Alaska Housing
FINANCE CORPORATION

Windows and Doors

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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All photos are property of AHFC unless otherwise noted.

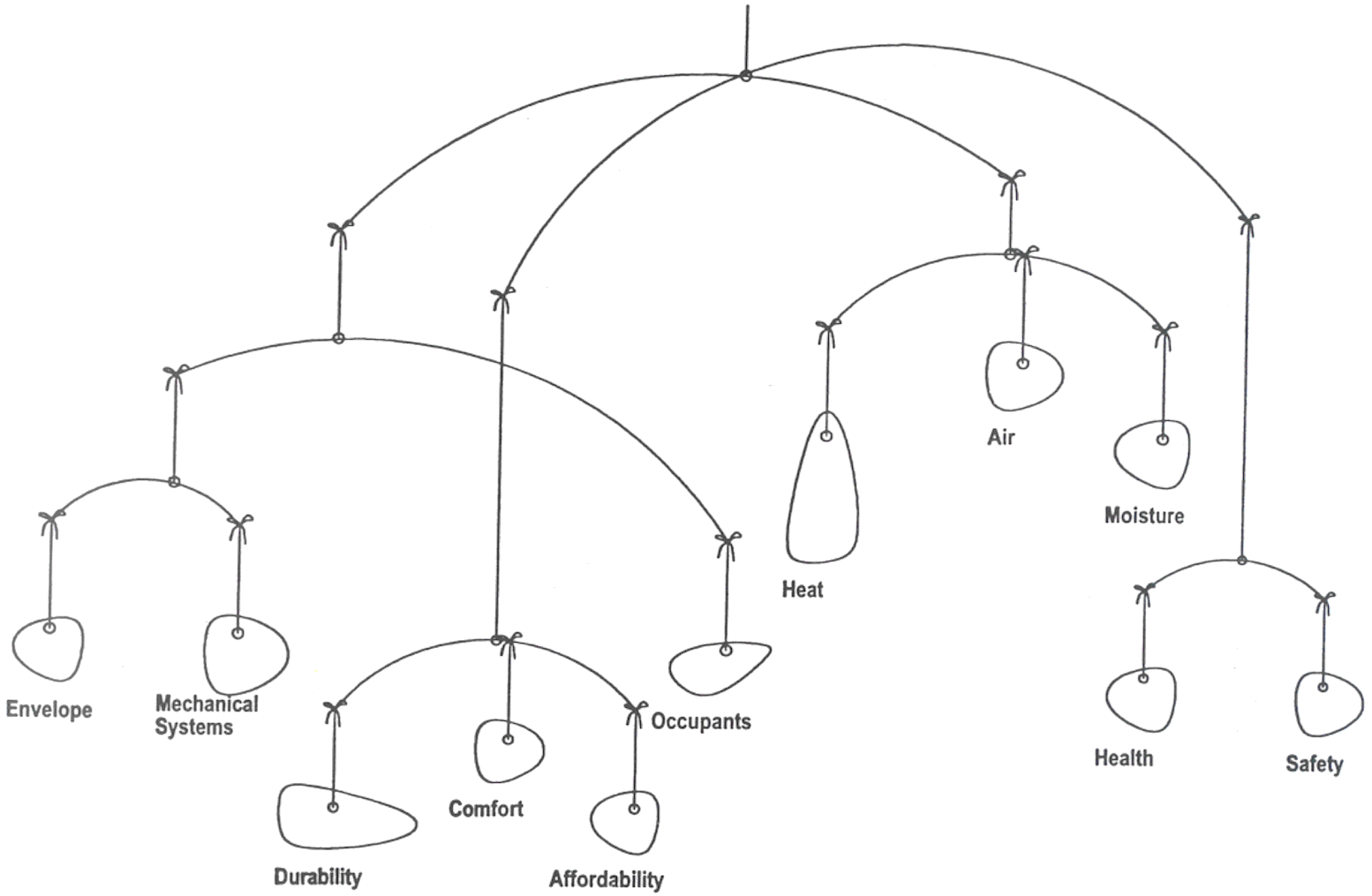
Topics for today:

- AHFC programs
- Building Science review
- Windows
- Installation best practice
- Window details
- Doors

AHFC Energy Efficiency Programs:

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

The house is a system



Windows

Window Considerations

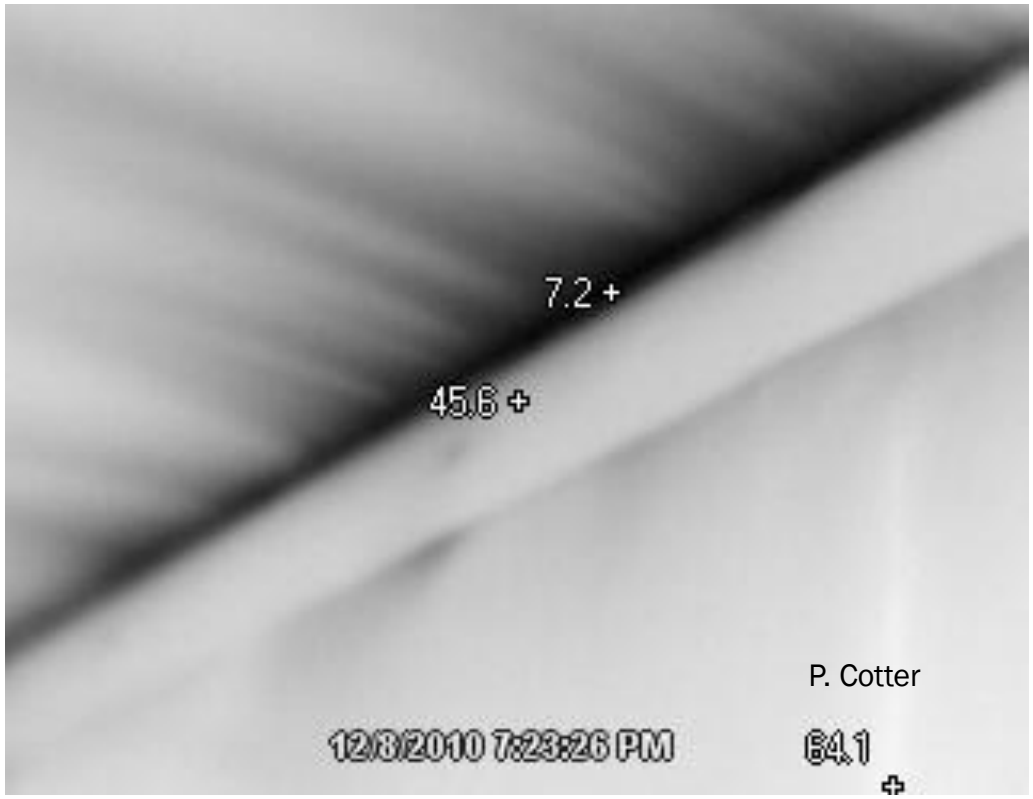
- Heat transfer via
  - Conduction, Convection, Radiation
- Window Paradox
  - Light, view, ventilation
  - Heat loss
- Source of heat loss in cold climates
- Replace or weatherize?
- New windows = NFRC label

1) Conduction

- Through solid objects

2) Convection

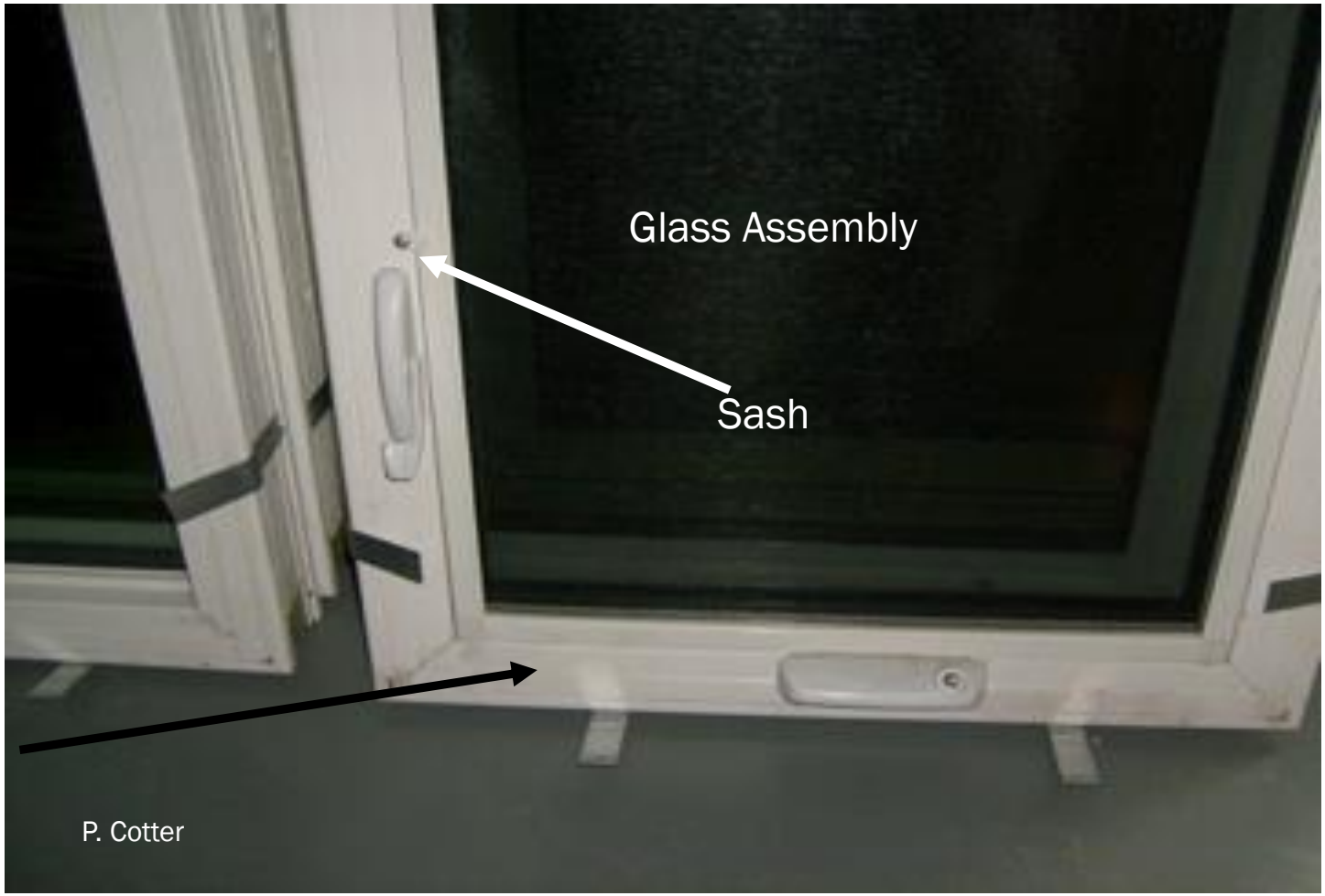
- Through air



3) Radiation

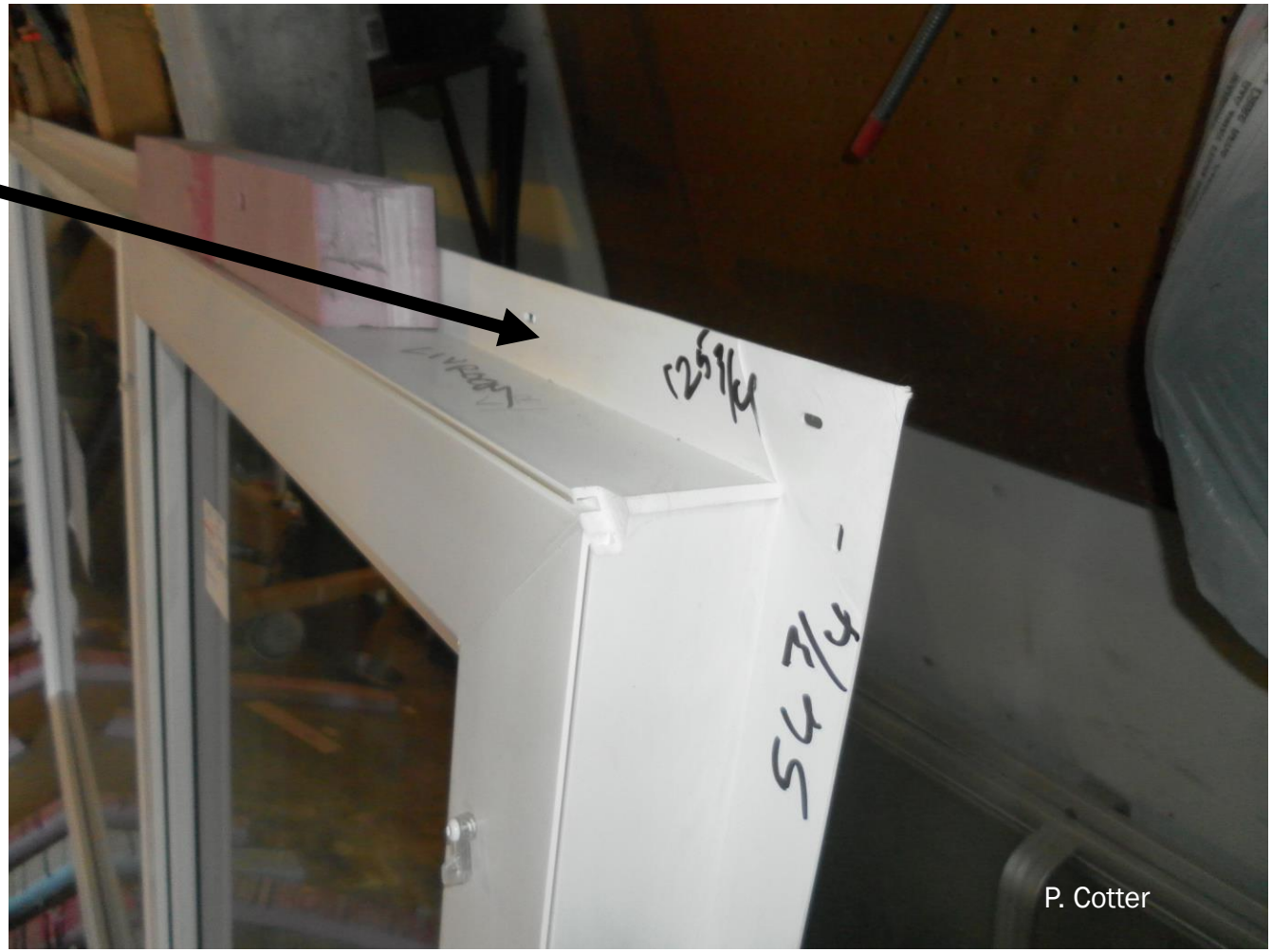
- The movement of heat away from an object by electro-magnetic waves (or infrared rays)

Basic window anatomy



Basic window anatomy

Window Flange



Frame and Sash materials

- Wood
  - Good looks? Maintenance? Thermal properties?
- Aluminum
  - Avoid in cold climates
- Vinyl
  - Low maintenance, variable quality
- Fiberglass
  - Low maintenance, frame and glass have similar physical properties, cracking?

Insulated fiberglass frames

These are flangeless units

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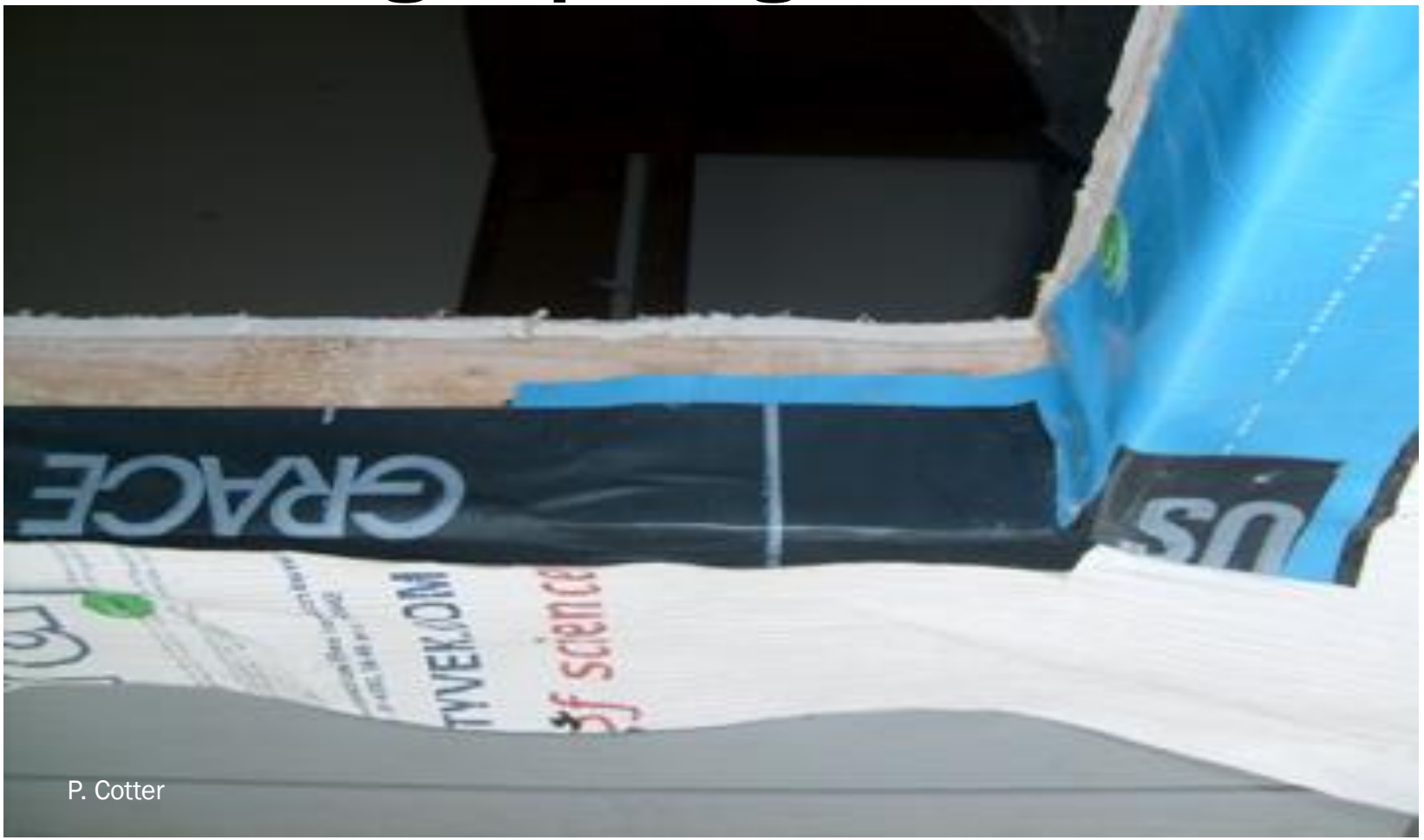
May need repairs…

Pretty typical, really

Protect Rough Openings



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See Alaska Building Manual for more details


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Poor Practice

Consult Alaska Building Manual for proper installation

U-factor and You

- U = 1/R = thermal transmittance
- Lower = better
- Determined for whole window assembly
  - Weighted average of different window components
    - Frame, sash, glass edge, center of glass
- Window Recommendation for our cold climates:

When replacing windows choose the lowest affordable U-Value

NFRC sticker indicates U-Factor

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If you think in R-values

- Calculate R by

$$R = 1/U$$

Example:

Window U-factor = 0.25

$$R = 1/0.25 = 4$$

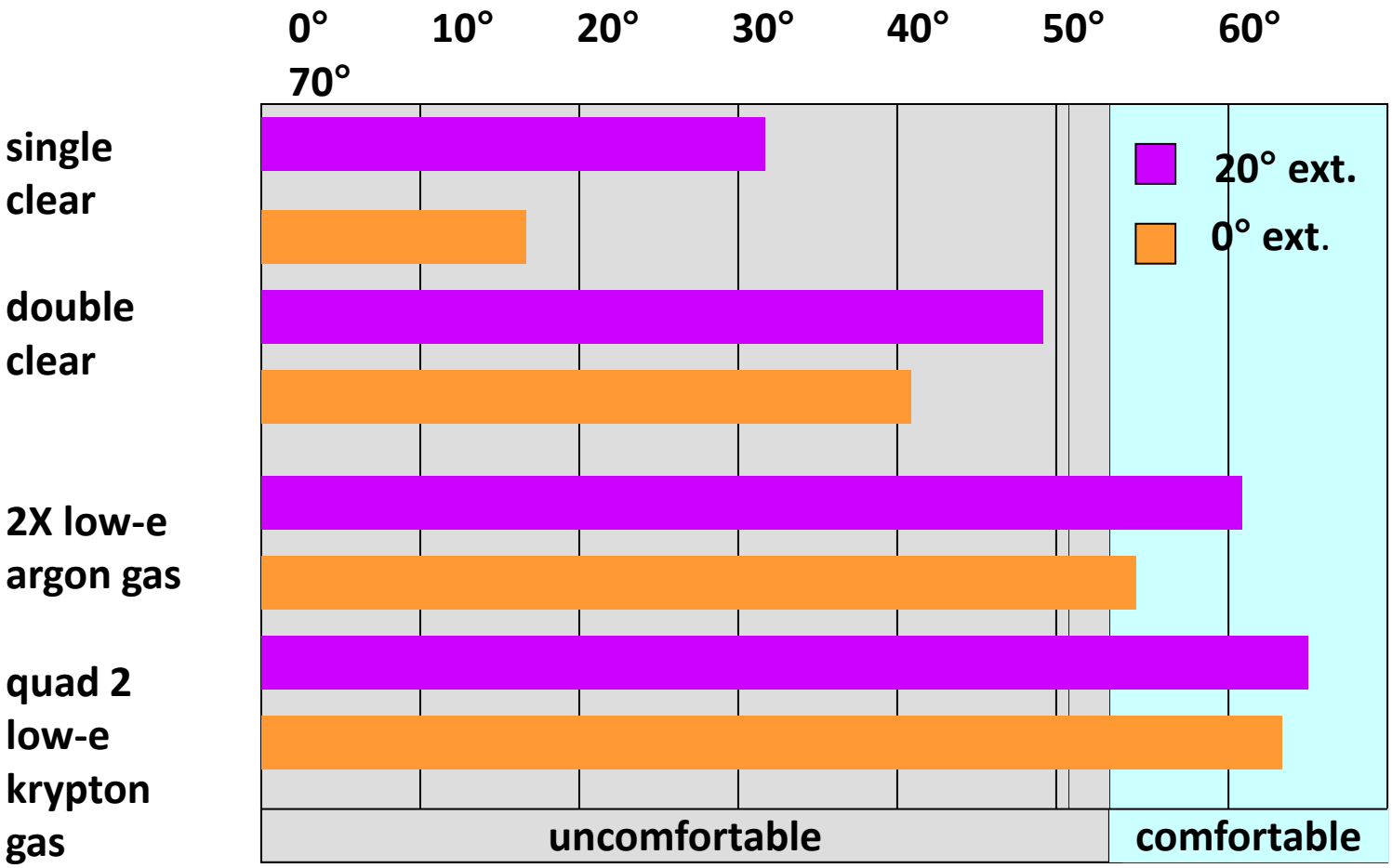
Window Efficiency Strategies

- R-value/U-value
  - Multiple panes
  - Gas fillings
  - Coatings
- In cold climates, use all 3
- Cold climates - low-e (low emittance) coating is on inner pane facing space between panes

An example window

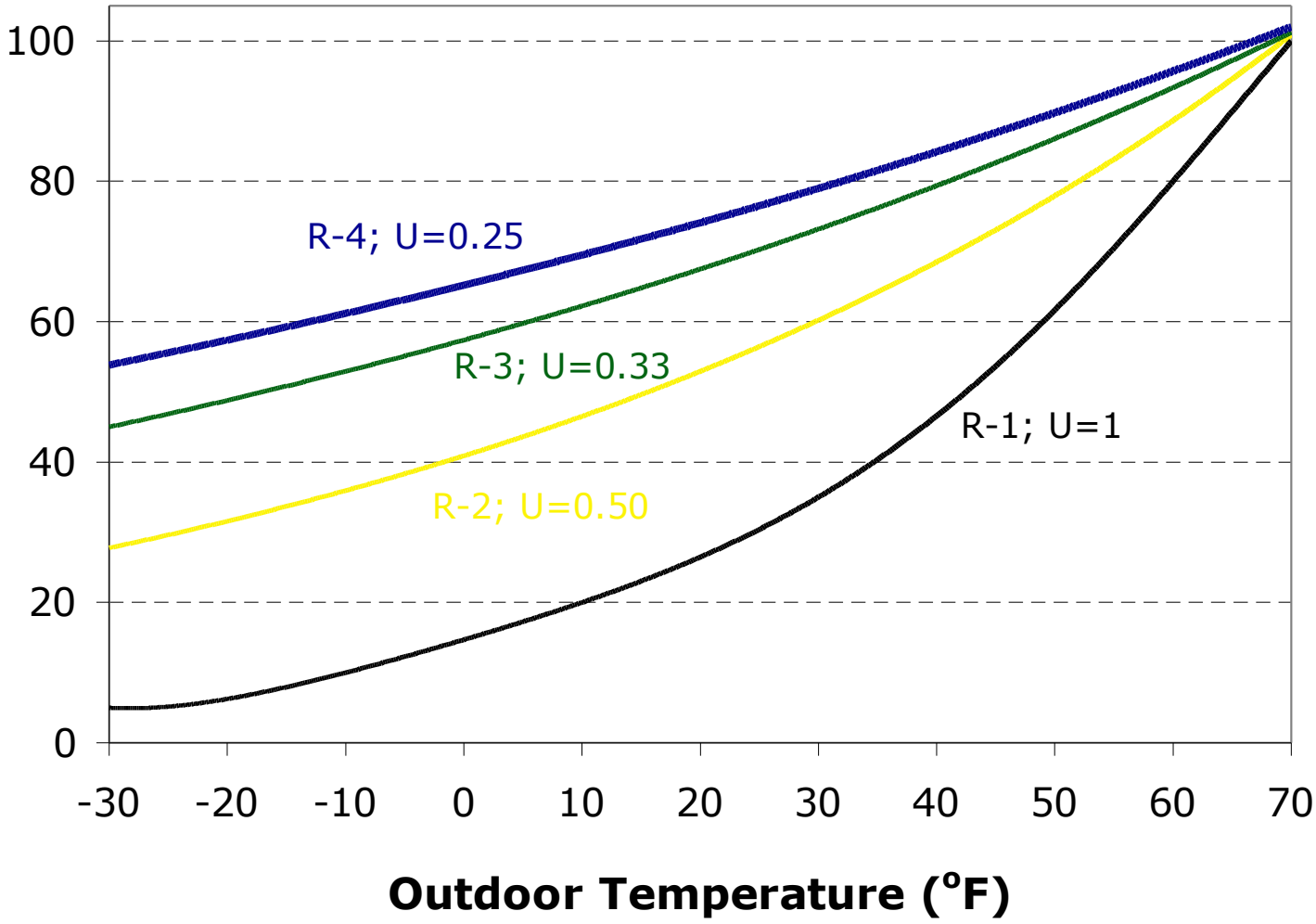
Triple pane (glaze), double low-E, argon-filled casement

Glass temperature



Source: Lawrence Berkeley National Lab (adapted)

Window Condensation



Window Condensation

Window recommendations

- U-factor less than ~ 0.22
- Avoid windows that open by sliding
  - Leaky
  - Poor performance
- Casement or awning are better
- Low-E coatings
- Choose 3 or 4 pane units
- Best practice installation

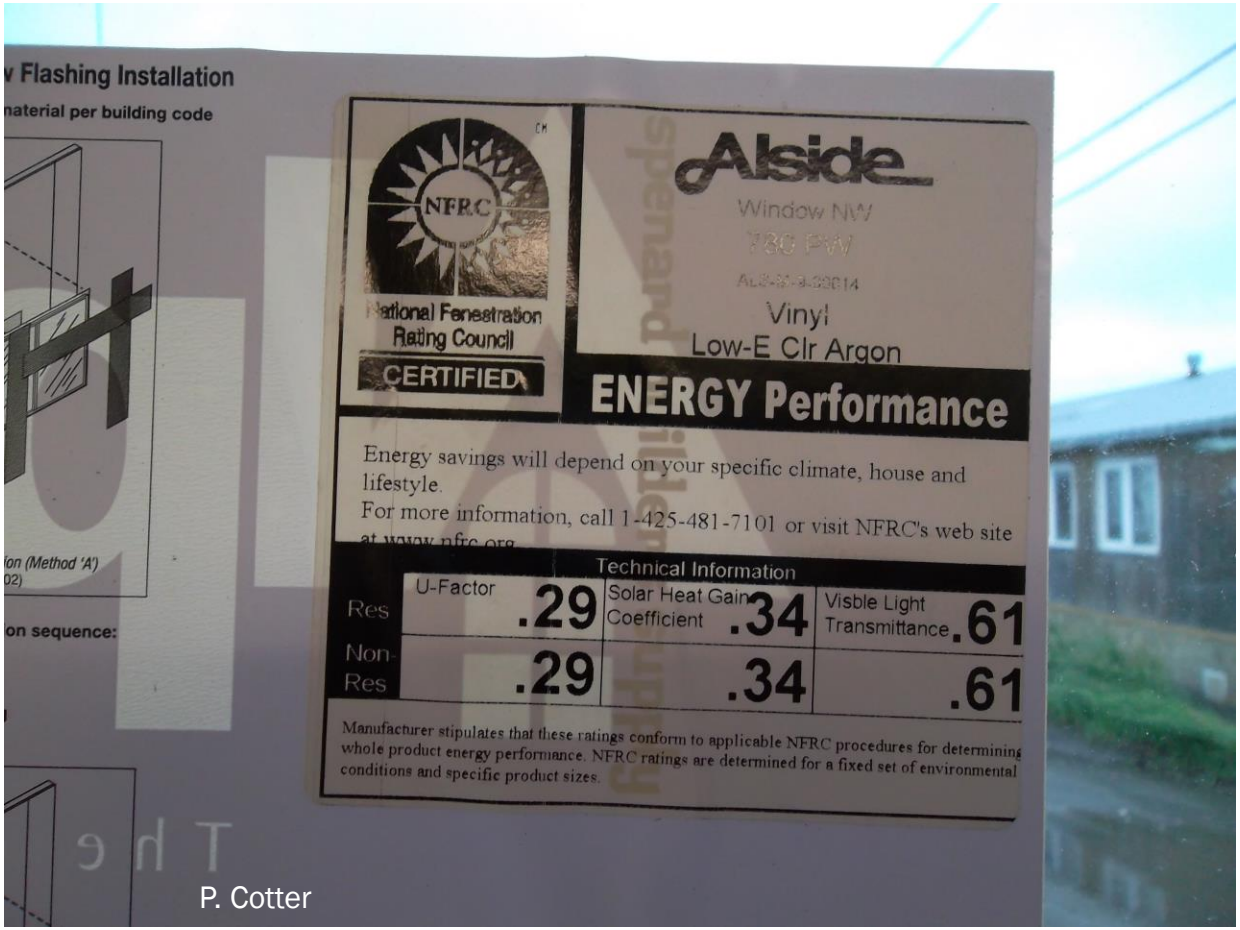
Other window characteristics

- Solar heat gain coefficient (SHGC)

  $$\frac{\text{solar heat passing through window}}{\text{solar heat hitting window @ } 90^{o} \text{ angle}}$$

  – NOT MANY CHOICES IN ALASKA

- Visible transmittance (VT)
  – Amount of visible light admitted by window
  – NOT MANY CHOICES IN ALASKA


Flashing Installation
material per building code
NFRC
National Fenestration Rating Council
CERTIFIED
Alside
Window NW
Vinyl
Low-E Clr Argon
ENERGY Performance
Energy savings will depend on your specific climate, house and lifestyle.
For more information, call 1-425-481-7101 or visit NFRC's web site
Technical Information
U-Factor
Solar Heat Gain Coefficient
Visble Light Transmittance
Res .29 .34 .61
Non-Res .29 .34 .61
Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product energy performance. NFRC ratings are determined for a fixed set of environmental conditions and specific product sizes.
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Air sealing around windows

- Poor installation can result in significant air leakage between rough opening and frame
- Backer rod
- Batt – ONLY use as a backer for caulk/foam
- Foam gun w/Low expansion foam
- Caulk
  - Quality important especially in cold climates

Foam and caulk

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Use the right foam

- Most manufacturers have a low expansion window foam
- Apply in 2+ layers for best performance
- Be careful

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Inconsistent foaming

Snowing inside

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

Do not use painter's caulk for sealing around windows

Use the right caulk

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

Backer Rod

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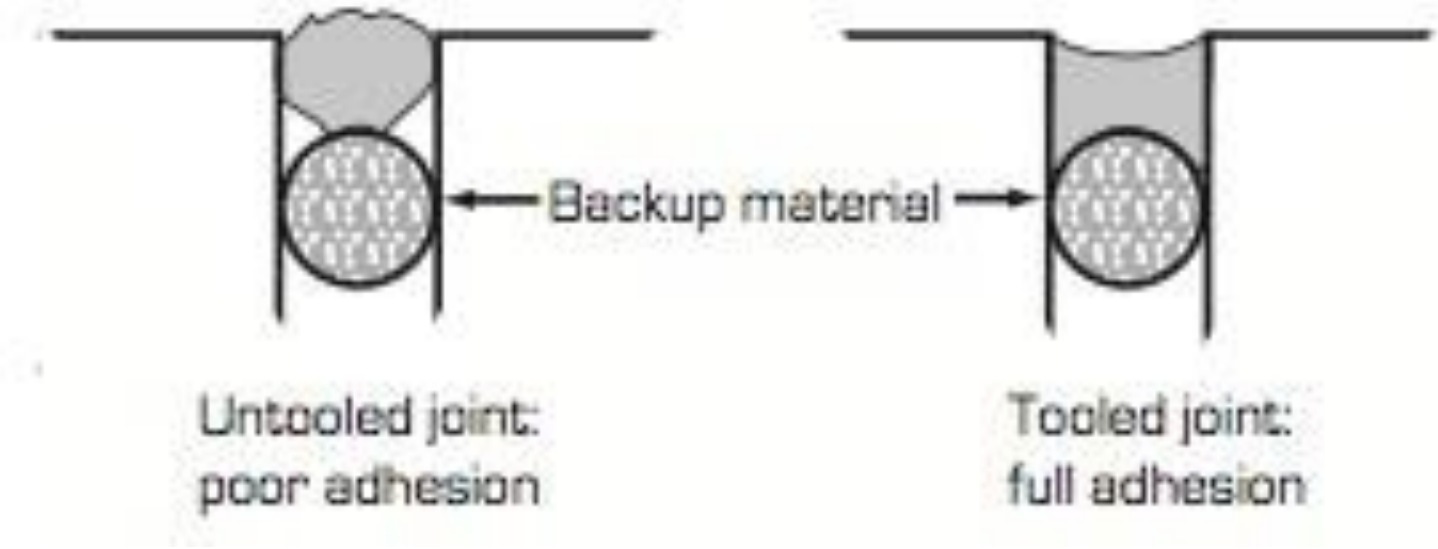
Proper caulking matters



Wrong Way

Right

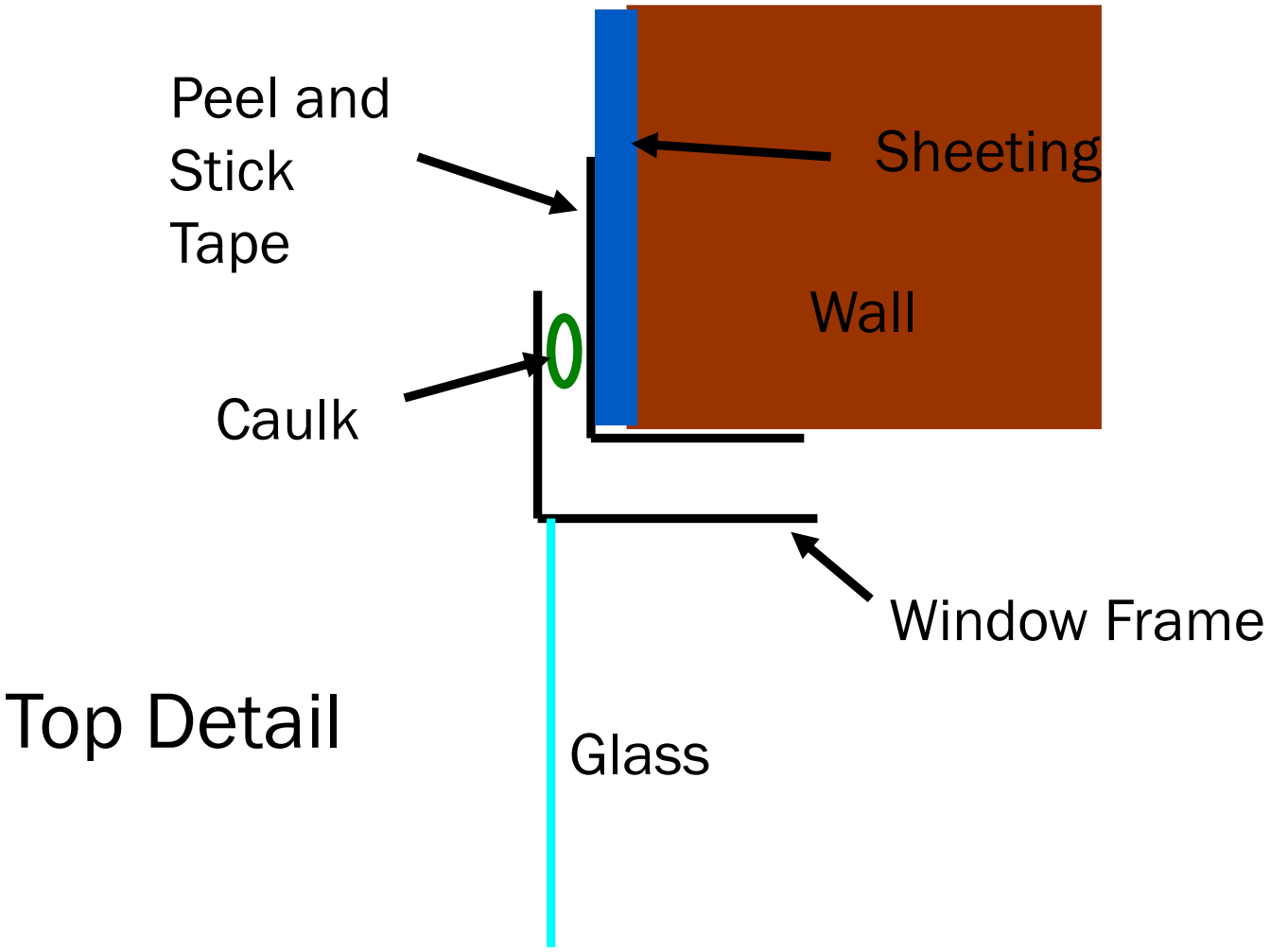
Way

Window Tips

1) Best window/most efficient you can afford
2) Avoid sliders, if possible
    - Leakier, less durable
3) Use proper water management strategy for installation (water drainage)
4) Seal well during installation
    - Caulk
    - Low expansion foam
    - Backer rod

Window Installation Details

Flanged Window Installation Detail



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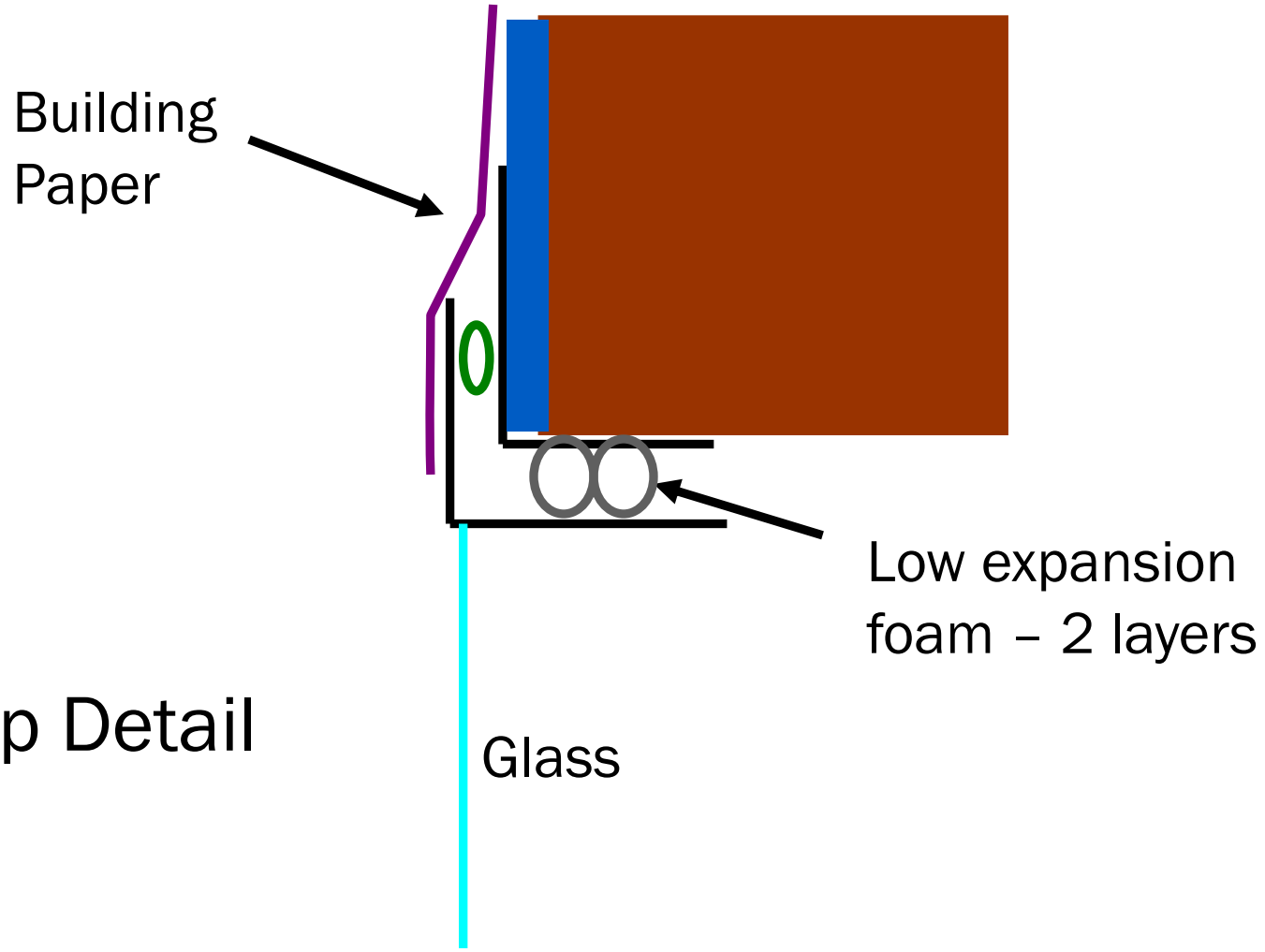
Flanged Window Installation Detail



Top Detail

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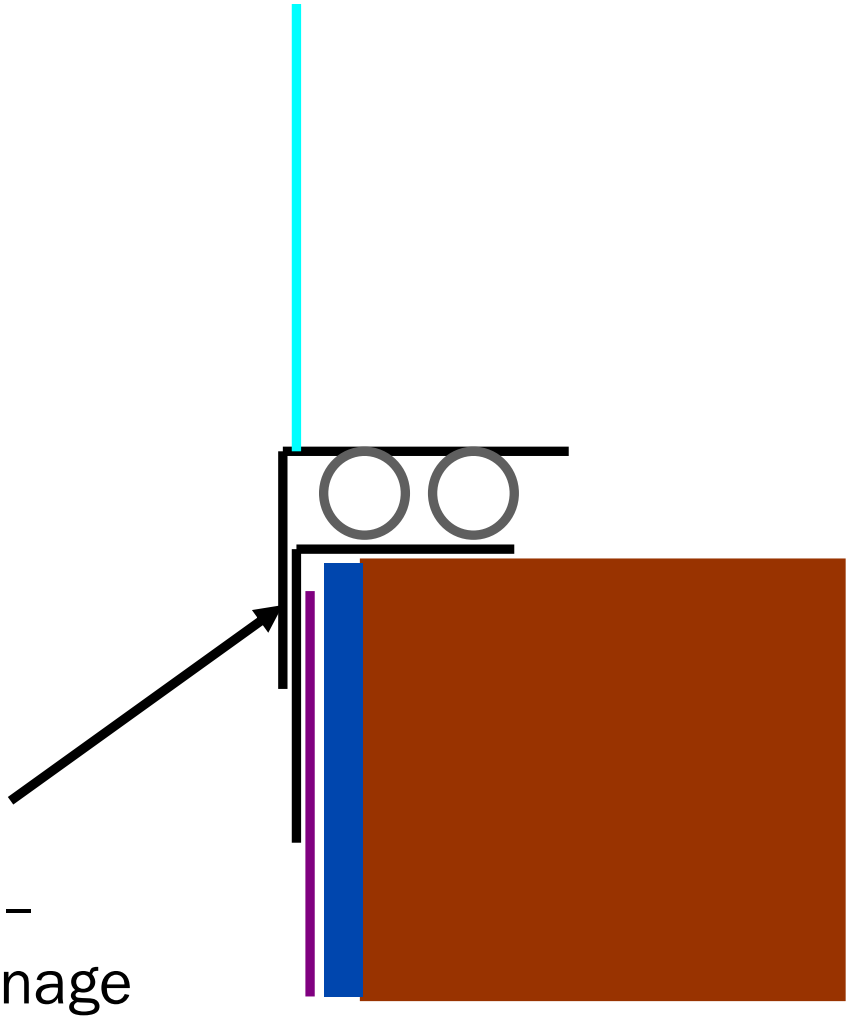
Flanged Window Installation Detail

Bottom Detail



No Caulk – allow drainage

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Flangeless Windows

Flangeless Window Installation Options

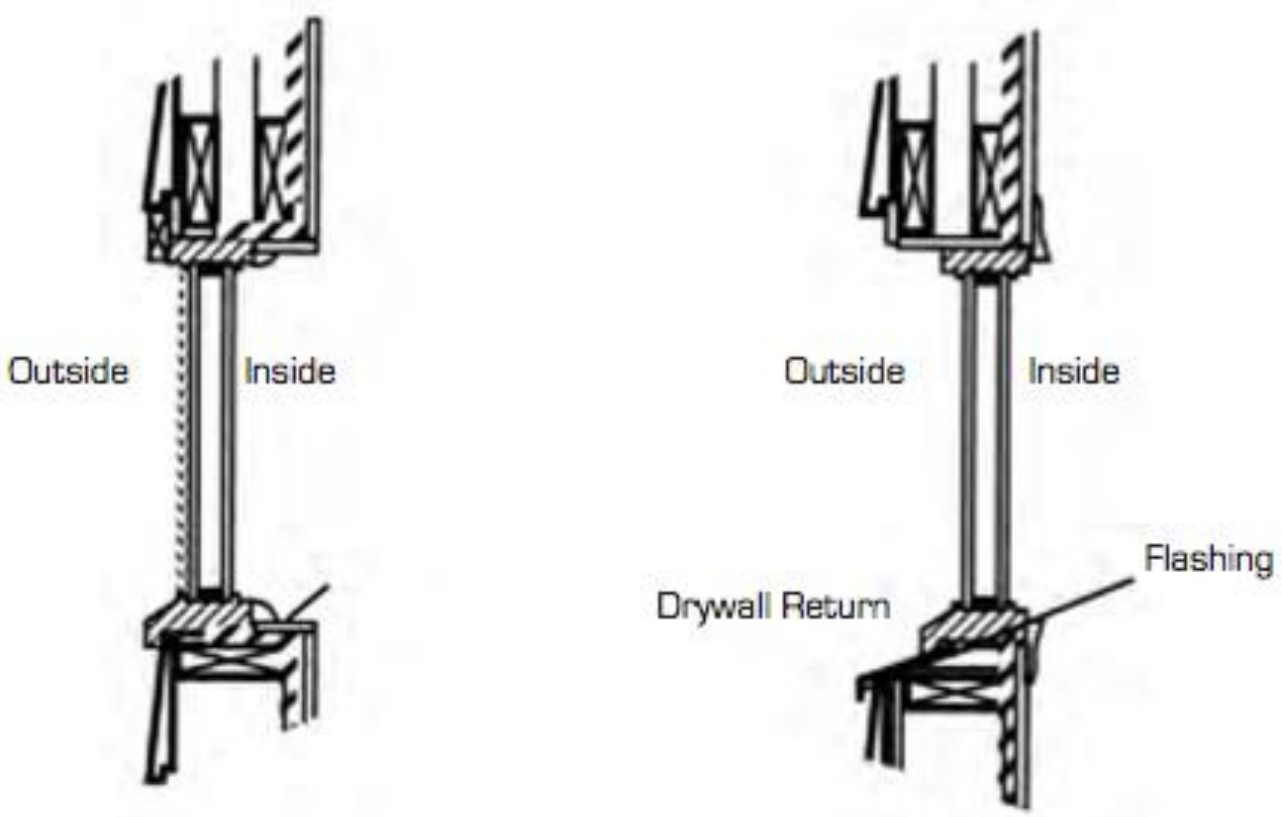


Figure 6.24: Window mounting options: left, window mounted on the outside of the rough opening; right, on the inside.

Flangeless Window Sealing Detail

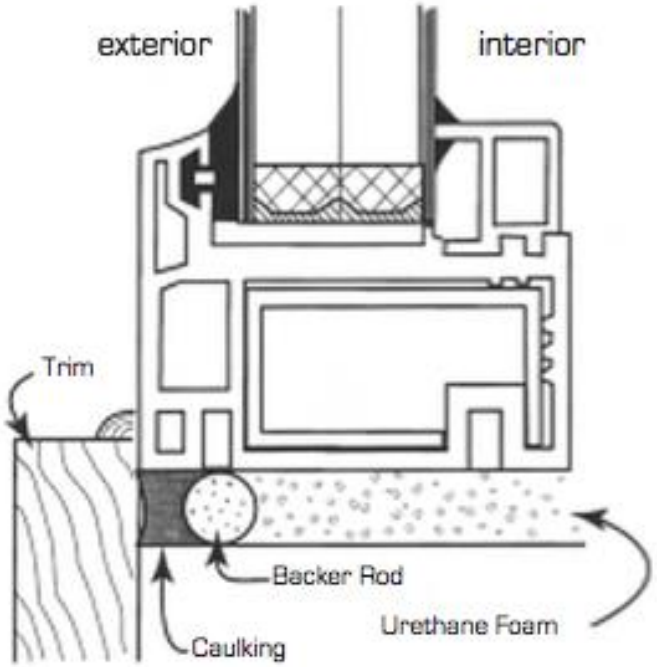
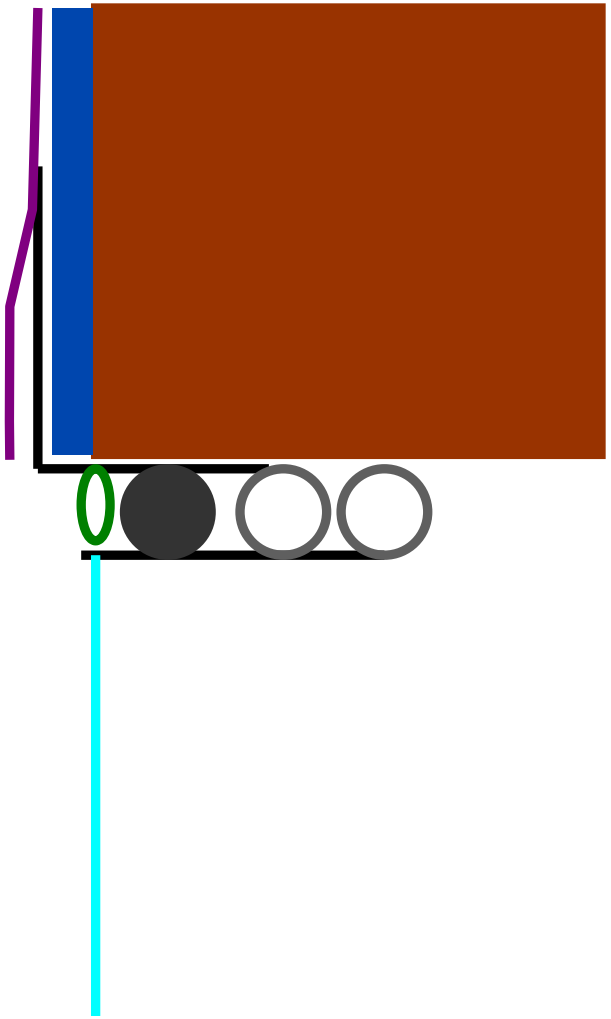


Figure 6.23: Sealing and framing details for PVC window frame

Flangeless Window Installation Detail

Top Detail



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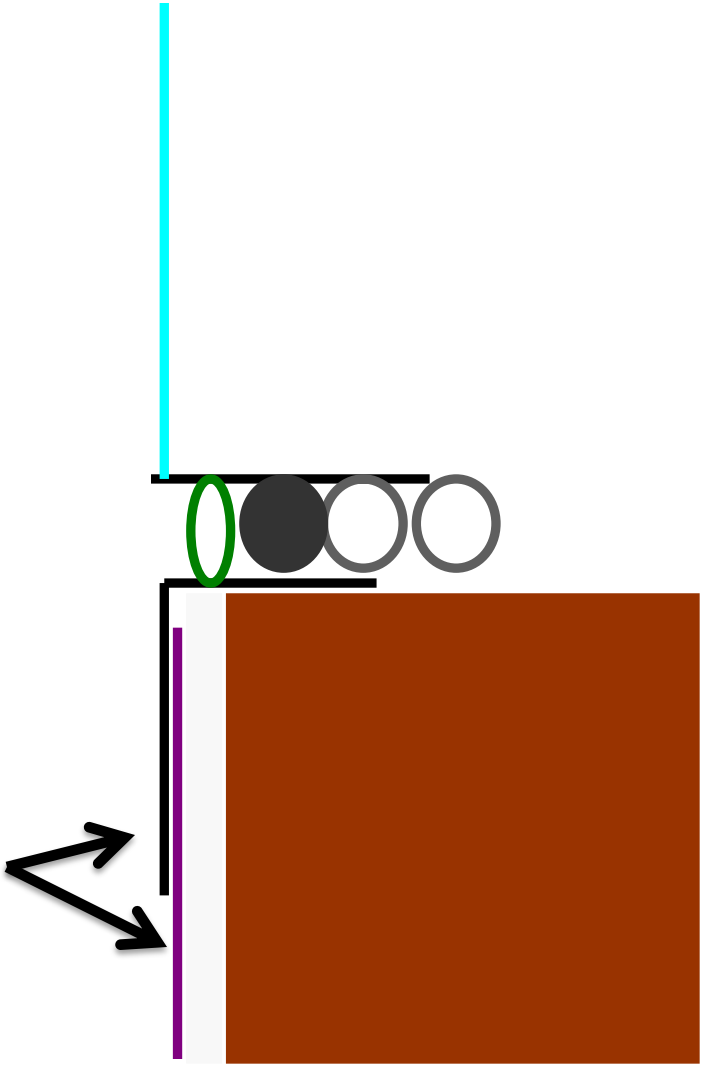
Flangeless Window Installation Detail

Bottom Detail



Material Compatability important

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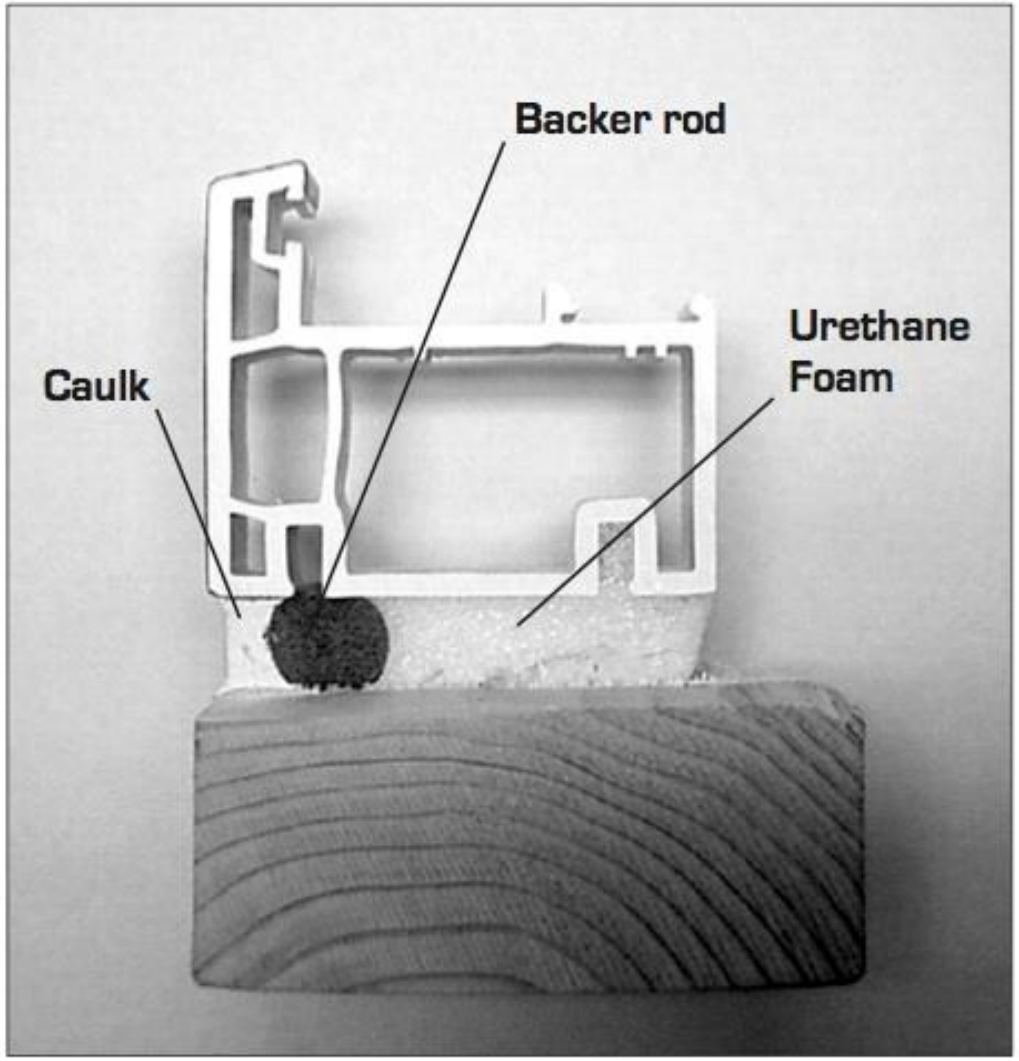
Proper Sealing – Flangeless Window

Exterior



Interior

Sealed Vapor Barrier Detail

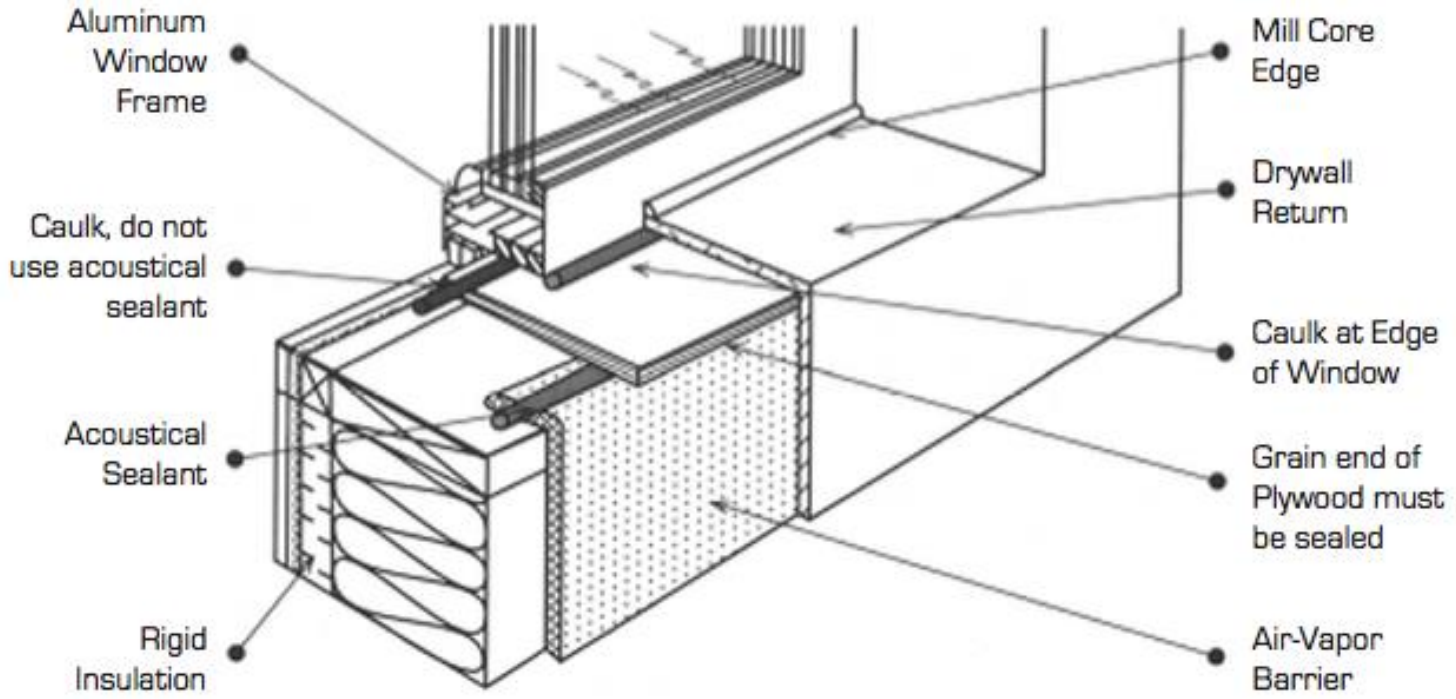


Figure 6.31: Vapor barrier sealed in single frame wall

Doors

Exterior Door Options

- Solid Core Wood
  - ~R2.5 – 3 (~U0.4 – 0.33)
- Wood Panel
  - ~R1.5 – 2 (~U0.66 – 0.5)
- Insulated Panel (wood/steel/FG)
  - ~R5 – 7 (~U0.2 – 0.14)

Sealing

- Bottom
  - Sweeps
  - Door bottom seal

- Sides – Weatherstripping
  - Many varieties

Snowing inside

Door Installation – Door and Frame

- Pan flashing details
  - Seal
  - Allow to drain
  - Counterflash weather barrier with pan
- Sides and top
  - Similar to window detail

Door Recommendations

- Lowest U/Highest R you can afford
- Adjust to fit tightly against door stop
- Inspect and repair sweeps and weatherstripping

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