Safe Handling and Application of Two-Component Polyurethane Foam Products

DuPont Performance Building Solutions

Introduction

- Thank you for your interest in the safe use and handling of two-component polyurethane foam products such as DuPont™ Froth-Pak™ products.

- These products provide a host of benefits to contractors and homeowners, and while they are considered safe materials, precautions should be made for applicators and building occupants to be protected from potential fumes, mists and spills.

- DuPont is committed to applicator and occupant safety, and we thank you for your commitment as well.

Learning Objectives

- ✓ Provide an overview of two-component, low-pressure spray foam
- ✓ Identify the possible health effects of exposure to isocyanate
- ✓ Describe the steps to follow for safety preparation and how to prepare the job site when using Froth-Pak™ foam products
- ✓ List the proper steps for using Froth-Pak™ products
- ✓ Identify the proper way to store and dispose of kits
- ✓ Review key advantages to using Froth-Pak™ products

Two-Component, Low-Pressure Spray Polyurethane Foams

- Sold in portable kits (or refillable cylinders).
- Considered two-component foam because the chemicals used to make the foam are stored in two separate containers: one contains isocyanate ("A" side) and the other contains polyol blend ("B" side).
- When released via a spray gun, the chemicals are mixed together to deliver the resulting foam.
- Considered low-pressure foam because it is usually delivered at less than 250 psi (high-pressure foam is usually delivered at 1000 psi or more).
- Low-pressure foam typically requires 1 hour before it is safe to re-occupy the space versus 4 to 24 hours for high-pressure foam.

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SECTION 1:
Potential Exposure to Isocyanates

(Material)Safety Data Sheet ((M)SDS)

- Before using any product, it is important to read and understand the product label instructions. Also, it is extremely important that you read and understand the (Material) Safety Data Sheet or (M)SDS.
- (M)SDS contains information regarding:
  - Physical data
  - Toxicity
  - Health effects
  - First aid
  - Reactivity
  - Storage
  - Disposal
  - Personal protective equipment
  - Procedures for handling spills
- This information should also be kept readily available at the application job site for reference.

Potential Short-Term Effects of Isocyanate (ISO) Exposure

Applicators are encouraged to follow safe handling procedures because there is the potential risk of exposure to isocyanate, which is contained in the cylinder called "A."

If you are exposed to the A-side (isocyanate) there are some short-term effects you might experience.

Possible irritation effects to eyes

- Tearing, redness, swelling, burning, stinging, temporary injury to the cornea

Possible skin irritation effects

- Skin discoloration, itching, swelling, rash

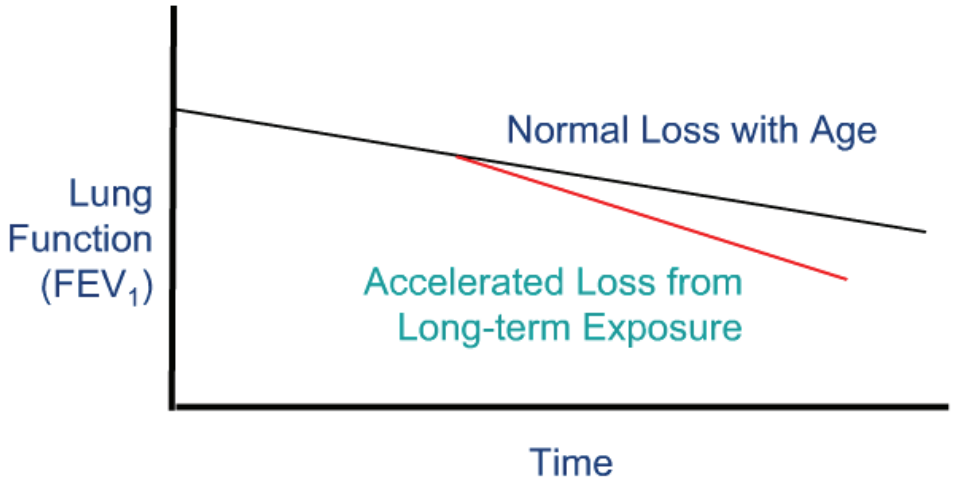
Possible respiratory irritation effects

- Sore throat, coughing, chest tightness/discomfort, shortness of breath

Potential Long-Term Effect of Isocyanate Exposure

Possible respiratory effects

- Accelerated loss of lung function
  - Source: Center for Polyurethane Insulation – CPI)



- Sensitization: Development of unusual sensitivity to a substance resulting in an allergic response to exposure in the future
  - (Source: http://nj.gov/health/eoh/rtkweb/documents/fs/1253.pdf)
- Skin rash
- Rare asthma-like respiratory response

[1] Steven P. Levine, Ph.D., David H. Garabrant, M.D., A Critical Review of the Methods of Exposure Assessment and the Pulmonary Effects of TDI and MDI in Epidemiologic Studies, Final Report to the Chemical Manufacturers Association, November 10, 1994even P. Levine, Ph.D.,

Sensitization to Isocyanates

- Once sensitized
  - Cannot become unsensitized
  - Can have a reaction at concentrations below the exposure limit
  - May have to avoid all work with isocyanates

- Possible causes of sensitization
  - Single exposure exceeding exposure limit without appropriate protection
  - Repeated exposure exceeding exposure limit without appropriate protection
  - Repeated contact with unprotected skin

- How to avoid sensitization
  - Always wear proper personal protective equipment (PPE), including respirator
  - Size of area determines the amount of ventilation available
  - Keep other people who are not wearing PPE out of the area while spraying

Safety Preparation

- BEFORE work begins, discuss with the owner/occupant:
  - Hazard information
  - Re-occupancy time
    - Typically 1 hour for Froth-Pak™ products
    - Information from CPI: https://spraypolyurethane.org/using_Two-ComponentSPF & Video: https://spraypolyurethane.org/Main-Menu-Category/Weatherization-Contractors/Installing-SPF
    - This is an advantage over high-pressure foam systems, which typically require a 4 to 24 hour re-occupancy
  - Explanation of safety controls
  - Post job cleanup

- Site preparation
  - Post warning signs for unprotected workers
  - Isolate the spray area, shut down the HVAC system and seal off air intakes
  - Ventilate the spray area during and after application
  - Protect surfaces from overspray

Safety Preparation - Ventilation

It is important to ensure that the spray area is well ventilated during application. Ventilation is measured in Air Changes per Hour (ACH):

- During application of Froth-Pak™ products a minimum of 10 ACH is required. Cross ventilation is recommended with negative pressure in the spray area and exhaust to a secured empty area. A commercial ventilation unit is recommended for increased ventilation rates.
- Continue to ventilate area for at least 1 hour after the job is completed at no less than 10 ACH.
- Re-entry into an application site less than 1 hour post spray with proper ventilation requires the use of an approved air purifying respirator equipped with an organic vapor sorbent and a particle filter.

Safe Use

- Review the (Material) Safety Data Sheet ((M)SDS)
- Cured Froth-Pak™ foam is combustible. It should **NOT** be sprayed where foam may come in contact with hot surfaces:
  - Heaters
  - Furnaces
  - Fireplaces
  - Recessed lighting fixtures
- Foam should not exposed to temperatures above 240° F (116° C)
- When air sealing buildings, ensure that combustion appliances, such as furnaces, water heaters, wood burning stoves, gas stoves and gas dryers are properly vented to the outside. See website: http://www.epa.gov/iaq/homes/hip-ventilation.html. In Canada visit: http://archive.nrc-cnrc.gc.ca/eng/ibp/irc/bsi/83-house-ventilation.html.

Safety and Protective Equipment

- Do not breathe vapor or mist
- Use in well-ventilated areas
- Wear proper respiratory protection
- Proper respiratory protection options include:
  - NIOSH-approved full-face or half-mask air-purifying respirator with an organic vapor sorbent and a P100 particulate filter
  - Positive-pressure, air-supplying respirator (air line or self-contained breathing apparatus) or supplied air
  - Change out respirator cartridges according to your employer's change-out schedule (typically 8 hours or end of shift)
  - Respirator use requires a health exam and training; follow all OSHA requirements.

Safety and Protective Equipment

- Personal protective equipment (PPE) used during the handling of Froth-Pak™ foam products may include, but is not limited to:
  - Protective clothing or impermeable coveralls, including long sleeves (no skin should be exposed)
  - Chemical-resistant gloves
  - Goggles or safety glasses
  - Proper respiratory protection
- PPE should be worn by:
  - The applicator
  - Anyone assisting applicator
  - Other workers in the room
- If PPE is contaminated during application, properly discard and replace immediately
- Do not consume or store food or tobacco in the work area

First Aid

- **Inhalation:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by a qualified professional. Call a physician or transport to a medical facility.
- **Eyes:** Flush eyes with water for 15 minutes. Seek medical attention immediately.
- **Skin:** Wash thoroughly with soap and water. Remove contaminated clothing. If irritation persists, seek medical attention.
- **Ingestion:** Do not induce vomiting unless directed to do so by medical professionals. Seek medical attention.

Safe Transportation

- It is safe to transport Froth-Pak™ products in either the cab or the bed/trunk of a vehicle providing they are upright and secured from moving or falling
- Caution should be used when the vehicle is left unattended
  - In winter, the kit may get too cold and product may freeze.
  - In summer, cabs and trunks can get too hot, possibly even in excess of 130 degrees Fahrenheit or 54 degrees Celsius.
  - Do not store cylinders below 45° F (7° C) or above 120° F (49° C).
- Follow all local, regional, and federal transportation requirements, including labeling and driver training.

SECTION 3:
Product Selection and Use

Sealant or Insulation?

- Froth-Pak™ is a two-component, quick-cure polyurethane foam that fills cavities, cracks and expansion joints for insulation and air sealing. It dispenses, expands and becomes tack-free in seconds, and completely cures in minutes.
  - The Class-A rating (flame spread of 25 or less) of Froth-Pak™ Foam Insulation allows its use in a wide range of industrial, commercial, institutional and residential applications in the United States.
  - Froth-Pak™ Foam Insulation can be left exposed in non-fire-resistant rated roof/wall junctures per National Fire Protection Association testing.
  - Froth-Pak™ Foam Sealant can also be used as a sealant and void fill in many applications.

Choosing The Right Product

- Froth-Pak™ Foam Insulation (***available in U.S. only***)
  - Class-A fire rated
  - For full coverage apply up to 2" thick
  - Typical applications include:
  - Wall cavity insulation
  - Rim/band joist insulation
  - Can be left exposed in commercial building roof/wall junctures at a maximum of 2” thick by 6” wide by unlimited length per NFPA 286 approval testing

Red Band on Box

It is important to note that two-component foam products will release heat while the liquid froth cures into the final solid. They should be applied in layers of 2 inches or less to allow the foam's heat to dissipate between sprayings.

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Choosing the Right Product

- Froth-Pak™ Foam Sealant (***Available in U.S. and Canada***)
  - Typically used to fill areas up to 2" thick by 4" wide
  - Typical applications include:
    - Sealing roof perimeters and parapet walls
    - “Picture framing” wall cavities and other small areas that require sealing
  - Note: Froth-Pak™ Foam Sealant is **NOT** approved for full coverage

Green Band on Box

Again, it is important to note that two-component foam products will release heat while the liquid froth cures into the final solid. They should be applied in layers of 2" or less to allow the foam’s heat to dissipate between sprayings.

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Choosing the Right Product – Froth-Pak™ Refill Systems

Affordable

- Lower long-term cost of ownership compared to high pressure drum and rig system
  - Less capital investment
  - Minimal set-up time
  - Less equipment maintenance
  - Low-cost replacement parts
  - No specialized technician required to maintain/repair
- Ability to work all year using heated option
- Avoid disposal fees; keep material out of landfills

Froth-Pak™ Refill Systems are available in 17, 27, 60, 120 and 350 gallon sizes, all with the high-performance features of Froth-Pak™ foam kits, but in refillable cylinders for large jobs. Contact your DuPont representative for more information.

Easy to Use

- Self-contained, eliminating need for generator or power cord
- Refillable cylinders avoid disposal fees
- Hose length up to 150'
- One hour re-entry period compared to 24 hours for drum/rig application

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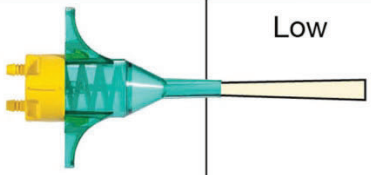
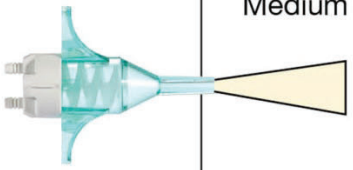
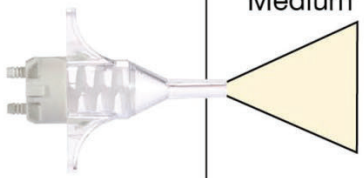
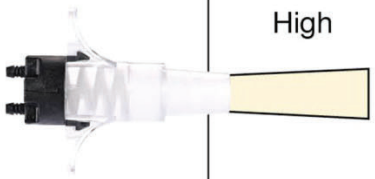
Industry-Leading, Anti-Crossover Gun Nozzles

One of the differentiating features of Froth-Pak-PAK™ products is the industry-leading selection of high-performance, anti-crossover nozzles and patented Insta-Flo™ dispensing gun. As you can see here, nozzles are available in a variety of flow rates and patterns.

Nozzle Type	Output	Part # (GMID)	Nozzle Color, back	Output, lb/min	Coverage Area	Description
Caulking 	Low	259212	Yellow	2	Controlled bead size	• Designed for precisely controlled output • Use for tight areas
		259211	White	4		
NS Cone/ Spray 	Medium	259219 (included in FROTH-PAK™ kits)	White	4	Small	• Cylindrical spray pattern • Fills voids and cavities
		259218	Gray	6-7		
		259217	Black	8-10		
Fan/ Spray 	Medium	259216 (included in FROTH-PAK™ kits)	White	4	Wide area	• Designed for flat applications – walls, roofs and ceilings • Use to smooth out orange peel or textured finish
		259215	Gray	6-7		
		259214	Black	8-10		
Pour 	High	259220	Black	8-10	Large volume	• Designed for filling large cavities (slow rise formulation recommended) • Use in hidden cavity applications

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Setting up the Kit

Click to view Video:

http://www.youtube.com/embed/4MOjp8peJcE?autoplay=1

Nozzles

Click to view Video:

https://www.youtube.com/embed/Idg6BrkMNIo?autoplay=1

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Optimal Temperature for Use

Temperature strips are located on Froth-Pak™ 210 board foot kits to help maximize product performance. Apply the product at 75 degrees Fahrenheit or 24 degrees Celsius

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Preparing the Job Site

- Prepare surface
  - Be sure to remove any loose material
  - Ensure it is clean and dry
- Overspray protection
  - Windows, electrical outlets, other surfaces not intended to be sprayed with foam
- Tools needed:
  - Box cutter to trim excess foam
  - Drop cloth or plastic sheeting
  - Masking tape
  - Trash bags
- Environmental conditions, 75° F or 24° C
- Ventilation
- Cordon off the job site & isolate the spray area
  - Post warning signs for unprotected workers

Job Site Preparation Video

Click to view Video:

https://www.youtube.com/embed/bpznJF_b34A?autoplay=1

Kit Assembly and Startup

1. Review instructions included with kit & prepare the site.
2. Put on the proper PPE.
3. Pull gun and hoses out of box.
   Note: *Some kits contain pre-attached hoses. If not, attach the hoses in the Froth-Pak™ GHA (gun hose assembly) kit following instructions.*

5. Apply petroleum jelly to inside face of gun and around the edges of the ports.
6. Flush lines by spraying into a waste container until the streams are equal.
7. Clean gun with paper towels and reapply petroleum jelly.
8. Insert nozzle into gun. Listen for two clicks to ensure full insertion.
9. Begin spraying.

Note: *If you stop spraying for more than 30 seconds, replace the nozzle.*

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CAUTION: When cured, these foam products are combustible and will burn if exposed to open flame or sparks from high-energy sources. Do not expose cured foam to temperatures above 240ºF (116ºC).

SECTION 4:
Proper Disposal and Storage

Kit Disposal After Use

Important: NEVER PUNCTURE OR INCINERATE CYLINDERS.

The following information is provided as a courtesy for customers and Dow believes that it is accurate. However, the customer is ultimately responsible for determining whether the information in this document is appropriate for customer's use and for ensuring that the customer's workplace and disposal practices are in compliance with applicable laws and other government enactments. If you have any questions regarding applicable disposal procedures, contact the appropriate government official. Dow assumes no obligation or liability for the information provided.

The following procedure must be performed in a well-ventilated area or preferably outdoors. See disposal guide included with the kit.

First, make sure you wear the same personal protective equipment as you would when applying the foam. The liquids remaining in the Froth-Pak™ cylinders must be disposed of as a solid foam waste material, not a liquid. The next steps are intended to guide you in the process necessary to convert any residual liquids into solids prior to proper disposal.

1. Carefully dispense and depressurize liquids from the cylinders with the gun and nozzle attached. Dispense chemicals out of the cylinders as foam until one or both components/cylinders are empty.
2. Carefully remove the nozzle from the gun and continue to depressurize the cylinders by dispensing chemicals into a waste container lined with a plastic bag that has adequate absorbent in the bottom.

Kit Disposal After Use

3. Carefully close both cylinder valves completely, then operate the gun trigger to empty and depressurize the hoses.
4. Lift each of the cylinders. The cylinders should feel empty, with no sloshing of liquid.
5. Carefully remove hoses from the cylinders. Use caution in case there is some residual chemical and/or pressure still in the hoses. Place hoses in plastic bag with absorbent material.
6. Carefully turn cylinders upside down and place over a waste container lined with a plastic bag. Slowly open the valves on the cylinders to catch any residual material. With cylinder pointed away from face, allow pressure to completely vent.

There is a possibility that a hose could become blocked and the tank is not yet empty. If this happens and the cylinder feels heavy, appears to be under too much pressure, or contains too much material, you should close the valve. In this case, the cylinder needs to be disposed of as a hazardous waste and cannot be emptied following these steps. Follow all federal regional and local hazardous waste handling requirements.

Kit Disposal After Use

7. Absorb any remaining liquids collected above with dry oil-absorbent material such as vermiculite. Once mixed thoroughly, it can be disposed of as ordinary industrial waste.
8. If the waste container contains an excess amount of “A” (ISO) versus “B” (polyol), spray a small amount of water over the waste material but not enough to have a pool of liquid. Allow container and waste material in the plastic bag to vent while protected from the weather for 24-48 hours. After this time, tie the bag loosely and dispose of the solid waste as ordinary industrial waste.
9. If waste contains more B side than A side, then mix material with a stick to ensure all liquids are absorbed (adding sorbent as needed) and dispose of as ordinary industrial waste.
10. EMPTY and VENTED cylinders can be disposed of as scrap, recycle steel, or ordinary industrial waste.

There is a possibility that a hose could become blocked and the tank is not yet empty. If this happens and the cylinder feels heavy, appears to be under too much pressure, or contains too much material, you should close the valve. In this case, the cylinder needs to be disposed of as a hazardous waste and cannot be emptied following these steps. Follow all federal regional and local hazardous waste handling requirements.

Storage of Froth-Pak™ Products

- Review the instructions.
- Ensure that Froth-Pak™ cylinders are stored in a dry area at moderate room temperatures (60° F to 80° F [15° C to 27° C]). Store out of direct sunlight.
- Do not store cylinders below 45° F (7° C) or above 120° F (49° C).
- Keep cylinders tightly closed until use, and avoid direct sunlight during shipping and storage on the job site.
- Use Froth-Pak™ products within the recommended shelf life.
- Do not store near steam pipes, hot water pipes, chimneys or heat vents.

Storage of Partially Used Cylinders

- **To store a partially used kit** (use kit within 30 days of opening):
  - Shut both cylinder valves completely
  - Leave hoses pressurized to keep moisture from air out of hoses
  - Clean end of gun and reapply petroleum jelly to face of gun
  - Re-insert a used nozzle in the gun to keep air and moisture out of the gun/hoses
  - Store above 45˚ F (7˚ C)
  - Warm to room temperature before using

SECTION 5:
Troubleshooting

Troubleshooting

Isocyanate Contamination

- Isocyanate and moisture **DO NOT** mix – even water from the air can cause a reaction which creates a solid.
  - Material will solidify and then gun/hose assembly will be unusable and must be replaced
- Take care of gun/hoses by using entire kit within 30 days of opening
- Minimize time spent with hose end open:
  - No more than a few minutes

Troubleshooting Tips

Observation	Cause	Potential Solutions
Spray pattern changes	Used nozzle	1. Inspect nozzle prior to dispensing. 2. Insert new, unused nozzle into INSTA-FLO™ Dispensing Spray Gun.
Spray or foam pattern does not react properly	A/B off ratio	1. Replace nozzle and check for kinks in the hose. 2. If problem persists, remove nozzle and carefully activate dispenser into a waste container. 3. Two chemical streams of approximately the same volume should be observed. 4. If streams are unequal, there may be a blockage. 5. Shut off properly working cylinder. 6. Activate problem cylinder at full force for 15 seconds. 7. Turn off both cylinder valves. 8. Clean chemical from face of gun with a cloth and reapply petroleum jelly. 9. Insert new, unused nozzle into gun. 10. Open valves on both cylinders and dispense a test shot into waste container. 11. Check foam quality. 12. If problem persists, turn off both valves, remove nozzle and dispense foam to relieve pressure. 13. Slowly loosen hose connections at cylinder valves. 14. Clean chemical from threads using a cloth. 15. Replace gun/hose assembly.
Clogged hose	Not used in a week or longer	1. Activate system for a few seconds. 2. Squeeze INSTA-FLO™ Dispensing Spray Gun fully without nozzle and spray into waste container. 3. This should clear and re-pressurize hoses. 4. Reapply petroleum jelly to INSTA-FLO™ Dispensing Spray Gun.
Friable or brittle foam	ISO rich; blockage of polyol side	Clear blockage from polyol side following procedures above.
Soft or mushy foam	Polyol rich; blockage of ISO side	Clear blockage from ISO side following procedures above.
Chemical streams result in unusable material	ISO side contaminated with water	Replace kit.

Always wear all PPE and maintain ventilation when troubleshooting and handling product

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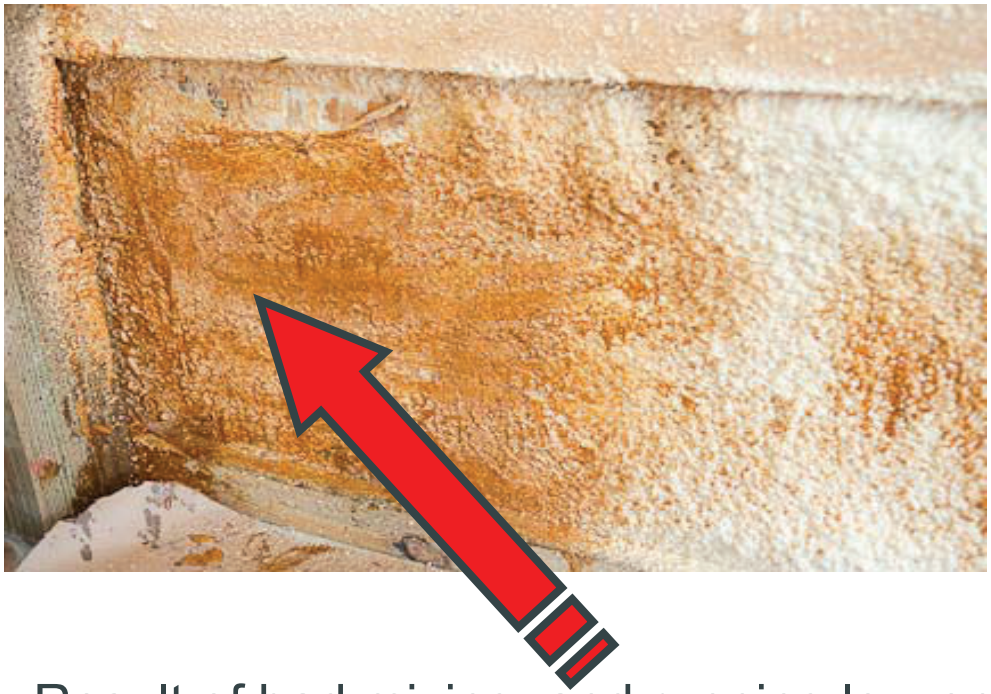
Troubleshooting

Watch for low foam chemicals and poor mixing when tanks are running low.



Result of bad mixing and running low on chemicals:
Foam is very gummy and doesn't cure or is friable (crusty) and flakes off of the surface

SECTION 6:
The DuPont Distinction

Key Advantages of Froth-Pak™ Products

- **Largest selection of nozzles and controlled flow rates**
  - Caulk, Cone Spray, Fan Spray and Pour
  - Control of flow at approximately 2, 4, 6-7 and 8-10 lb/min by nozzle choice
  - Allows precise control of pattern and flow
- **Anti-crossover nozzle**
  - Every nozzle has a patented check valve to keep components from mixing in the gun and hoses
- **Insta-Flo™ Dispensing Spray Gun**
  - Easy to use
  - Excellent ratio control

See How FROTH-PAK™ Foam Kits Rated(1)

	FROTH-PAK™ Foam Kits	Major Competitors
Consistent Quality, application on ratio (0.95-1.20 A:B)	98% (see Table 1)	20% to 60%
R-Value	Aged and initial listed	Unspecified, so what is the value long term?
Flow Rate	Most consistent from start to finish (see Table 2)	Becomes too fast to be controllable and too slow to be useful
Reliability, dispensing system	Distinct anti-crossover nozzles	Standard nozzles
Time to Dispense Kit (min)	10	10-23

(1) Testing conducted by Dow Building Solutions using 200/205 sized kits. There is currently no third-party standard to make these evaluations. All product was sprayed within the kit's expiration date at a nominal room temperature of 75°F- 85°F. Spray equipment was used as supplied with the kit and sprayed per manufacturer's instructions using supplied cone spray nozzles.

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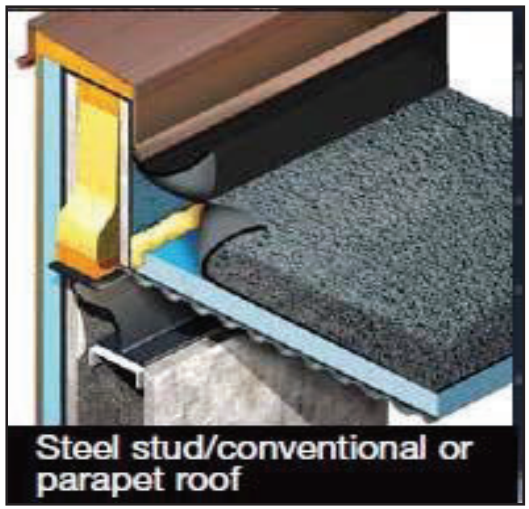
Froth-Pak™ Foam Insulation (Class A) Commercial Applications

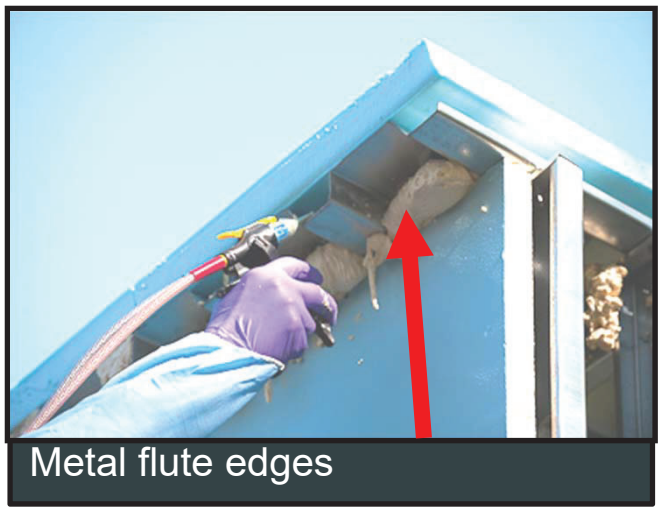
Froth-Pak™ Foam Insulation (Class A) Commercial Application	Acceptable Use?	Qualifier
Roof penetrations – Sealing hole and pitch pockets	Yes	In non-fire resistive rated roof assemblies, max 2“ annular space and 6“ max depth penetrating through roof. No more than 2“ exposed foam below the roof deck.
Blocking inside conduit	Yes – non-hourly rated No – hourly rated	Metal – If not a rated roof, then yes. If rated roof, then no. Plastic – If not a rated roof, then Yes. If rated roof, need to consider more
Outside of support beam	No	Unless steel is fireproofed and area is sealed off from interior. Steel itself is not a thermal barrier, especially on the ends.
Wall/floor juncture	Yes	Max 2” x 2” x unlimited length.
Duct sealing	Yes	Max 2” thick and 6” in width at each joint. Use is limited to IRC construction

Common Froth-Pak™ Foam Insulation (Class A) Commercial Roofing Applications


Metal building/roof


Concrete wall/roof


Steel stud/conventional or parapet roof


Metal flute edges

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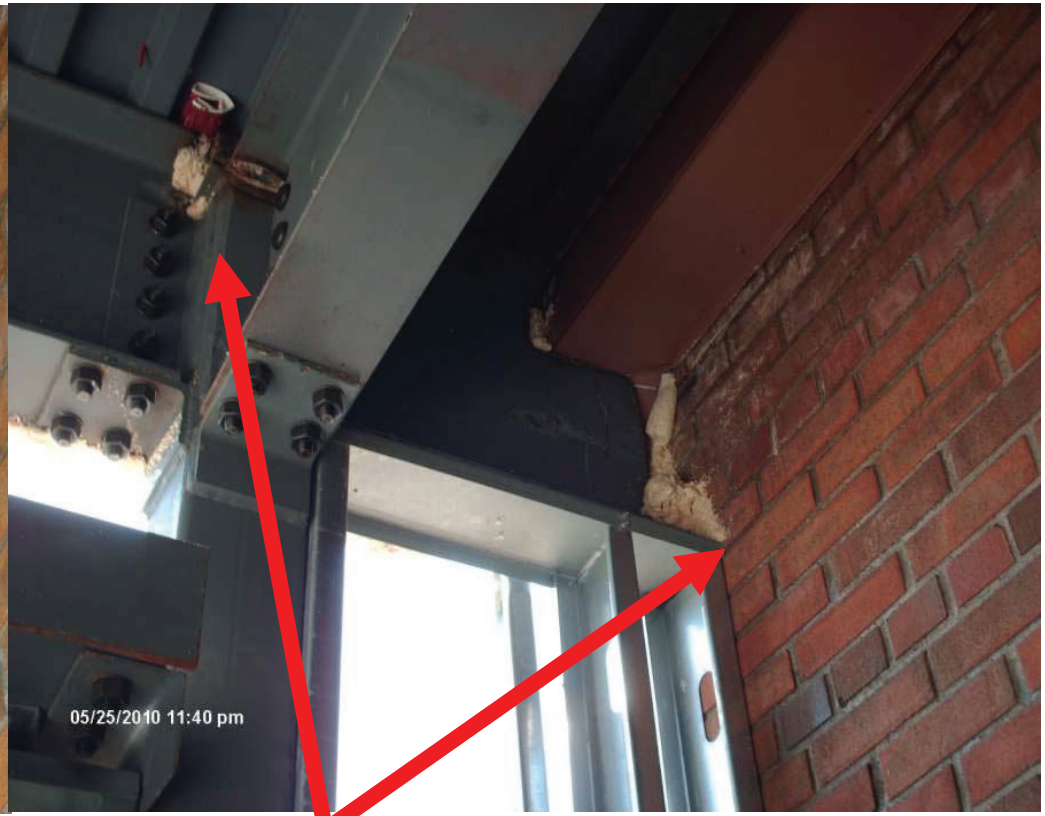
Froth-Pak™ Foam Insulation (Class A)

BEFORE

Air penetration from the gap between deck and beam needs to be sealed.

AFTER



Deck opening sealed with Froth-Pak™ Foam Insulation (Class A), eliminating air movement.

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Residential Applications

Froth-Pak™ Foam Sealant

- Used primarily as an air sealant at openings around vents, pipes, ducts, cables and wires; flash and batt projects; or under cellulose to air seal

Attic duct

Froth-Pak™ Foam Insulation

- Class-A rating (flame spread of 25 or less)
- Commonly used to insulate along sill plate, rim joists and wall cavities

Rim joist

Additional Information

For more information, contact DuPont at:
building.dupont.com
1-866-583-2583 (technical support)
1-800-232-2436 (sales information)

DuPont recommends additional training provided by:

- Spray Polyurethane Foam Alliance
  http://www.sprayfoam.org/
- Center for the Polyurethanes Industry (CPI) of the American Chemistry Council
  http://polyurethane.americanchemistry.com/About-CPI/

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CAUTION: This product is combustible. Protect from high heat sources. A protective barrier or thermal barrier may be required as specified in the appropriate building code. For more information, consult (Material) Safety Data Sheet ((M)SDS), call DuPont at 1-866-583-2583 or contact your local building inspector. In an emergency, call 1-989-636-4400 in the U.S. or 1-519-339-3711 in Canada.

WARNING: Rigid foam insulation does not constitute a working walkable surface or qualify as a fall protection product.

Froth-Pak™ Spray Polyurethane Foam contains isocyanate, hydrofluorocarbon blowing agent and polyol. Read the instructions and Material Safety Data Sheets carefully before use. Wear protective clothing (including long sleeves), gloves, goggles or safety glasses, and proper respiratory protection. Building and/or construction practices unrelated to building materials could greatly affect moisture and the potential for mold formation. No material supplier including DuPont can give assurance that mold will not develop in any specific system. When air sealing buildings, ensure that combustion appliances, such as furnaces, water heaters, wood burning stoves, gas stoves and gas dryers are properly vented to the outside. See website: http://www.epa.gov/iaq/homes/hip-ventilation.html. In Canada visit: http://archive.nrc-cnrc.gc.ca/eng/ibp/irc/bsi/83-house-ventilation.html.

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