QUALITY INSULATION INSTALLATION

New Energy Efficiency Standards

- Presentation will begin shortly
- Session will be recorded
- Please be aware that participants will be muted. Q&A at bottom of screen – ask your questions here

DEVELOPMENT SERVICES TRAININGS

- Each year since 2014, The City of Chula Vista DSD has provided a series of seminars to inform attendees about Energy Efficiency opportunities as well as Energy and CALGreen Building Code updates. Our mixed audience trainings are attended by Contractors, Designers, City Staff and the Community.
- This year the trainings are being offered online and they are being recorded.
- Funding for the program is provided by the Local Government Partnership with SDG&E

MORE WEBINARS COMING SOON

- October 13 CALGreen Residential Code
- November 17 CALGreen Non-Residential Code
- December 8 Indoor air quality and ventilation with a connection to COVID 19

QII

What Building Inspectors Need to Know

Russell King, M.E.

September 2020

CalCERTS, Inc.
HERS PROVIDER

CalCERTS, Inc.
HERS PROVIDER

CalCERTS, Inc.

- Private company based in Folsom, CA.
- Approved by the CEC to be a HERS "***Provider***" since 2003
- We train, certify and track HERS "***Raters***"
- Not a government agency.
- Not affiliated with, but closely regulated by, the California Energy Commission (CEC)
- HERS raters are not employees of CalCERTS.

What is QII?

QII is a Protocol for the Verification of Properly Installed Insulation

- Based in industry standards: NAIMA and ICAA
- How the **manufacturer's** intend their insulation to be installed.
- In CA, enforcement is delegated to 3rd party Special Inspectors called HERS Raters.
- Reference Appendix Section RA3.5 – "Protocols"

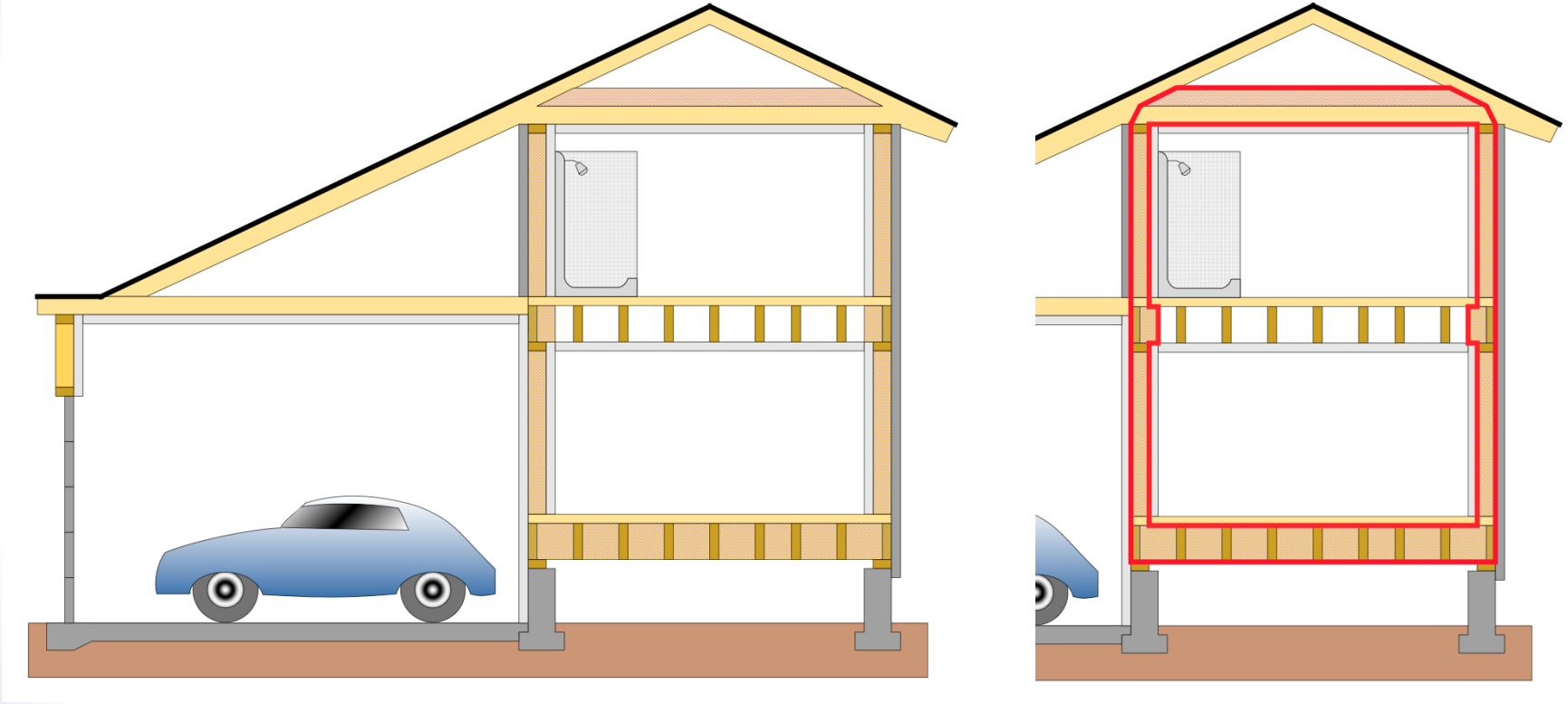
QII – WTF? (Why the fuss?)

- There was a large study done prior to the 2005 energy code that determined that poor quality installation was very common and very poor.
- The compliance software that models a house to determine compliance automatically derates insulation by ~13.5%.
- If energy consultant selects QII, HERS verification is triggered (shows up on the CF1R-PRF-01).

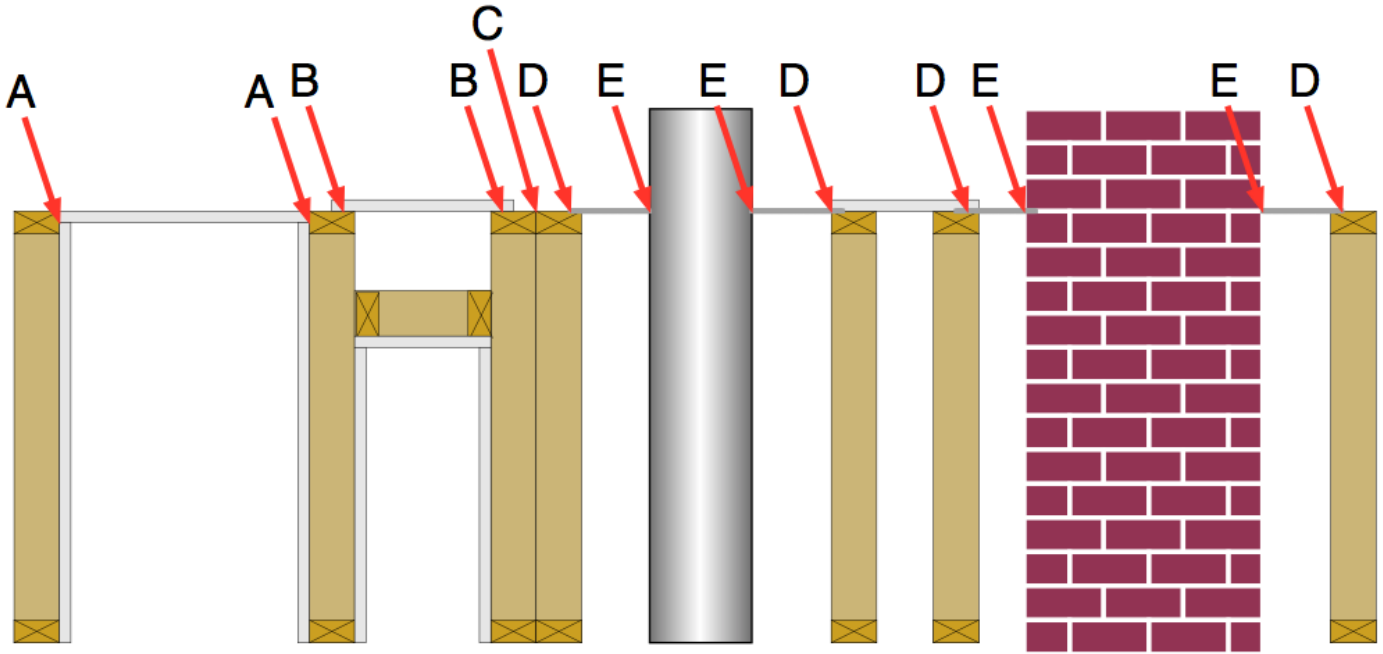
QII – WTF? (Why the fuss?)

- If it is not planned for from the beginning, there will be a lot of problems.
- Coordination is key.
- Education of installers is very important.
- HERS raters inspect the insulation, but building inspectors can help a lot.

QII – Well-Defined Thermal Boundary



QII – Seal All Potential Air Leaks



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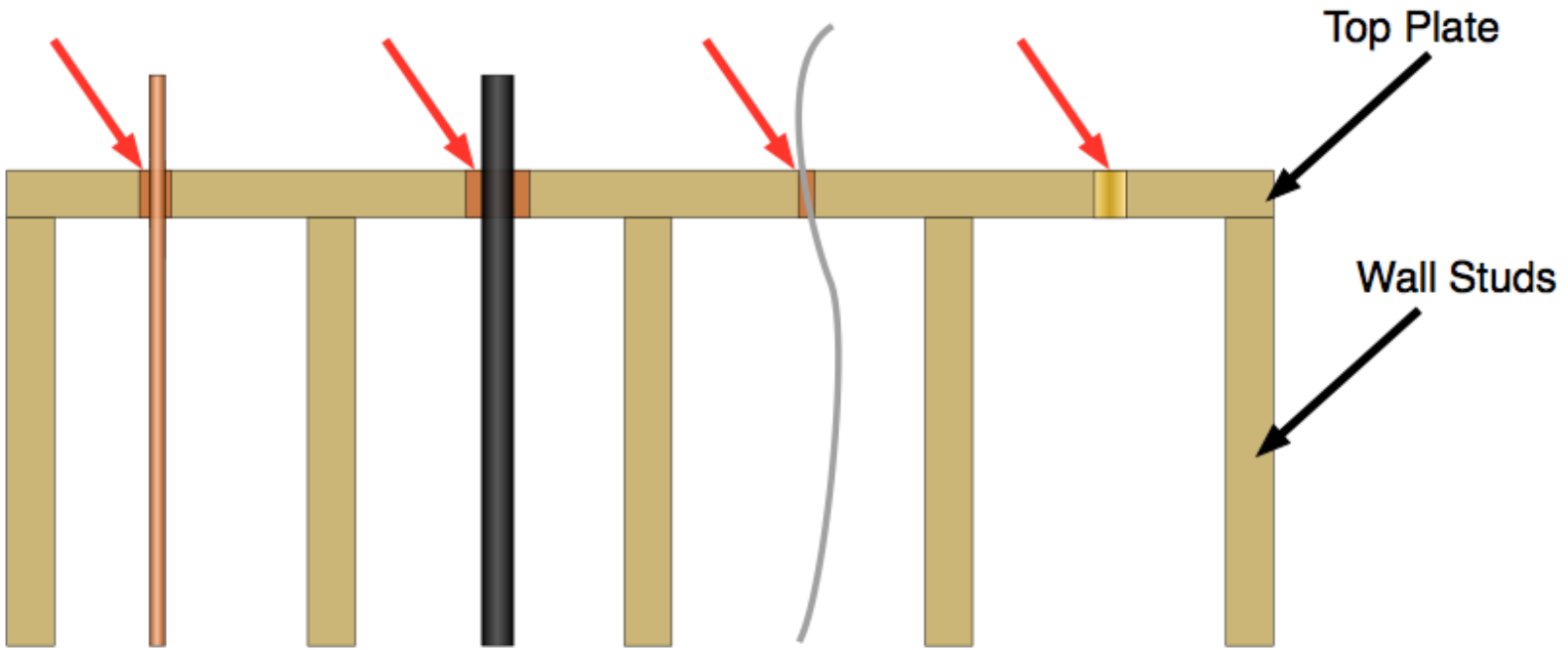
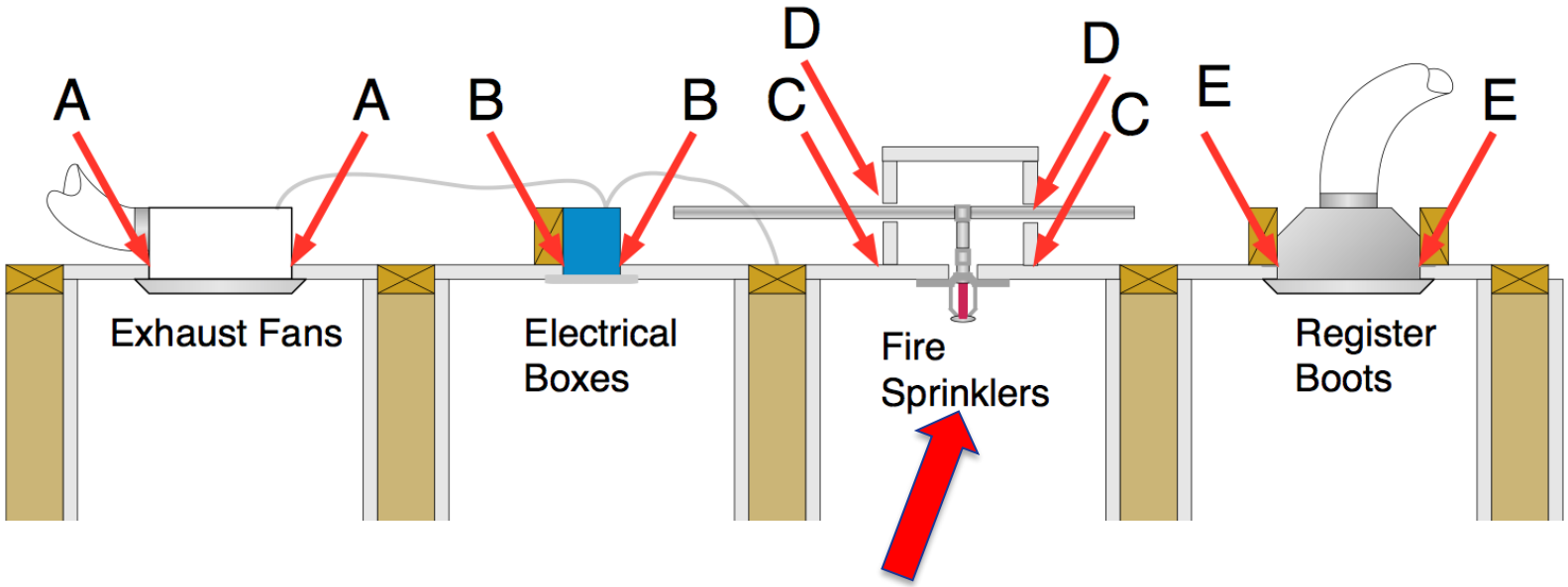
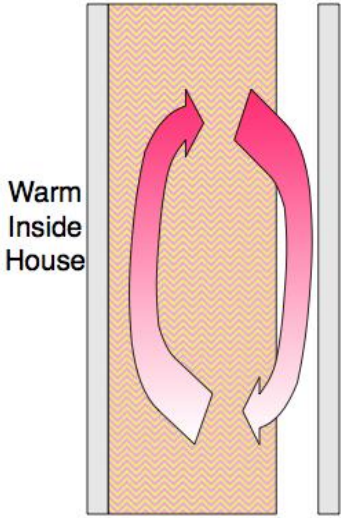


QII – Seal All Potential Air Leaks

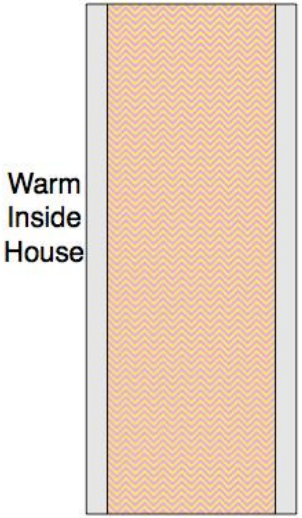


Fix Diagram, page 23: **“Per Sprinkler Manufacturers”**

QII – No Gaps or Voids

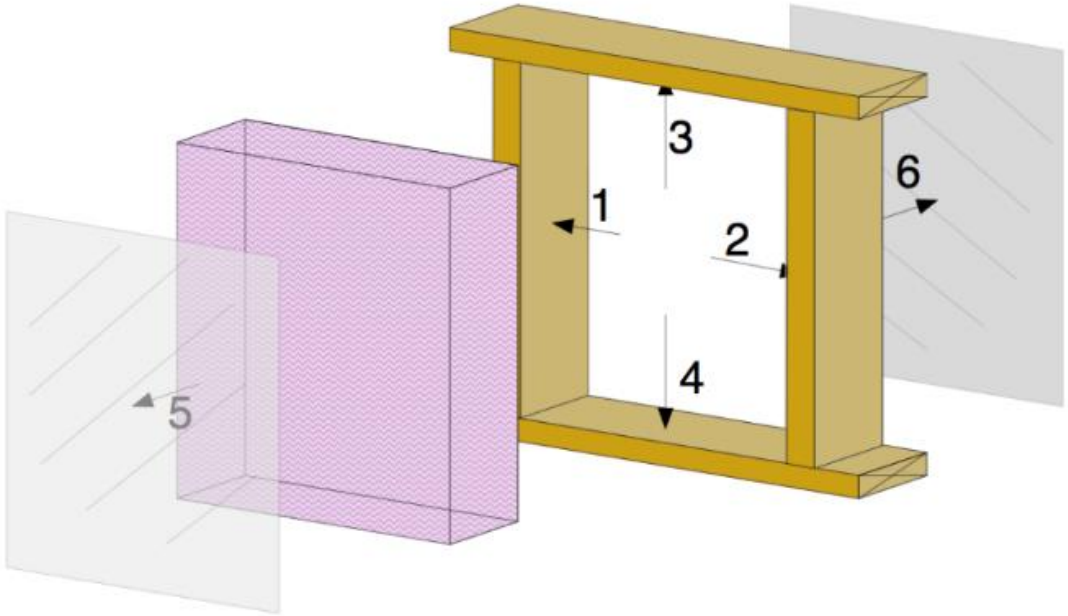


Vertical Surface
Air Barrier on
Two Sides, Void
(Some Thermosyphon)



Vertical Surface
Air Barrier on
Two Sides
(No Thermosyphon)

QII – All Walls: “6-Sided Contact”



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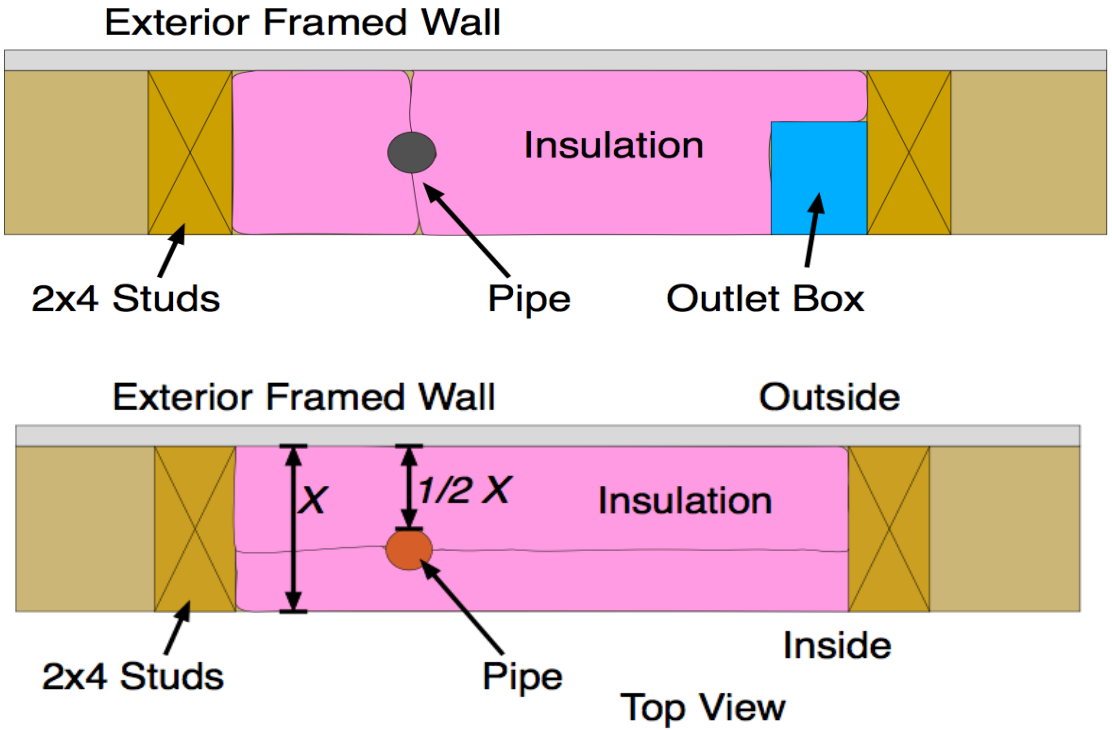

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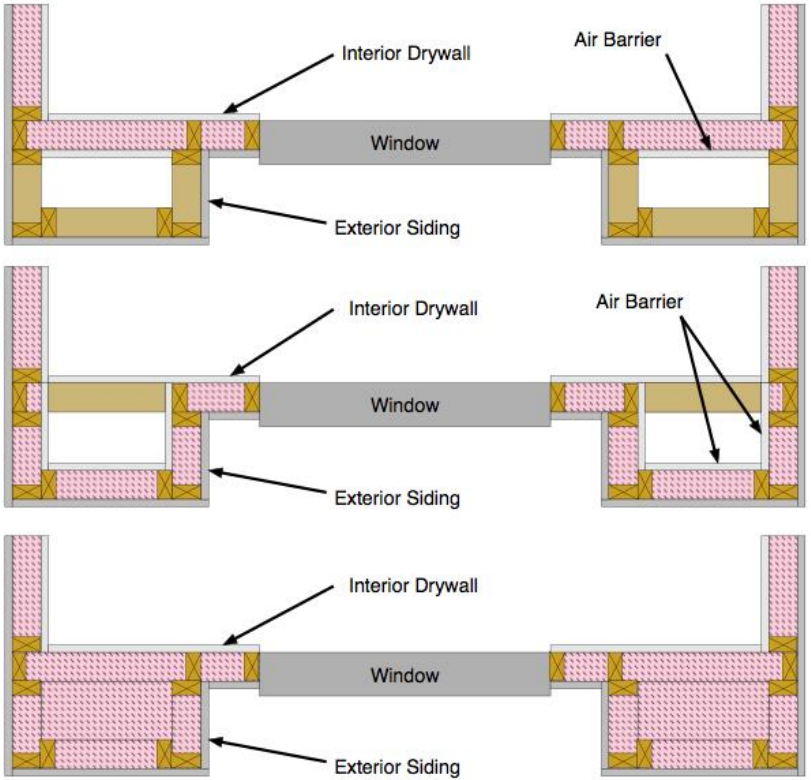
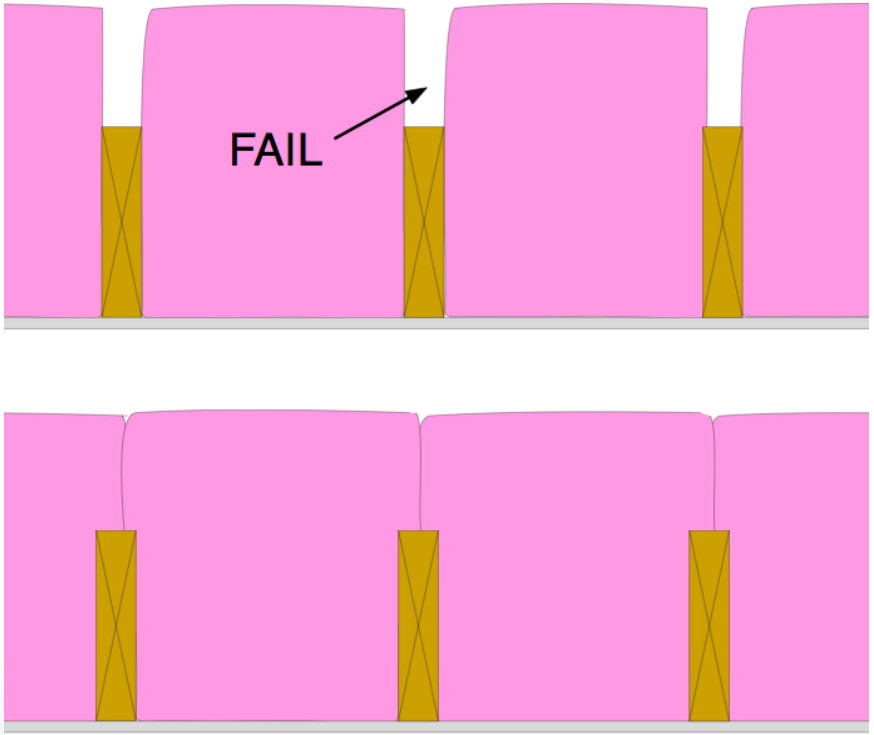
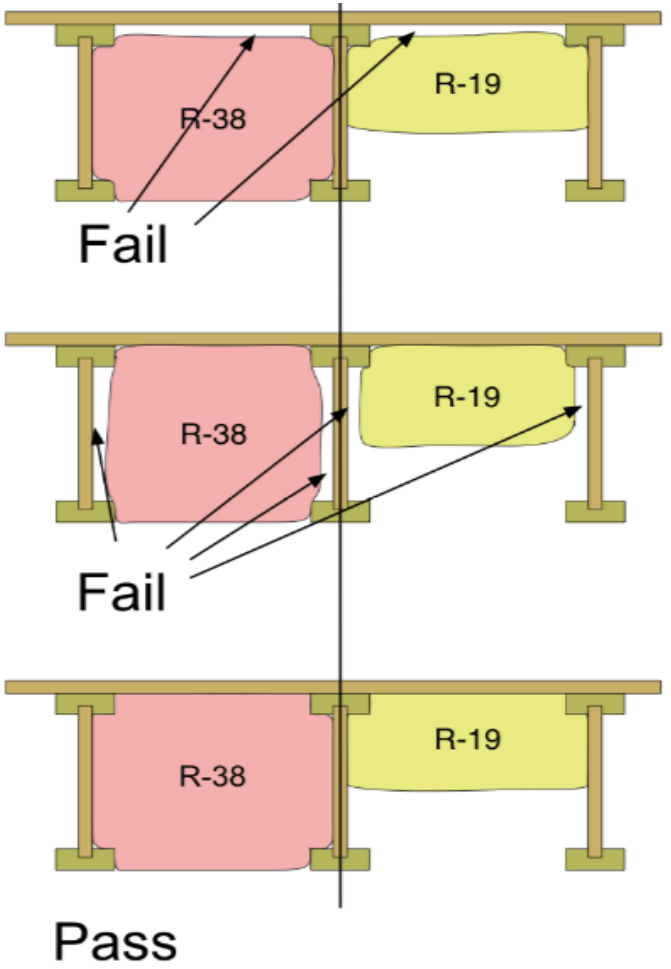
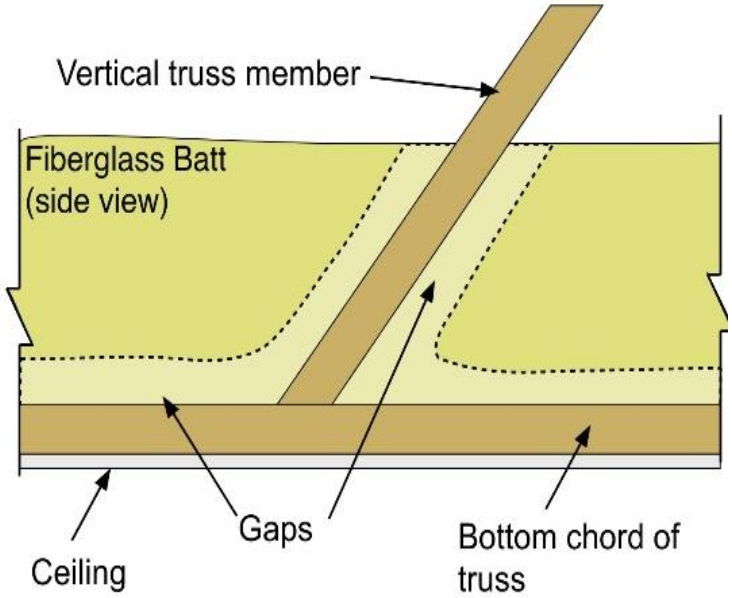


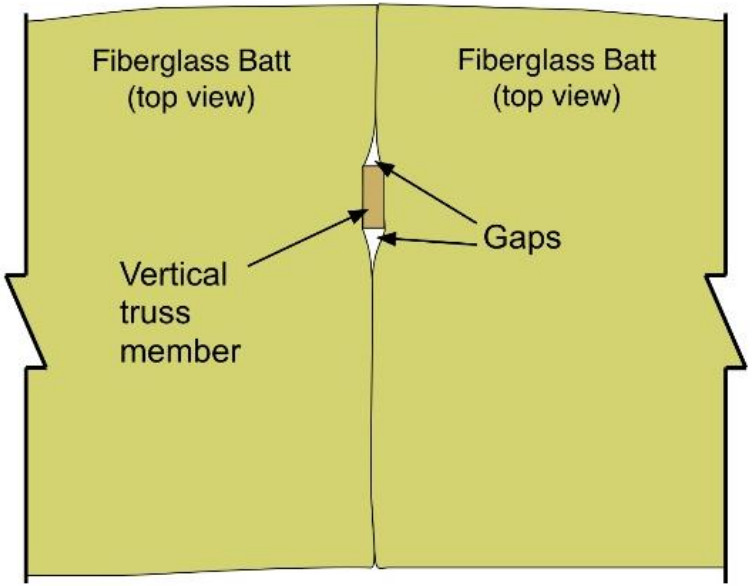
QII – Full Width Batts





QII: Batts + Trusses = Gaps and Voids





QII – What's Changing for 2019?

- We are currently in the "2019 Energy Code".
  - Effective January 1, 2020.
  - Based on permit submittal date
- Biggest change: QII is a *prescriptive* measure.
- This means that the "standard house" that sets the target for compliance has QII.
- The "proposed house" is not *required* to have QII, but it will have to achieve the same level of overall efficiency somehow.

QII – Quality Insulation Installation

- QII will be more common.
- It has the highest fail rate of any HERS inspection
- Known Problems:
  - Added cost
  - Lack of knowledge of requirements for QII
  - Design of house must consider special requirements
  - Tricky coordination with HERS Rater, small time window
- Others?

QII – Builder Tips for New Projects

- Know early if the project needs QII (Check CF1R-PRF-01)
- Evaluate plans very carefully. Look for unclear parts of thermal boundary. (knee walls, hard covers, bump outs, fire places, etc.)
- Clearly define responsibilities for trades. (air barriers, blocking, attic vents, sealing around fans, electrical boxes, etc.)
- Contact HERS Rater.
  - Ask for checklists, other informational materials.
  - Meet at project. Walk through.
  - Learn to use CalCERTS registry.

CalCERTS QII Handbook

Quality Insulation Installation (QII) Handbook

For Installers and HERS Raters
(2016 Energy Code)

Note: Structural Insulated Panels (SIPs) and Insulated Concrete Forms (ICFs) are not covered in this document – Refer to RA3.5 for these types of insulated assemblies.

October 2018

- Basically a condensed version of RA3.5 (QII Protocols) with pictures and diagrams.
- RA3.5 takes precedence.
- Will be updated for 2019. No substantive changes, just more examples.
- Downloadable from CalCERTS website.

CalCERTS QII Handbook

- At very end of Handbook:
- Check Lists
  - Env-21
  - ENV-22
- “How to Read the Insulation Requirements on a CF1R-PRF-01”

CEC Contact

- **California Energy Commission Telephone Hotline:**

  General questions, technical assistance and interpretations of the Title 24 Efficiency Standards.

  800-772-3300 (Statewide)

  916-654-5106 (Sacramento Area)

  E-mail: title24@energy.state.ca.us

CalCERTS Contact

- **Contact Information:**

  CalCERTS, Inc.
  31 Natoma Street, Suite 120
  Folsom, CA 95630
  Ph: 916-985-3400 ext. *
  Fx: 916-985-3402

  www.calcerts.com

- **E-mail Support:**

  Support@Calcerts.com

Air Sealing

The importance of Air Sealing, How CA Code is requiring it, and how to Achieve it.

Rich Williams

Vice President, Western AeroBarrier

Jeff Adams

President, Western AeroBarrier

WESTERN AEROBARRIER™

Breakthrough Envelope Sealing Technology

R

I’m already insulating, why is air sealing so important?

“…if we boil your question down to its essence — ‘What’s more important, air sealing or R-value?’ — the answer is clear: Air sealing always comes first.”

Martin Holladay,

Senior Editor, Green Building Advisor

R

Why is Air Sealing Important?

- 20-40% of thermal losses in buildings are from air leakage. Achieving a tight envelope provides huge improvements to building thermal efficiency.
- We simply cannot achieve California's Net Zero Energy construction goals without addressing air tightness. The code is changing and you *WILL* have to air seal tight and have your work verified to pass.
- Air-sealing has a far greater efficiency and comfort impact than additional insulation improvements to the envelope (beyond what current code requires.)
- Tight homes are far more comfortable, require less heating and cooling, and are less prone to moisture issues in building assemblies (with proper ventilation.)
- Tight homes, ventilated correctly, have better Indoor Air Quality.
- The new code as of Jan.1 2020 provides an efficiency credit in T24 Modeling for air sealing, and it will require HERS Rater verification with Blower Door Testing. You will start seeing projects that take this credit in your T24's.

R

Building Science

A building envelope has 4 Control Layers:

1. Bulk Moisture Control
2. Air Flow Control
3. Thermal Flow Control
4. Moisture Vapor Control

Risk Management

COMPLETE THERMAL ENCLOSURE SYSTEM *(Next Slide)*

Complete Thermal Enclosure System

From Previous Slide

1. Air Sealing
2. Reduced Thermal Bridging
3. Advanced Insulation
4. Advanced Windows

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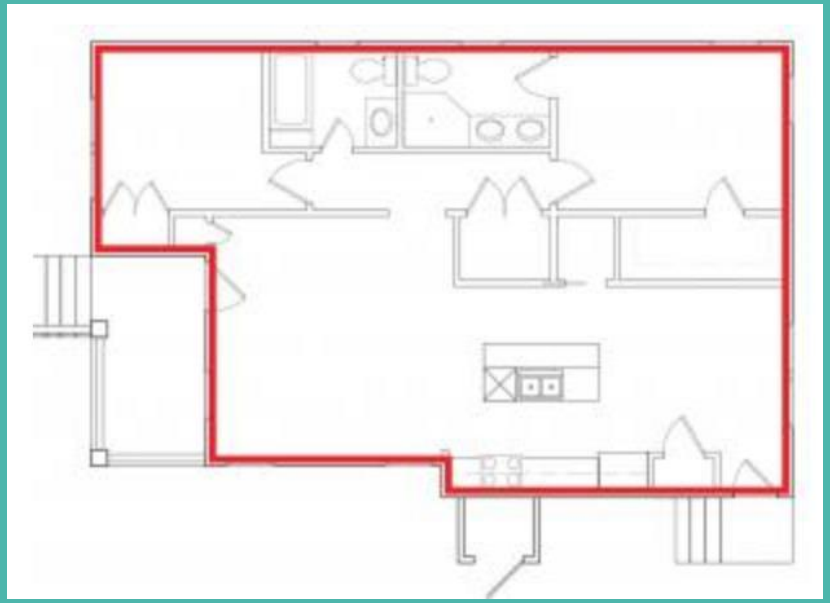
Continuous Air Barrier

Ensure that a continuous air barrier exists at the entire building envelope



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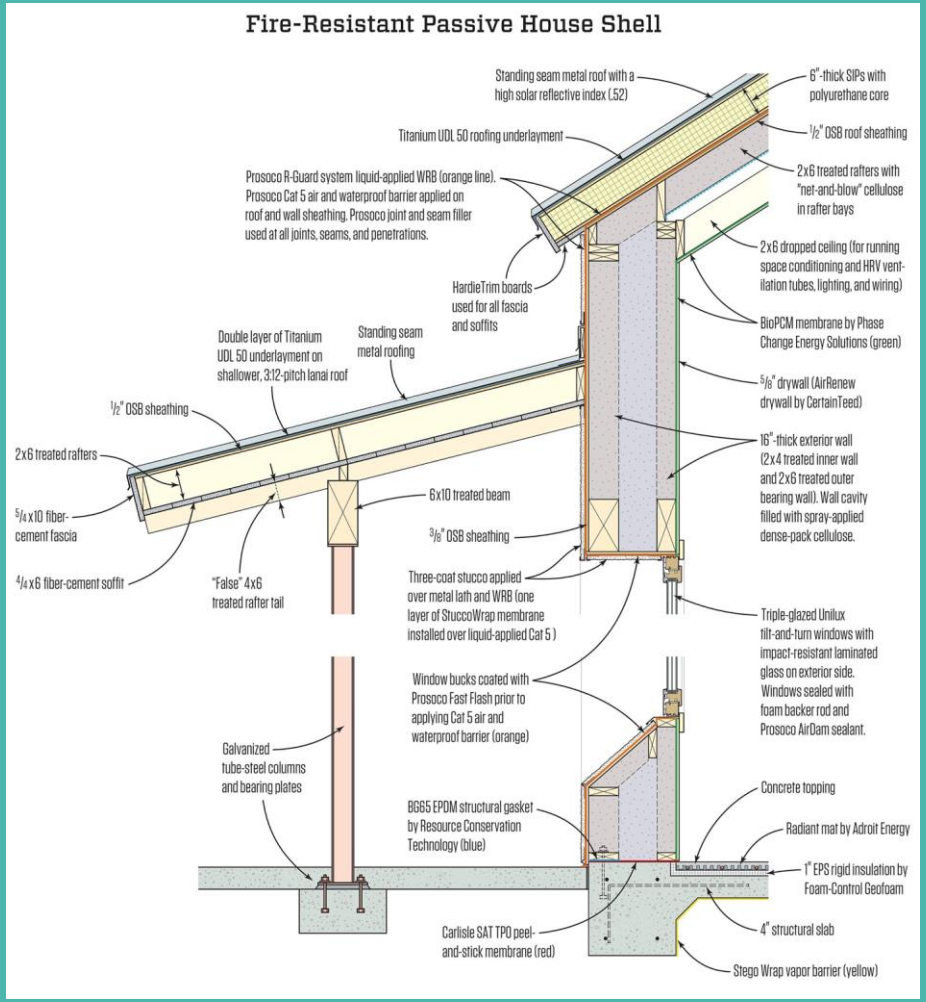

Fire-Resistant Passive House Shell
Standing seam metal roof with a high solar reflective index (.52)
6"-thick SIPs with polyurethane core
Titanium UDL 50 roofing underlayment
½" OSB roof sheathing
Prosoco R-Guard system liquid-applied WRB (orange line). Prosoco Cat 5 air and waterproof barrier applied on roof and wall sheathing. Prosoco joint and seam filler used at all joints, seams, and penetrations.
2x6 treated rafters with "net-and-blow" cellulose in rafter bays
2x6 dropped ceiling (for running space conditioning and HRV ventilation tubes, lighting, and wiring)
HardieTrim boards used for all fascia and soffits
BioPCM membrane by Phase Change Energy Solutions (green)
Double layer of Titanium UDL 50 underlayment on shallower, 3:12-pitch lanai roof
Standing seam metal roofing
5/8" drywall (AirRenew drywall by CertainTeed)
½" OSB sheathing
2x6 treated rafters
16"-thick exterior wall (2x4 treated inner wall and 2x6 treated outer bearing wall). Wall cavity filled with spray-applied dense-pack cellulose.
6x10 treated beam
5/4 x 10 fiber-cement fascia
3/8" OSB sheathing
Three-coat stucco applied over metal lath and WRB (one layer of StuccoWrap membrane installed over liquid-applied Cat 5)
4/4 x 6 fiber-cement soffit
"False" 4x6 treated rafter tail
Triple-glazed Unilux tilt-and-turn windows with impact-resistant laminated glass on exterior side. Windows sealed with foam backer rod and Prosoco AirDam sealant.
Window bucks coated with Prosoco Fast Flash prior to applying Cat 5 air and waterproof barrier (orange)
Galvanized tube-steel columns and bearing plates
Concrete topping
BG65 EPDM structural gasket by Resource Conservation Technology (blue)
Radiant mat by Adroit Energy
1" EPS rigid insulation by Foam-Control Geofoam
4" structural slab
Carlisle SAT TPO peel-and-stick membrane (red)
Stego Wrap vapor barrier (yellow)

J

THE BIG LIE: “Homes Need to Breathe”

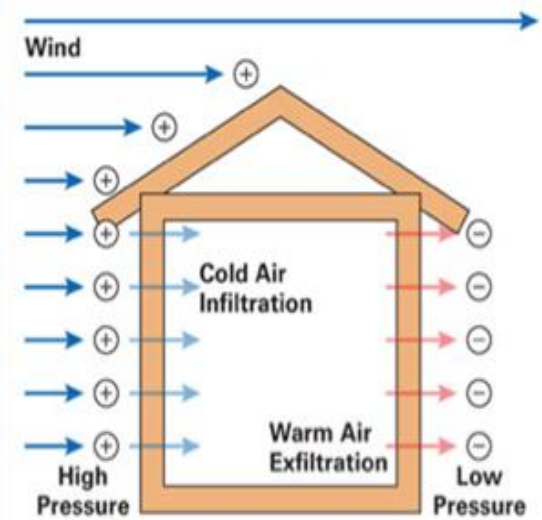
THE TRUTH:

Buildings don’t need to breathe, PEOPLE need to breathe.

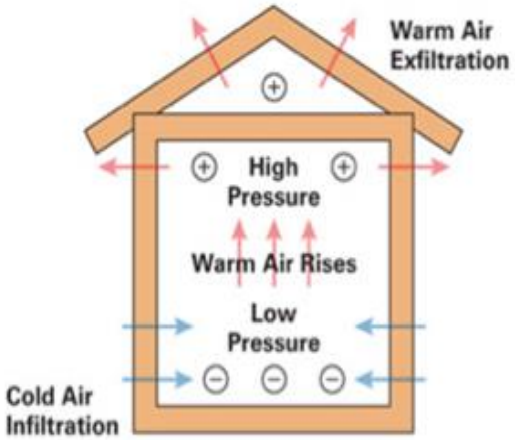
- Buildings need moisture kept out of their building assemblies, and if the assemblies do get wet then the assemblies need to be able to dry. So, “Homes need to dry, not to breathe.”
- Bulk Moisture Control, Vapor Control, and Air Flow Control all keep moisture out of building assemblies.

Homes that “breathe” (leak) are homes that get moisture in their assemblies. Moisture in assemblies creates indoor air quality problems. And then people can’t breathe.

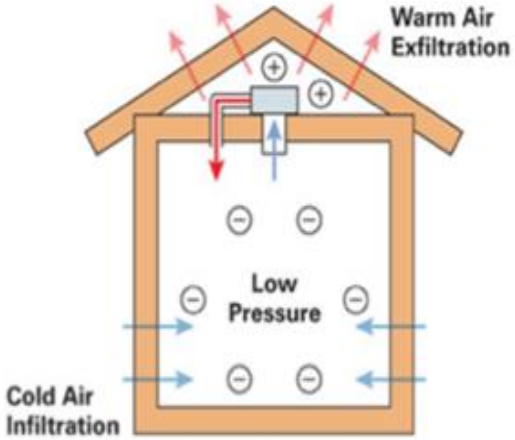
Three Main Driving Forces of Airflow & Heat Loss



Wind-Induced Airflow:
Wind blows on the outside of the home and pushes air through holes (infiltration). An equal amount of air will be pushed out of the holes in other places in the home (exfiltration).



The Stack Effect:
Rising warm air causes pressure differences throughout the building envelope making warm air exfiltrate through ceiling and attic, while cool air infiltrates through crawl spaces and basements.



Mechanical Systems:
Heating and ventilation systems create positive and negative pressures within the building envelope. In this example, the heating/cooling mechanical system is leaking warm air into the attic.

Air Leakage Usual Suspects

Cracks:
- Sill Plates
- Windows & Doors
- Drywall at Top Plate
- Access Panels
- Sheathing Joints
- Foundation/Framing

Penetrations:
- Plumbing
- Wiring
- Recessed Lights
- Vents
- HVAC Duct Boots

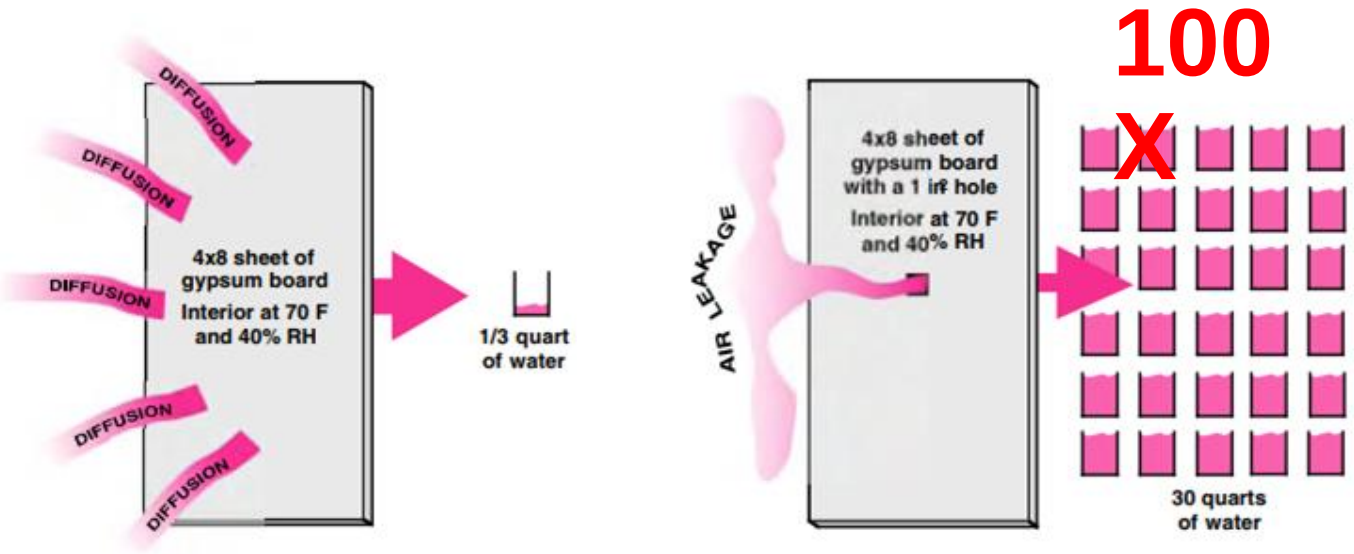
Odd Geometry:
- Cantilevers
- Knee-walls

Critical Question:
Who Owns the Holes?

J

Air Sealing is a Big Deal for Moisture Control

Example: In most cold climates over an entire heating season, 1/3 quart of water can be collected by vapor diffusion, 30 quarts of water can be collected by air leakage.



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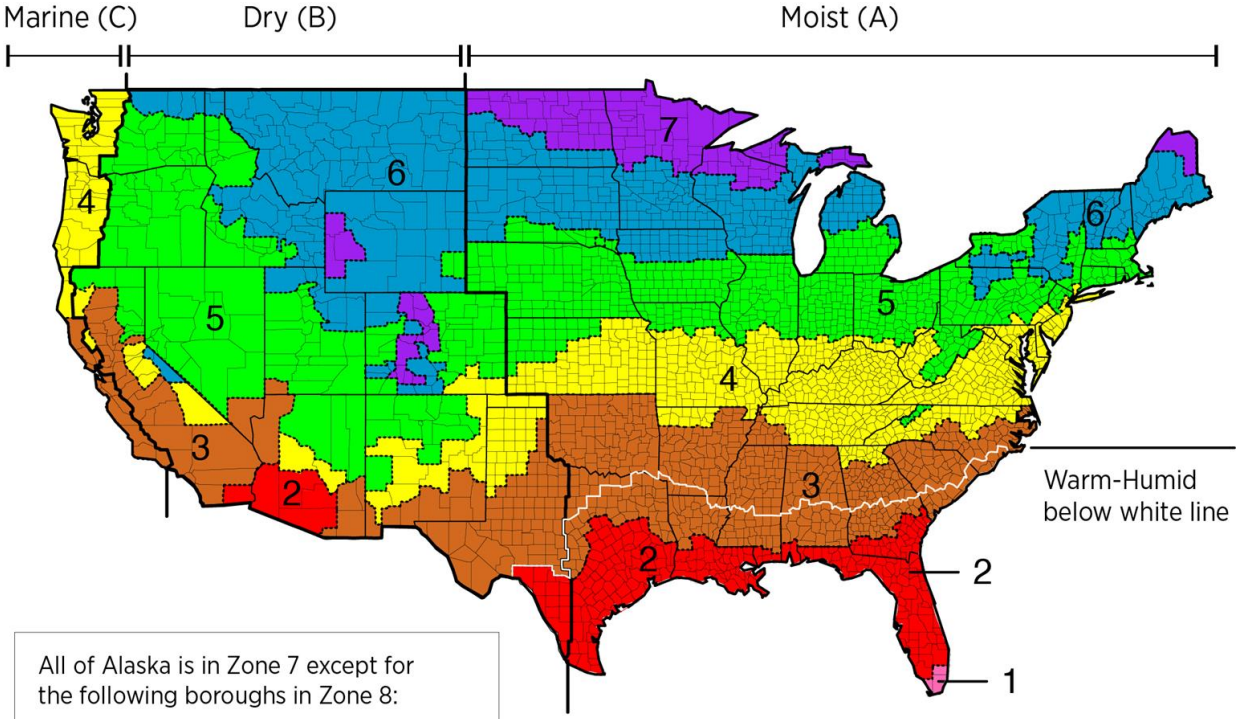
Source: Thermal and Air Leakage Control Building Science Corporation

What's in the code for Air Sealing?

- California has adopted 2018 IECC (International Energy Conservation Code) that has an air tightness mandate, but that part of the IECC code has not been adopted in the state's current Energy Code. I know, right?
- The writing is on the wall: California will eventually have a mandate for achieving air-tightness. Even Texas and Nevada have had such state-wide mandates (for several years now.)
- However, even though there is no California code-mandate right now, as of this year there have been changes to both Single Family Residential and Low-Rise Multifamily for air-sealing that you need to be aware of.

IECC Climate Zone Map



All of Alaska is in Zone 7 except for the following boroughs in Zone 8:

Bethel, Northwest Arctic, Dellingham, Southeast Fairbanks, Fairbanks N. Star, Wade Hampton, Nome, Yukon-Koyukuk, North Slope

Zone 1 includes Hawaii, Guam, Puerto Rico, and the Virgin Islands

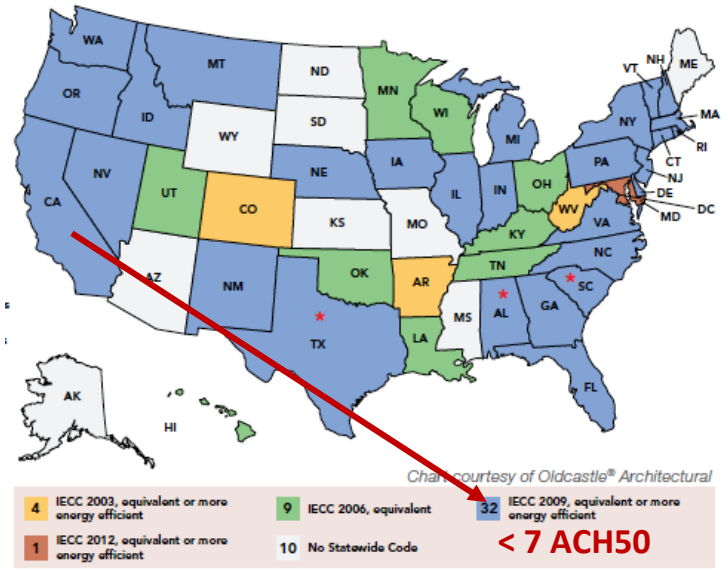
R

IECC Codes Continue to Change

(International Energy Conservation Code)

More stringent codes are forcing builders to change the way they build their homes and find ways to effectively and consistently meet the tighter code requirements

2012 IECC Code required a Blower Door Test to prove compliance. CA is now under 2018 IECC.



	ACH50 Requirements/Targets			
Climate Zones	Zero Energy Ready	ENERGY STAR V3	2012 IECC	Passive House
1-2	3.0	6.0	5. 0	0.6
3-4	2.5	5.0	3.0	0.6
5-7	2.0	4.0	3.0	0.6
8	1.5	3.0	3.0	0.6

San Diego

R

Requires BOTH:

2018 IECC

✓ Whole-house pressure test

Air Leakage Rate	Climate Zone	Test Pressure
≤ 5 ACH	1-2	50 Pascals
≤ 3 ACH	3-8	50 Pascals

- Testing may occur any time after creation of all building envelope penetrations

✓ Field verification of items listed in Table R402.5.1.1

R

CALIFORNIA CODE CHANGES as of Jan.1 2020

LOW-RISE MULTIFAMILY: Requires either a “balanced ventilation system” (for example, and ERV or HRV) in each dwelling unit **or** continuous supply or exhaust ventilation shall be allowed if dwelling units are verified to meet an air tightness target (0.3 cfm per sq.ft of dwelling unit envelope surface at 50 pascals.)

SINGLE FAMILY: Because QII has now become part of the prescriptive pathway, Energy Engineers will be looking to the new options in the modeling to achieve compliance. There isn’t much for them to reach for in their bag of tricks, however HRV/ERV ventilation and air tightness credits can give them roughly the same credit bump they used to get from the QII credit.

LOOK AT YOUR TITLE-24’S TO SEE IF ENGINEERS HAVE INCLUDED AIR-TIGHTNESS REQUIREMENTS !

R

HOW TO AIR SEAL?

There are plenty of ways to approach air sealing , but what is best?

- Specialty Air-Sealing Sheathing Systems
- Specialty Sealing Tapes
- Adhesive Air-Sealing Home Wraps
- Liquid Applied Membranes
- Open and Closed Cell Foam Insulation
- Airborn Sealant

Manually Air-Sealing the envelope isn’t easy

The process can be a time-consuming, labor-intensive, multi-step process depending approaches employed.






Cheap & easy start: Sill sealing at plates

Inexpensive to implement.

Reduces air infiltration at plates.

Reduces pest intrusion at plates.

Eliminates wood to concrete connections, thus reduces moisture transport from foundation into framing (mold, termites, and dry rot love moist wood.)

ZIP SHEATHING

DRAWBACKS:

- Expensive.
- Labor intensive.
- Difficult to install correctly, incorrect installation allows leakage.
- Not readily available on west coast (special order.)

Adhesive Home Wraps (i.e. Henry Blueskin)

DRAWBACKS:

- Far more expensive than Tyvek Home Wraps.
- Not a continuous air barrier (walls only.)
- Requires experienced contractors to install.

Liquid-applied membranes (i.e. Prosoco R-Guard)

Excellent system that includes specific solutions for sealing around doors & windows. Works very well when installed correctly.

DRAWBACKS:

- Difficult if not impossible to apply at roof/eave areas.
- Expensive.
- Labor intensive.
- Requires a lot of time to apply.
- Requires specialty contractors to apply.

J

Closed-cell foam insulation

Not as costly as liquid applied membrane systems and easier to install. Does decent job of air sealing.

DRAWBACKS:

- Expensive.
- Proven not 100% effective, no guarantee of any required sealing.
- Concerns with long-term health risks with air quality.

Open-cell foam insulation

Not as costly as closed cell foam and is more easy to remove if needed (for additional construction work.) Does decent job of air sealing.

DRAWBACKS:

- Typically full-fill of cavities as opposed to closed-cell foam.
- Proven not 100% effective, no guarantee of any required sealing.
- Concerns with long-term health risks with air quality.

Airborne Sealant

AERO**BARRIER**™
Breakthrough Envelope Sealing Technology

AeroBarrier is a convenient, cost effective approach that seals homes in less than 3 hours and provides verification that the air-tightness requirement has been achieved.

Changing the Way Homes are Built with:

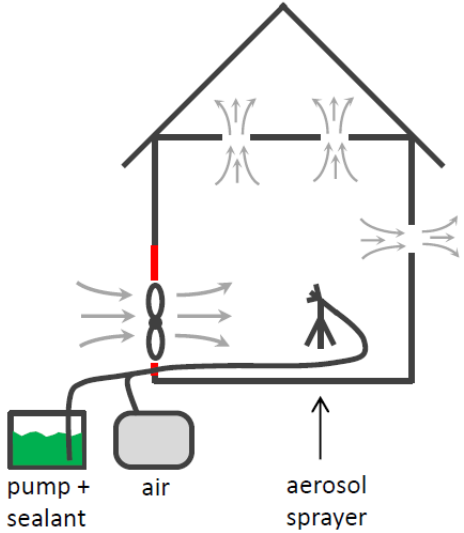
- Consistently tighter building envelopes
- Verified and documented results
- A single process
- Time saving

R

AeroBarrier Process

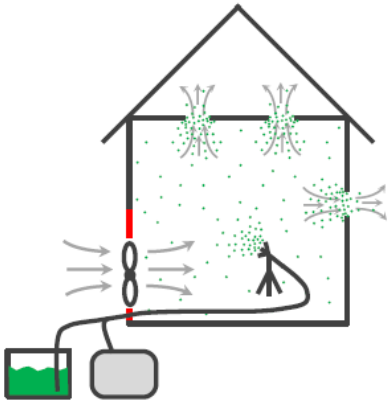
STEP 1:

Prepare house for sealing. Cover all large openings (drains, bathroom vents, etc.) and horizonal surfaces, set up sealing equipment, and pressurize home.



STEP 2:

Start the sealing process and begin to aerosolize the sealant. Air currents will transport & deposit sealant particles along the leaks throughout the space.



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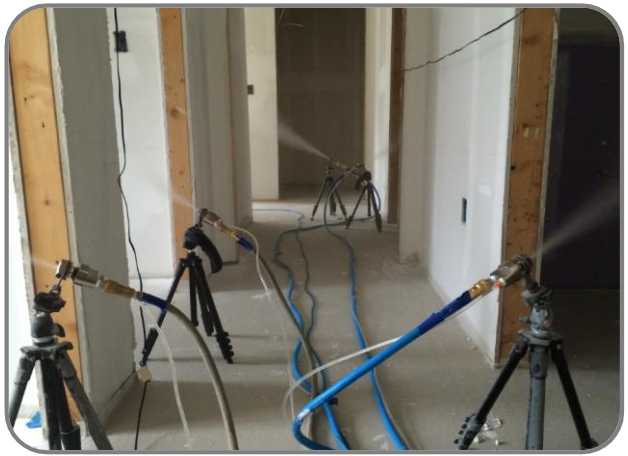

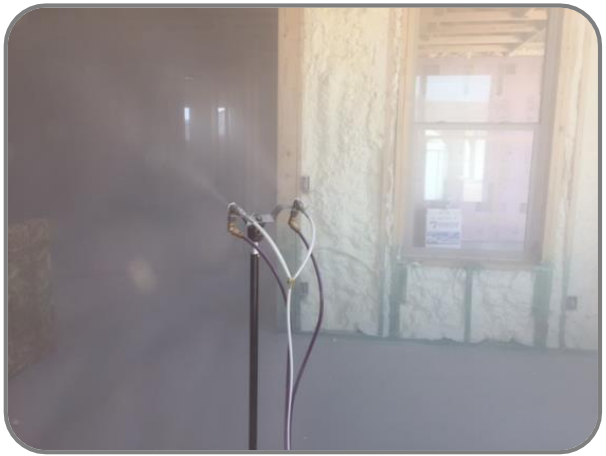

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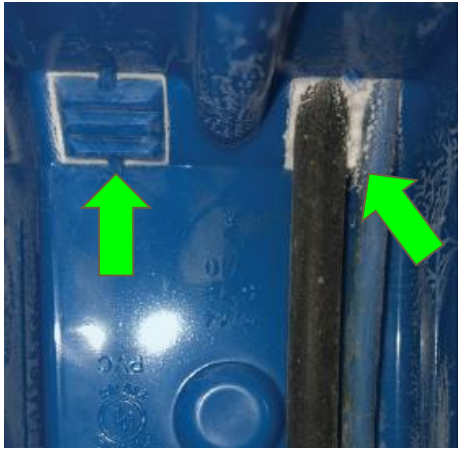
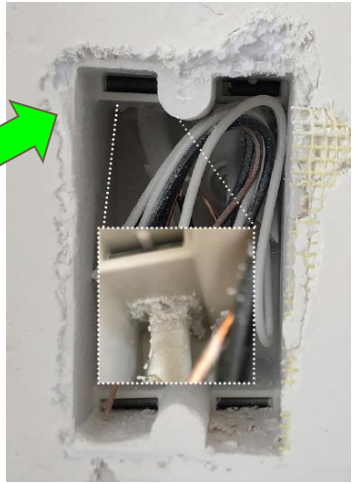
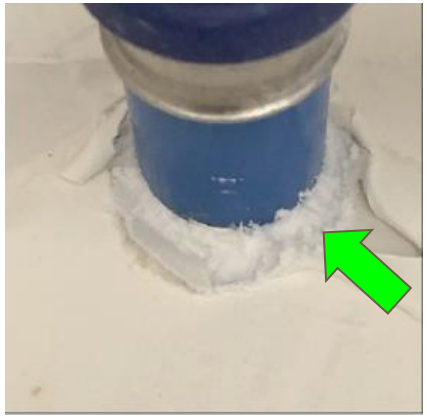
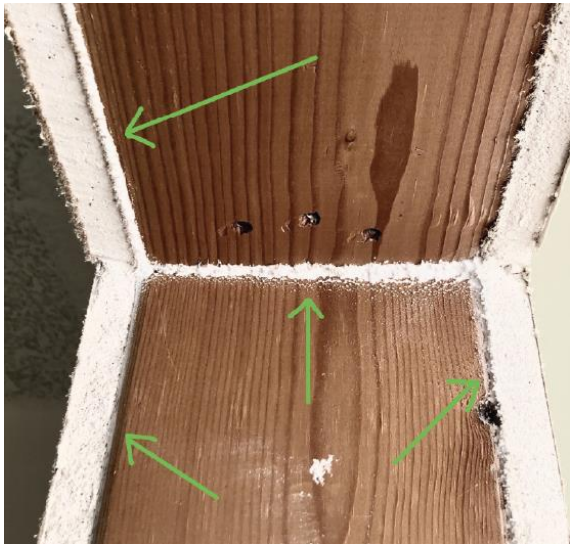
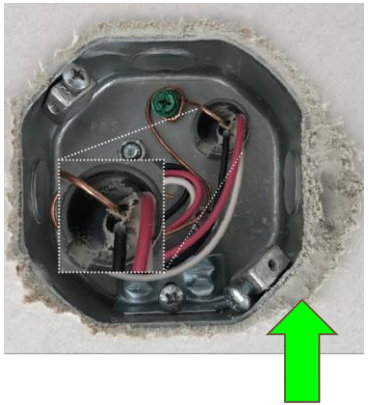
AeroBarrier Sealing Examples











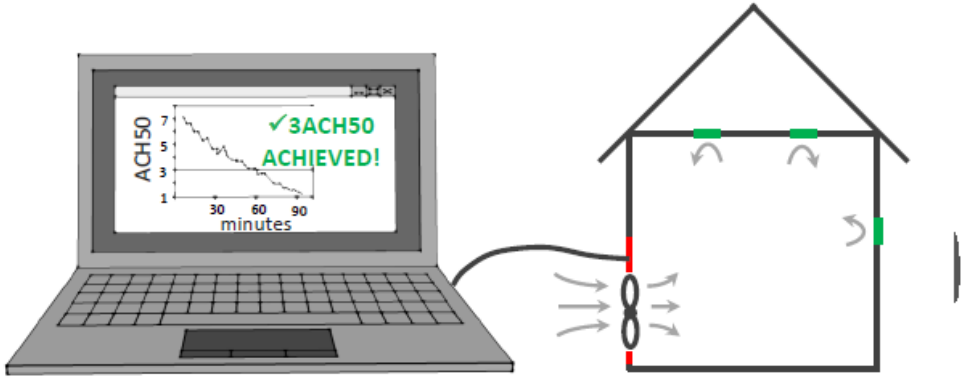
R

AeroBarrier Process cont’d

STEP 3:

The software regulates the entire process; controlling all parameters, monitoring the sealing, recording all data, and verifying air-tightness target is achieved.

Verified Results: Every seal provides a certificate of completion outlining the sealing work. Pre and post-leakage are captured and the seal duration and leakage reduction are all displayed on the graph



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AeroBarrier Process

AEROBARRIER™
Breakthrough Envelope Sealing Technology

VERIFIED RESULTS!

No guessing whether you succeeded or not in air sealing efforts.

R

Example of Results from Solana Beach Project

Overall Sealing Results

When we arrived,

YOUR HOME HAD:

4308.1 CFM of Leakage, equivalent to a

518.7 Square Inch Hole or **11.01 Air Changes per Hour**

*(for your **2766** square-foot structure enclosing a volume of **23475** cubic feet).*

After we finished,

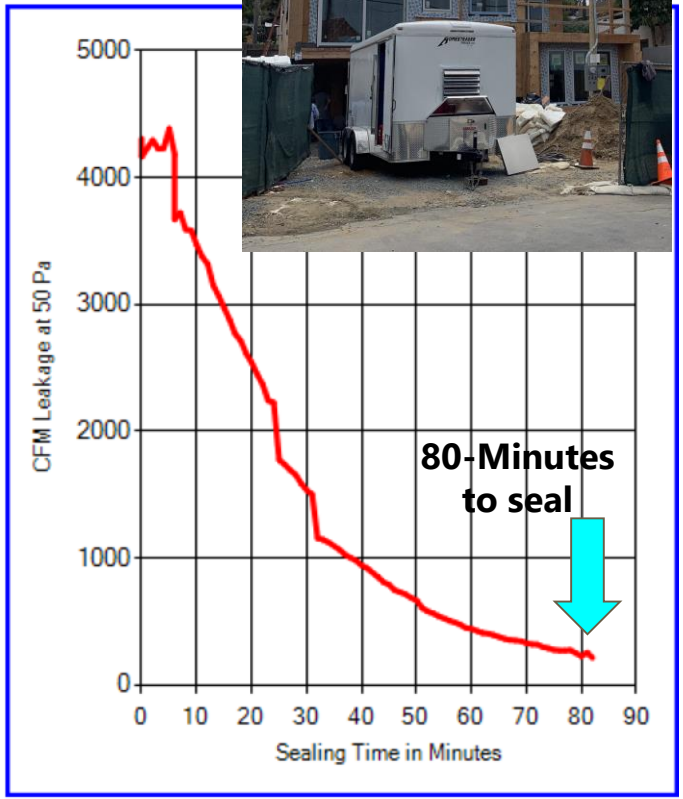
YOUR HOME HAS:

212.7 CFM of Leakage, equivalent to a

25.6 Square Inch Hole or **0.54 Air Changes per Hour**

This corresponds to a **95.1% Reduction** in Envelope Leakage.

Note: Envelope leakage and air-change results are calculated at a standard pressure of 50 Pa.



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Thank you!

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Rich@WesternAeroBarrier.com

Jeff Adams
Jeff@WesternAeroBarrier.com

WESTERN AEROBARRIER
BREAKTHROUGH ENVELOPE SEALING TECHNOLOGY

Questions?

Quality Insulation Installation (QII)

Danny O'Connell

Next Level Insulation

Bad bays

Bad bays

Old batts / air infiltration

Bad batts

Bad batts

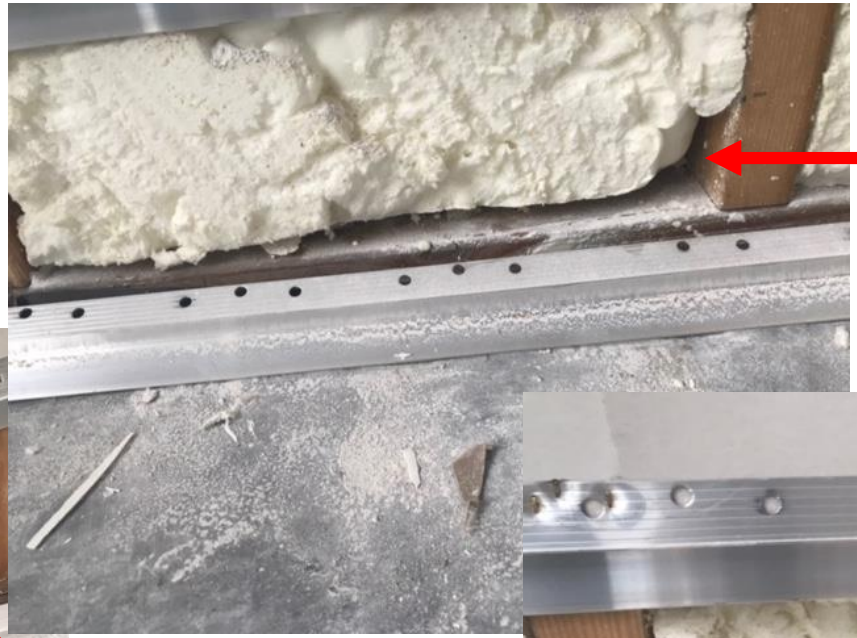
Bad batts

Good batts

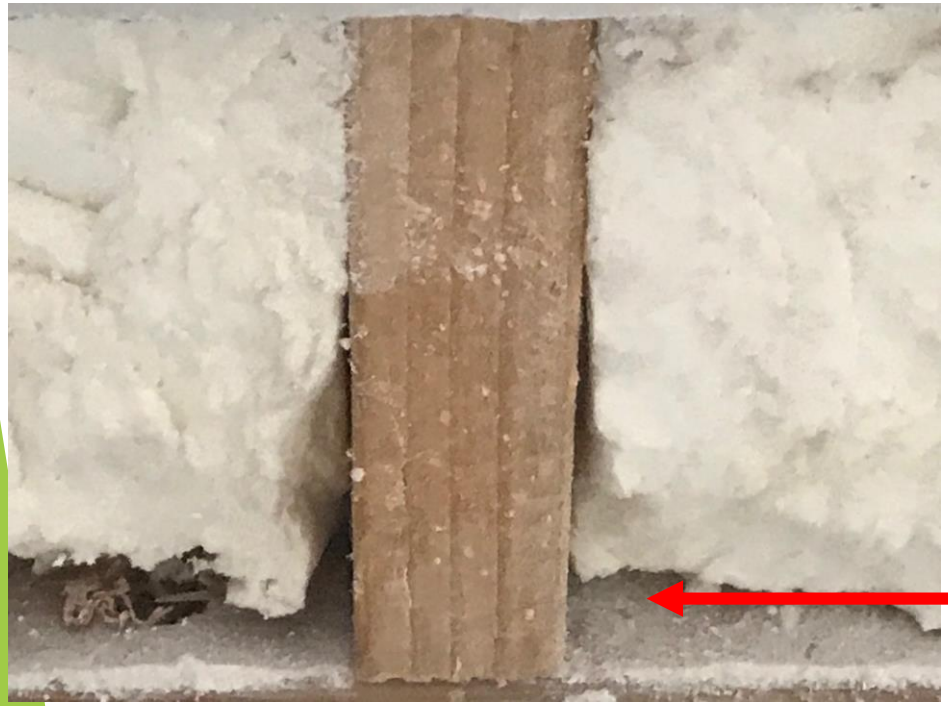
Good batts

Good batts

Bad open cell foam



Bad open cell foam



Good open cell foam

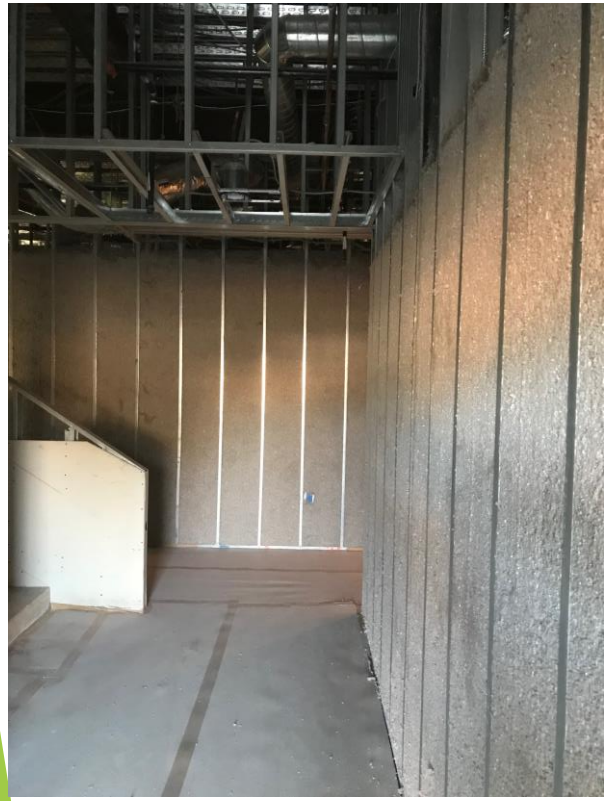
Closed cell foam

Wool

Wool

Spray applied cellulose

Spray applied cellulose



Spray applied cellulose

Thank you!

- Danny O’Connell
- Next Level Insulation
- dannyoinsulate@gmail.com

Questions?