

## Air Sealing with Two-Part Foam



### Technical Update

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Every once in a while, a new product comes along that represents something a lot different than just a better mousetrap. Two-part foams are not new, but they have recently been gaining widespread acceptance among energy retrofitters as a very effective air-sealing product. Performing truly effective air sealing in dark, dusty and hot attics is one of the most difficult parts of a weatherization technician's job. It also represents one of the most critical aspects to the success of an energy retrofit.

Partially sealed bypasses due to inappropriate use or poor application of air sealing materials will allow warm moist house air to migrate into the attic and degrade the effectiveness of the insulation. In cold climates attic moisture problems may result.



*A variety of two-part foam products are available.*

Two-part foam is a foamed-in-place insulating air barrier designed for air leakage control in the building envelope. A typical package includes two pressurized tanks consisting of different chemical components. When mixed in the

frothing chamber or tip and dispensed into the ambient air, a closed cell polyurethane foam is produced. The material expands to roughly three times and sets up to a hard shell cure in under one minute. Also included in the kit is a generous length of hose (available in different lengths) attached to a gun type dispenser along with a quantity of interchangeable tips.

Two part foam systems are designed as a "one time use only" product, although refillable tank systems are available from at least one manufacturer. Quantities are rated in "board feet". A 200 board foot package typically yields 16.5 cubic feet of coverage. Its insulation value is rated at approximately R-6 per inch. Once cured the material may be easily trimmed or shaped with a saw or rasp. It should not be applied into constricted cavities adjacent to windows and door frames where material expansion may deflect those operating surfaces.

### Product Review and Field Testing:

During the past year WTC staff has been experimenting with several manufacturer's two-part foam products and have put them to the test in different applications and a under a variety of conditions. We were initially impressed with the high dispensing rate of the foam and the amount of effective control and accuracy at distances of up to 12 inches from the target.

The generous length of hose offered a great deal of freedom of applicator motion even in fairly tight spaces. We noticed that the high pressure blast of propellant and foam actually dispersed dust and debris ahead of it. Post cure adhesion was very good on wood or paper based substrates.

Although manufacturers recommend application temperatures at or greater than 75<sup>0</sup> F, we applied this product at much lower temperatures with adequate results, but longer internal cure times. To mimic real world conditions, we intentionally left the material in a truck for the night where the temperature dipped to 15<sup>0</sup> F. After a brief warm up at room temperature, the material dispensed normally.

Manufacturer shut down procedures were followed to the letter, resulting in no gun or hose clogging throughout the life of the tanks. The so-called reusable and expensive guns associated with one-part foam products have developed a reputation among field techs for developing permanent clogs, which render them quite useless.

Two-part foam will fill up to a two-inch gap. Larger openings require a backing material. As rookies we tended to go a little crazy with the gun, spraying anything and everything in sight. We soon learned that conservative and more targeted use of the product was much more effective and economical.



*Two-part foam is being applied to a band joist mock-up using a wide spray pattern tip. The operator should be within six to twelve inches of the target area to prevent waste and overspray.*

There was a consensus among the test users that the quantity of extra tips provided by the manufacturers was insufficient. Due to the quick cure time of one minute or less, tips clogged during some of the typical construction delays

associated with switching locations or other preparatory measures. We therefore recommend ordering extra dispensing tips or that manufacturers provide more with their kits.



*Fiberglass backer material stuffed into attic bypasses and encapsulated with triple expanding two-part foam creates a very fast and effective air barrier. In this case the installer applied a lot more than necessary to get the job done.*

Speed is where two-part foam really shines. When sealing attic bypasses such as an open top stud bays, the current state of the practice has been to cut a piece of rigid insulation or cardboard to roughly the size of the opening and sealing the edges with one-part foam. We timed this process at roughly 1.5 minutes per stud bay.

Through trial and error we found that stuffing a piece of unfaced fiberglass into the opening and encapsulating the entire surface of the fiberglass and edges with a short burst of two-part foam created a very effective seal. This was accomplished in fairly short order or about 20 seconds.

In another time study an attic, containing 75 open top stud bays, was sealed in less than 45 minutes (1.5 person hours). One person stuffed fiberglass and the other followed with foam. By comparison, field technicians we consulted with, estimated that traditional air sealing methods using blue board or cardboard and one-part foam in the same attic would have taken the same crew, three to four times as long. An entire 120 board foot system was used during that project, representing approximately \$175.00 in material costs. Cost effectiveness aside, reduced time in nasty building cavities will likely enhance crew health, comfort and ultimately morale.

### **Recommendations:**

It is highly unlikely that you will be able to walk into a large chain hardware center and pick up a set of two-part foam. This product is generally only available through distributors. Training on the safe and effective use of this product is highly recommended. Therefore, a manufacturer or distributor who offers strong technical support will be an added value.



*Two-Part Foam is being applied to open topped stud bays. The installer should be wearing a NIOSH approved breathing respirator.*

Pay particular attention to manufacturer recommendations for use and application, temperature tolerances, shut down procedures and storage. The product does have a generous shelf life for up to 18 months but cured foam should not be left exposed to UV light. Consult with local codes governing flame spread or exposure to the living space referenced in material safety data sheets (MSDS). These should be provided by the manufacturer. The use of NIOSH certified respirators as well as eye and skin protection is also specified in the product MSDS.

When choosing a manufacturer, consider the incremental cost differences between different sized systems. For instance, a 600 board foot package may be a better alternative than smaller quantities when considering economies of scale. The weight of the larger systems may make the system a bit more unwieldy on the job site, but longer hoses in combination with centrally located tanks may solve that difficulty.

Prices vary considerably between manufacturers. There may be variations between the mechanical components among manufacturers but the product is all basically the same polyurethane foam. Prices generally range from about \$215 to \$310 for a 200 board foot system. In addition there are shipping and HAZMAT charges. Initially, the cost may result in mild sticker shock to some who are thinking about a conversion to two-part foams. However, one needs to take into account the considerable reduction in labor costs not to mention ease of application in often very difficult conditions.

When applied by trained field technicians, we believe that the use of these two part foam systems have the potential to dramatically improve quality and cost effectiveness in the program. The PA Weatherization Training Center is now demonstrating the use of this material in conjunction with several of its courses. References to a few specific applications also appear in the "Weatherization Field Guide for Pennsylvania".

**Resources:****FROTH-PAK**

The DOW Chemical Company  
[www.flexibleproducts.com](http://www.flexibleproducts.com)  
Distributor: Fastener Systems Inc.  
Bolmar Industrial Center  
640 Snyder Avenue, Unit I  
West Chester, PA 19382  
Toll Free: 800-232-5060

**HANDI FOAM**

Fomo Products, Inc.  
2775 Barber Road, Norton OH 44203  
Toll Free: 800-321-5585  
[www.fomo.com](http://www.fomo.com)  
Distributor: Great Northern Products  
Toll Free: 888-887-4549

**ZERO DRAFT**

125 Traders Blvd. East, Unit #4  
Mississauga, ON, L4Z 2H3, Canada  
Toll Free: 877-272-2626  
[www.zerodraft.com](http://www.zerodraft.com)  
Distributor: EFI (Energy Federation Inc.)  
40 Washington Street, Westborough, MA 01581  
Toll Free: 800-876-0660