Ice Dams

Causes and Solutions

Funding

Funding for this class was provided by the Alaska Housing Finance Corporation (AHFC).

This course is designed to empower homeowners with the knowledge to live in and maintain a safe, energy efficient home.

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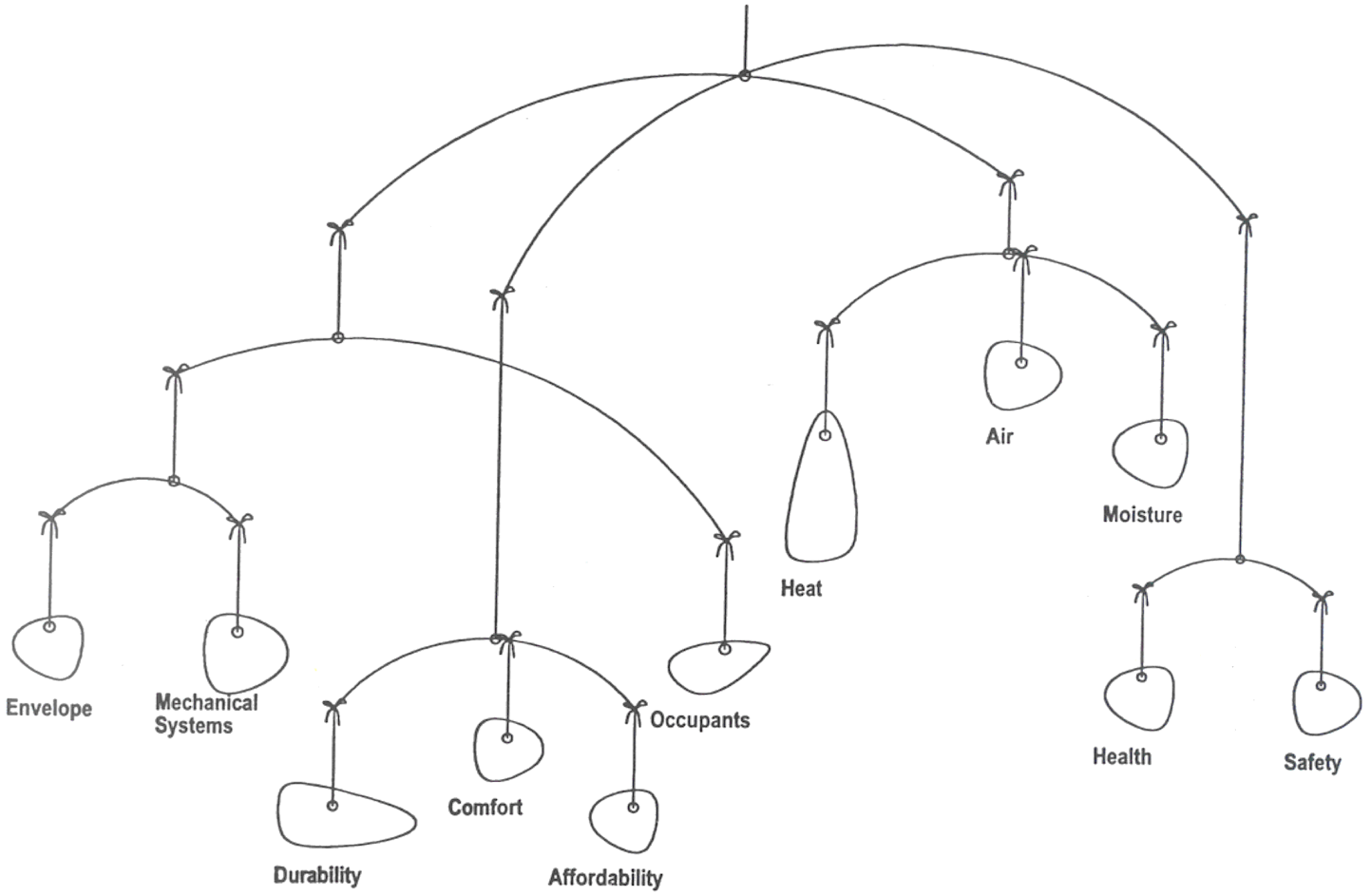
Topics for today:

- AHFC programs
- Ice Dams & Air leakage
- Air sealing tools
- Attic air sealing priorities
- Attic insulation

AHFC Energy Efficiency Programs:

- Home Energy Rebate Program
- Weatherization Assistance Program
- New Home Rebate
- Second Mortgage for Energy Conservation
- Energy Efficiency Rate Reduction Mortgage
- www.ahfc.us

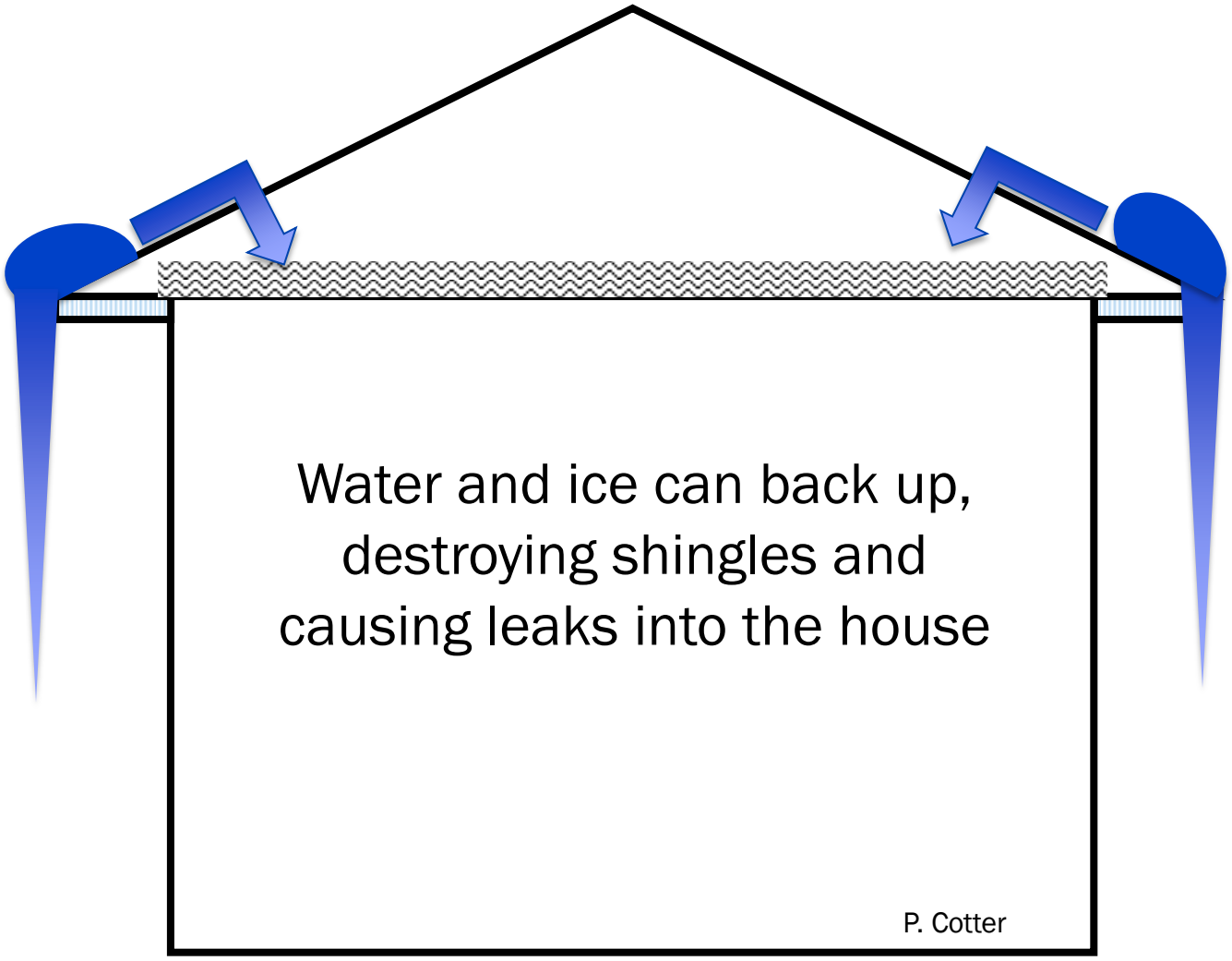
The house is a system



What's the problem?

Ice dams can cause

- Damage to
  - roof
  - Walls
  - Interior furnishings
- Water damage
- Health issues due to water damage
- Ice spears


Water and ice can back up, destroying shingles and causing leaks into the house
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Water damage and mold

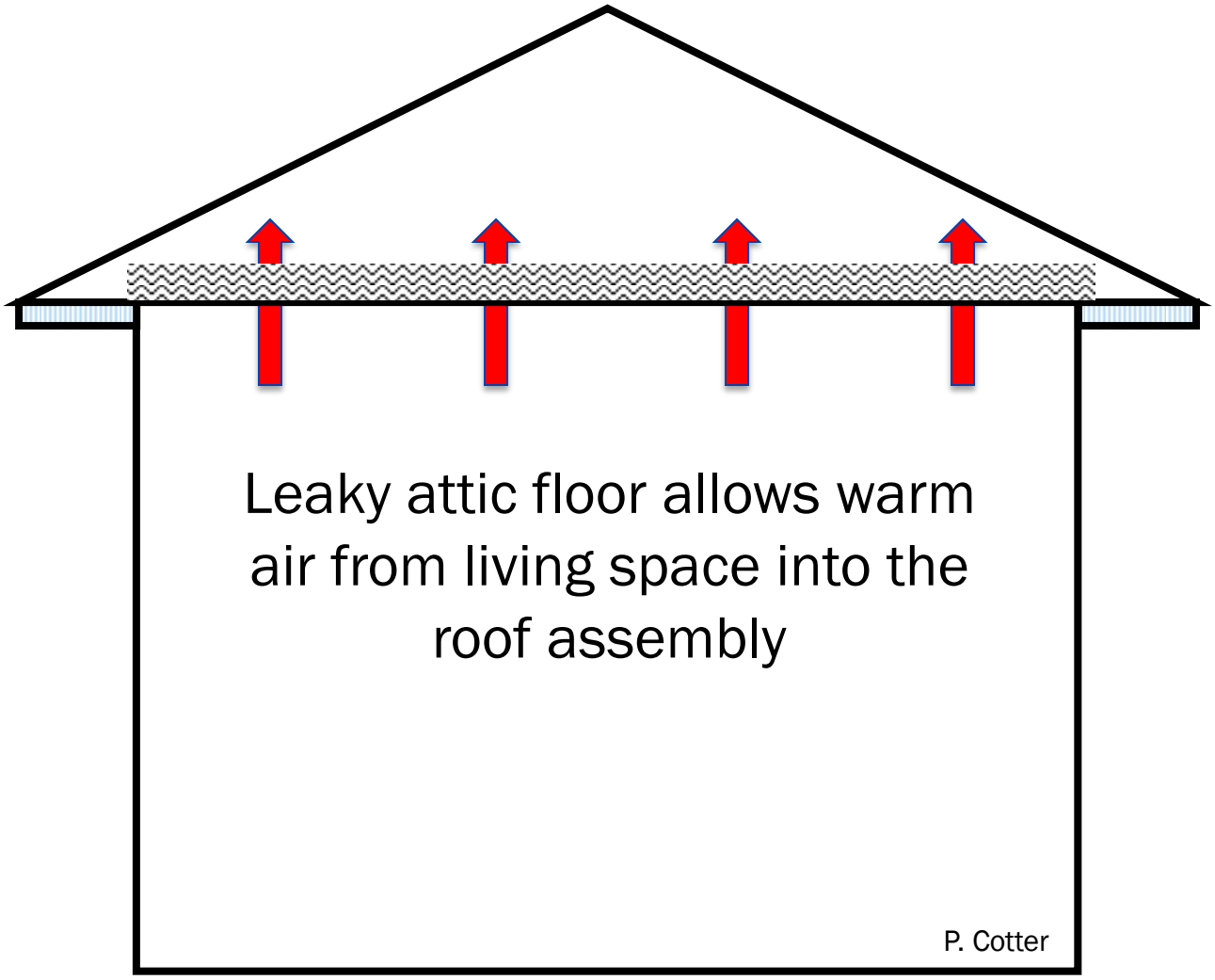
P. Kaluza

What causes ice dams?

1) Air leakage into roof/attic assemblies

2) Poorly insulated attic floors

Air leakage and ice dams


Leaky attic floor allows warm air from living space into the roof assembly
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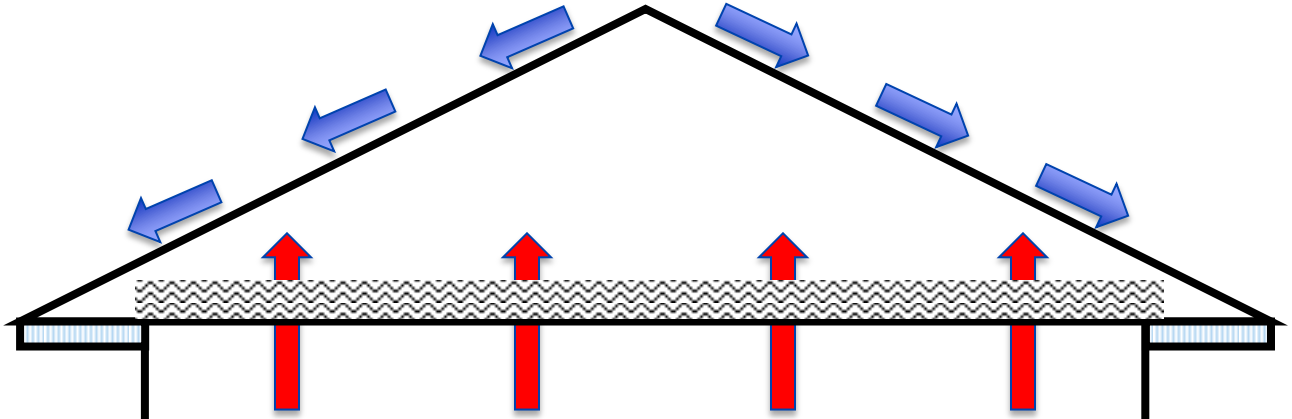

Roof warms and melts snow on roof; water flows down roof

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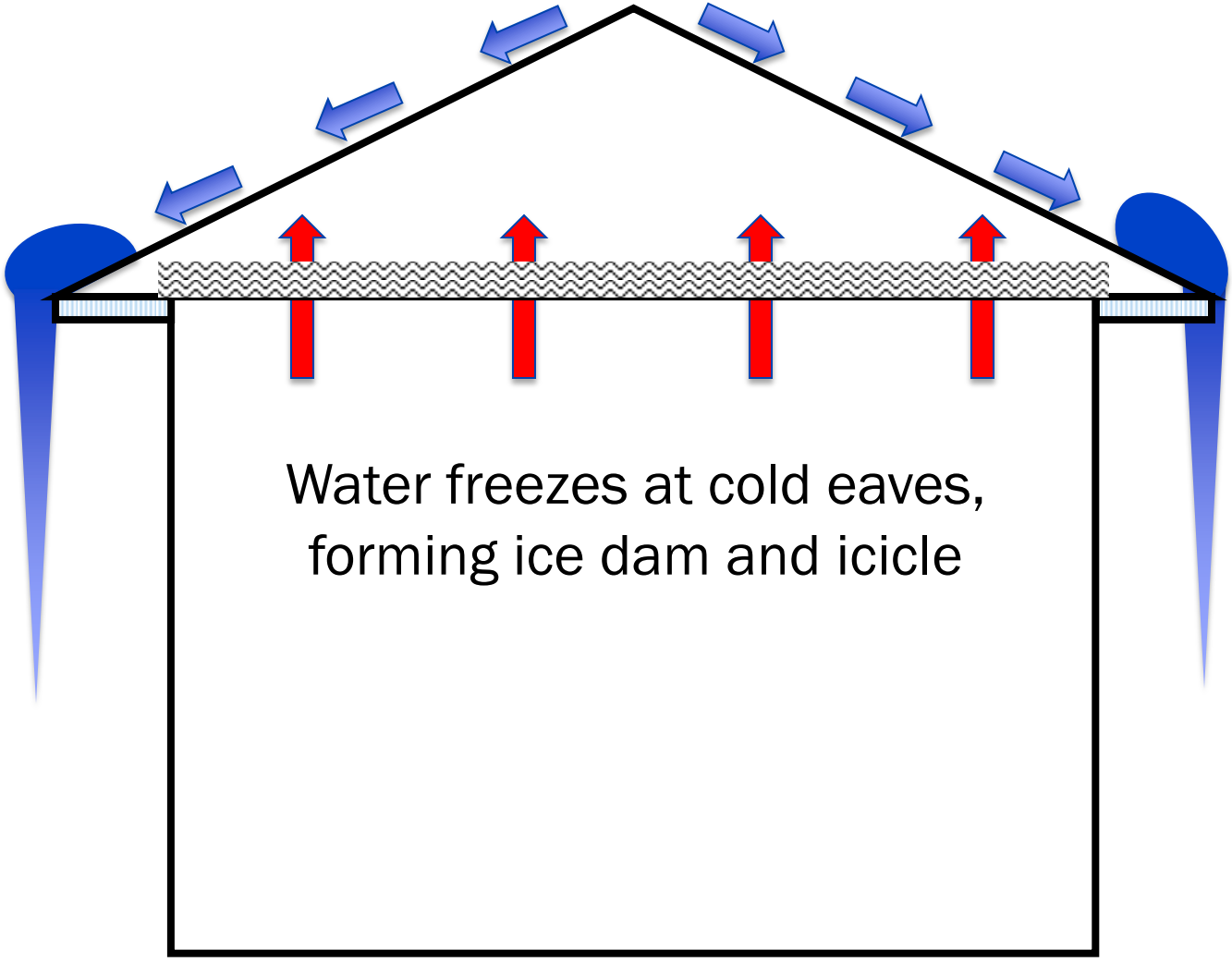
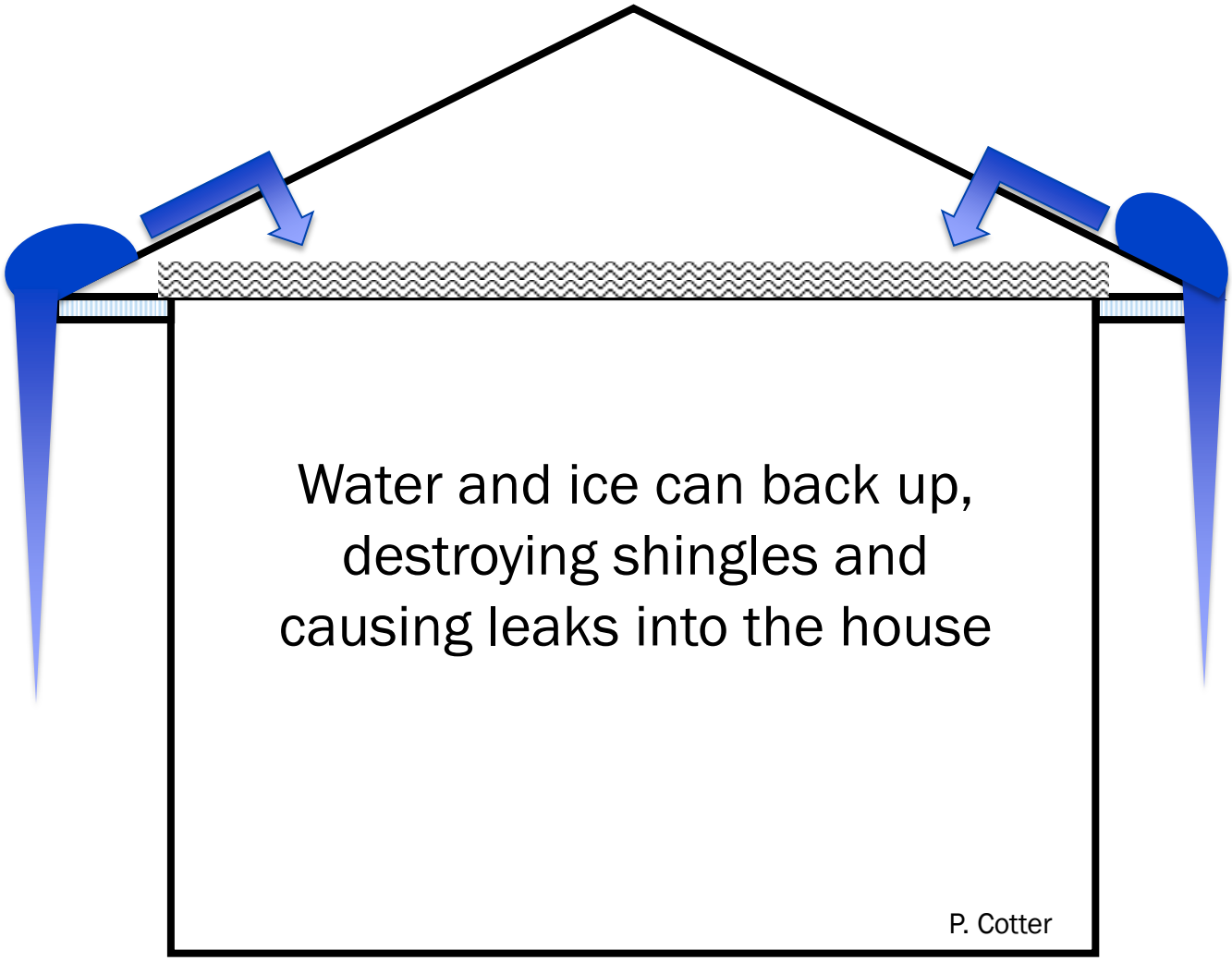

Water freezes at cold eaves,
forming ice dam and icicle


Water and ice can back up, destroying shingles and causing leaks into the house
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Air leakage and air sealing

Where buildings leak

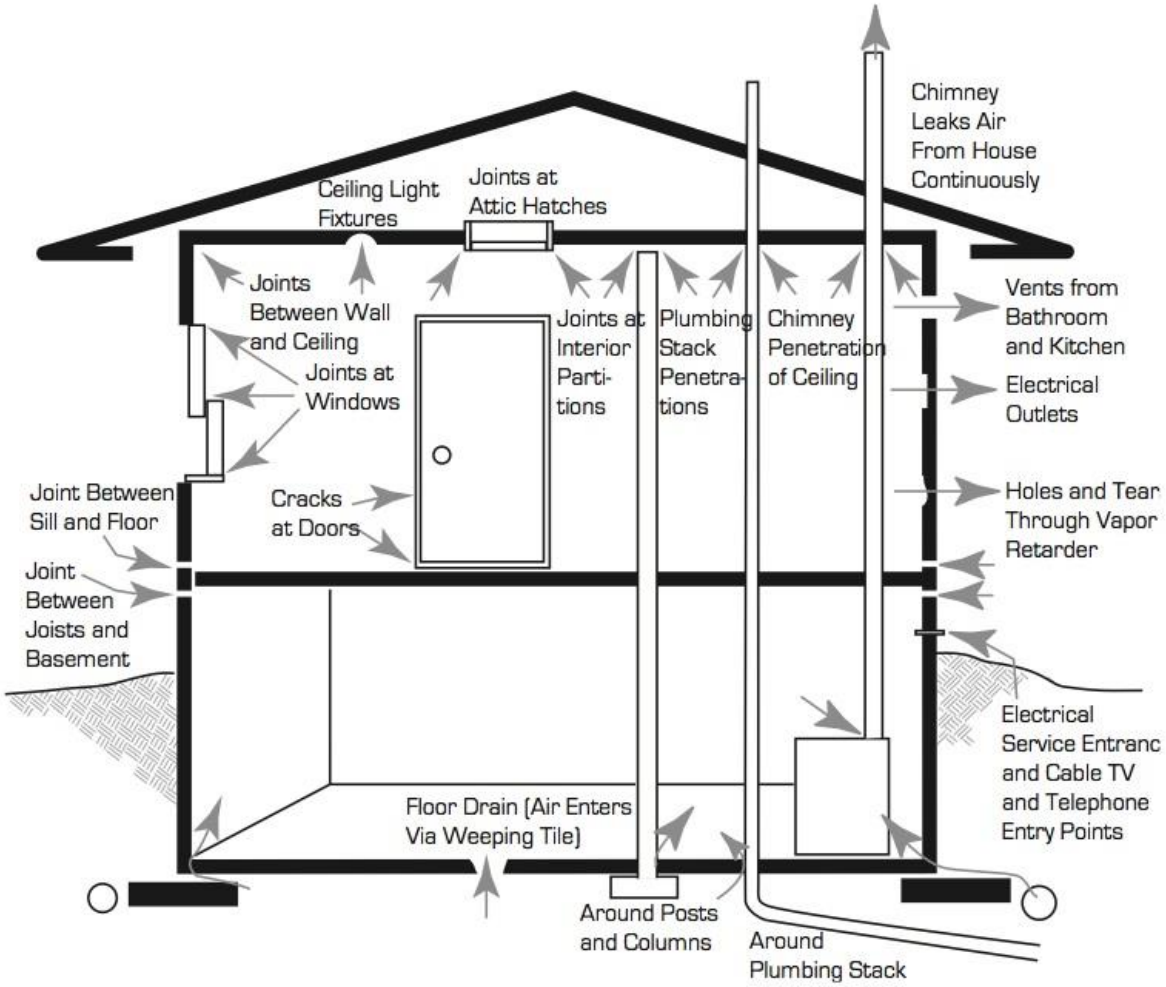


Figure 2.8: Air leakage points in a house.

Well-planned air sealing usually reduces ice damming

but it is not always easy

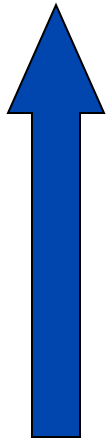
Fundamental rules of air leakage

- Air DOES leak through holes and cracks
- Air DOES NOT leak through solid objects
- Direction of air leakage depends on direction of pressure gradient

Building Air….

Leaves High

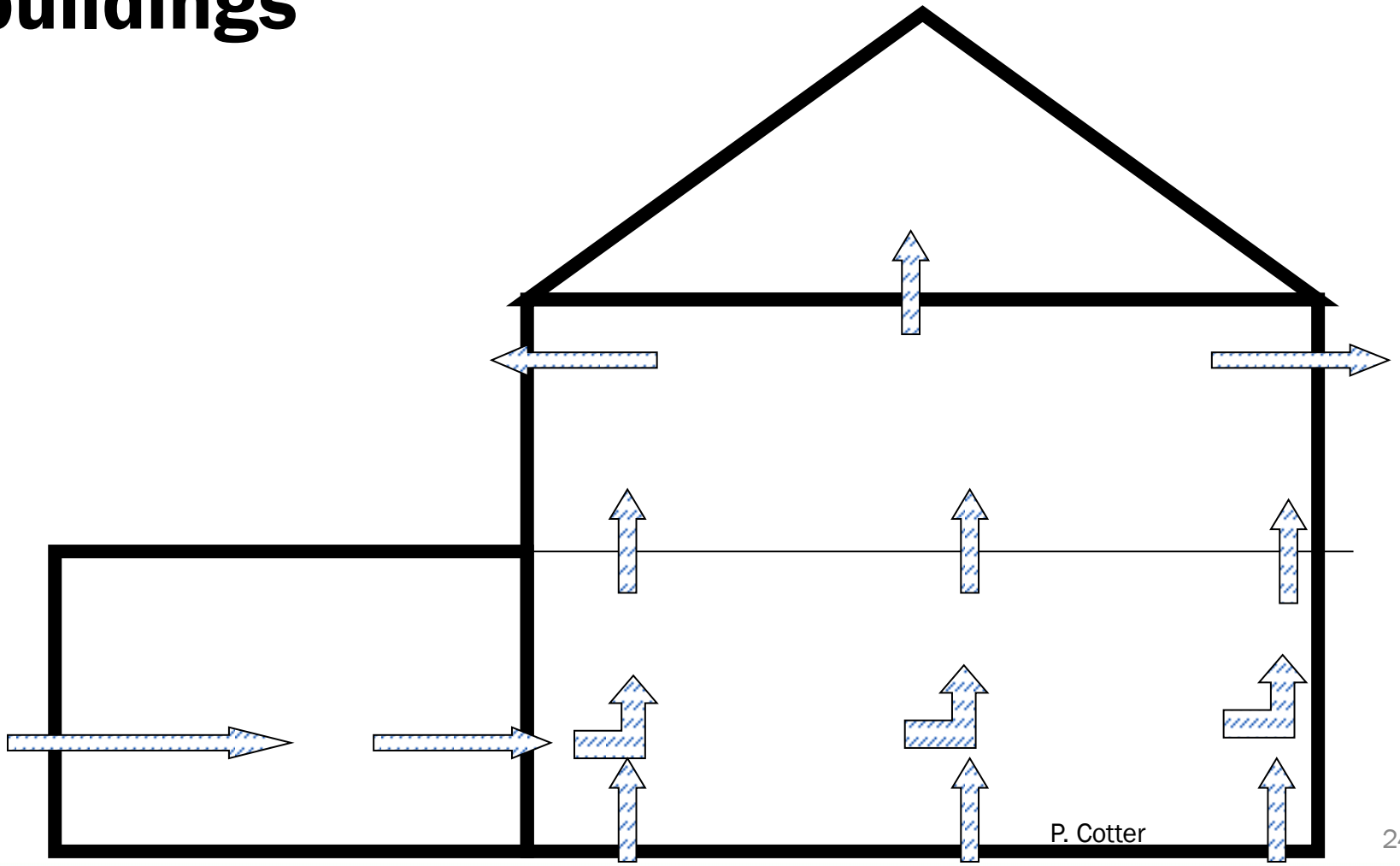
THE STACK EFFECT



Enters Low

When air warms, it becomes less dense (more buoyant) and it rises

General airflow pattern in cold climate buildings



Unintended air flow results in

- Heat loss
- Increased likelihood of moisture problems
- Increased likelihood of ice dam formation

Sealing air leaks* can reduce

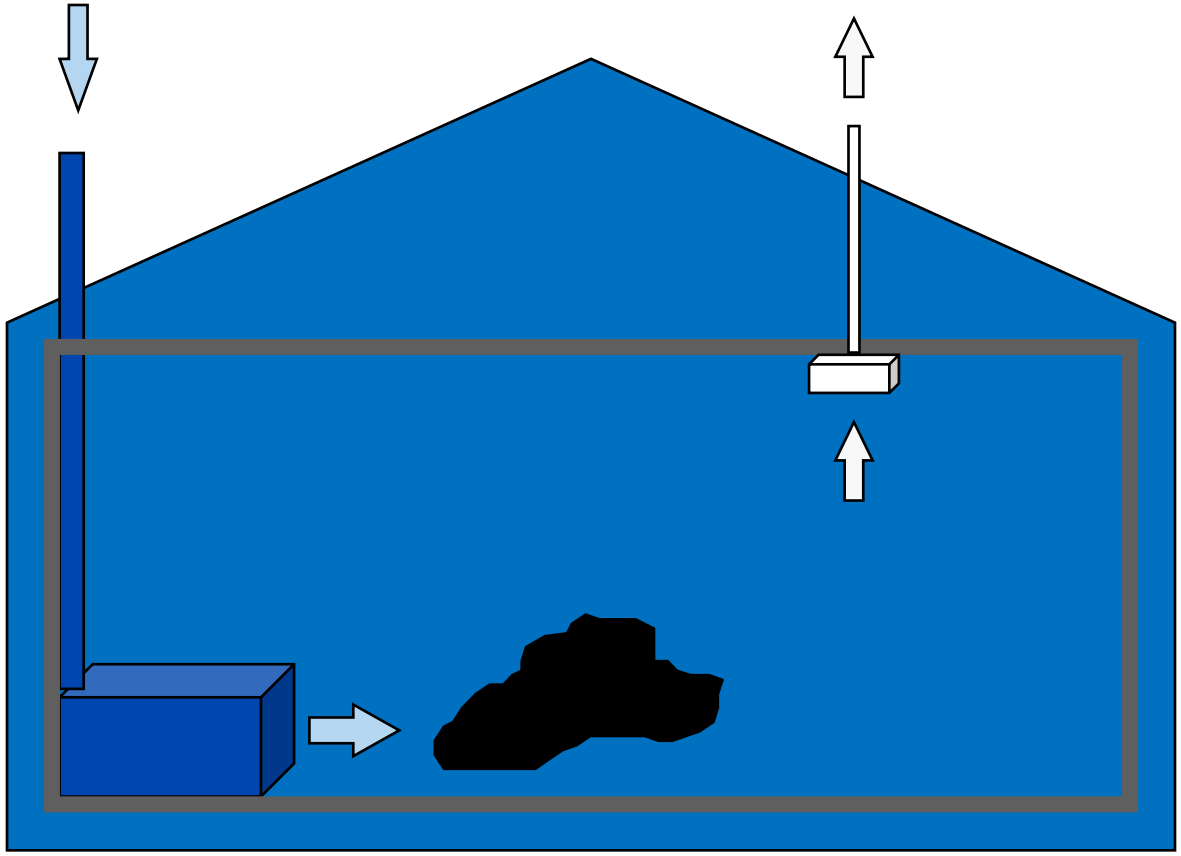
- heat loss
- likelihood of moisture problems
- Likelihood of ice dam formation

*Care must be taken – excessive air sealing without proper precautions may be extremely dangerous

Benefits of attic air sealing

- Decrease warm outgoing air up high
  = Decreased cold incoming air down low
- Decreases need for attic ventilation
- Decreases risk of ice dam formation
- Increases comfort
- Prevent moisture problems
- Minimize chance of dangerous depressurization issues

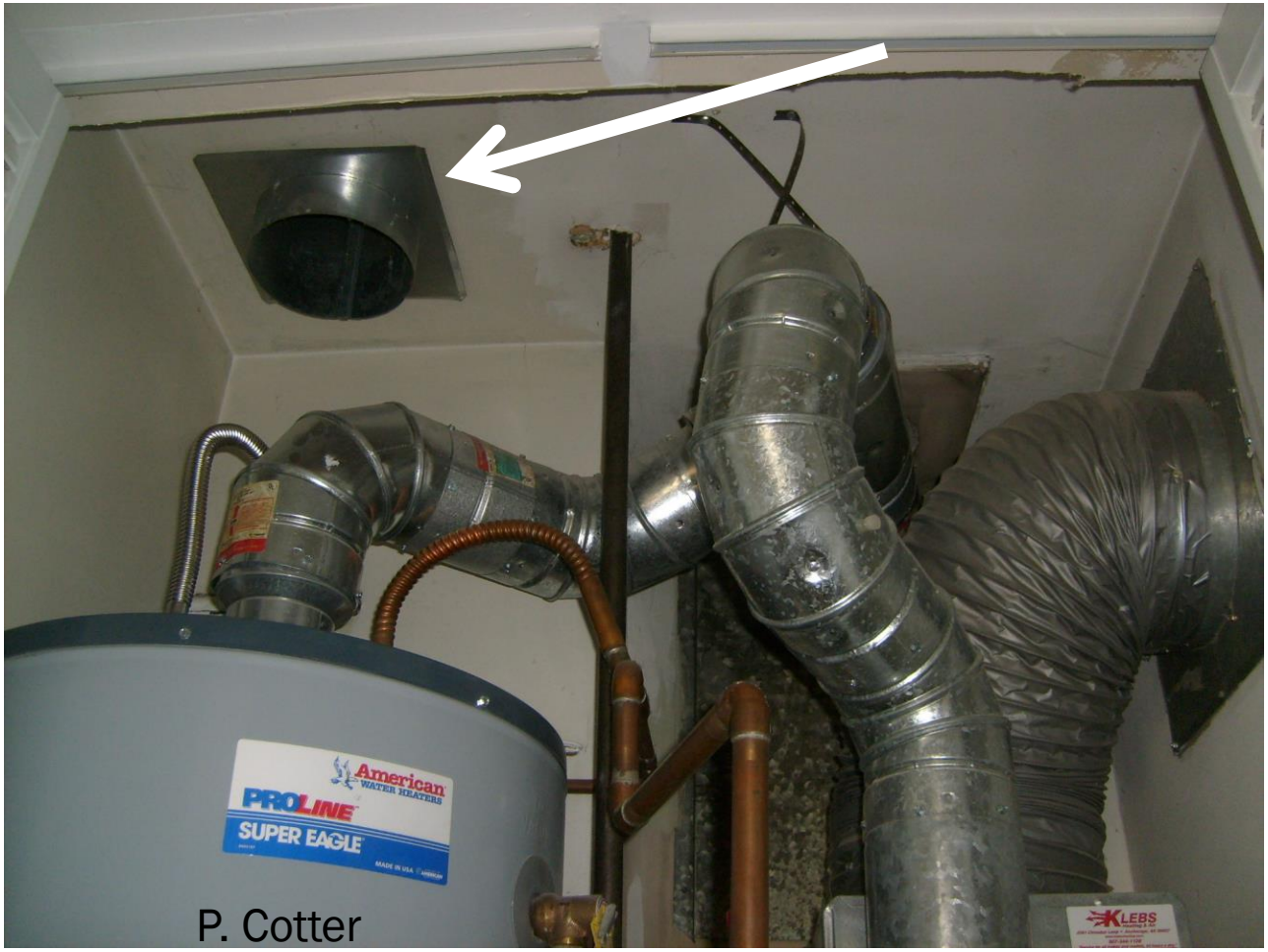
Combustion gases and tight homes: Be careful of backdrafting



Install ventilation system prior to or during air sealing operations

Seal it tight, ventilate right

DON'T SEAL COMBUSTION OR MAKE-UP AIR SOURCES!



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Air sealing equipment

Tools of the trade

- Foam gun (much better than disposable cans)
- 2-part polyurethane systems
- Caulking gun (good one) and caulk
- Backer rod
- Rigid foam, batt, cellulose insulation
- Protective equipment - resp, tyvek, etc
- Red tape, aluminum duct tape, mastic
- Poly sheeting

Spray foams

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Caulk and Caulking Gun

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Do not use painters caulk for air sealing

Lots of caulks out there

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High quality caulks preferred (Ex. silaconized acrylic, elastiomeric, etc.)

In rural Alaska, these caulks ~ $8 - $12/tube

Caulks

- Newer polymer caulks
- Siliconized acrylic latex
- Polyurethane
  - Chemcaulk 900 excellent low temperature characteristics

Backer rods, tapes, mastic…

...and more

Rigid foam

Fiberglass batt can be used for backer for foam/caulk in some areas, but it MUST NOT be used as an air sealant

And safety gear…

Respirator/mask

Gloves

Protective suit

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Air sealing the attic floor

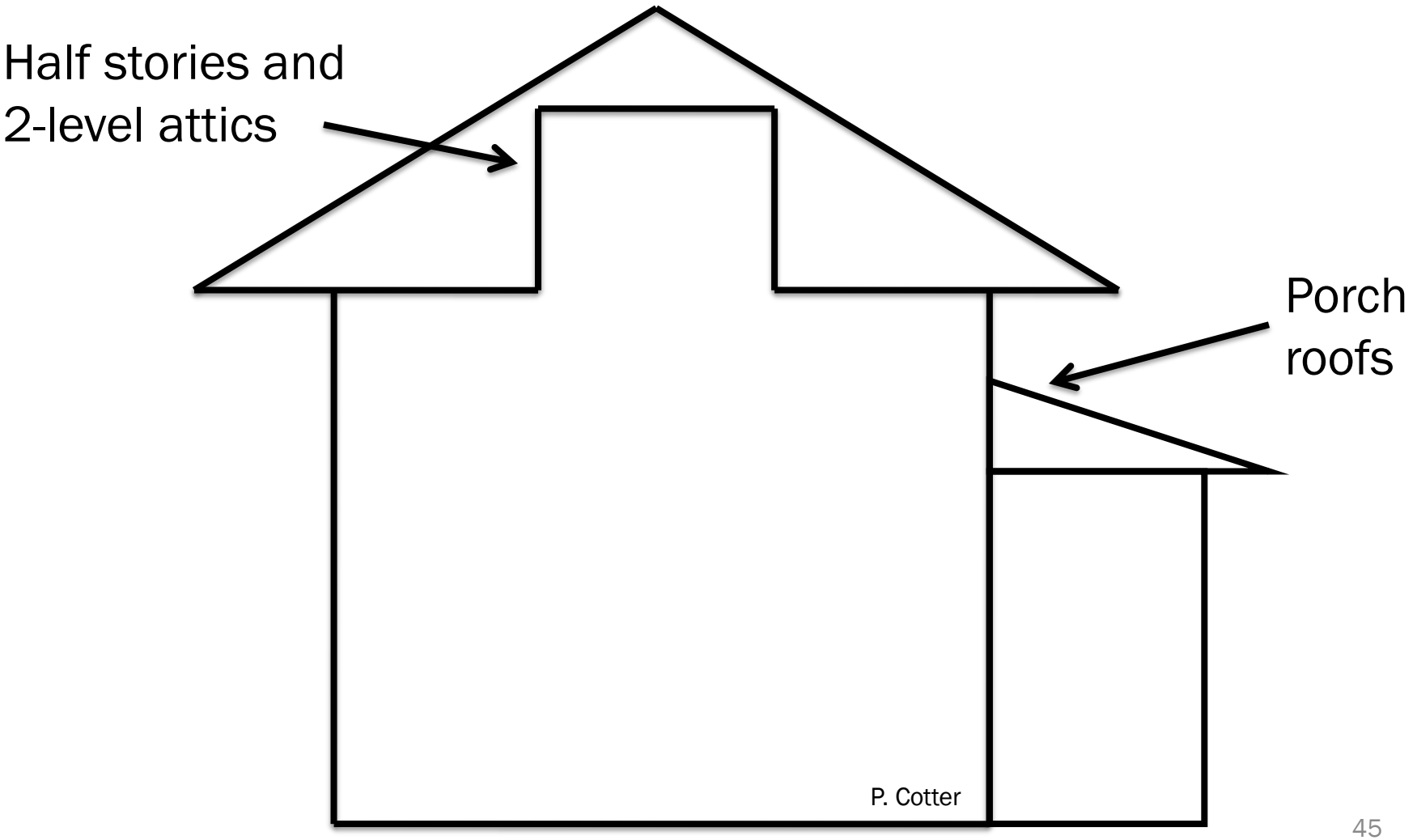
What does it take?

- Small body and long arms, preferably
- Protective equipment
- Foam (gun/kit/rigid)
- Caulking
- Tape?
- Batt for backing?

Attic airsealing made easy(er)

- Before going into attic, locate and map
  - Penetrations
    - Electrical (lighting, outlets, etc)
    - Plumbing
    - HVAC
  - Partition walls (rooms, halls, closets, etc.)
  - Ceiling height changes
  - Stairwells

Look for Transitions



Air sealing organization

- Clear out work areas
- Follow your map
- Convenient starting point
  - Work in organized fashion
  - Clear existing insulation to find leak points
- Check for black/brown discoloration in batt insulation
- Special attention to wet rooms (bath, kitchen)

Suggests air leakage

Top plates

Caulked and foamed

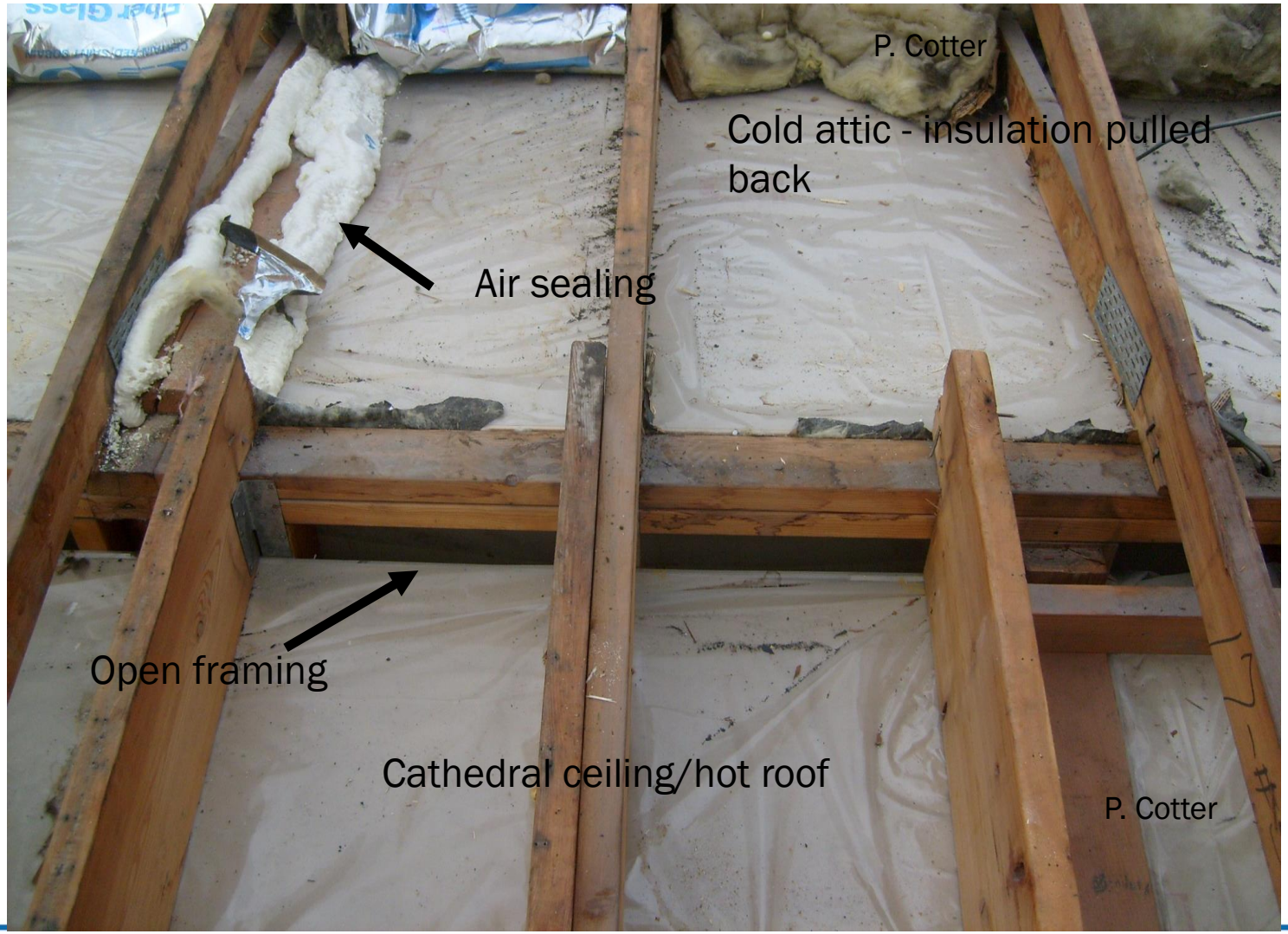
Sealing the top plates from exterior

Top plates from outside

Wire through top plate

Foam or caulk here – may be difficult to reach

Transitions



Open Framing

Open framing around closets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Additions

Air and thermal Communication

This is really an open framing problem

Serious Attic Bypasses

2’ X 4’ unsealed penetration in ceiling

Remedy with, framing, sheet metal and fire-safe sealant

Flue penetrations sealed with sheet metal

Careful selection of caulk here

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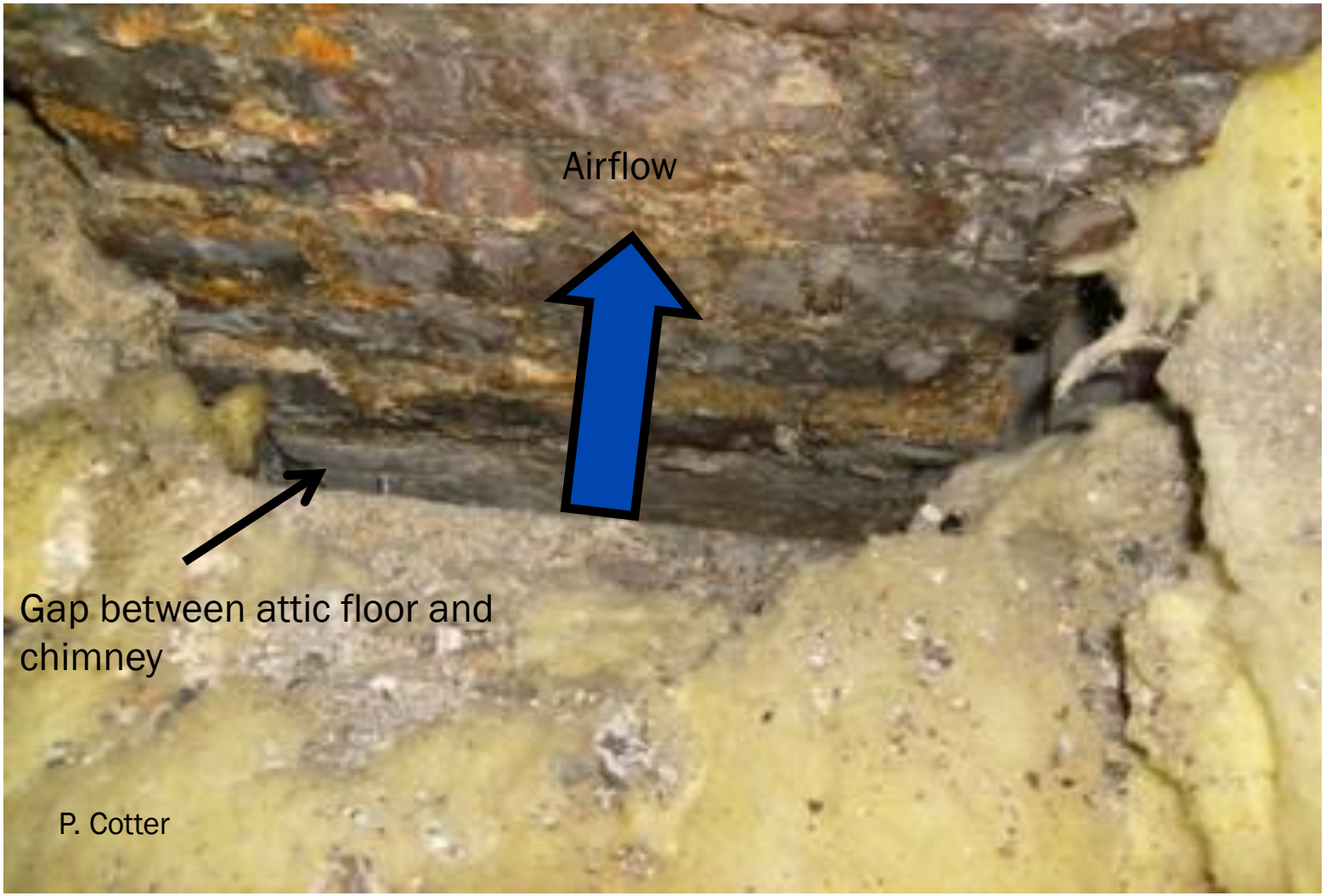
Masonry Chimneys



Don’t forget to seal around exhaust fans

Seal these with duct mastic or aluminum duct tape

Plumbing Vent penetration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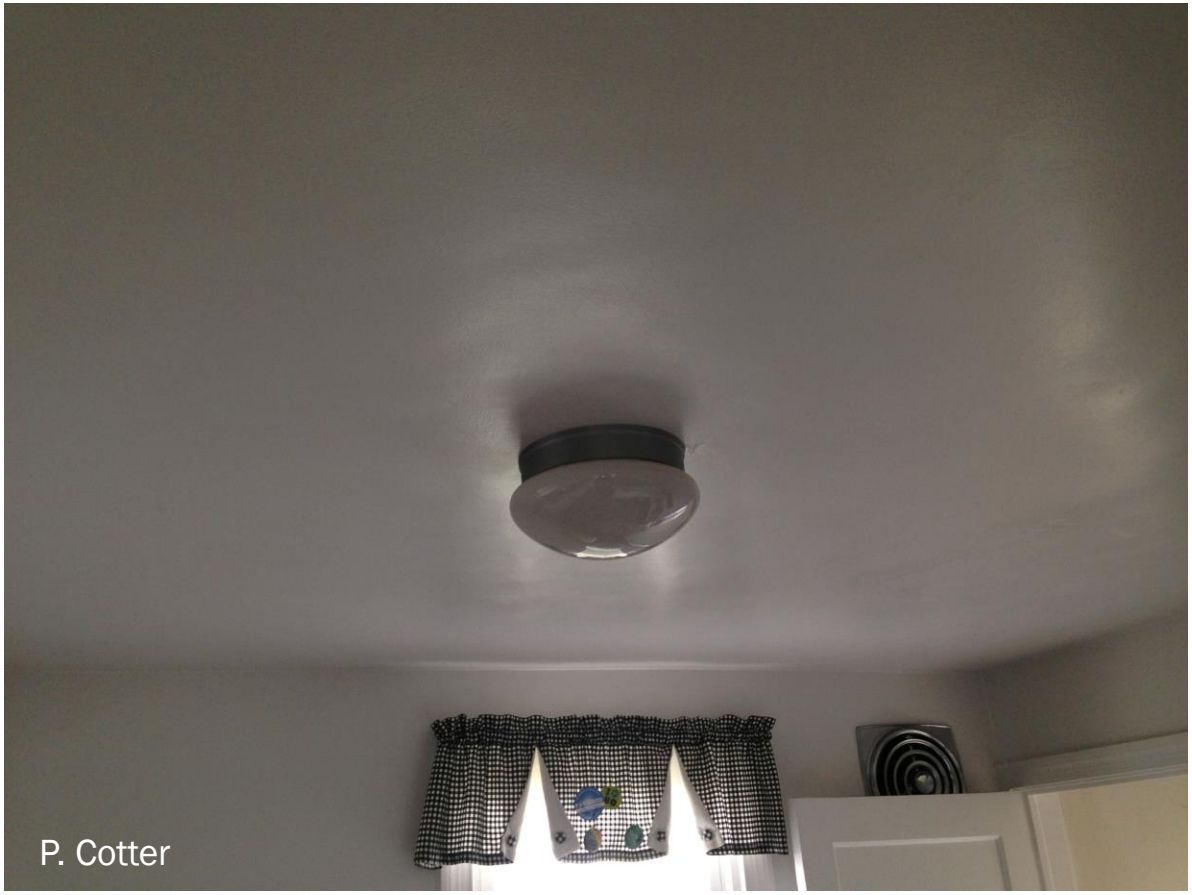
Sealed wiring and plumbing penetrations

Some prefer flexible air seal around plumbing penetrations to allow for movement (especially for ABS)

Extreme Air sealing

Electrical boxes, lighting



Partition walls

- Often leak to attic
- Seal
  - In attic or
  - Interior

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Seal walls and wires


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Random holes

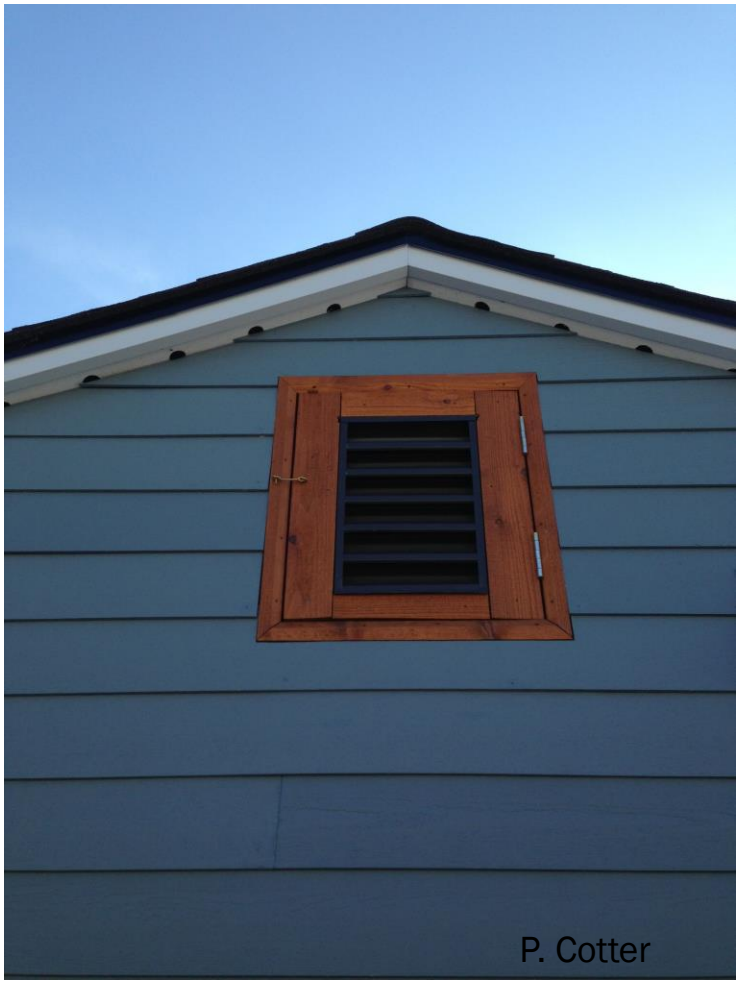
Attic Hatches

- Best Practice = Remove and place on gable end

- Good Practice
  - Gasket
  - Positive latching mechanism

Bad Hatch

Gable end hatch



Gable end attic access – eliminate louvers in high wind areas

Gasketed Hatch

Recessed lights

- Best Practice = Remove them!

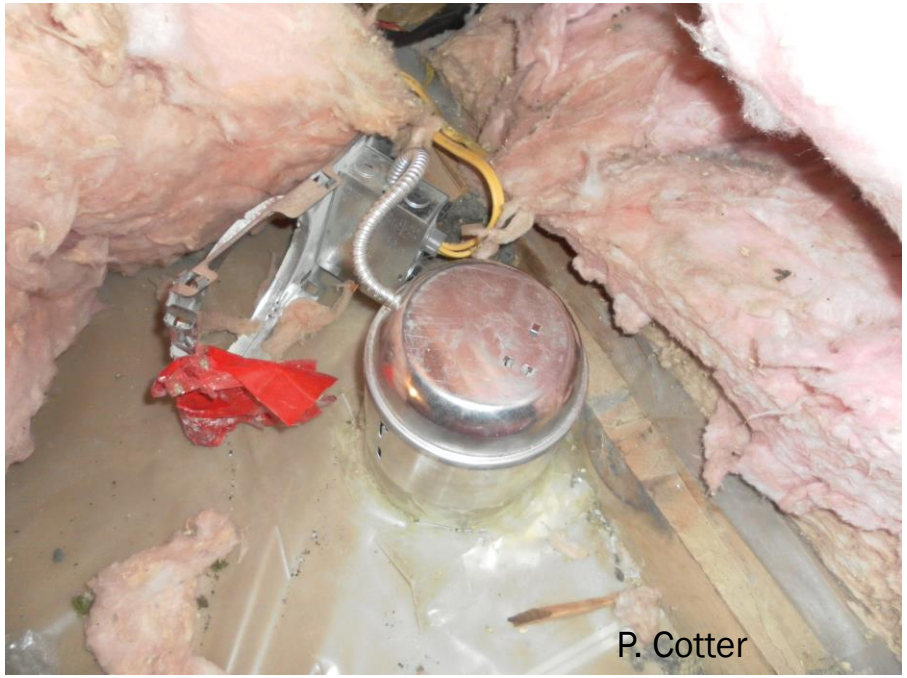
- Look for IC-rated fixtures
  - Model Energy Code (MEC)
  - Washington State Energy Code
  - ASTM E 283-91

Recessed lights - Existing

- Air tight retrofit
  - Sealed cans
- Attic box - MUST MEET FIRE CODE
  - Sheet steel or aluminum
  - Duct board/rigid fiberglass OK
  - Tape, caulk, foam to framing
- If fixture is not IC-rated…

  …box walls must be at least 3” from light

Most recessed lights leak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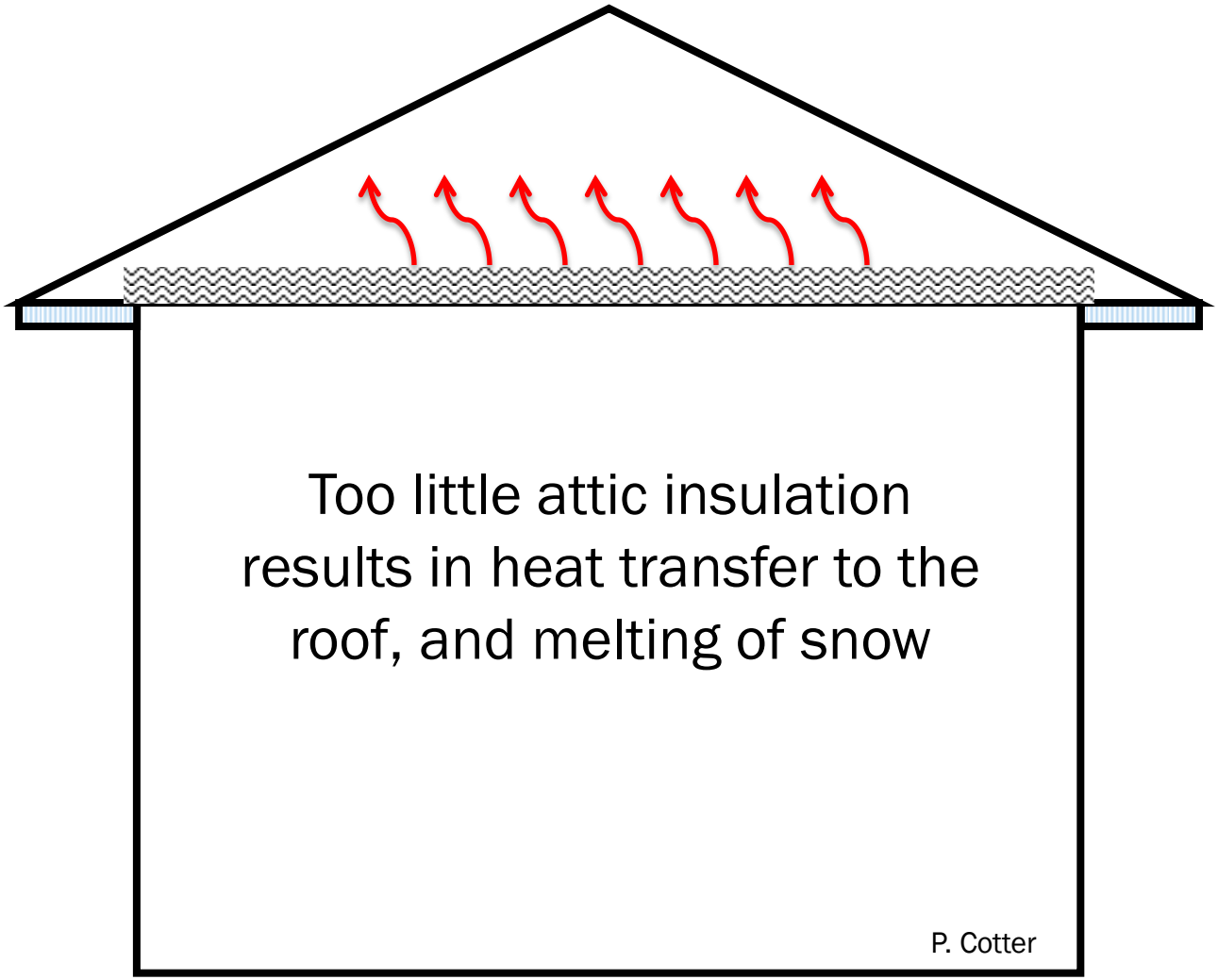
This box still leaked

After all that air sealing, you can now insulate

Insulation and ice dams


Too little attic insulation results in heat transfer to the roof, and melting of snow
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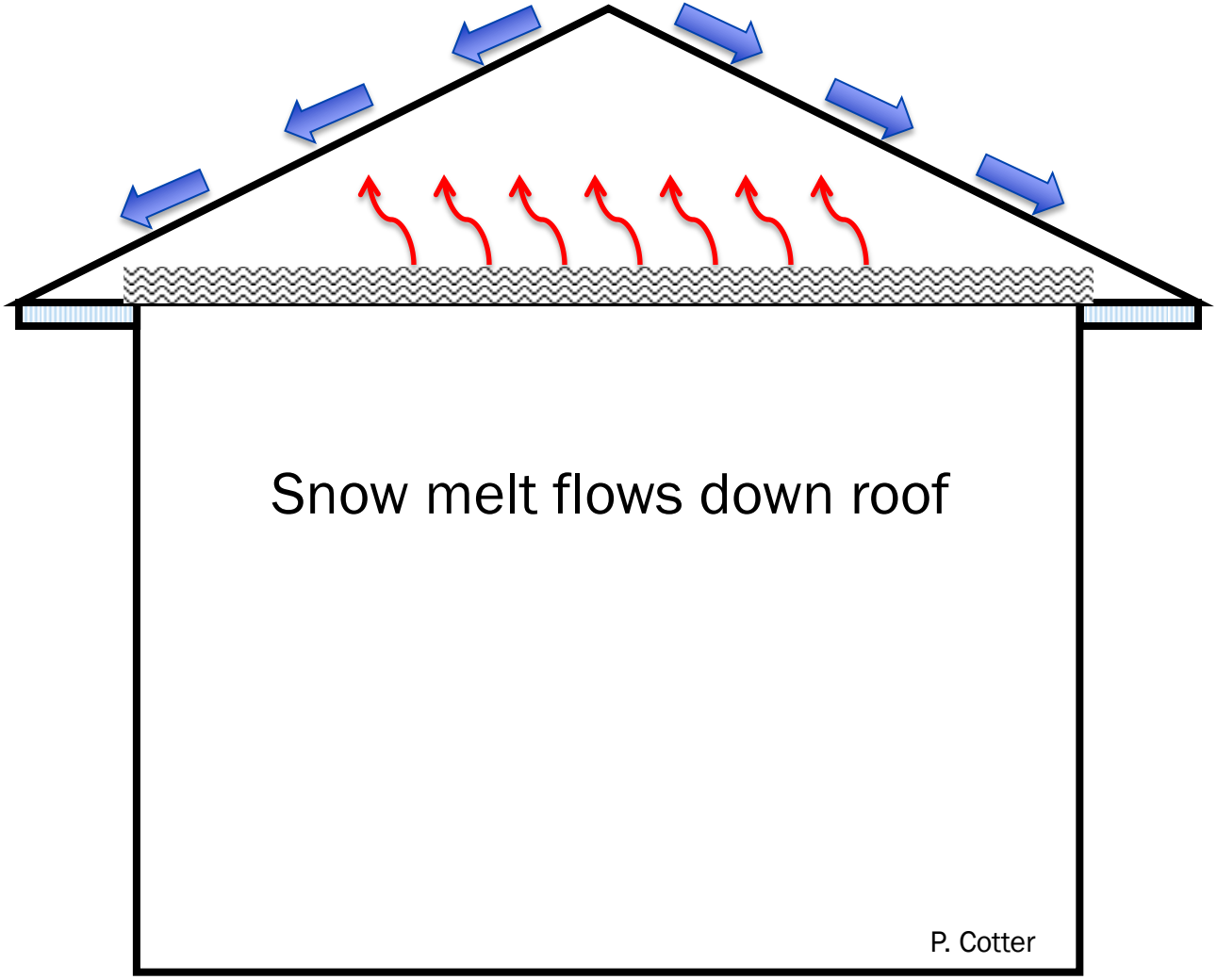
Snow melt flows down roof
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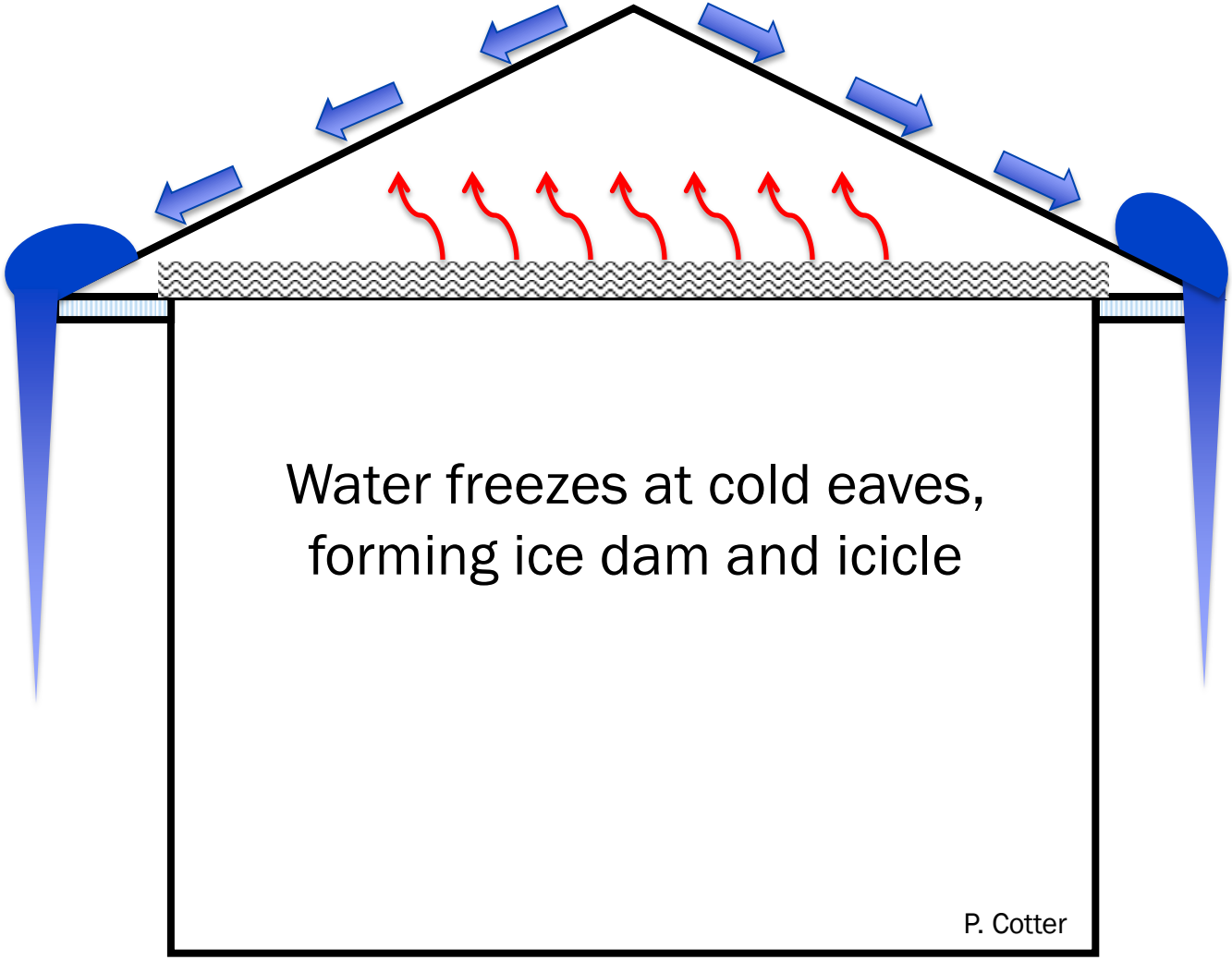
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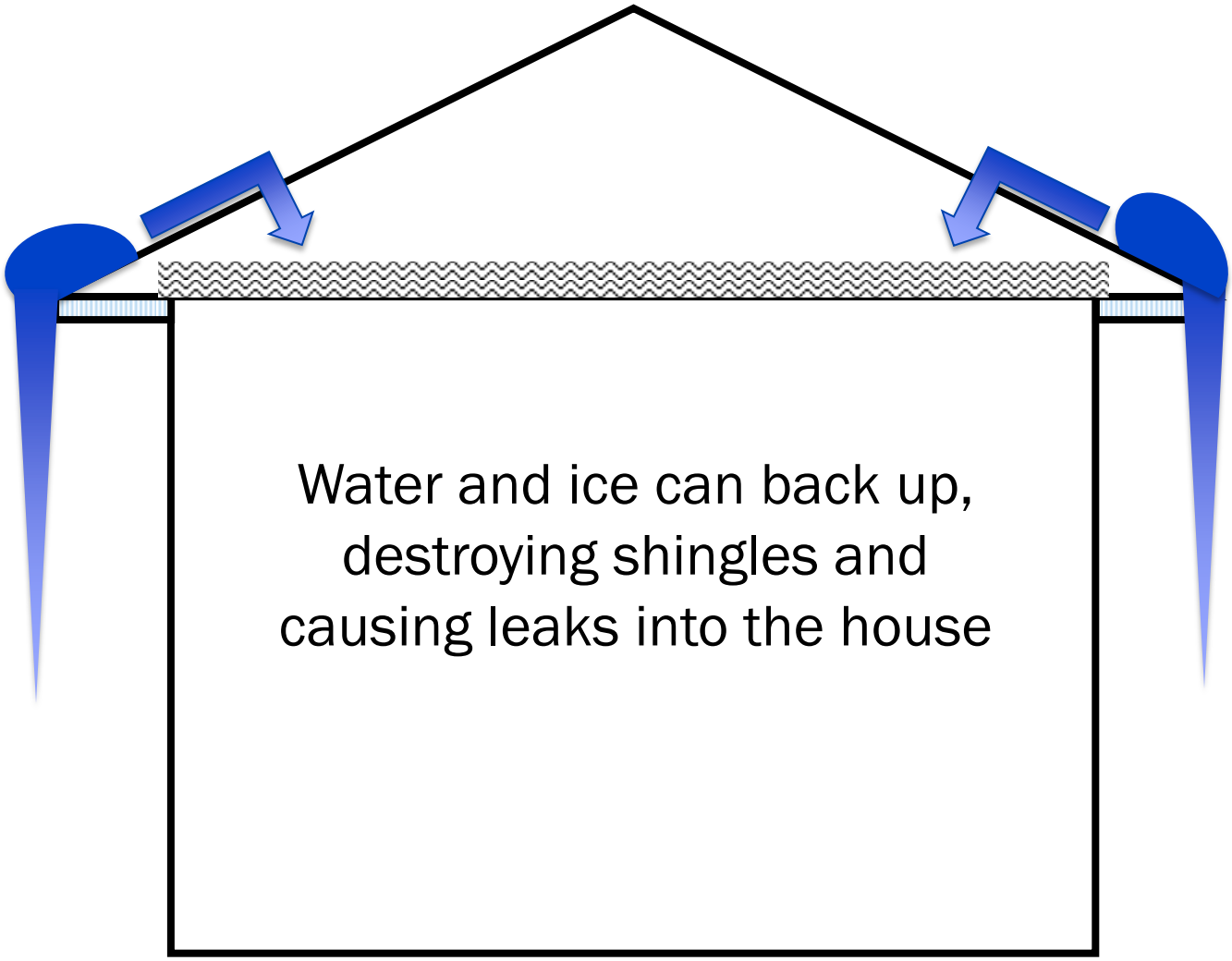
Water and ice can back up, destroying shingles and causing leaks into the house

Air sealing the attic floor should always be done before adding insulation

Underinsulated

~2”
vermiculite
insulation

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Insulating attics

- Air seal first
- Complete coverage
- Insulate over top plates
- Insulate to at least minimum BEES
- Use baffles
- Insulation MUST NOT contact sheathing
- Protect from weather


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Unfaced Fiberglass Batt Insulation

- Many uses
- Difficult to install around wiring, etc.
- Inexpensive
- R11 – R38
- Stackable

Mechanically secure on vertical surfaces

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Loose-fill Fiberglass

- Requires blower
- For attics mostly
- Infinite R-value(~R3/in)
- Susceptible to wind

Cellulose

- Requires blower
- Loose or dense pack
- Infinite R-value (~R3/in)
- Heavier than fiberglass

Loose fill cellulose in attic

Insulating attics - Caution

Unless specified for insulation contact (IC), electrical fixtures and combustion appliance flues must not be in contact with insulation

How Much Insulation?

Table R-A402.1.1 Nominal Insulation and Glazing Minimum R-values by Component April 3, 2012 AK Amendments							
Climate Zone	Windows, Doors & Skylights	Ceiling [a]	Exterior Wood Frame Wall	Floor	Below Grade Wall [b]	Slab [c] & Depth	Crawl Space Wall [b]
6	3.33	54 or 43	25	38	15/19	15, 4ft	15/19
7	3.33	54 or 43	25	38	15/19	15, 4ft	15/19
8	4.5	59 or 48	30	38	15/19	15, 4ft	15/19
9	5	65 or 52	35	43	NR	NR	NR

A common question

Q) Does ventilating the attic cure ice dam problems?

An answer

Q) It can, but it can also make the ice dam problem worse. The best strategy is to address air leakage and insulation issues first

Primary causes of ice dams

1) Air leakage into roof/attic assemblies

2) Poorly insulated attic floors

Resources

- AHFC - Research Information Center
- Alaska Residential Building Manual
  www.ahfc.us
- Cold Climate Housing Research Center
  www.cchrc.org
- One stop shop for AK Energy Efficiency information
  www.akenergyefficiency.org