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MOBILE HOME TRAINING

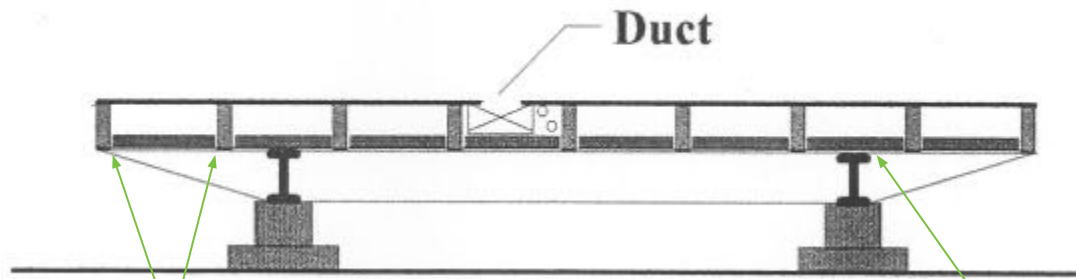
Mobile Home Belly Retrofit

By attending this session, participants will become aware of:

- The benefits of insulating the belly cavity
- Important factors to consider prior to insulating
- Mobile home floor components
- Belly preparation methods
- Specialized tools and materials for sealing up the belly cavity
- Methods for gaining access to the belly cavity
- Insulation methods and techniques

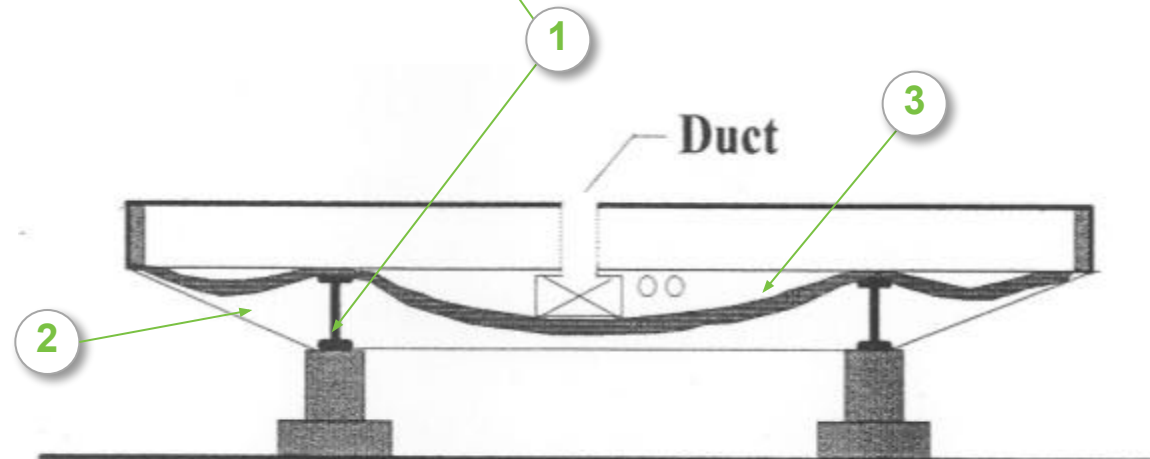
Mobile Home Belly Components

MOBILE HOME BELLY RETROFIT



4 Lengthwise Floor Joist System

1. Main beam
2. Outrigger beam
3. Rodent barrier
4. Floor joists



Crosswise Floor Joist System

Re-Insulating the Belly Cavity

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- Increases thermal performance
- Big air leakage reductions are possible
- Occupant comfort is enhanced



Photo courtesy of PA WTC

A belly blow involves:

- Sealing and repairing the duct system
- Repairing minor plumbing leaks
- Repairing, sealing and reinforcing the rodent barrier
- Sealing penetrations from the belly to the conditioned space
- Locating combustion air inlets
- Accessing and drilling the rim joist
- Insulating belly with loose-fill insulation

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Photo courtesy of PA WTC

Factors to consider:

- Insufficient clearance
- Significant plumbing leaks
- Structural problems
- Standing water or open sewage
- Major obstructions
- Electrical hazards



Photo courtesy of WV GOEO

Note: *The health and safety of workers and the long-term integrity of the client's home should be the main concerns.*

Belly or Not #2

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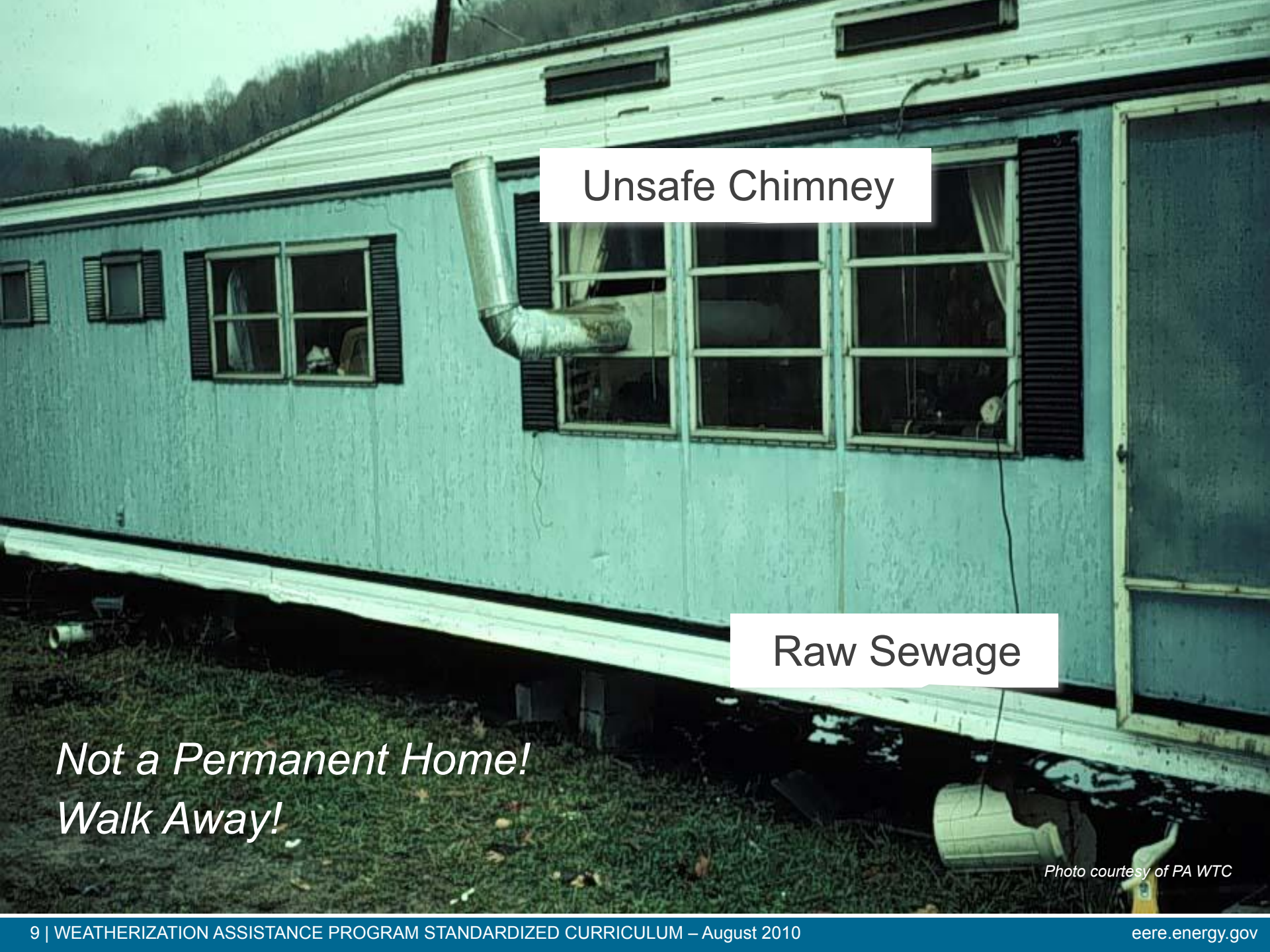


Water Problems



Photos courtesy of PA WTC

Insufficient Clearance



Unsafe Chimney

Raw Sewage

*Not a Permanent Home!
Walk Away!*

Photo courtesy of PA WTC

The auditor should note:

- Duct location and condition
- Return air system
- Joist spacing and direction
- How much belly repair is required
- Minor repairable plumbing leaks
- Air leakage penetrations



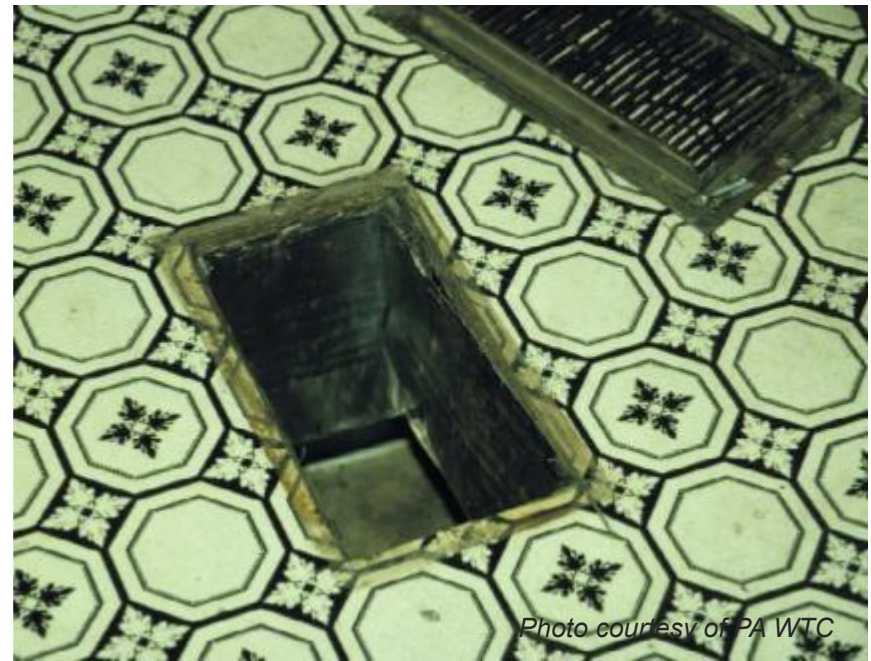


Photo courtesy of PA WTC

Duct Risers offer clues about floor joist direction



Longwise Joists



Crosswise Joists

- Install a ground vapor retarder
- Vent the clothes dryer to daylight
- Seal ducts
- Protect water lines
- Seal all penetrations to living space
- Repair (or replace) the rodent barrier
- Reinforce the belly
- Drill holes in the band joist or access from underneath

Re-Route Dryer Vent to Outside!

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Photo courtesy of WV GOEO

Install Ground Vapor Retarder

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Photo courtesy of WV GOEO

Seal Duct and Patch the Belly Board

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Photo courtesy of WV GOEO



Secure sagging ductwork



Secure water lines to the floor where possible

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Selected patching materials:

- House Wrap
- “Flexmend” Belly Patch
- Foil-Backed Insulation Board
- Lathe Strips
- Drywall Screws with Deck Washers
- Aluminum Coil Stock
- Foam Sealant
- Bubble Foil
- Spray Adhesive
- Stitch and Regular Staples



Photo courtesy of PA WTC



Photos courtesy of PA WTC

Flexible sheet materials may be used to repair small holes or shore up weak areas

Belly Prep – Sealing Materials #3

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Replace and/or reinforce belly with a variety of materials



Photos courtesy of PA WTC

Fasten lathe and insulation board to the bottom of floor joists with screws

Replacing the Rodent Barrier

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When replacing the rodent barrier is the only option...



Photos courtesy of PA WTC

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- Remove the remains of the old rodent barrier and fiberglass batt insulation
- Fasten house wrap between the center I-beams with staples along the length of the home
- Fit sheeting around penetrations and seal
- Repeat the process for each edge section
- Reinforce with lathe strips screwed to the bottom of the floor joists



Belly Prep – Sealing #1

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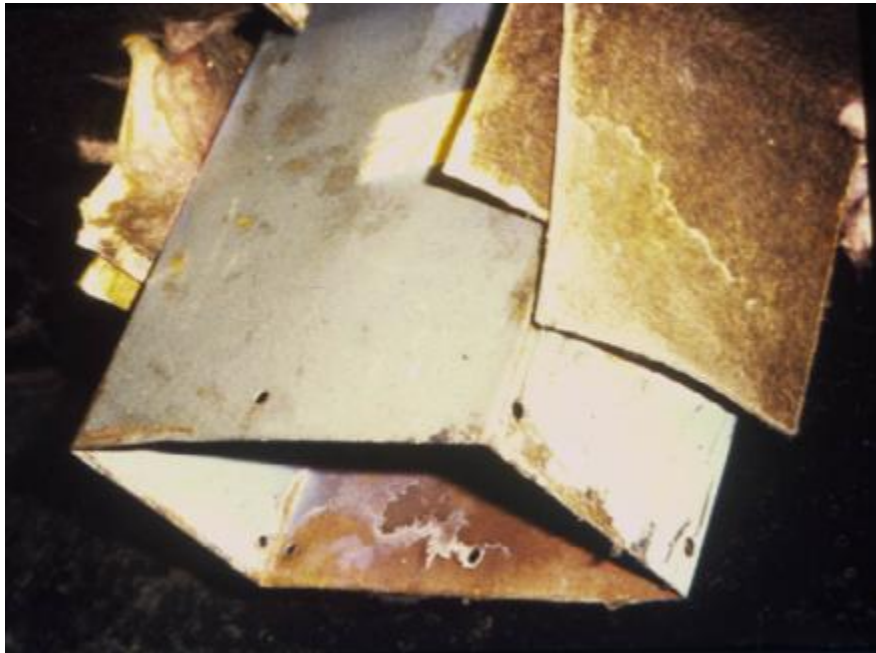
**Seal around all penetrations
where insulation may spill.**



**Reinforce the belly
where needed.**

Belly Prep – Sealing #2

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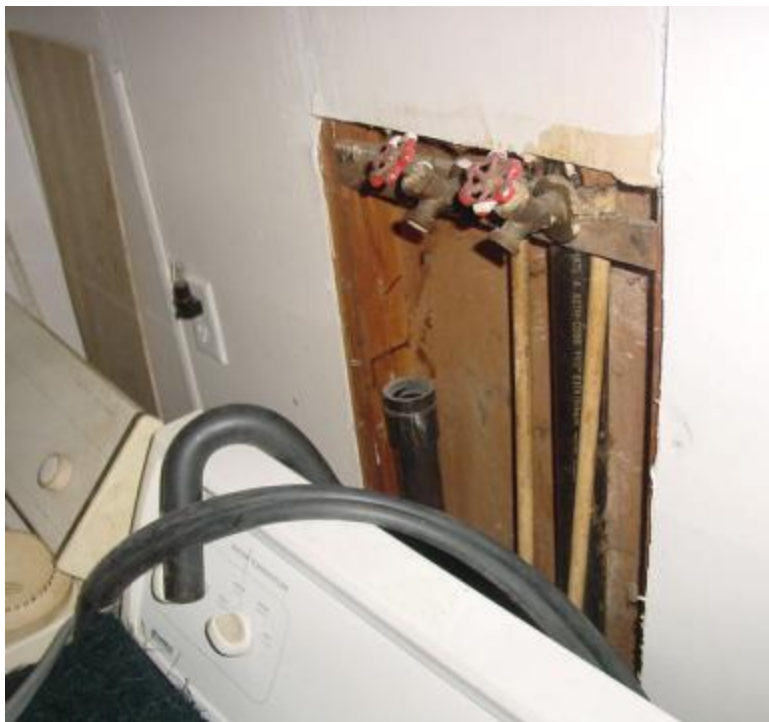
**Take care not to seal any
combustion air inlets!!**



Photos courtesy of PA WTC

Belly Prep – Sealing #3

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**Seal plumbing penetrations
from the top...**



Photos courtesy of PA WTC

...and from the belly cavity

Belly Prep – Sealing #4

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**Seal fuel line penetrations
to furnace cabinet and...**



....plumbing penetrations

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Photo courtesy of PA WTC

Seal around:

- Dryer vents
- Sink cabinets
- Built-in dressers
- Hot water tank closets

Get them all!

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What You Need

- Multi-fiber, high-capacity blowing machine.
- 200 feet of insulation hose in a variety of diameters.
- 70 feet of low grade 2" PVC pipe sections.
- Cellulose or fiberglass.
- 2 ¼" wood plugs (rim joist).
- 2 ¼" wood boring bit (rim joist).
- Duct tape.
- Scrap fiberglass.
- Directional nozzle (belly method).



Photos courtesy of PA WTC

Rim Joist Method - Access

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Remove skirting for access

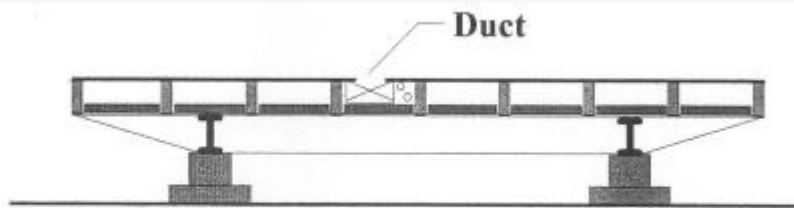


Expose the rim joist

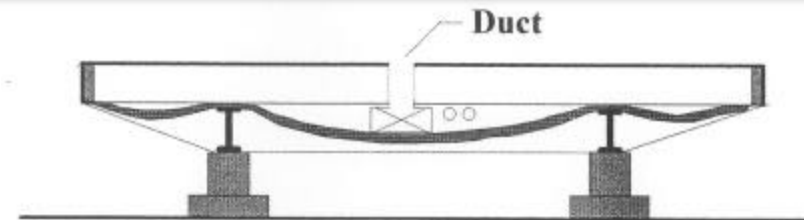
Determine joist direction to drill either the ends or the side



Photos courtesy of PA WTC



Duct Location - Lengthwise Joists



Duct Location - Crosswise Joists

Fill Tube Basics #1

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Fill tube



Photo courtesy of WV GOEO

Fill Tube Basics #2

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Fit the flexible insulation hose into the bell end of the fill tube.....



Photos courtesy of WV GOEO

.....and duct tape the joint.

Fill Tube Basics #3

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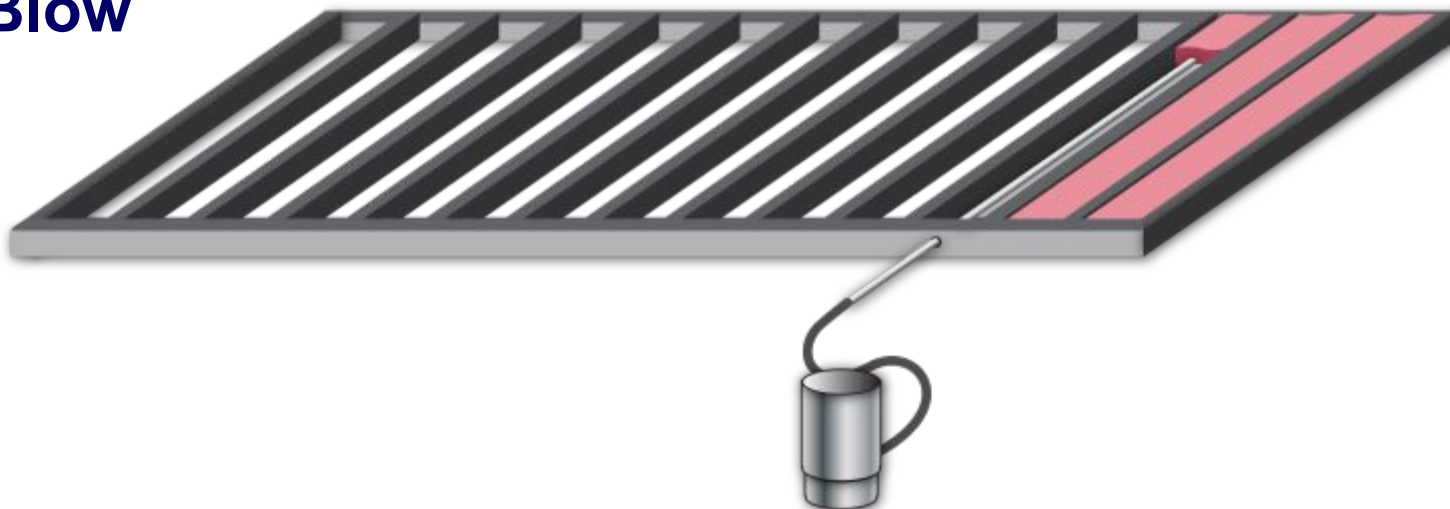
Photos courtesy of WV GOEO

Cut a taper on the end of the tube to get past obstructions

Rim Joist Method: Blowing the Belly #1

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Side Blow



End Blow



Rim Joist Method: Blowing the Belly #2

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End Blow



Photos courtesy of PA WTC

Side Blow

Blown Cellulose – “Cocoon™”

Thickness	R Value	Density/ft ³	Weight	Bags/1,000ft ²	Coverage
2X4	13	2.6 lbs.	0.75 lbs.	28	36 ft ²
2X6	20	2.6 lbs.	1.192 lbs.	43	23 ft ²

Blown Fiberglass – “Certain-Teed Optima”

Thickness	R Value	Density/ft ³	Weight	Bags/1000ft ²	Coverage
2X4	14	1.6 lbs.	0.46 lbs.	17	60 ft ²
2X6	22	1.6 lbs.	0.73 lbs.	26	38 ft ²

Fiberglass

- Lighter in weight by volume than cellulose.
- Certain types install better than others in closed cavities.
- Low moisture retention at 5%.
- Not as readily available as cellulose.
- Price is fairly competitive with cellulose.
- Personal respiratory protection is required.

Cellulose

- Readily available commercially.
- Heavier in weight by volume than fiberglass.
- Installs extremely well in closed cavities.
- High moisture retention.
- Personal respiratory protection is required.

Insulation Blowing Tips

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- Initially adjust your blowing machine settings at “high-air” and “low-material feed.”
- Gradually increase material feed to maximize production while minimizing clogs.
- Hose transitions should be gradual.
- Use at least 200 feet of hose for good maneuverability while working.
- Have someone on the crew continually check inside and underneath the home for spills.



Photos courtesy of WV GOEO

Insulation Machine Settings

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Open the product gate for optimal material feed



Photos courtesy of WV GOEO

Adjust the air pressure to optimal flow

Through the Belly Method #1

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Photo courtesy of PA WTC

Through the Belly Method #2

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- Cut three small square or triangular holes in each joist cavity at the outriggers on each side and in the center between the I-beams
- Insert the hose and blow in insulation
- At the outriggers, center the hole between the outer rim joist and I-beam and blow in each direction until full
- Works best on crosswise joist configurations or where siding cannot be neatly removed to expose the rim joist
- The disadvantage is that you are on your back



Photos courtesy of PA WTC

- Increased comfort
- Significant heat loss reductions through reduced air leakage and improved R-value
- Blower door reductions at 25% - 50% are not uncommon
- Increased seasonal heating efficiency due to duct system improvements
- Clients love it

Mineral Springs, PA

- Belly retrofit, which included a complete rodent barrier replacement, air sealing, duct sealing and insulation
 - 42 person hours (crew of three)
 - \$500 in material
 - \$2,600 total cost
- Pre-blower door test: 2,607 cfm₅₀
- Post-blower door test: 1,056 cfm₅₀
- Client was happy

MOBILE HOME BELLY RETROFIT

- Re-insulating the belly cavity can result in huge energy savings, is cost-effective, and greatly improves comfort.
- Consider moisture issues and the condition of the floor and rodent barrier before insulating the belly.
- Prepare by sealing penetrations to the living space and repairing the rodent barrier.
- Access methods depend on joist configuration.
- Blown-in fiberglass is recommended because it is lighter than cellulose and won't absorb water.
- Weatherization methods developed over the years help technicians overcome hurdles that were once thought impossible.
- Attention to detail avoids problems.
- Having the right tools and materials on hand helps technicians deal with a variety of special circumstances.