take when installing spray foam.

- Always wear personal protective equipment that prevents chemicals from coming into contact with the skin or eyes.
- Use spray foam only in well-ventilated areas and while using respiratory protection.
- Do not smoke, use welding equipment, or use any type of flame during application.
- Avoid storing spray foam components at excessive temperatures. For VERSI-FOAM products, this is above 120°F.
- Spills should be collected using absorbent materials such as sawdust.

In Summary

SPF insulation is rapidly becoming popular because it offers a lot of advantages. It is a versatile product that is useful in most residential building applications, though you will need to determine which type of foam is ideal for different applications. It is also a long-lasting type of insulation that isn't prone to settling—which means that homes featuring SPF insulation are able to maintain a well-sealed building envelope for longer than homes using blown insulation or other types of insulation that may compress with time. For more information on RHH Foam Systems' products, visit www.rhhfoamsystems.com.