

# Validation Study of Experimental Insulating and Air-Sealing Technology for Enclosed Roof Cavities

Building Envelope Materials

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## Team

### Doug Lamm, Principal Investigator



- Developed “Micro-Injection Foam” process for retrofit insulation of wall cavities
- Awarded 4 federal and state grants for new retrofit insulation processes and equipment
- Completed JDA with CertainTeed/Saint Gobain for new insulation system
- 30 years experience starting up new specialty materials businesses

### Alex Bell, Engineering



- 7 years developing foam-based thermal energy storage for SustainX and General Compression
- Developed the “In-Situ Proportioner” for BEM (new to the world mobile foam proportioner)
- BS, Chemical Engineering, University of New Hampshire. MEM, Dartmouth

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**Enclosed Roof Cavities Are Common:  
Est. 80% Of Homes Have Dormer Roofs and/or Cathedral Ceilings**

## Two Big Enclosed Roof Cavity Problems

### 1. Ice Dams



### 2. Heat Loss



Source:  
• Weatherization in 2011 and Beyond, SPFA

## Two Problematic Solutions

### 1. Cellulose: Moisture Damage

However, a dense-packed compact roof assembly has high moisture and durability risks due to winter-time interior-induced condensation (Lstiburek 2010b; Schumacher and LePage 2012) (Figure 1).

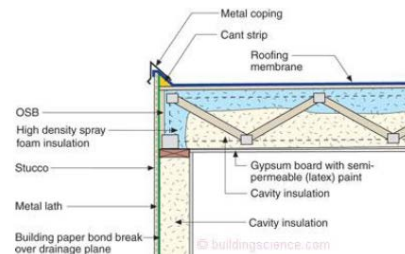


Figure 1. Dense-pack insulation of roof (left); resulting moisture issues (right)

Source:  
Don't Be Dense, Building Science Corp, 2010

Source: Lstiburek (2013a)

### 2. Spray Foam: Invasive and Expensive



Source:  
Don't Be Dense, Building Science Corp, 2010

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## Our Solution:

Inject Closed Cell Polyurethane Foam To Fill ERC Through A Single ½" Hole

### Step 1: Site-Prep



Find studs, measure, mark, drill

Insert tubes  
with  
a guide rod



### Step 2: Calibration



5-10 s calibration shot



IR camera mark foam rise;  
determine fill rate

### Step 3: Injection

Multiple 1-foot  
shots to fill the  
lower portion;

Repeat for  
upper portion;

Finishing shot.





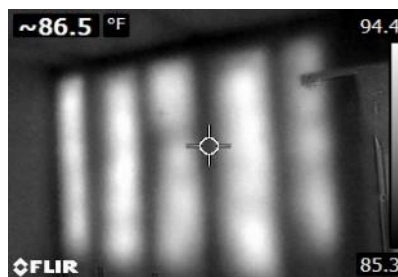
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## Benefits Of Micro-Injection Foam

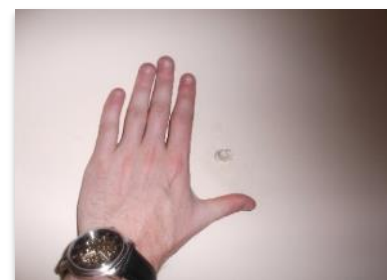
Inject Un-insulated and Under-Insulated Cavities



Validated Fill



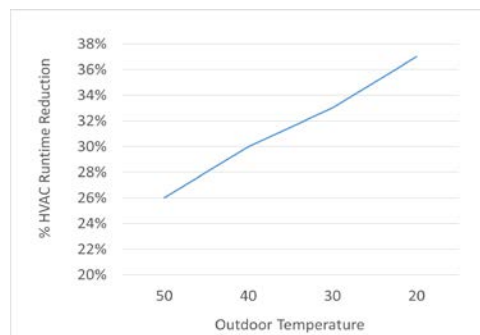
Minimally Invasive



Minimal Blowout Risk



Effective: > 25% Energy Reduction



Safe For Workers And Occupants

“...airborne exposure to MDI and NCO groups are almost non-existent during SPF Injection”  
- Dhimeter Bello, UMass

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# Thank You

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