

# Building a Better Building Envelope



# Elements of a Better Building Envelope

- Foundation Insulation
- Walls
- Ceilings
- Air Tightness
- Details ,Thermal Bridging
- Windows

# High Density Spray Foam

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- Less fussy
  - Less labour
  - Less space
  - OK air tightness

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- Very expensive
  - No thermal break
  - High embodied energy
  - Less environmentally friendly
  - Hard to renovate
  - Not good for some small gaps
  - Not as air tight as you would think

# Insulated Concrete Forms (ICF's)

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- Very air tight
- Very durable
- Fire proof
- Good basement for winter construction

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- Expensive
- Limited R value
- Very high embodied energy
- Extra thermal mass is not useable
- Architecturally restrictive
- Takes extra space
- Extremely hard to renovate



# SIPS

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- Shortened Construction period
- Factory Construction
- Minimal Waste
- Good for winter construction

- Expensive
- Non standard construction
- High embodied energy
- Minimal labour savings
- Not exceptionally air tight
- Hard to renovate

# Riverdale Deep Wall

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- Low incremental cost
- Follows normal construction sequence
- Can be very air tight
- Versatile
- Low embodied energy
- Same amount of dimension lumber as standard 2x6 @ 16" O.C.
- Recycled materials
- Minimal Waste

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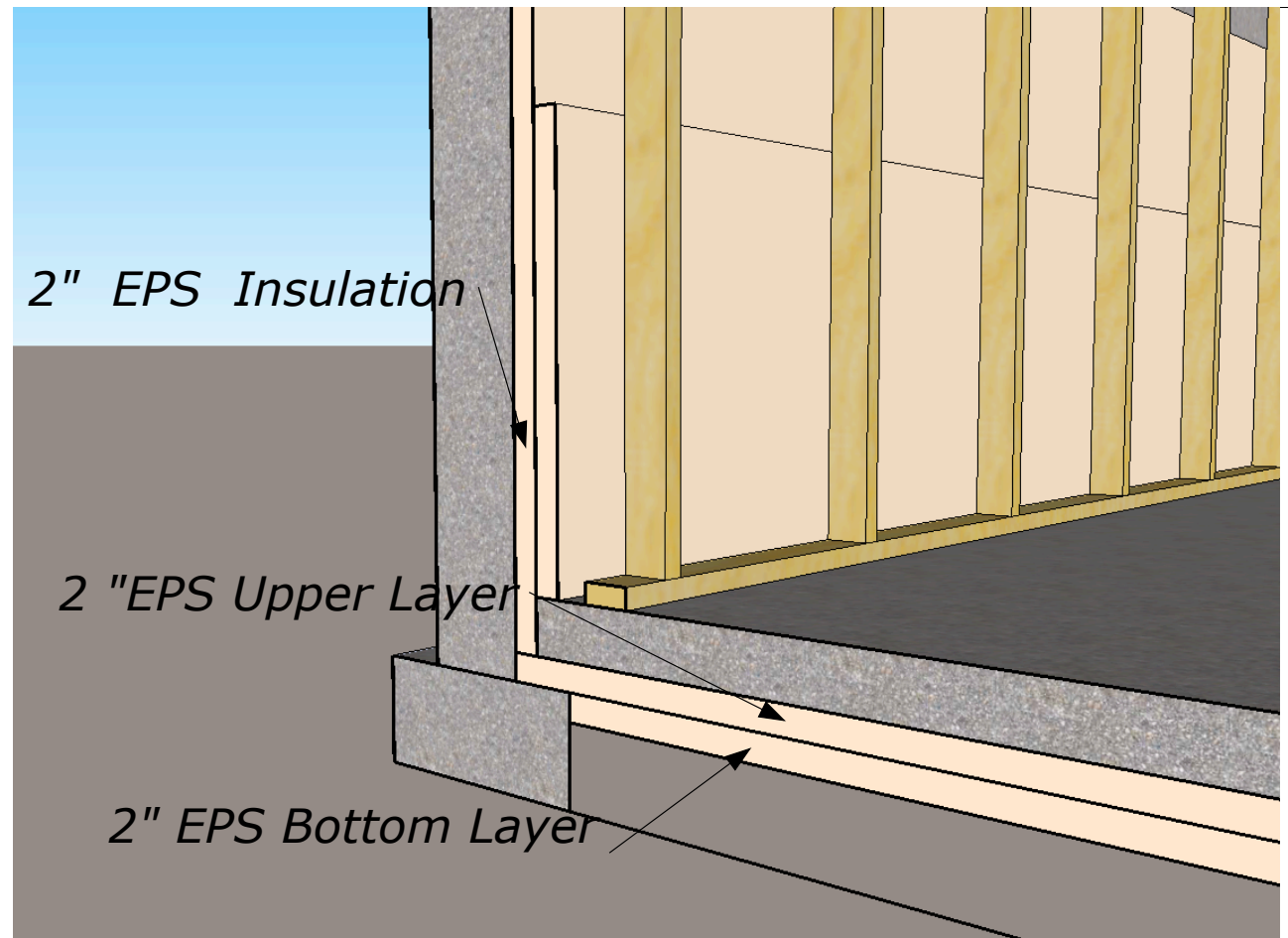
- Extra labour
- Takes extra space
- Hard to renovate



# Foundation Insulation



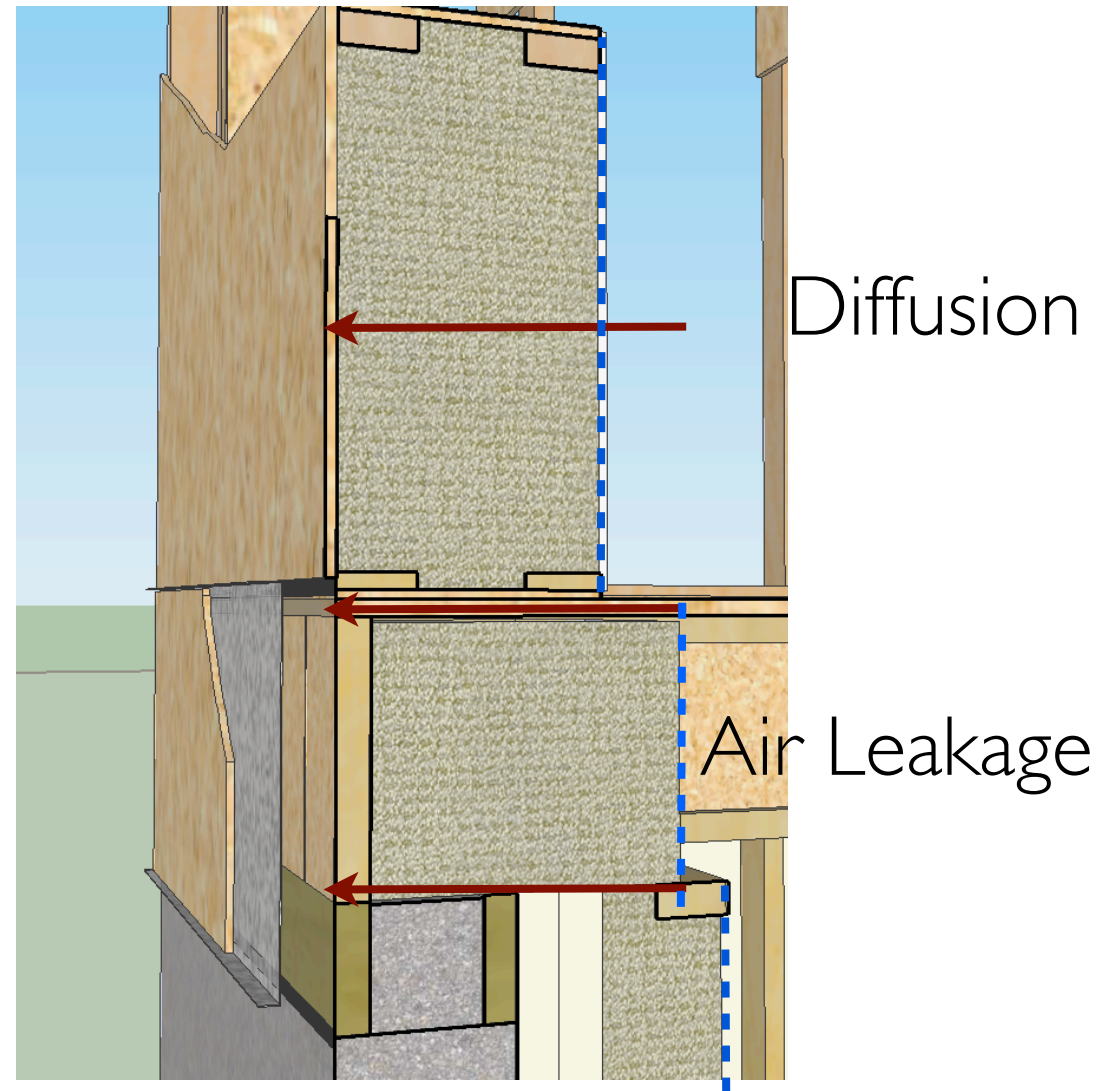
- 20 to 30% of total house heat loss can be from the basement.
- Basement walls should have almost as high R value as upper walls
- Very hard to add later



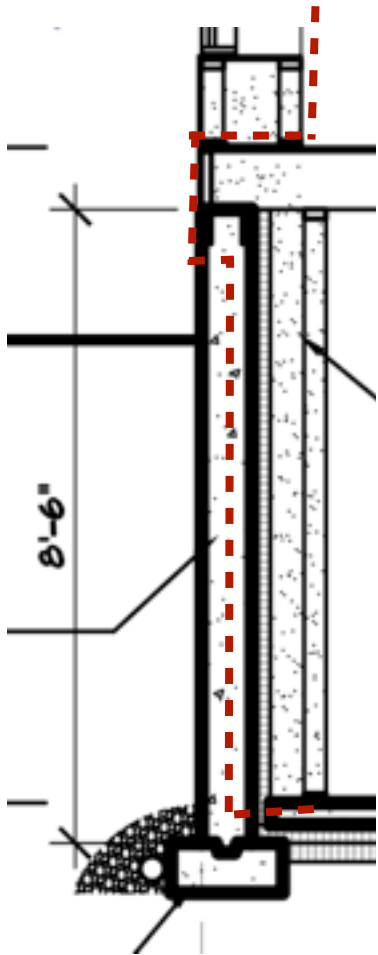
# Air Barrier vs Vapour Barrier

## Moisture Migration

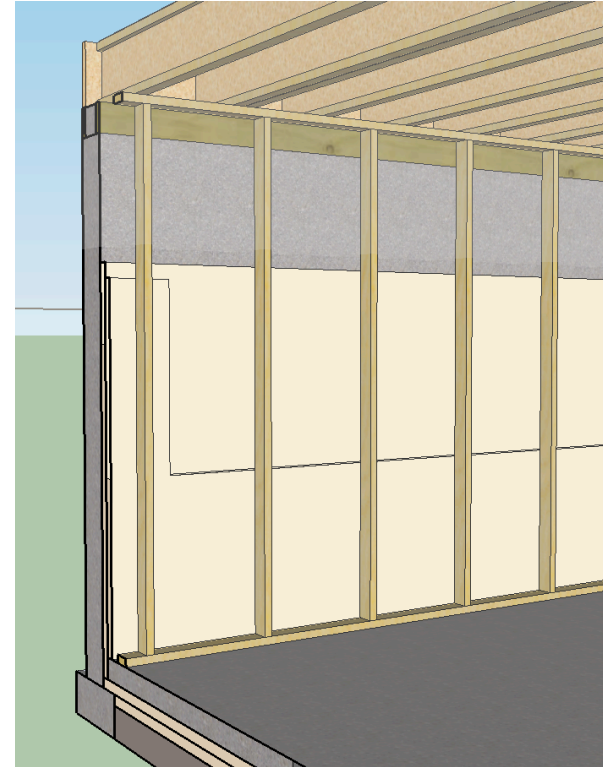
- The building code (and common sense) tells us to prevent moisture from getting into wall cavities.
- Diffusion is moisture transmission through materials with high permeability.
- Moisture migration from air leakage is about 100 times greater than from diffusion.
- Moisture carried by air leakage can build up to damaging concentrations.



# Basement Air Barrier Path



- Concrete wall is part of the air barrier
- Not as concerned with sealing basement poly





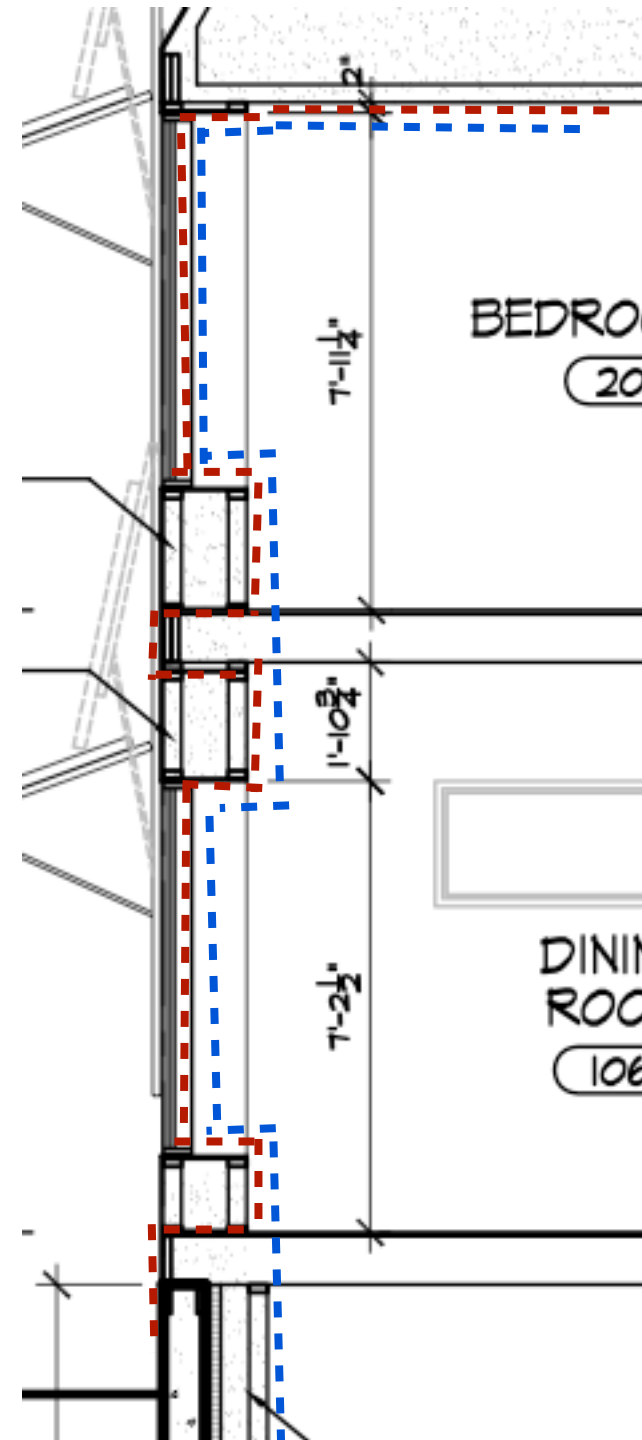
# Air Barrier Path

- Makes use of common materials
- Easiest, most opportunistic route



Air Barrier      - - - - -

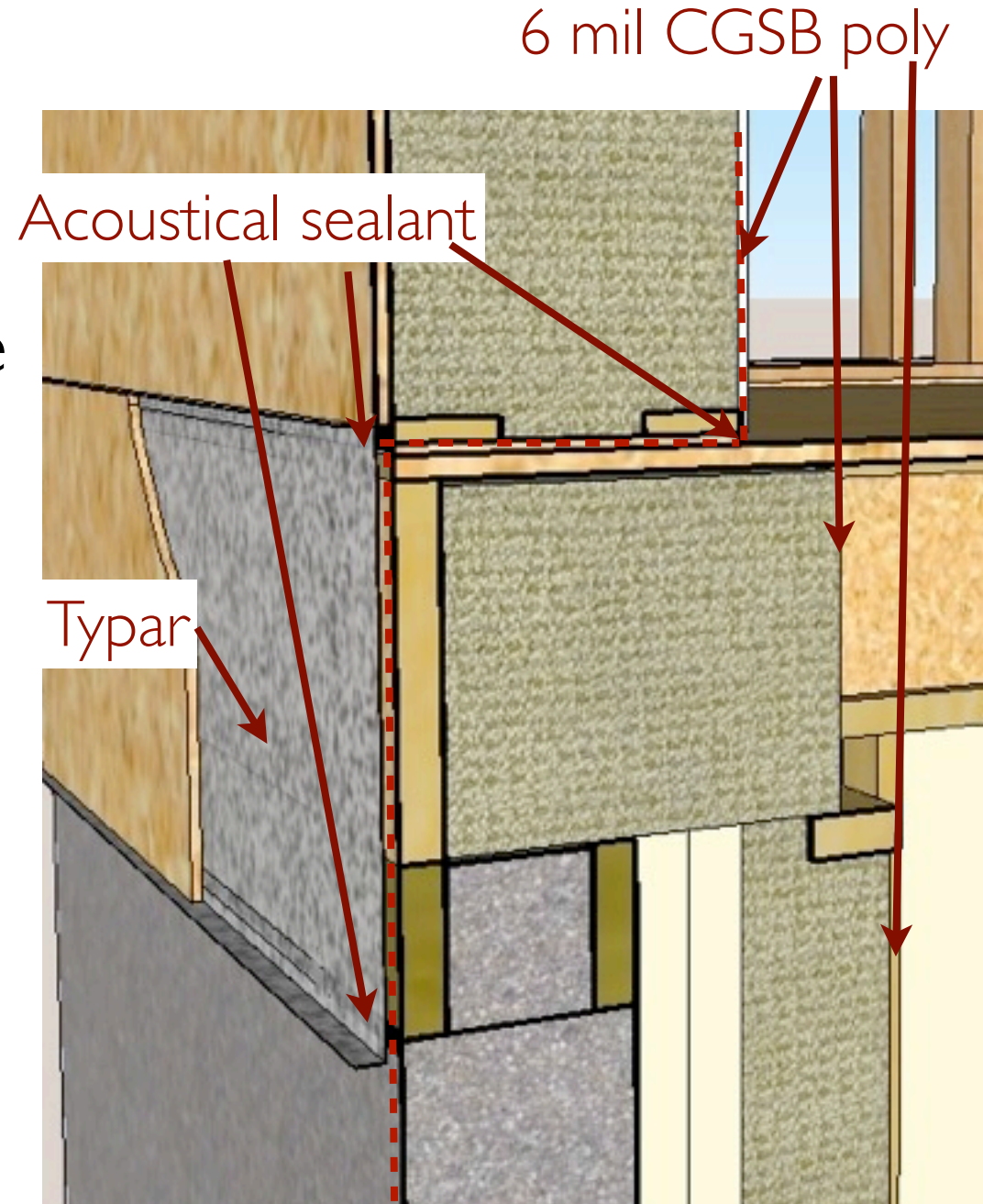
Vapour Barrier      - - - - -





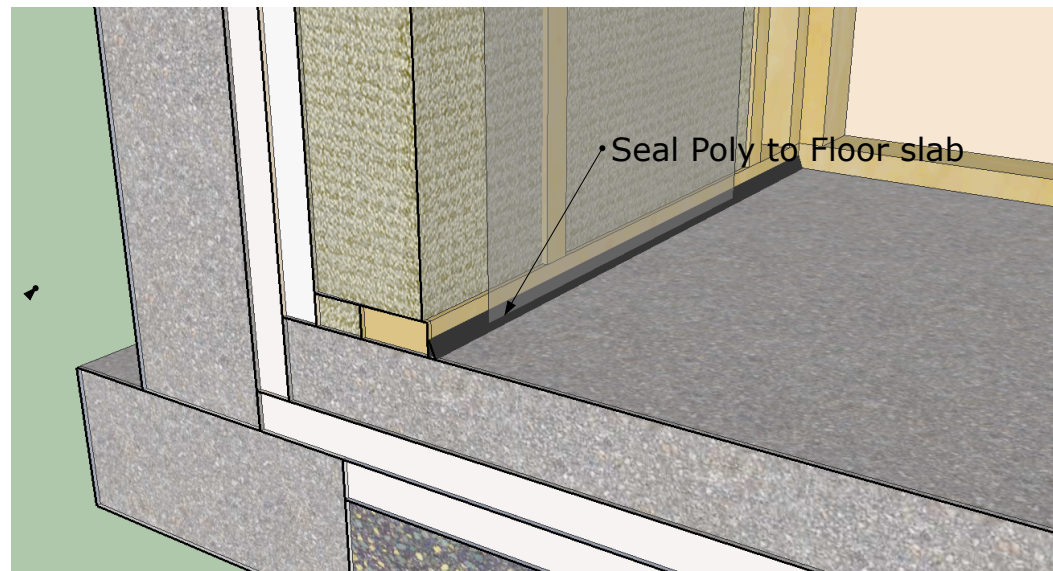
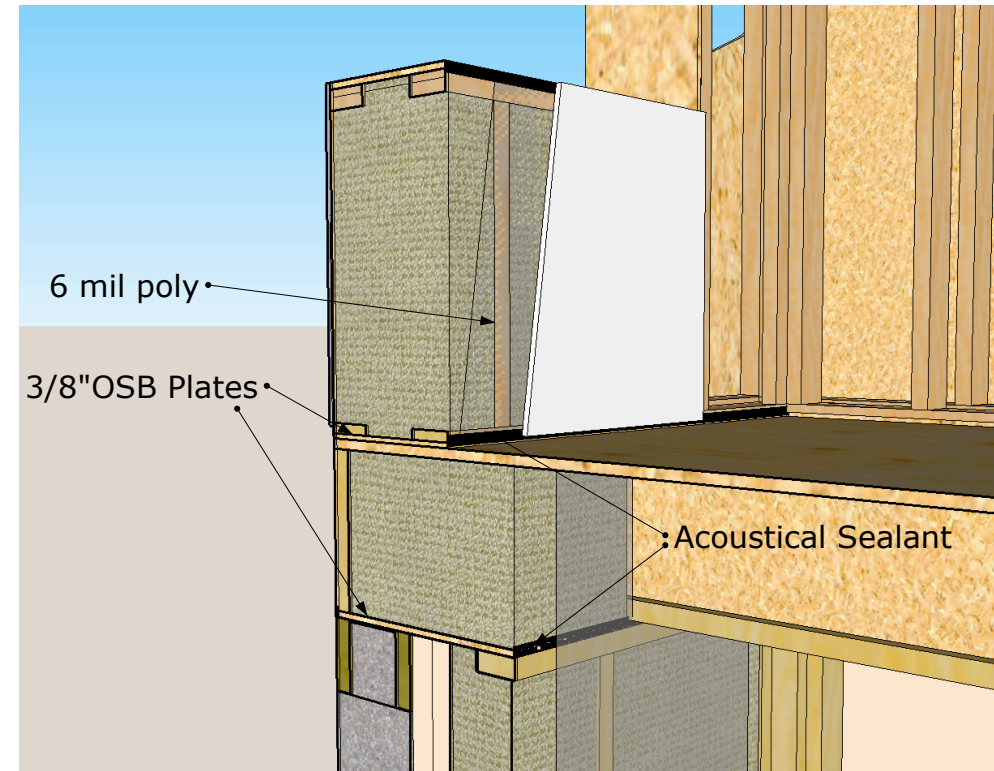
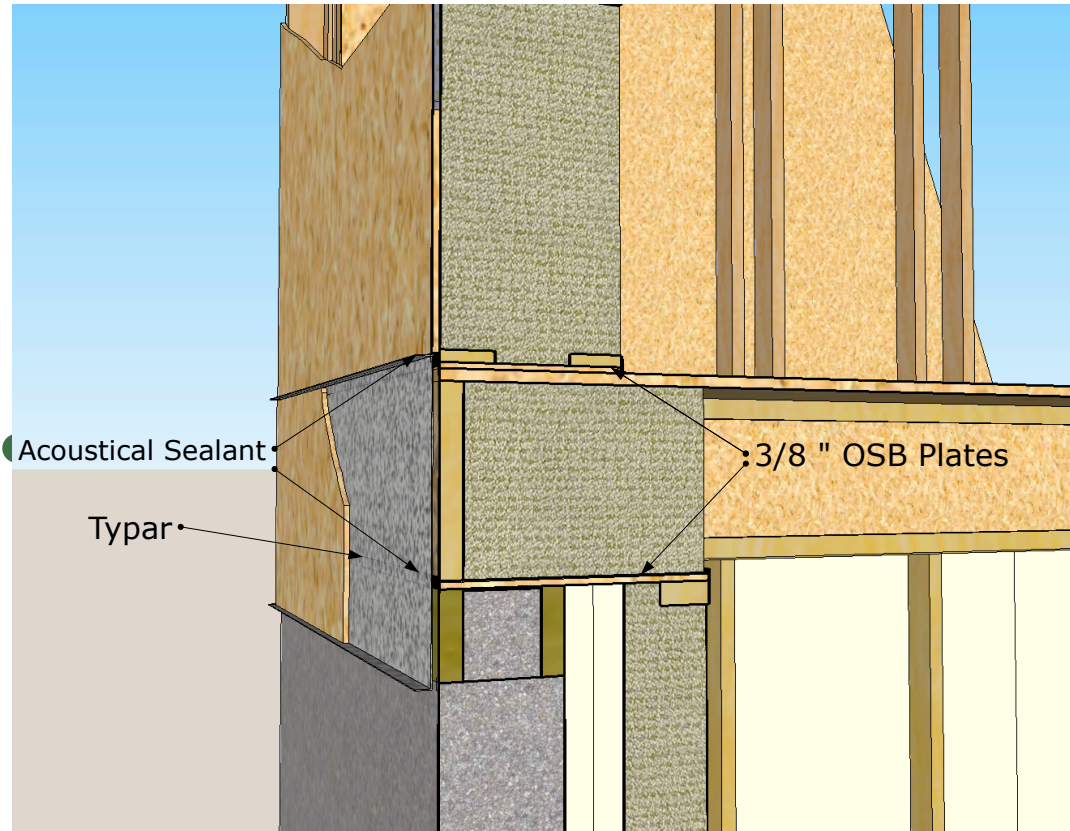
# Rim Joist Leakage

- If you do a good job on the outside you don't need to caulk between the joists on the inside





# Improved Basement Air Sealing



- Instead of relying on the concrete wall to be part of the air barrier, this approach transfers the air barrier back into the inside via the OSB plate on top of the foundation wall.
- The frost wall vapour barrier is then seal to the OSB plate at the top and the concrete slab at the bottom. Since the concrete floor is now part of the air barrier and penetrations in it should also be sealed.

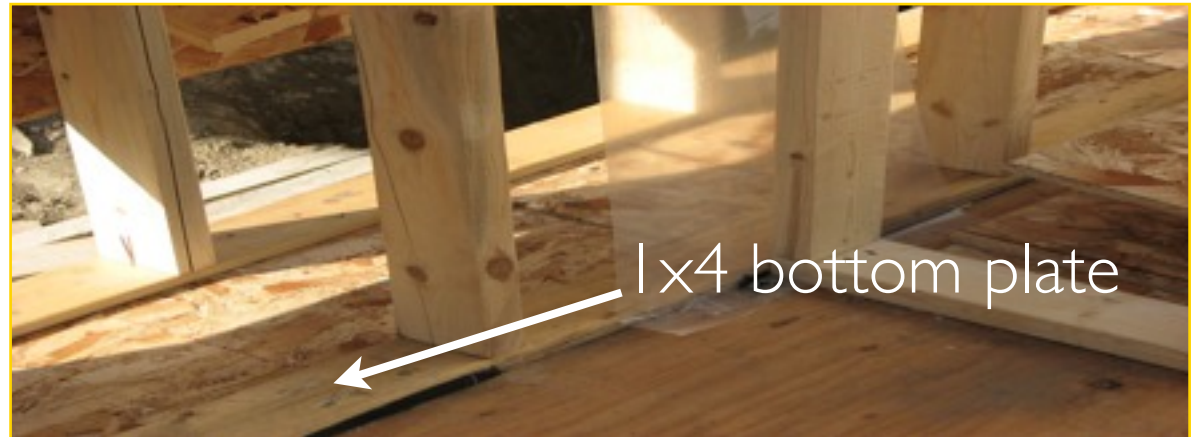


# Rim Joist Seal Application



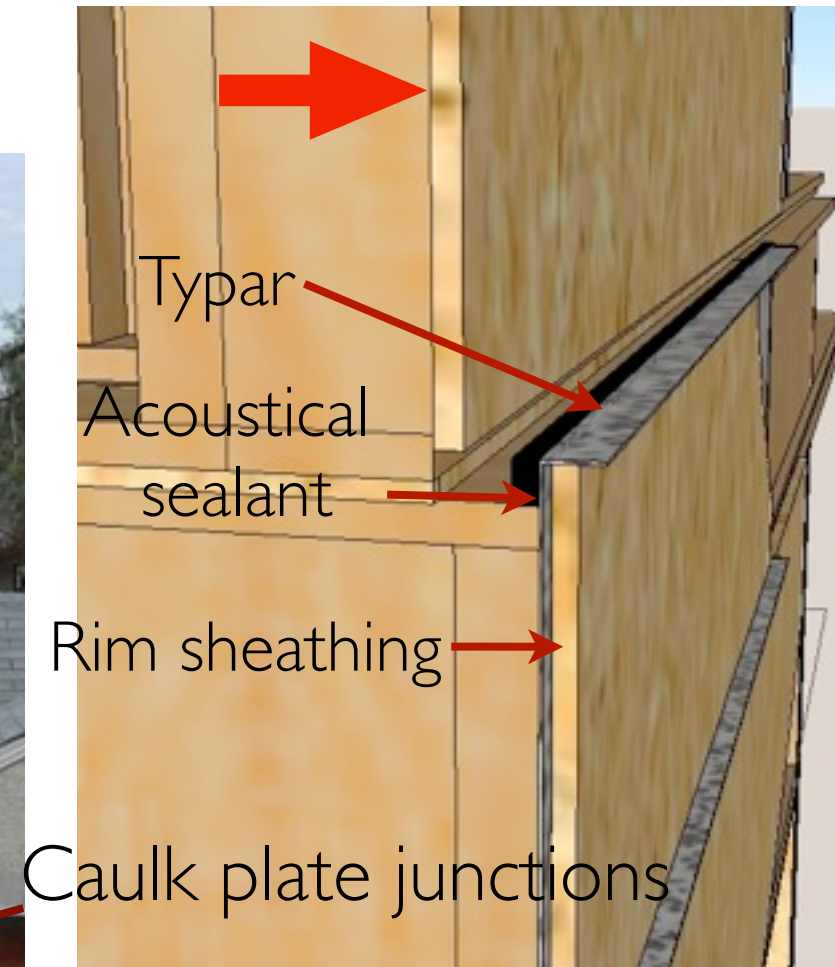
# Wall Construction

- Preassemble the plates
- Normal layout and assembly
- Align inside and outside studs.
- Outer wall is bearing
- Note 'peal and stick' on plates





# Assembly



Rim Joist Typar and  
Acoustical Sealant



# Details

- extra framing around doors
- sheathing the window openings
- headers in floor system





# More Details

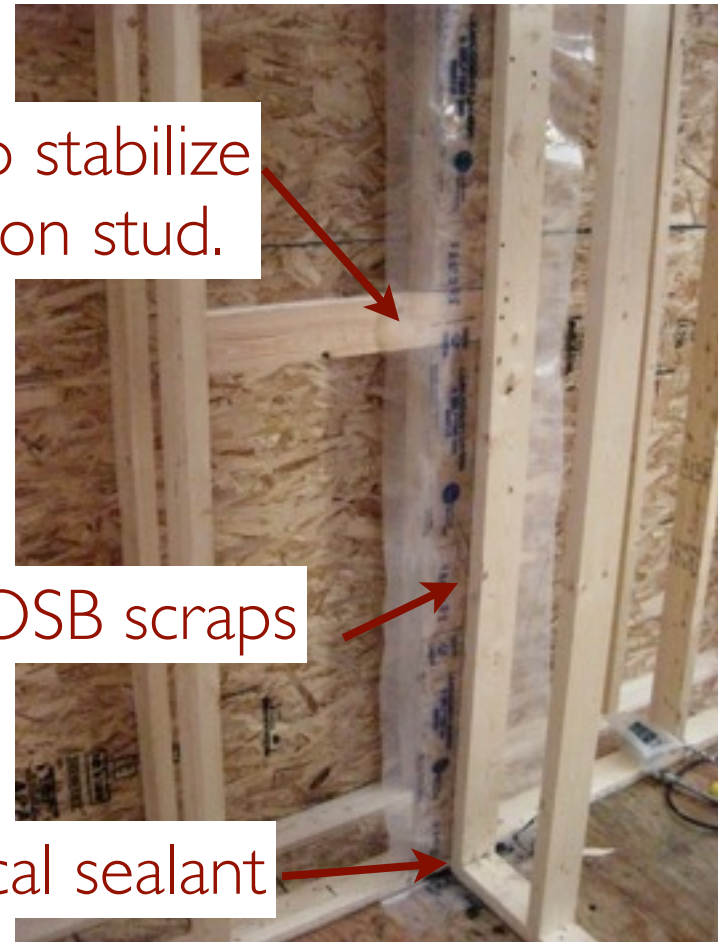
- Use up subfloor and sheathing off cuts for backing at partition intersections and ceilings
- Gussets stiffen the wall, keep it straight.

Block to stabilize  
partition stud.

OSB scraps

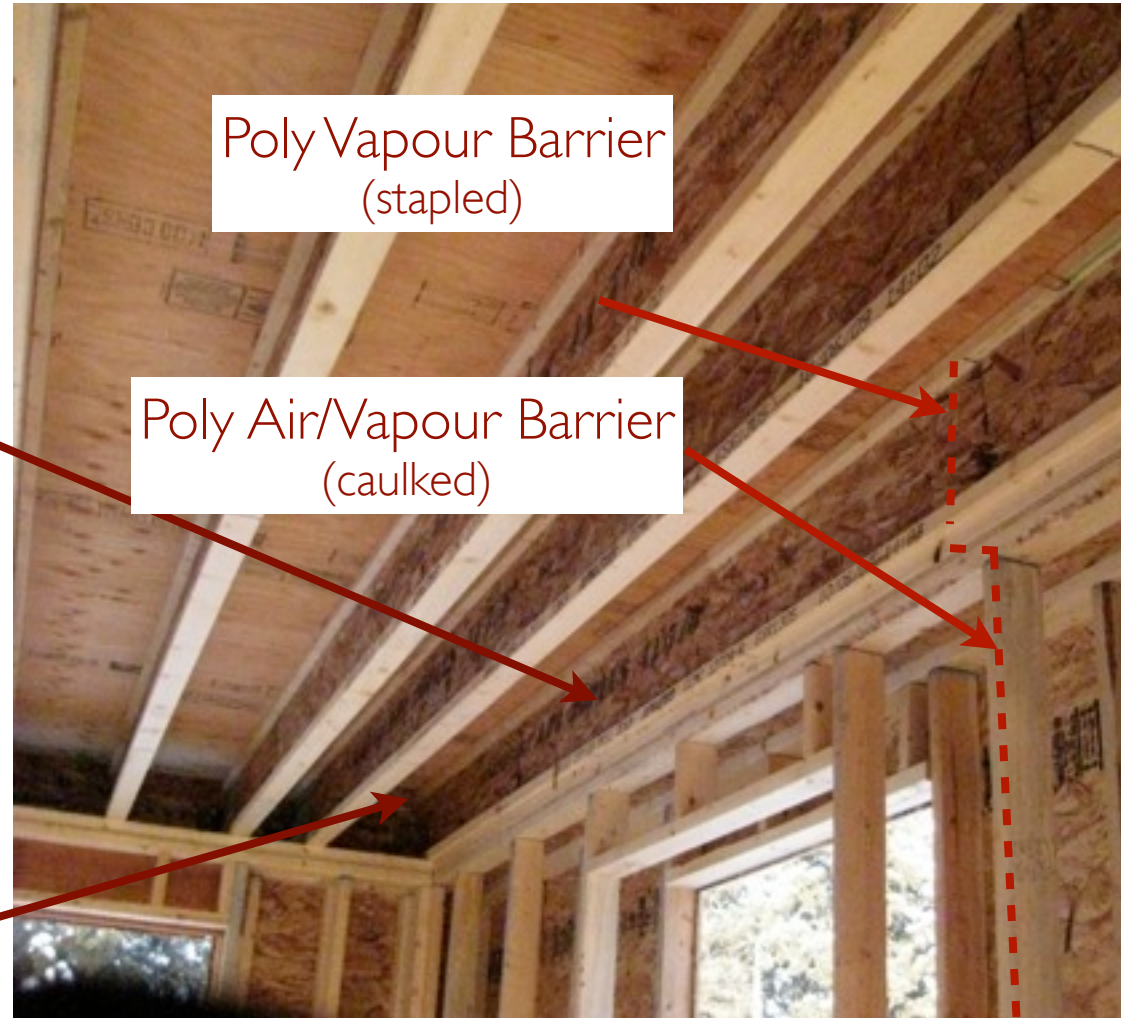
Acoustical sealant

Scrap OSB gussets



# End Joists

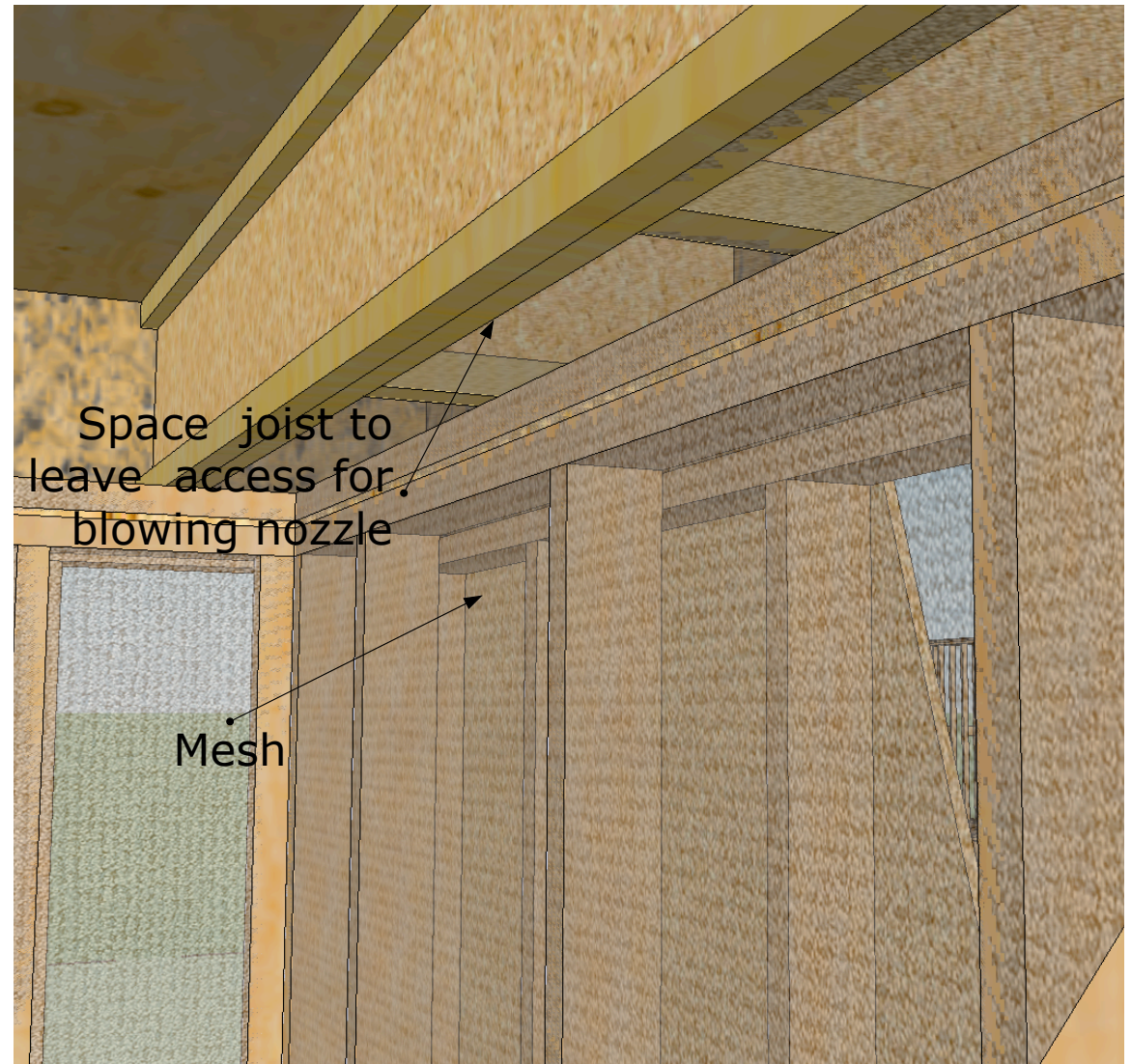
- Layout joist to create an insulation space about as thick as the wall
- Insulate cavity during framing
- Leave a full joist space next to the outside





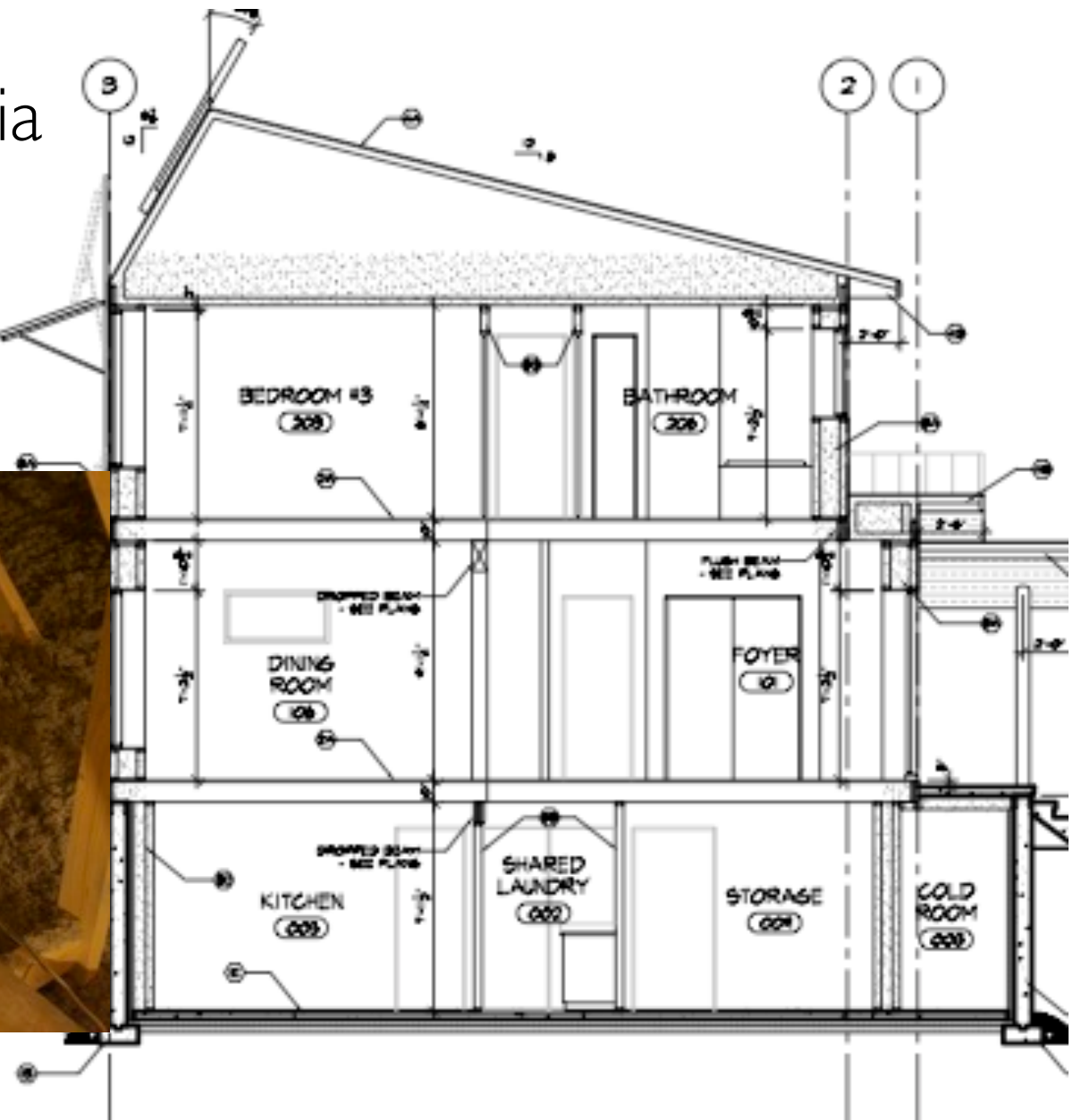
# End Joist Improvement

- Move box joist in 3" to so that the cavity can be easily filled
- Insulate cavity during framing
- Leave a full joist space next to the outside walls for



# Accommodating R90

- High heel trusses - 17" heel for 24" of insulation at Belgravia NetZero
- Consider ventilation





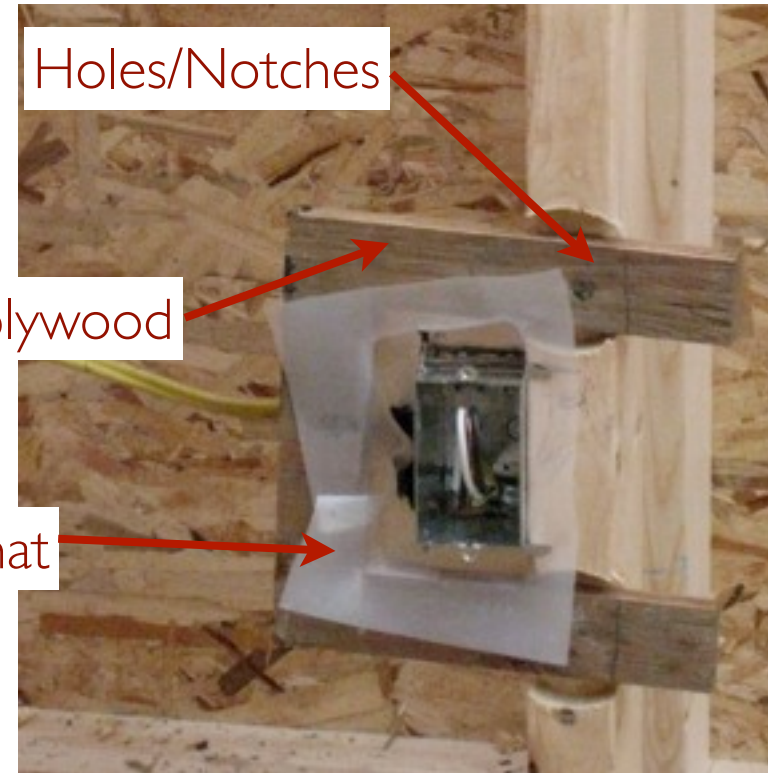
# Window Installation

- Window opening is part of the air barrier
- Need to seal joints in the OSB box.
- Seal between the window unit and box with low expanding foam or air barrier tapes
- Foam works better in warm weather



# Pre-insulation Sealing I

- Electrical boxes are very leaky.
- Worthwhile to back up the poly hat edges





# Window Installation

- Window opening is part of the air barrier
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# Improved Window Installation

- There is some concern that urethane foams become brittle with age.
- New tapes available from Europe and 3M provide durable , flexible easy to apply air sealing



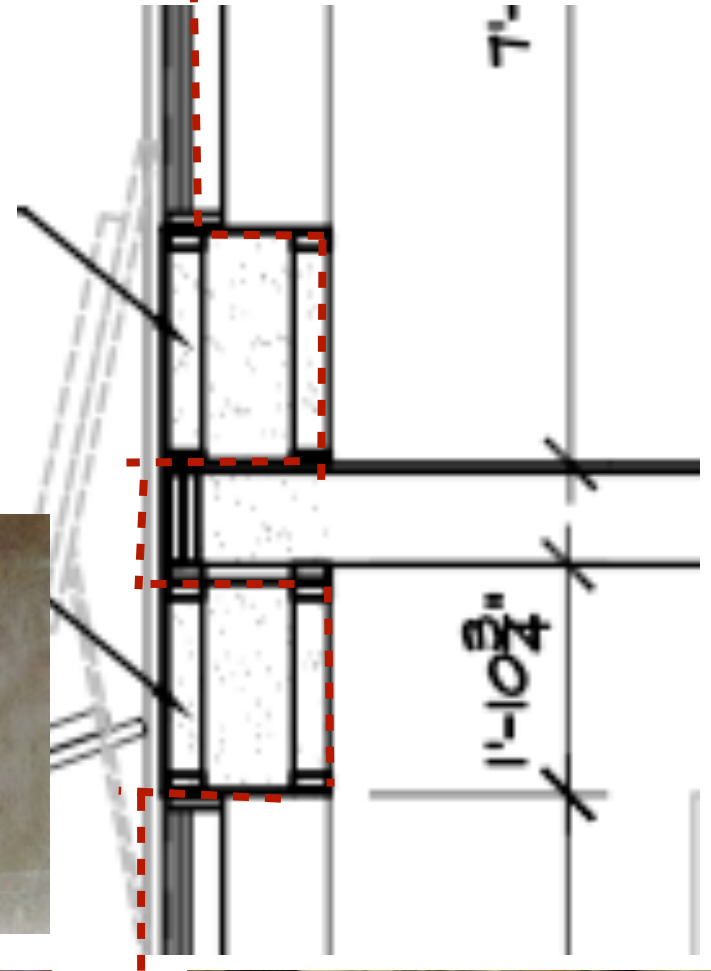
Better



Just OK

# Pre-insulation Sealing 2

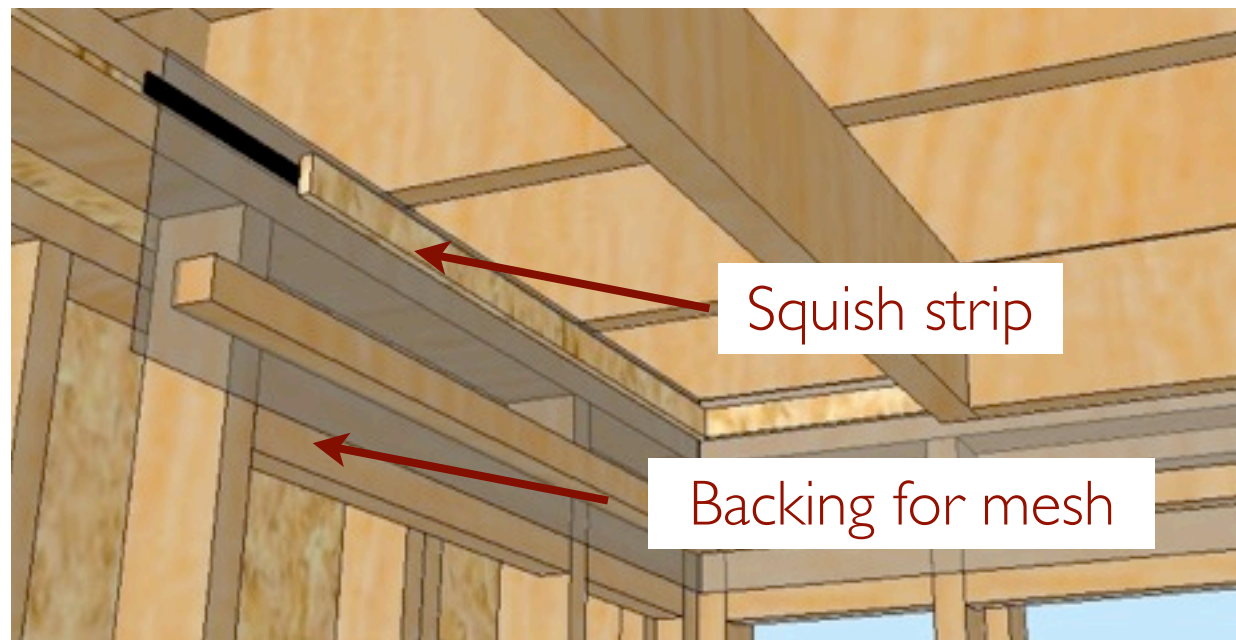
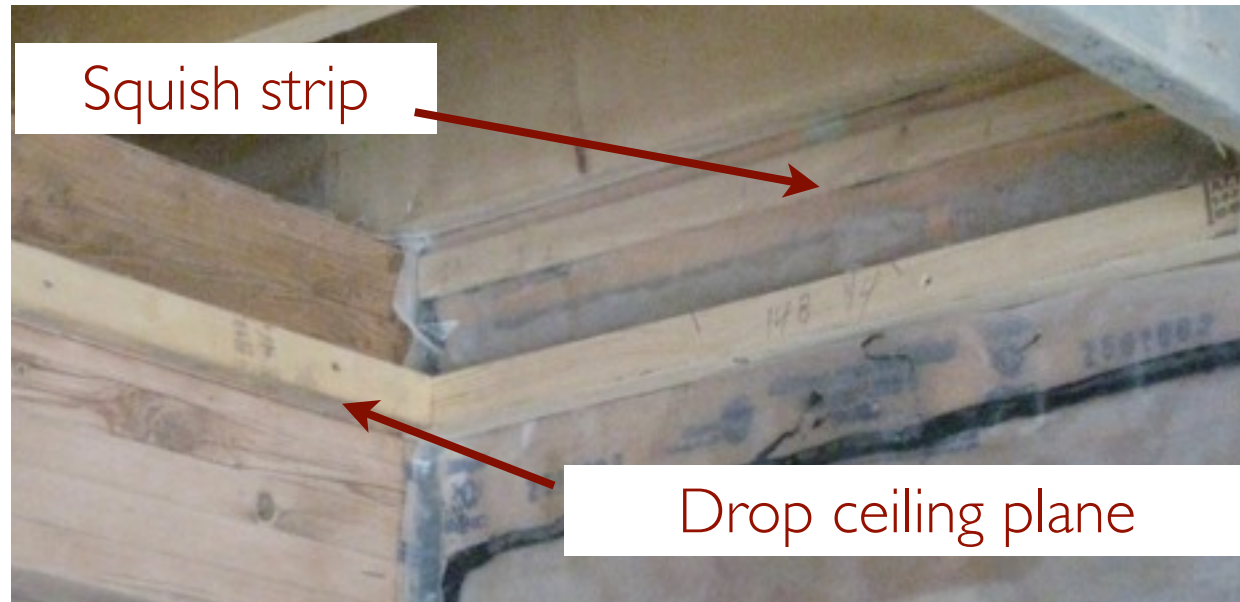
- Seal around wires and pipes where they go through the air barrier
- Provide backing for more durable seals around air barrier penetrations





# Drop Ceilings

- Need to secure poly joints that won't get drywall
- Easier to do before electrical work



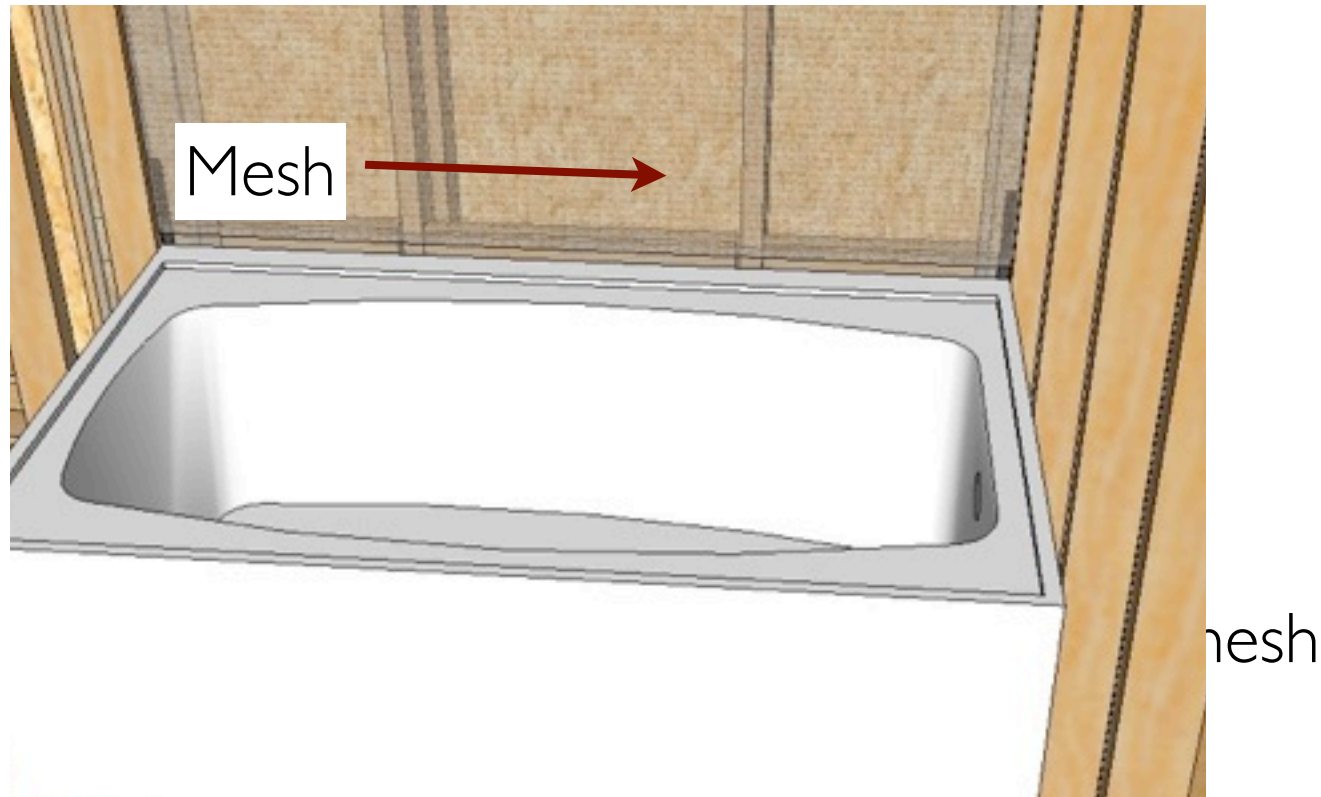
# Pot Lights

- Avoid Pot lights in insulated ceilings if you can
- “Air Tight” pot light housings aren’t
- Pre-seal with Foil Tape
- Use Poly hats with backing



# Tubs and shower preparation

- Needs to be done before plumbing rough in
- Should be done for any type of insulation





# Insulation Installation

- It is worth checking to make sure the density is fairly consistent.
- Be prepared to work with insulator on hard to access areas.



# Ceiling / Attic

- Mark insulation depth on trusses
- Use CD drywall board
- Use extra screws to fasten ceiling drywall



# Vapour Barrier

- All laps to occur on framing members or be pinched between 2 building components.
- Don't spare the acoustical sealant
- Minimize reliance on vapour barrier tape





# Rim Joist Vapour Barrier



# Attic Hatches

- Leaky attic hatches can result in ice build up in the attic



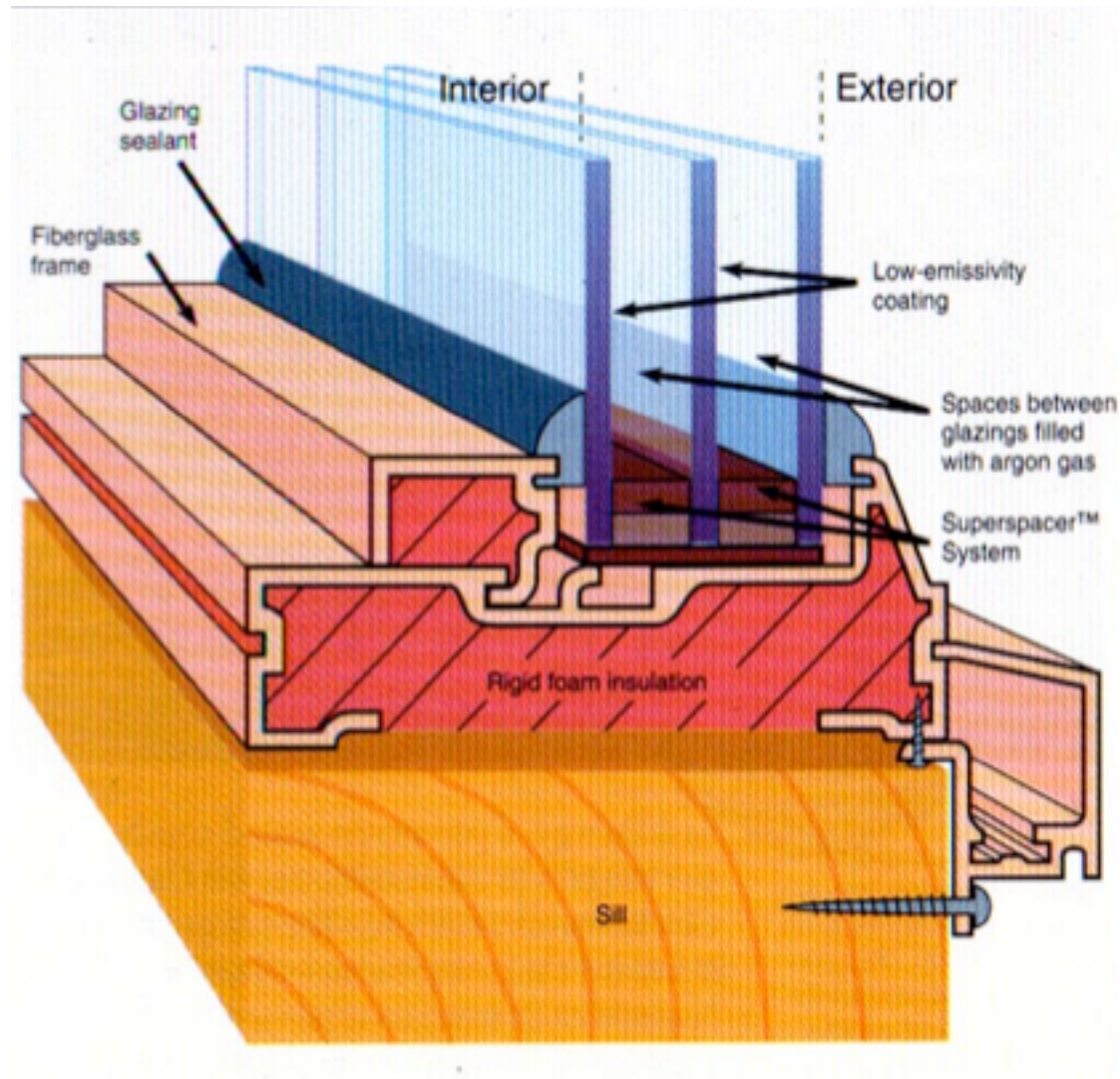


# Window Selection

- Choose glazing appropriate to orientation
- High R value on North, East and West
- High Solar Heat Gain Coefficient on south faces
- Get the best windows you can afford.
- Triple Glazed , 2 Low E, 2 Argon

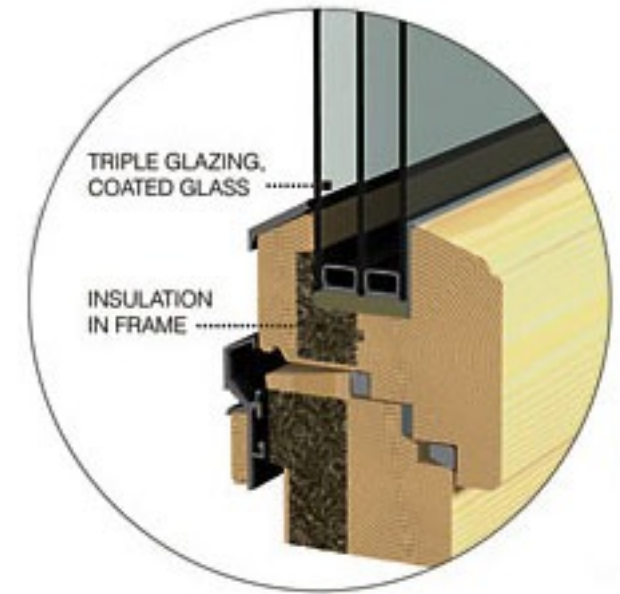
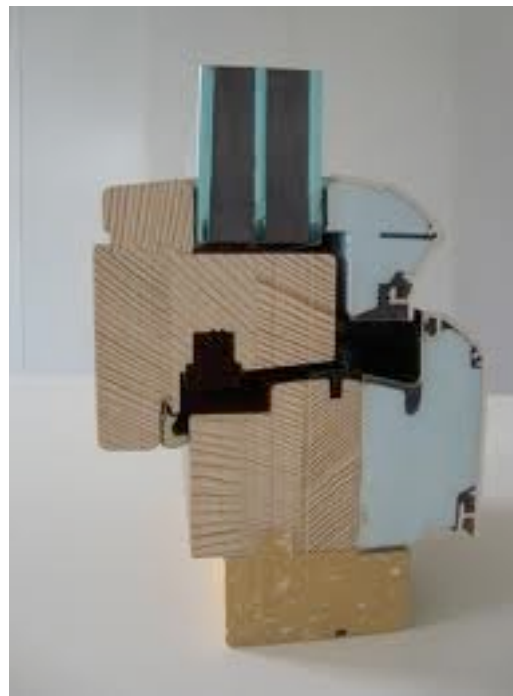


# Good Windows



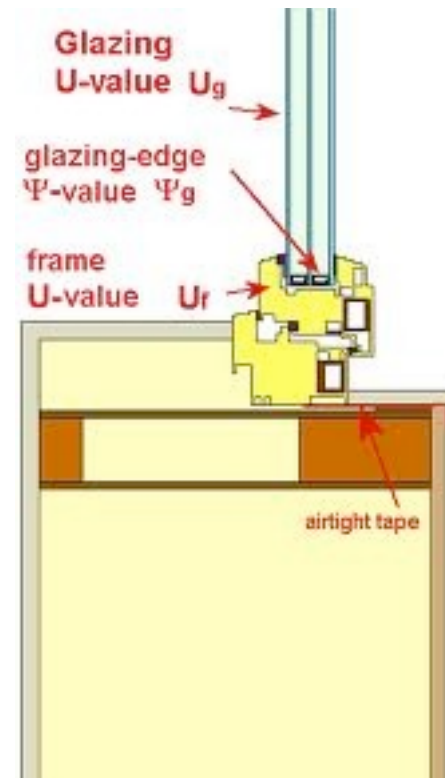
# Better Windows

- Thermally broken frames
- Low conductivity materials
- Triple weather stripping



# Better Window Installation

- Window installed back from the outside edge of the wall
- Insulate to reduce frame loss







[riverdalenetzero.ca](http://riverdalenetzero.ca)

[greenedmonton.ca/MillCreekNetZeroHome](http://greenedmonton.ca/MillCreekNetZeroHome)

[habitat-studio.com](http://habitat-studio.com)