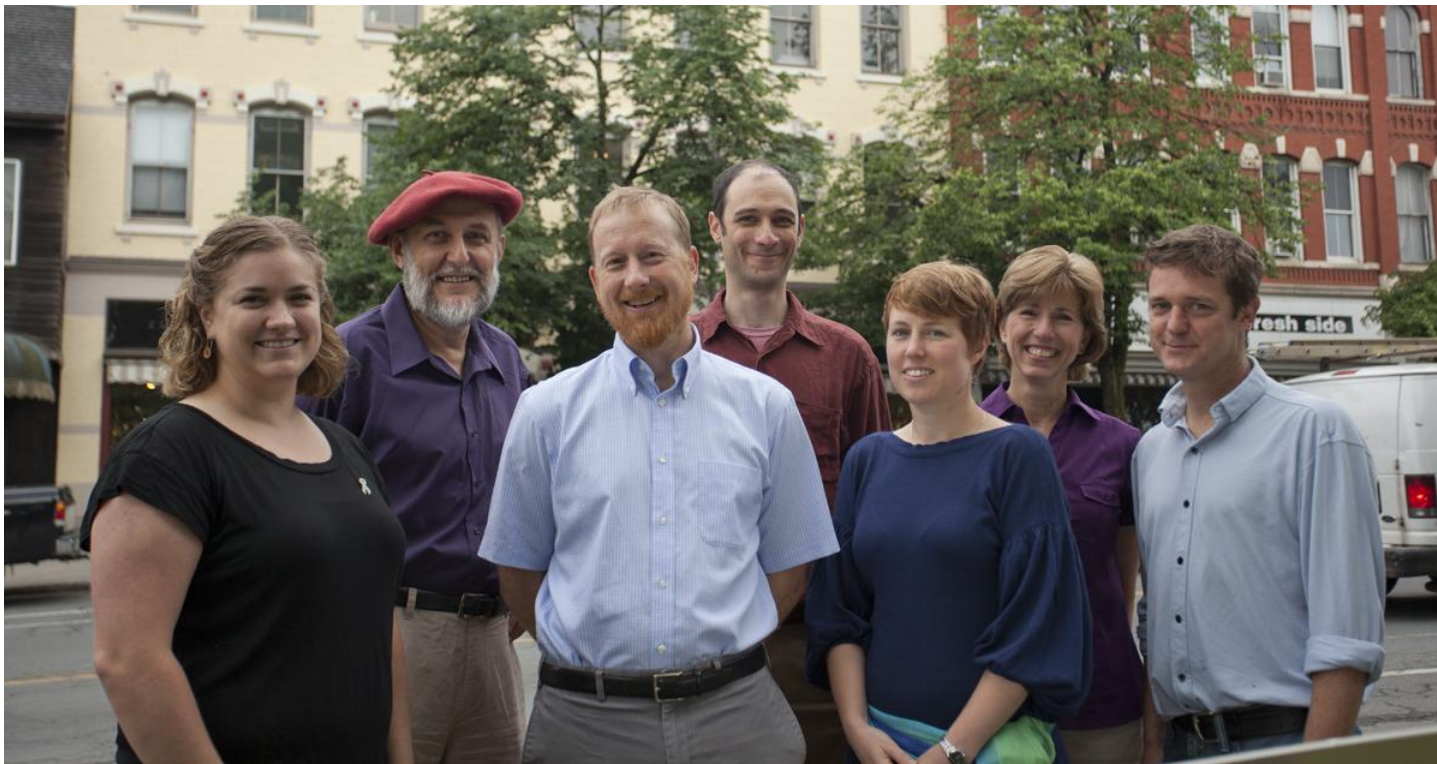


# Deep Energy Retrofits

The trouble we make for ourselves,  
even when we try to do it right.



Today is Thursday, between 2:00 and 3:30. You are in Track 7,  
Fundamentals

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# Session Description

- “The house was so tight, you’d slam the door and the toilet would flush.” Have you ever heard anyone say that? How about hearing about someone getting Carbon Monoxide poisoning from a backdrafting heating system? Every decision we make in a house has an effect on the system as a whole and knowing how these systems interact can save a life, prevent a lawsuit, or get you the most bang for your buck in conservation upgrades.

# Learning Objectives

1. Understand the Concept of the House as a System
2. Gain an understanding of the importance of safety and what things to avoid, particularly in reference to combustion gases, mold and moisture
3. Understand positive and negative consequences of altering components of the House as a System.
4. Integrate and Evaluate these concepts as they are applied in the extreme sense to highly efficient buildings.
5. Acquire skills from case studies to gain knowledge from others' successes and mistakes.

What I mean when I say DER:

## Deep Energy Retrofit

Your home is worth fixing.



### Goal

To prepare the existing houses of the Northeast for a changing energy climate.

### Strategies

Analysis, research, & collaboration.  
Careful listening.  
Practical design solutions.

### Results

Simple, beautiful, energy-efficient renovation.  
A comfortable, durable, healthy home.

[www.coldhamandhartman.com/DER](http://www.coldhamandhartman.com/DER)

Coldham&Hartman Architects

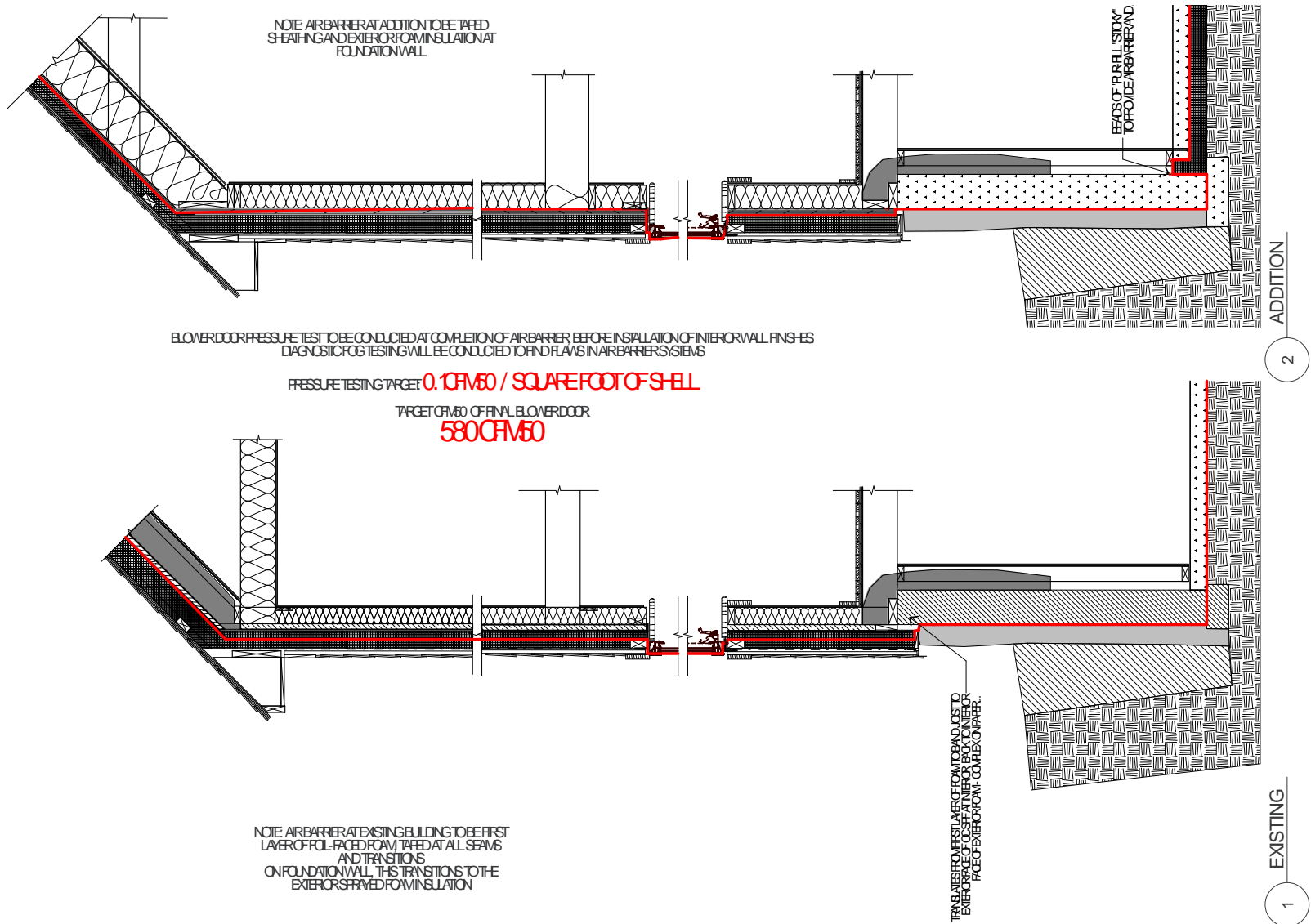
What are our big issues – particular to  
DERs?

## First and Foremost: Life Safety



# Building Energy 14 and House+ as a System

House





# Building Energy 14 and House+ as a System

House



Building Energy 14  
and House+ as a System

House

DANGER:



DANGER:



DANGER:

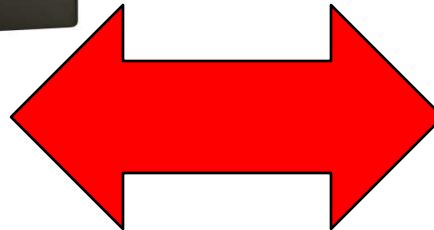


100–200 cfm

DANGER:



100–1000 cfm



Building Energy 14  
and House+ as a System

House

SOLUTION:



and/or



Building Energy 14  
and House+ as a System

House

SOLUTION:



## How to Provide Makeup Air for a Wood Stove

**Should your wood stove get ducted outdoor combustion air direct to the firebox, or to a location near the stove — or perhaps no ducted outdoor air at all?**

Helpful?  
2  
Sign in to  
vote

POSTED ON DEC 19 2011 BY **SCOTT GIBSON**

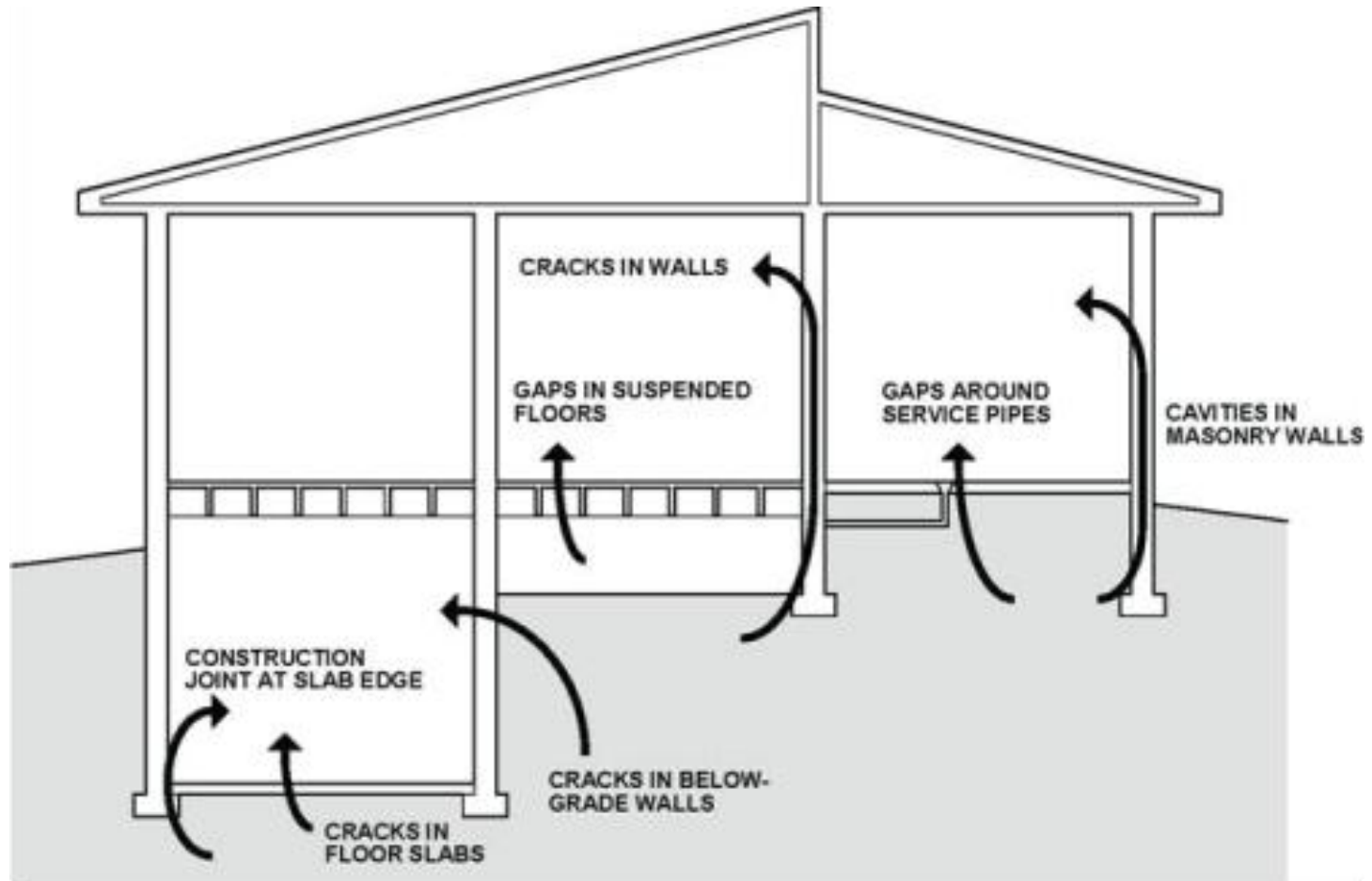
Wood stoves used to be pretty uncomplicated devices. Even though they weren't airtight and they weren't especially efficient, these cast-iron stoves warmed plenty of New England farmhouses in the dead of winter.

Our forebears never considered the source of makeup air to replace all the heated combustion gases that were going up the flue. They didn't need to, because back then, houses were leaky. As the stove burned its load of oak or maple, makeup air had no trouble finding its way into the house.

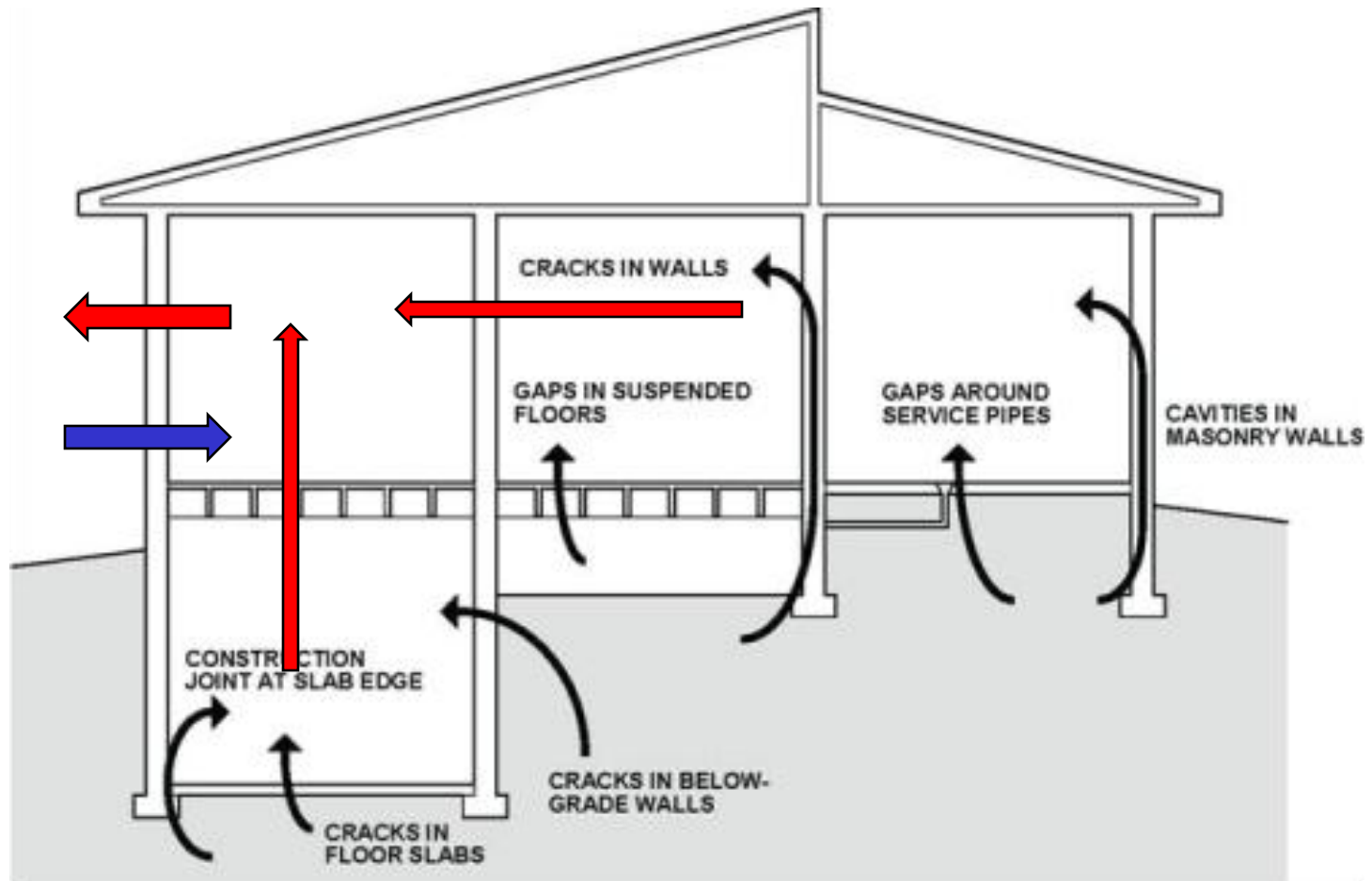
In the era of airtight construction, however, a wood stove is a different animal altogether. For one thing, stoves are more efficient. For another, the current emphasis on air sealing has reduced the number of cracks and leaks that were traditional sources of makeup air.



## What about Soil Gas?



## Tight Homes Can Trap Soil Gas



Balanced Ventilation will discharge some of this gas and replace with fresh air



## Solution: ADD Radon Collection Pipes



Other ventilation concerns – odors, heat  
loss





I've done all that right.  
What about the building?

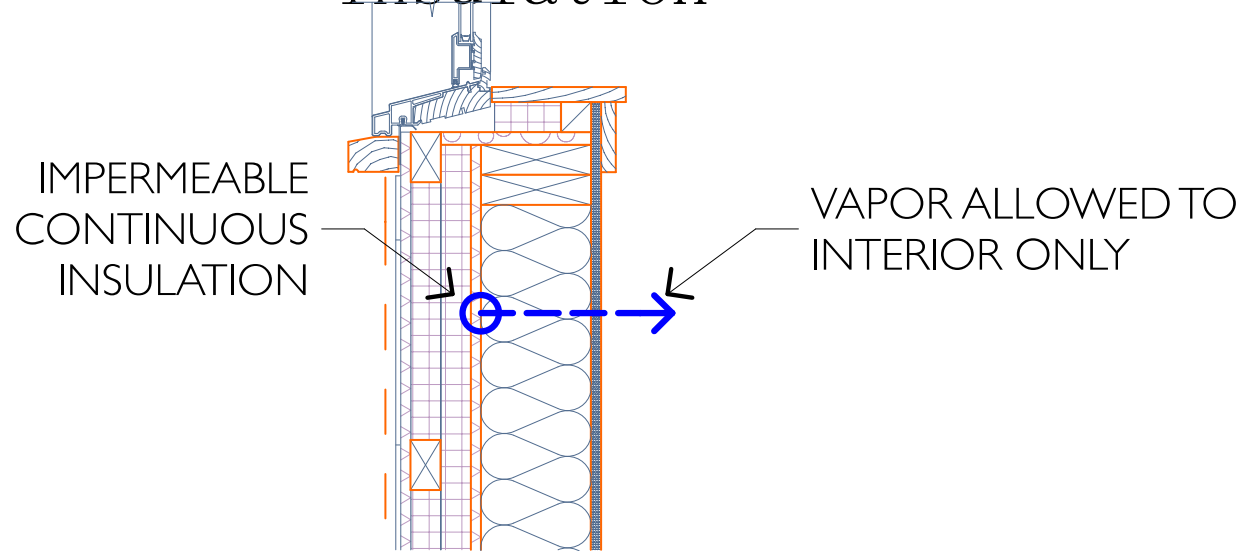
Building Energy 14  
and House+ as a System

House

# Typical Exterior Foam Job



# At a wall with impermeable exterior insulation



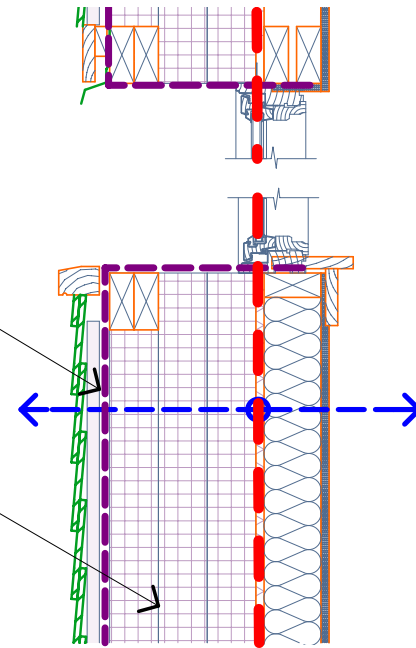
WUFI Plus will show long-lasting sheathing moisture within an out-sulation assembly in cold climates.

BUT: What are we really worried about?

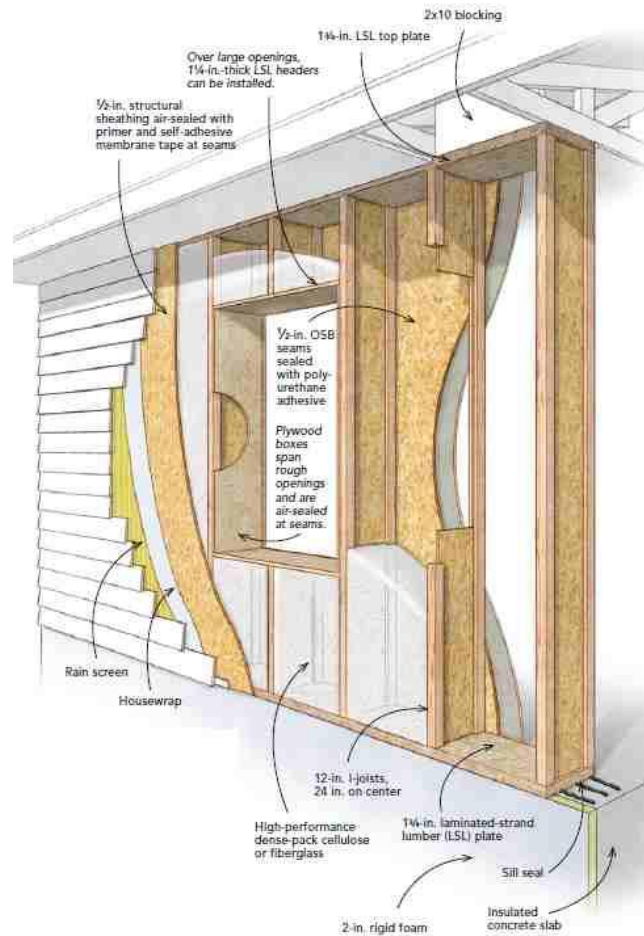
## Walls with permeable exterior insulation

VAPOR PERMEABLE SMART  
MEMBRANE ALLOWS DRYING  
OF SHEATHING / INSULATION  
TO THE OUTSIDE

THREE LAYERS OF 3" MINERAL  
WOOL BOARD STOCK - ALL  
SEAMS STAGGERED AND  
BUTTED TIGHT





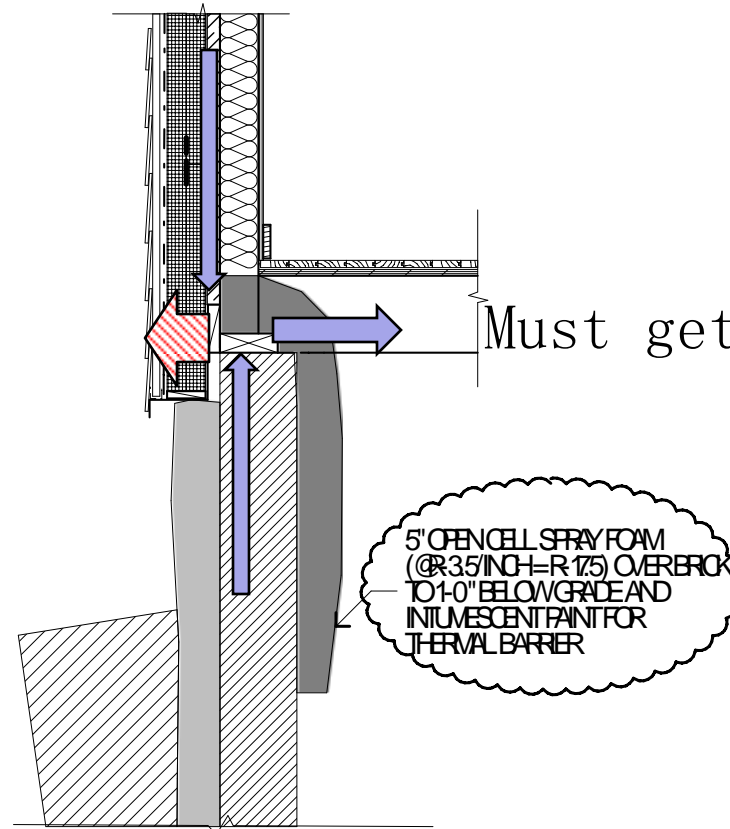


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# At the sill – a potential vapor sandwich

Can't get out here

Must get out here



2

EXISTING BASEMENT - NO STUD WALL



## Problem: Insulating Brick Walls



Insulate to the inside? =  
Bricks stranded outside thermal  
boundary

## Solution: Insulate Outside



## Solution: Accept and Monitor



## Summary:

Use devices that can't be backdrafted

Use devices that don't backdraft others

Consider all-electric solutions (with PV!)

Have a strategy for IAQ

Know your assemblies' vapor profiles

Drying both ways is better than drying one  
way

Drying one way is better than staying wet

Pay attention to bricks



This concludes the American  
Institute of Architects Continuing  
Education Systems Program

Thank you

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