

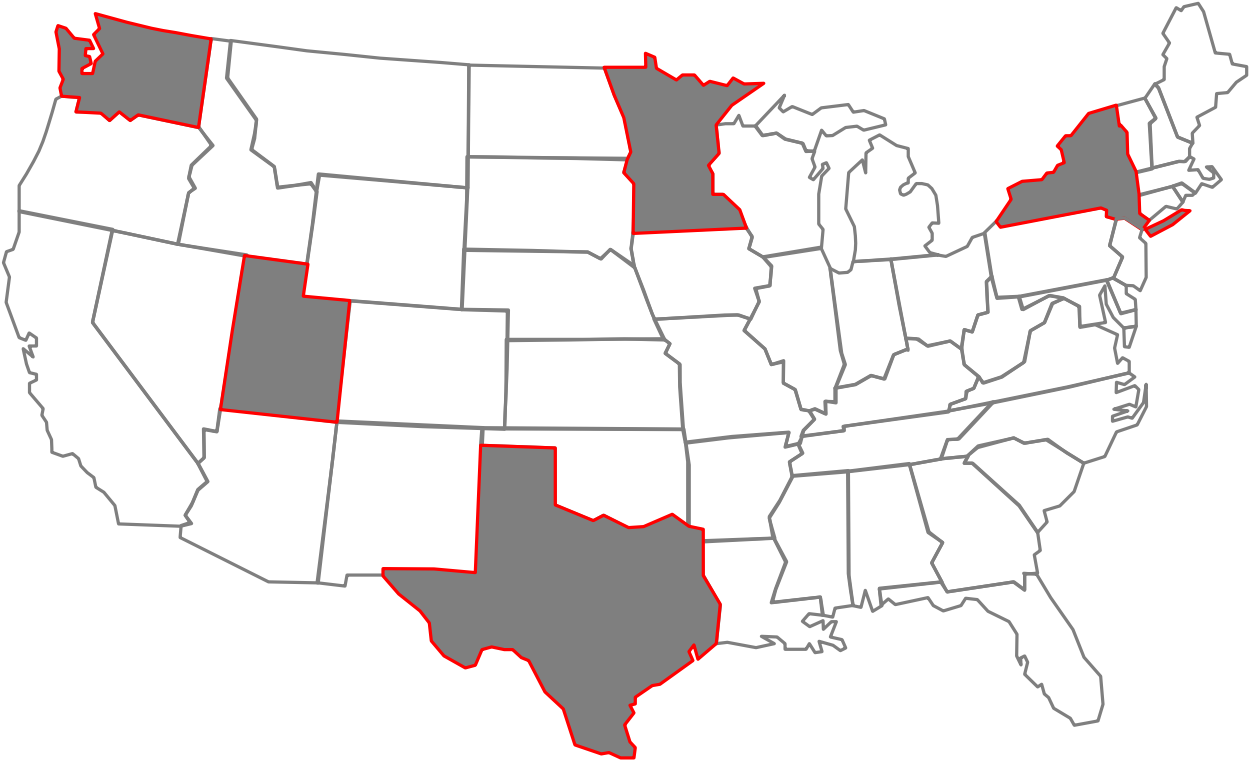
Meeting the Challenges of Emerging Air-Tightness Requirements

Best Practices that Add Up



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28 September 2016
Dallas, Texas*

Air-tightness standards are increasing



Climate Zones	Requirement
1-2	5 ACH50
3-8	3 ACH50

Why is 3ACH a “heavy lift”?

- I. Knowledge... *What’s Leaking?*

- II. Building process... *It’s complicated!*

- III. Change... *It’s difficult!*
 (But possible)



If you're looking for silver bullets...



KNOWLEDGE

What's leaking?

How do I seal it?



Categories of air-leakage

- 1 blocking issues
- 2 penetrations
- 3 joints

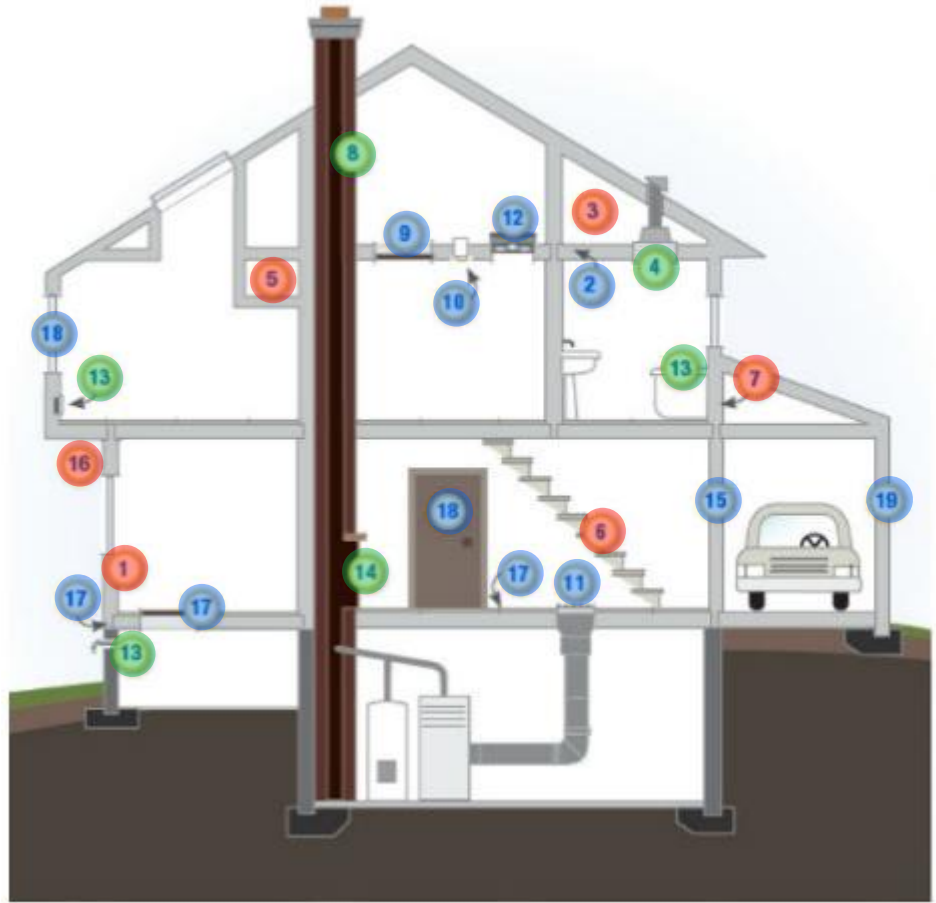


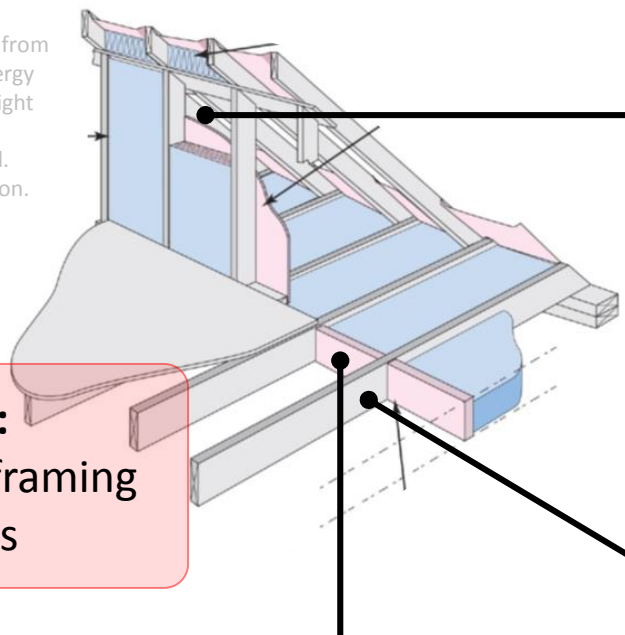
Image Credit: U.S. Department of Energy

blocking issue *n* a large hole in the air-barrier created by the absence of a matching piece of air-impermeable material like wood.

Blocking issues > knee wall



*Section 402.4. Excerpted from the 2009 International Energy Conservation Code, Copyright 2009. Washington, D.C.: International Code Council. Reproduced with permission. All rights reserved. www.ICCSAFE.org



Root cause:

- complex framing
- awareness



gaps at top plate



no blocking between joists



blocking between joists

Blocking issues > porch roof

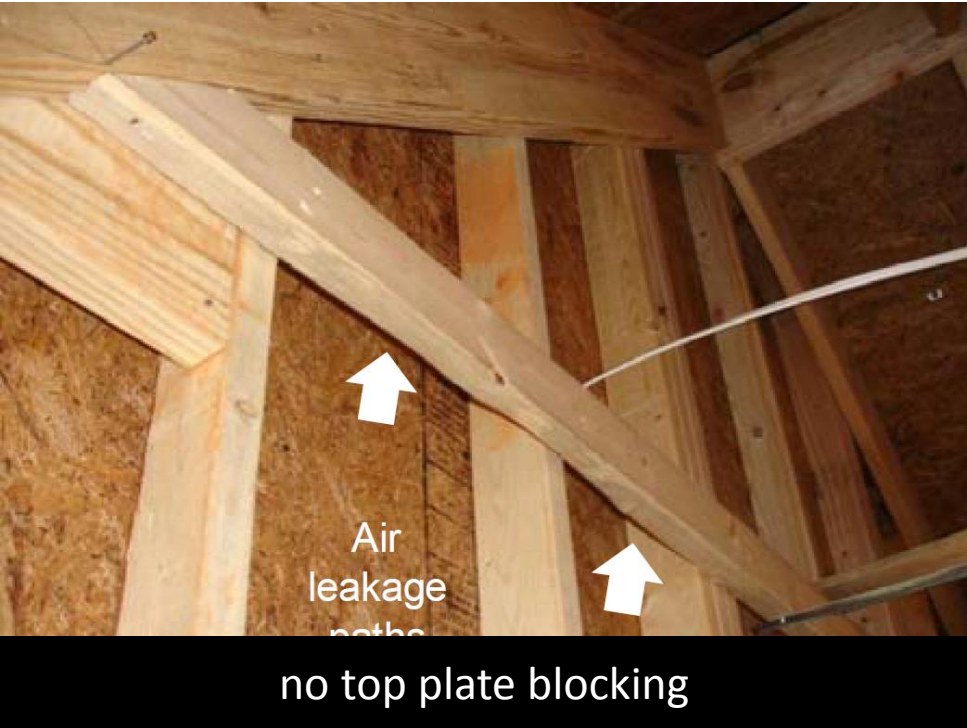


Root causes:

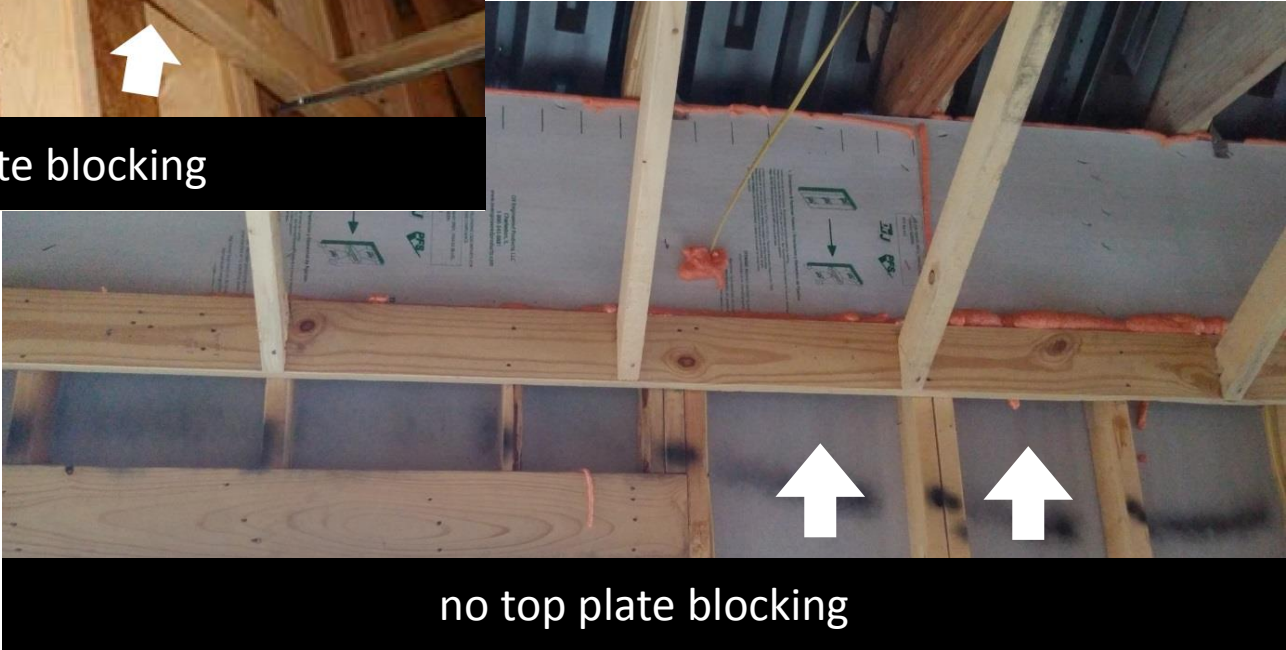
- sequencing
- restricted access
- division of labor
- complex framing
- awareness



Blocking issues > uncapped cavities



- Root causes:**
- complex framing
 - awareness



Blocking issues > cantilevers & bump-outs

Root causes:

- sequence
- visibility
- human error



cantilever



box window

Penetration *n* a hole created in the air-barrier, usually for the purpose of adding functionality to a house.

Penetrations – examples



pipe-sheathing



can-drywall

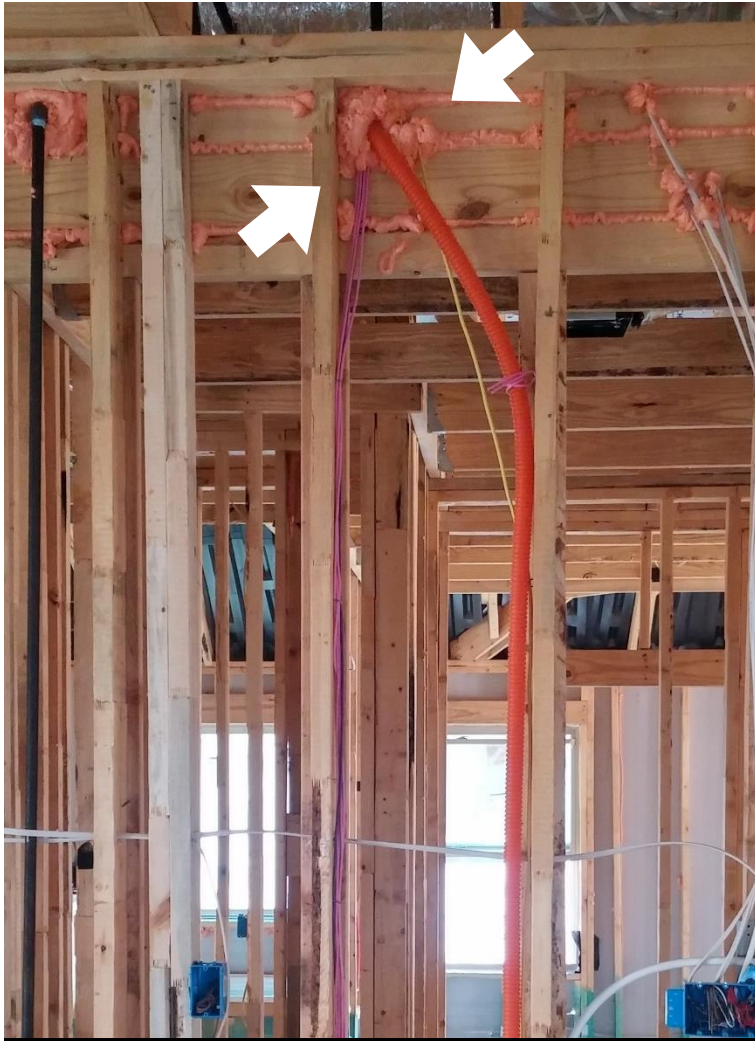


boot-drywall



flue-collar

Penetrations – smurf tube




sealed smurf tube?...



...not inside.

(but lots of length)

A red curved arrow pointing downwards from the handwritten text towards the word 'Joint' in the definition below.

Joint *n* a small hole in the air-barrier created at the interface between two adjacent building materials, like drywall and wood.

Joint air leakage study

HOME AIR LEAKAGE SOLUTIONS BY OWENS CORNING:
Isolating critical joints through research and improving them with groundbreaking product systems



HOME AIR LEAKAGE SOLUTIONS BY OWENS CORNING:
Isolating critical joints through research and improving them with groundbreaking product systems



air — 5,280 feet
leakage can
or less pleasant
nd, Owens
o identify and
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error, it also
System.

for heating
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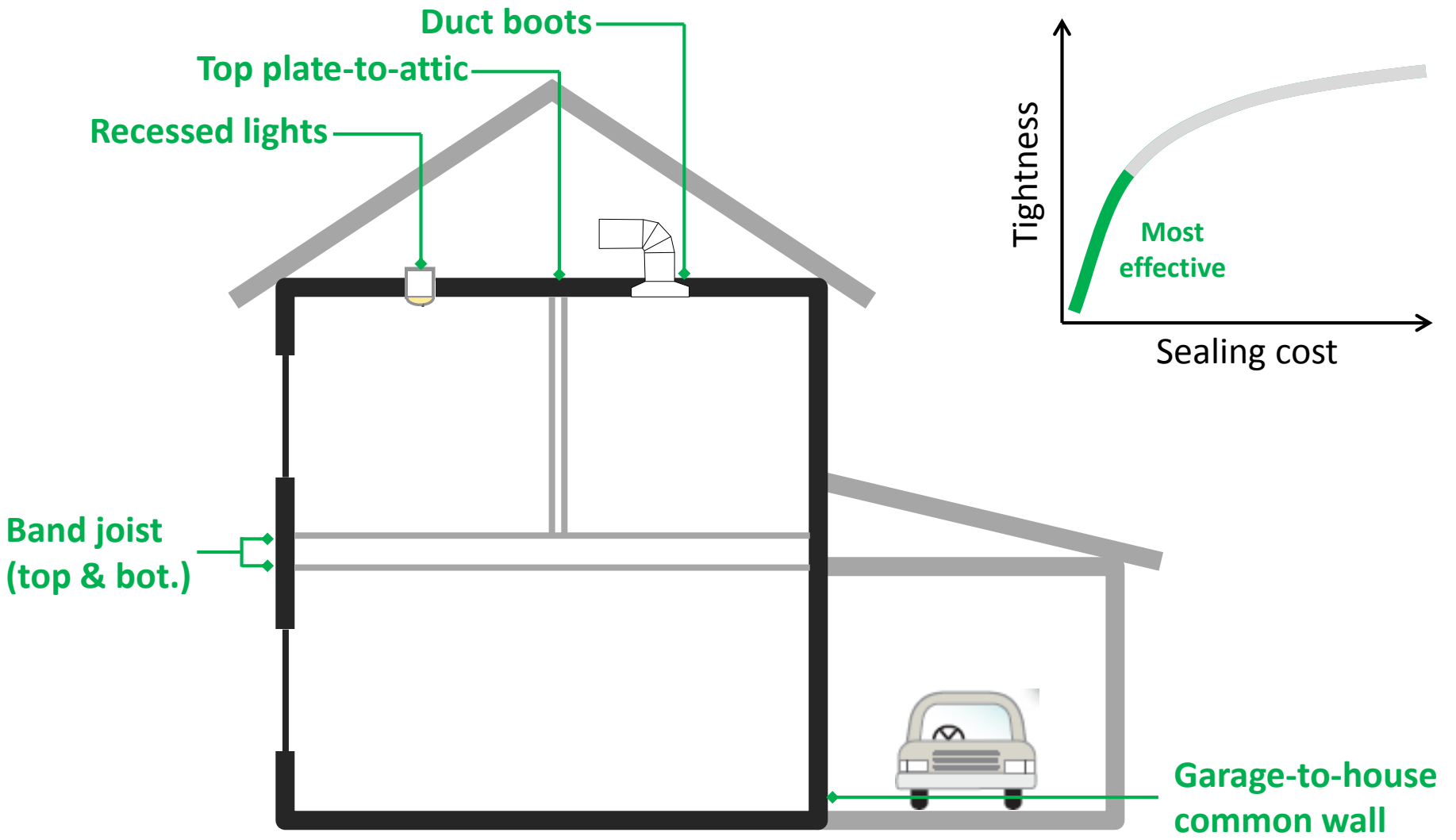
Figure 1
Schematic of a house cross section showing the various air leakage paths (Image from Conservation Technology).



<https://w.owenscorning.com/building-genius/where-to-air-seal-for-maximum-impact-efficiency-and-savings>

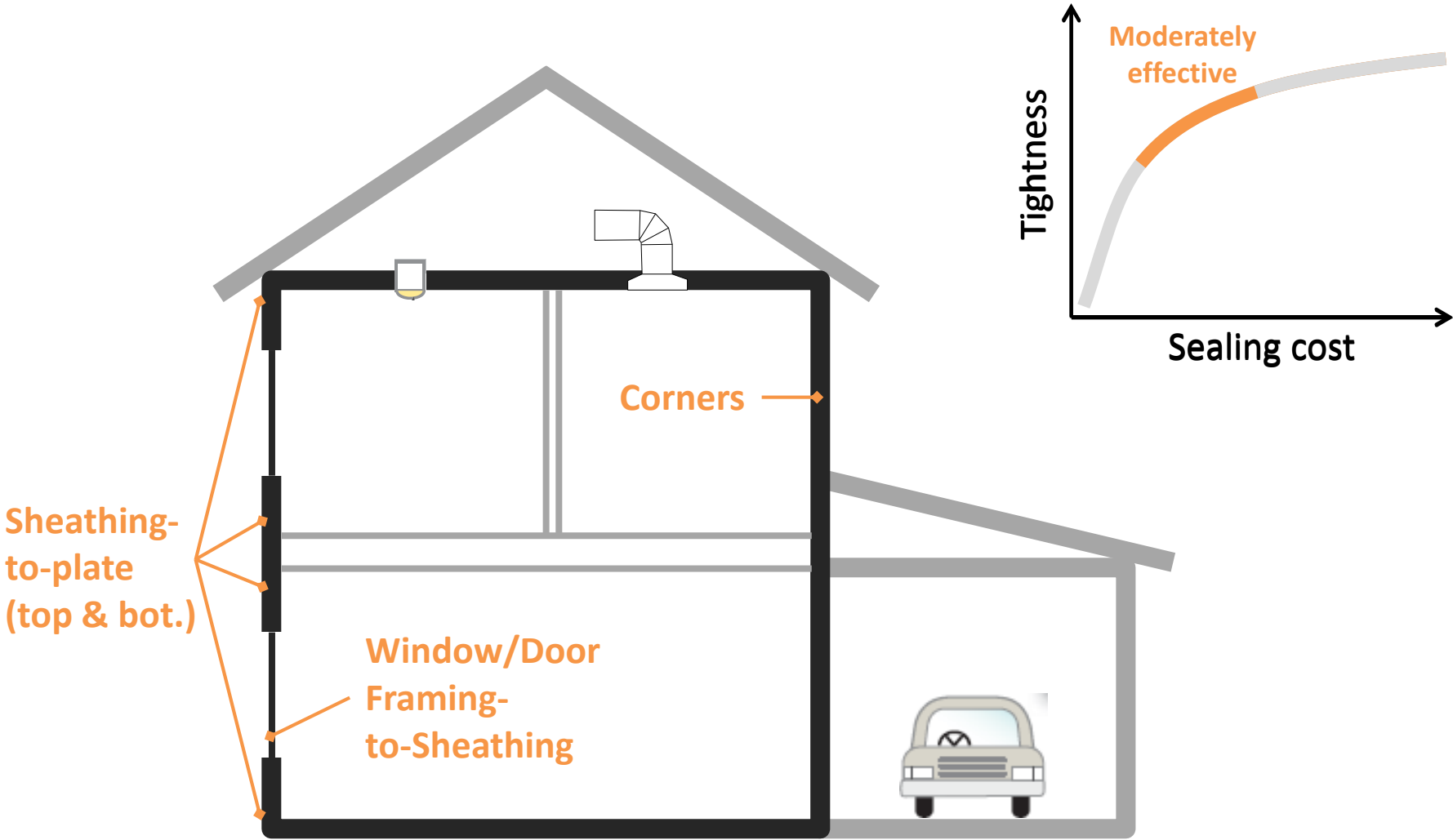
Joints – high leakage

(0.4 – 0.9 CFM50/ft)



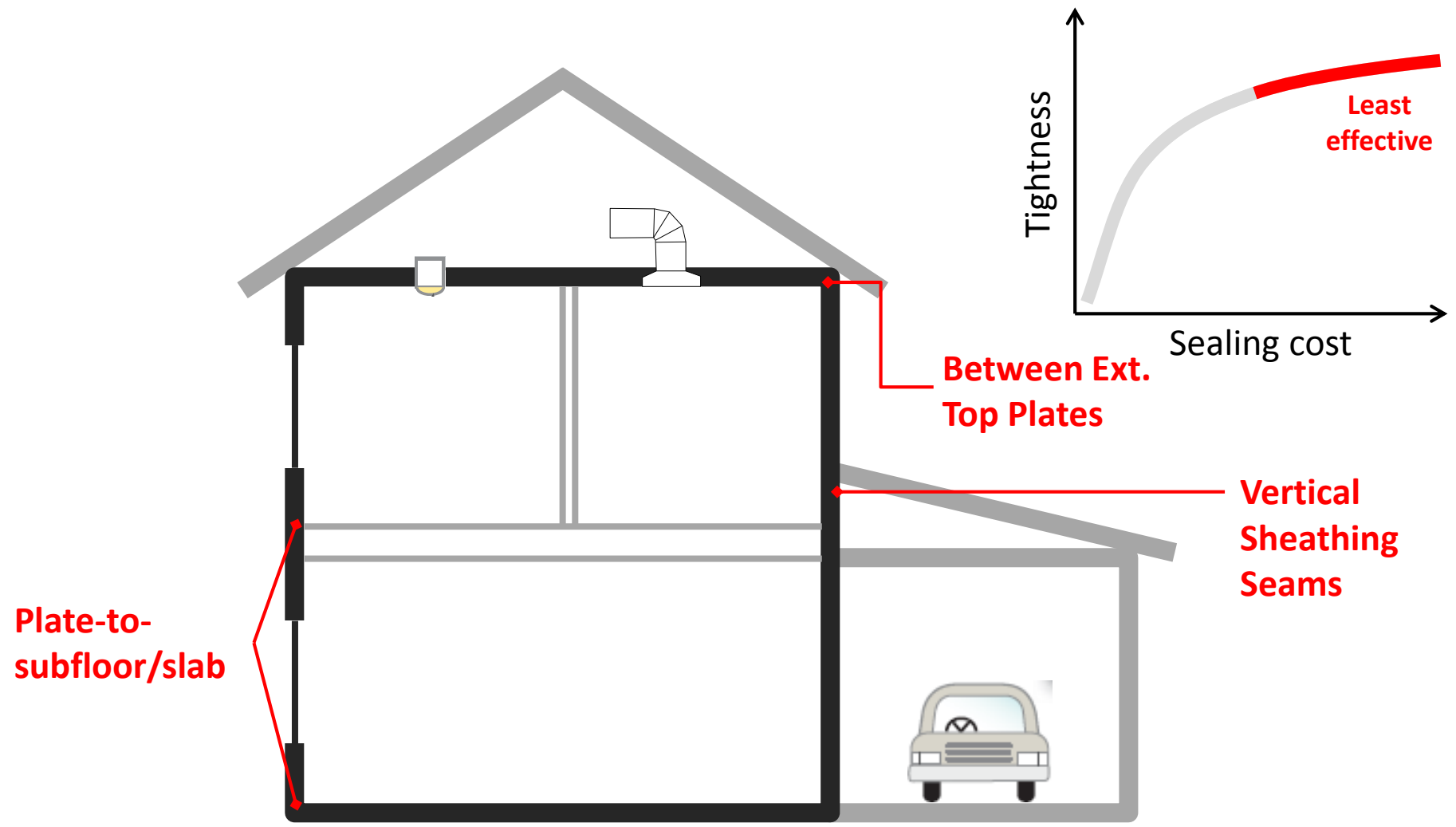
Joists – medium leakage

(0.2 – 0.4 CFM50/ft)

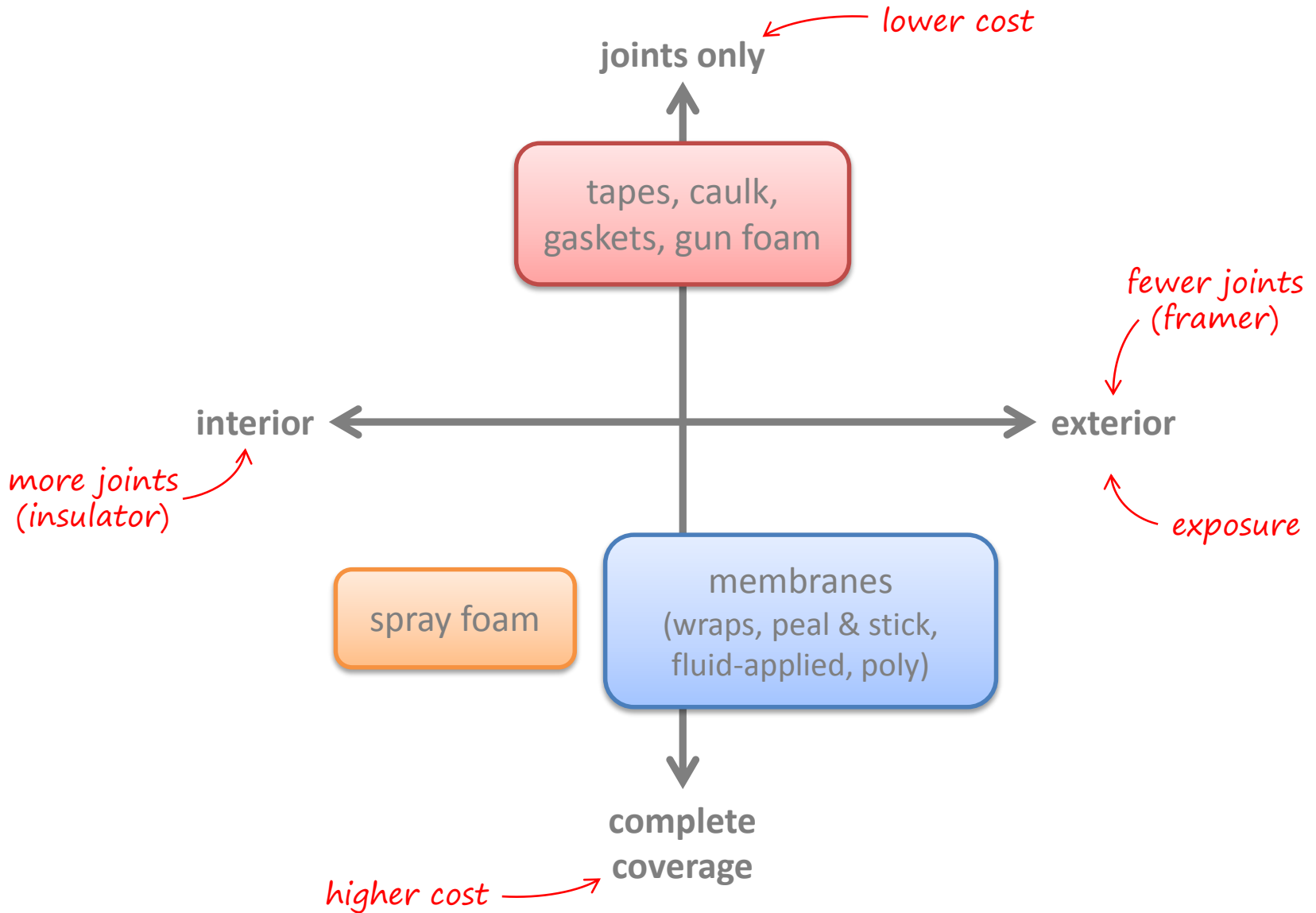


Joints – low leakage

(0 – 0.2 CFM50/ft)



What product do I use?

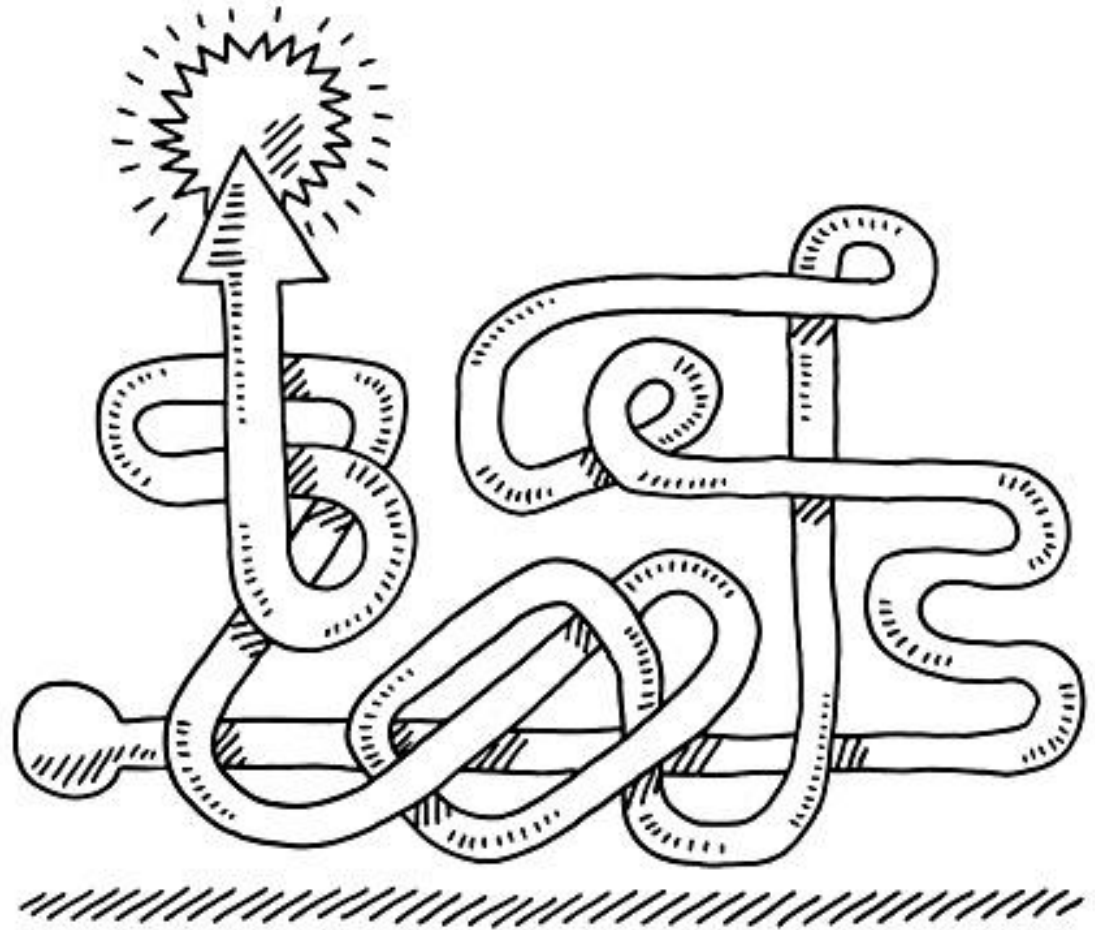


Other things to consider

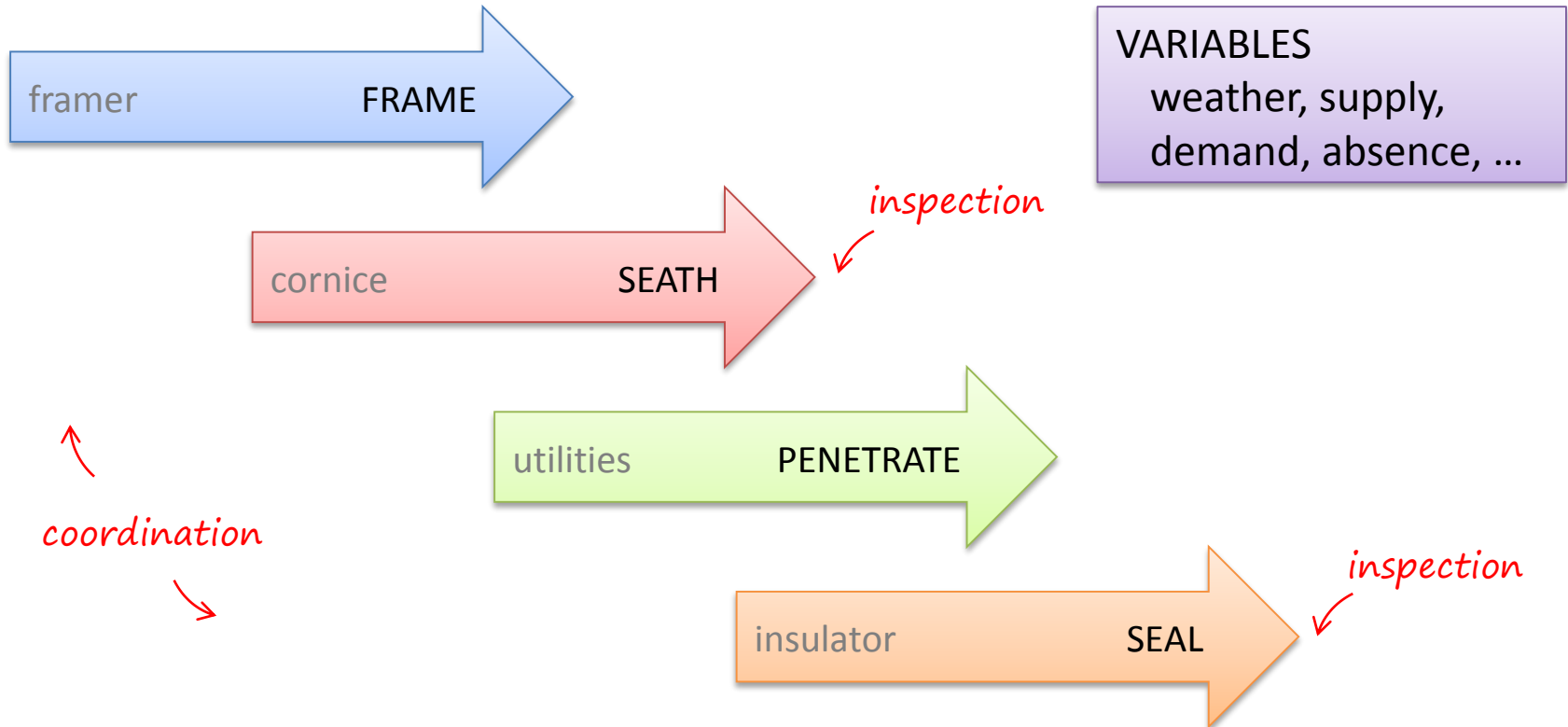
- One sealant does not seal all joints!
- Joint movement
- Durability

PROCESS

It's complicated!



Process for creating air-barrier (simplified)



CONSTRAINTS
maximize – production, return on investment, ...
minimize – cost, labor, schedule, return trips ...



Implications for who has air-sealing responsibility



Who should seal this?	Pros	Cons
Insulator	Consolidate responsibility	Insulator has to buy high temperature sealant
Fire place installer	Seal penetrations when made	Distribute responsibility

Sequencing issues



blocked access to downstream trade

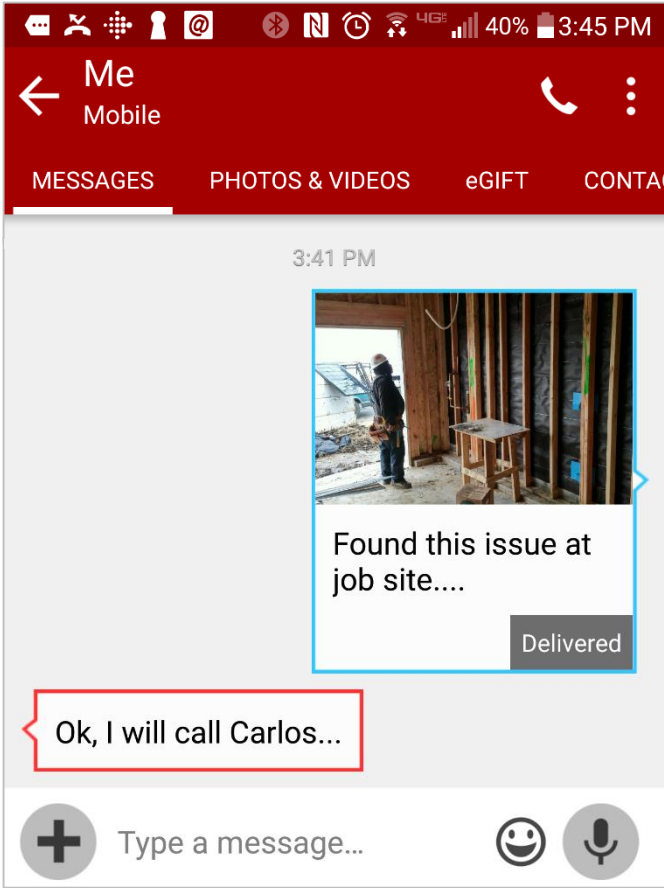
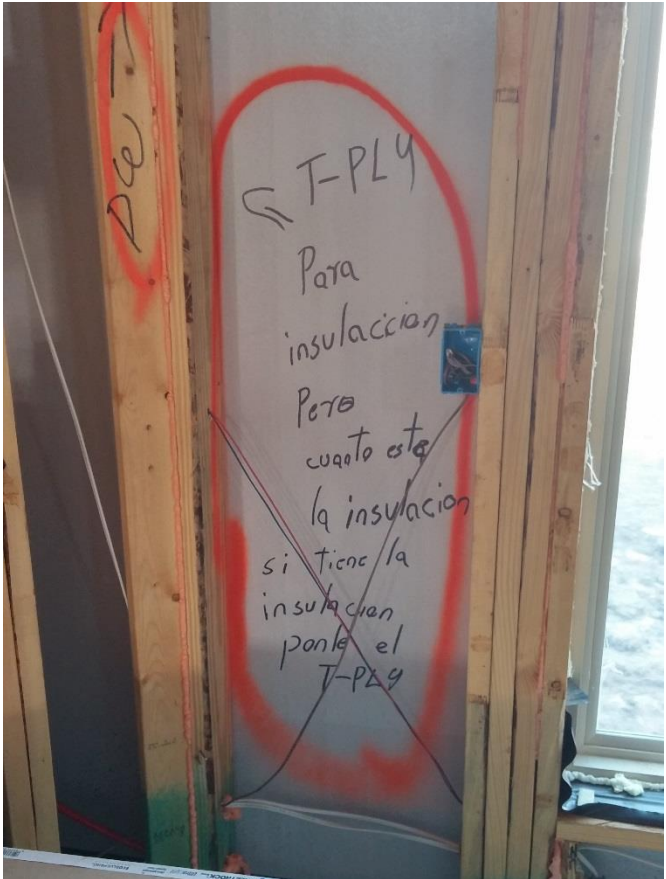


blocked access



delayed delivery

Communication helps work around sequencing issues



Lifting constraints to achieve less than 1 ACH50



ceiling drywall before interior walls eliminates top-plate leakage

Image courtesy of Steven Baczek, Steven Baczek Architectural Services

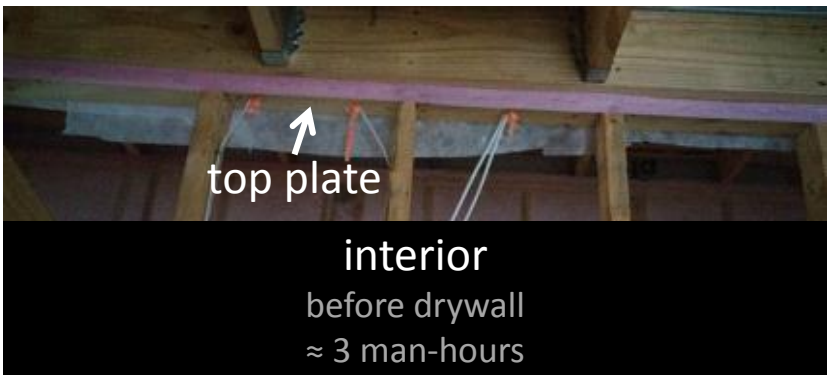
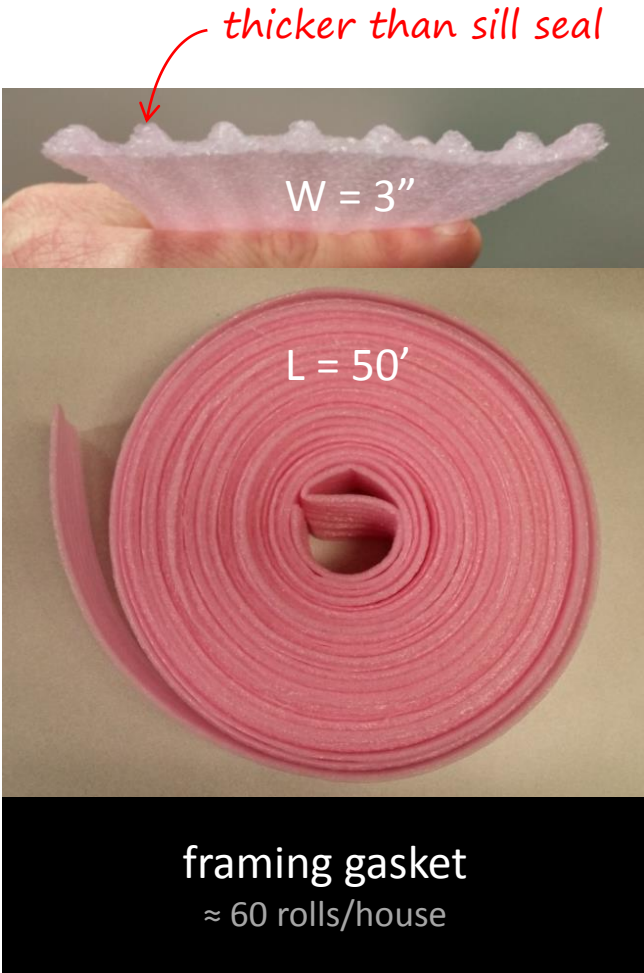
Change

It's possible...



- 2015 Highland Homes started working with Owens Corning on achieving the new 3ACH50 standard.
- Average ACH50 \approx 5
- Here's what we did...
 - leveraged 2012 air-leakage study
 - implemented cost effective gasket
 - Owens Corning supported transition to a new process

Overview of framing gasket approach



Days before first install...



team meeting

WHO

supervisors, purchasing manager, framing contractor, insulator, drywaller, energy rater

WHY

- educate on proper installation
- emphasize importance of air-barrier
- raise awareness of upcoming changes
- foster communication between trades

HOW

- learn through discussion
- at job-site
- English, Spanish, ...

During install...



installer training

WHO

installer, supervisors

WHY

- educate on proper installation
- assess time to install

HOW

- learn by doing, trial & error
- at job-site
- English, Spanish, ...

- Provide to job-site supervisors
- Show where and how product is applied
- English and Spanish

Exterior Basement/Crawl Space and 1st Floor Connection

Option 1: Rim/Band Joist Locations. (See Fig. 6)

1. Position RimSealR where Rim/Band Joists will be located at both top and bottom Rim/Band Joists locations where base plate and/or subfloor junctures occur, before Rim/Band Joists are installed.
2. Staple RimSealR no greater than 3" on center between the base of the Rim/Band Joist and base substrate and between the top of the Rim/Band Joists.

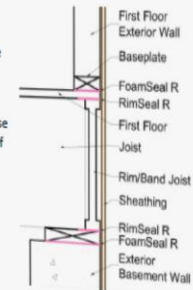


Fig. 6

Option 2: Exterior Side of Rim/Band Joist Location (See Fig. 7)

1. Assure floor adhesive is applied between top of Rim/Band Joist and subfloor substrate.
2. Position RimSealR with ribbed surface facing outward where top and bottom seams of Rim/Band Joist are located.
3. Staple RimSealR no greater than 3" on center prior to exterior sheathing (OSB) installation.

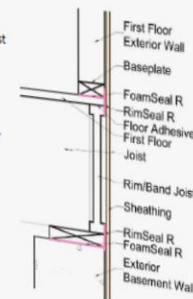
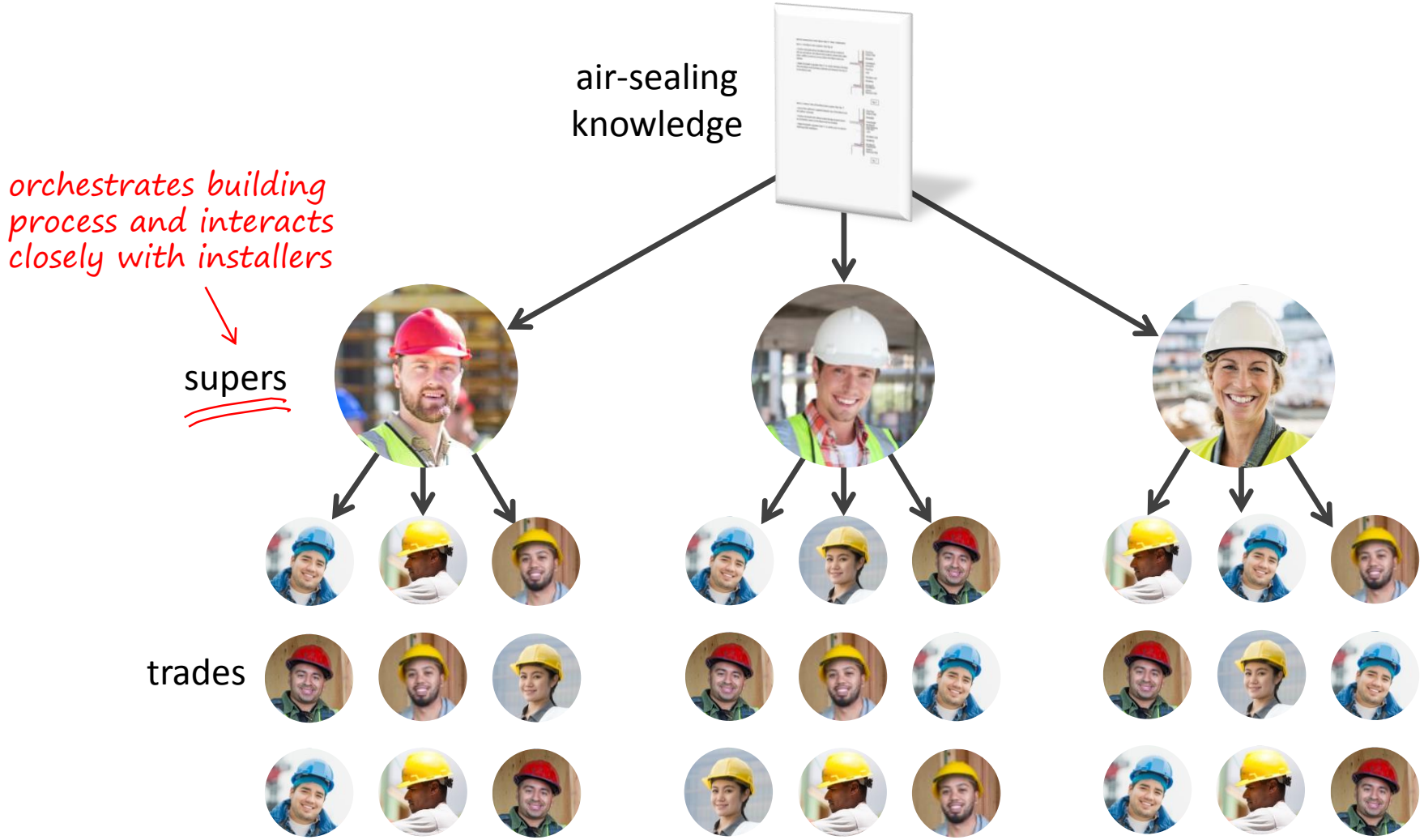


Fig. 7

Focus on supervisors to sustain new process



Diagnostics reveal opportunities for improvement



blower door testing



smoke testing



improve process



make an impression

↖ find the leaks ↗

Continuous improvement mindset

opportunity to improve



It even helps when disposal crews are aware of new process

Where are they now?

2.5 ACH50

- There are no silver bullets.
- Keys to success...
 - Education and awareness
 - Continuous improvement mindset
- Change is possible!

full air-leakage study available online



1. D. Wolf, F. Tyler, "Characterization of Air-Leakage in Residential Structures Part 1: Joint Leakage.
2. D. Wolf, F. Tyler, "Characterization of Air-Leakage in Residential Structures Part2: Whole House Leakage.

Thermal Performance of the Exterior Envelopes of Whole Buildings XII International Conference, 2013 ASHREA.

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Questions?