Explaining the Thermal Bypass Checklist

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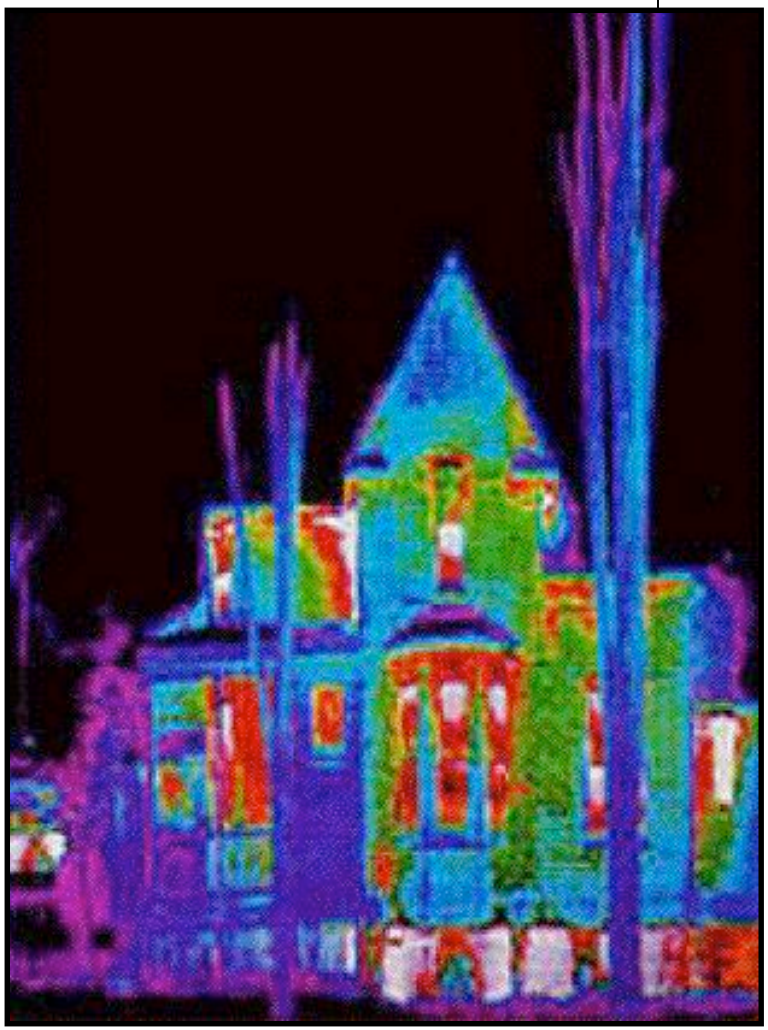


ENERGY STAR

Thermal Bypass Checklist – WHY?

ENERGY STAR is roughly doubling the number of houses verified each year, and there are now enough houses out there to see trends:

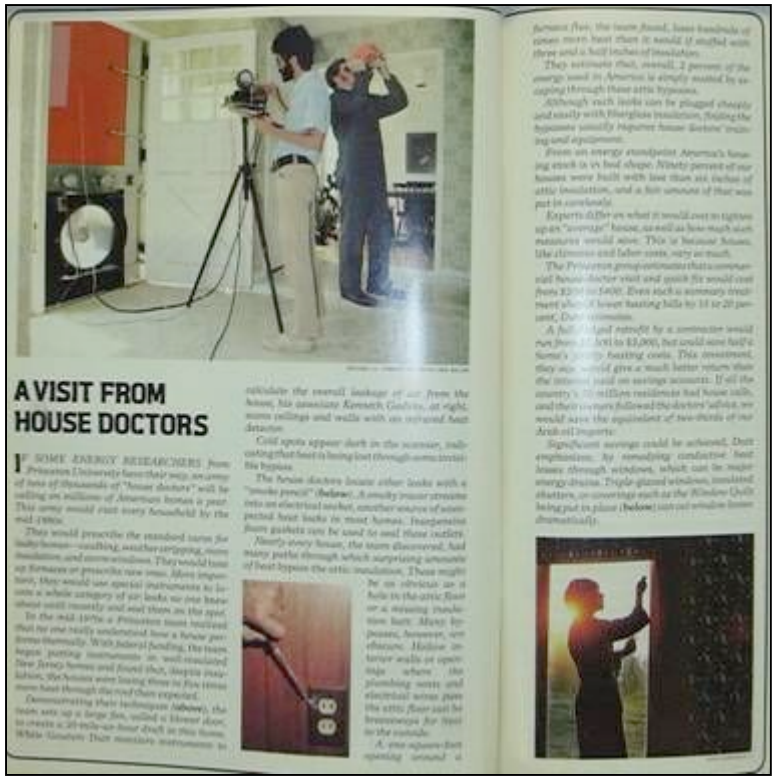
ENERGY SERVICES GROUP

GWS

Engineers Consultants Inspectors

Early History of the Bypass

During the oil embargo of early 70's, a research team at Princeton University did basic building diagnostic research. They developed the Blower Door and proved that Air Infiltration is a problem, but still had a "mystery loss". They adapted Infrared and found the "Thermal Bypass"



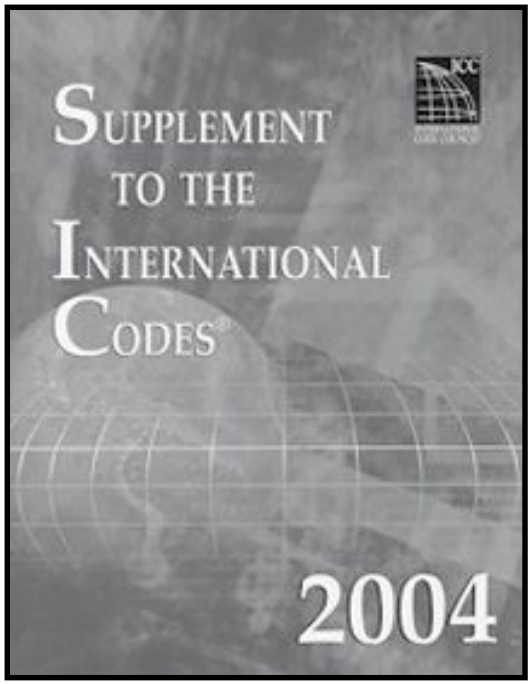
A VISIT FROM HOUSE DOCTORS

This article in the February 1981 issue of National Geographic was the first time the term was in general use.

Energy Star did their research and found that there are places where many homes, even though tight on the blower door, were not properly sealed.

They came up with the Thermal Bypass Checklist to cover these areas.

Many of the items on the TBC are required in the 2004 International Code Supplement and will be a part of the 2006 IECC



ENERGY STAR Qualified Homes
Thermal Bypass Inspection Checklist

Home Address:_____ City:_____ State:_____

Thermal Bypass	Inspection Guidelines	Rater Verified	Builder Verified
1. Air Barrier and Thermal Barrier Alignment	Insulation is installed in full contact with the air barrier to provide continuous alignment of the insulation with the air barrier	☐	☐
2. Shower / Tub at Exterior Wall	Exterior walls have been enclosed on all six sides	☐	☐
	Exterior walls have been fully insulated	☐	☐
3. Insulated Floor Above Garage	Air barrier is installed at any exposed edges of insulation	☐	☐
	Insulation is installed to maintain permanent contact with the underside of the sub-floor decking	☐	☐
4. Attic Knee Walls	Continuous top and bottom plates are installed with an air barrier on the attic side of insulated walls, including exposed edges of insulation at joists and rafters	☐	☐
	Insulation is in complete alignment with interior wall finish and the attic side air barrier	☐	☐
5. Attic Access Panel / Drop-Down Stair	Attic access panel or stair is fully gasketed for an air-tight fit	☐	☐
	Attic access panel or stair is covered with insulation that is attached and fits snugly in the framed opening	☐	☐
6. Cantilevered Floor	Air barrier spans cantilever and any exposed edges of insulation	☐	☐
	Floor framing is completely filled with insulation or insulation is installed to maintain permanent contact with the sub-floor decking	☐	☐
7. Duct Shaft	Openings to unconditioned space are sealed with solid blocking and any remaining gaps are sealed with caulk or foam	☐	☐
8. Flue Shaft	Opening around flue is fully sealed with flashing and any remaining gaps are sealed with fire-rated caulk or sealant	☐	☐
	Combustion clearance between flue and combustible materials (e.g., OSB) are properly closed with UL- approved metal collars	☐	☐
9. Piping Shaft / Penetrations	Opening is fully sealed as required with flashing and any remaining gaps are sealed with caulk or foam	☐	☐
10. Dropped Ceiling / Soffit	Air barrier is fully aligned with insulated framing and any gaps are fully sealed with caulk, foam, or tape	☐	☐
11. Fireplace Wall	Air barrier is fully aligned with insulated framing in framed shaft behind fireplace and any gaps are fully sealed with caulk, foam, or tape	☐	☐
12. Staircase Framing at Exterior Wall / Attic	Air barrier is fully aligned with insulated framing and any gaps are fully sealed with caulk or foam	☐	☐
13. Recessed Lighting	Airtight IC-rated recessed light fixtures are sealed to drywall with gasket, caulk, or foam	☐	☐
14. Porch Roof	Air barrier is installed at the intersection of the porch roof and exterior wall	☐	☐
15. Whole-House Fan Penetration at Attic	An insulated cover is provided that is gasketed or sealed to the opening from either the attic side or ceiling side of the fan	☐	☐
16. Common Walls Between Dwelling Units	Air barrier is installed to seal the gap between a gypsum shaft wall (i.e., common wall) and the structural framing between units in duplex and townhouse construction	☐	☐

Home Energy Rating Provider:_____ Builder Company:_____
Home Energy Rater Company:_____ Builder Employee Signature:_____
Home Energy Rater Signature:_____ Inspection Date:_____
Inspection Date:_____ Re-Inspection Date:_____

The Thermal Bypass Checklist is a list of 16 items that must be completed in each ENERGY STAR home.

1) Air barrier and Thermal Barrier in Alignment

Insulation is installed in full contact with the air barrier to provide continuous alignment of the insulation with the air barrier

1) Air barrier and Thermal Barrier in Alignment

2) Shower/tub at exterior wall

Exterior walls have been enclosed on all six sides and exterior walls have been fully insulated

2) Shower/tub at exterior wall

To ensure comfort it is very important to
make sure there are no leaks in walls behind the tubs

We find this to be a very serious problem

2) Shower/tub at exterior wall

Packed out wall at head of tub open to attic.

Tub and shower open to attic behind.

¼” strips added to make sheetrock line up with tub flange – ¼” slot at top of wall.

2) Shower/tub at exterior wall

Soaking tub base open to knee wall attic

Sealed tight

3) Insulated floor above garage

Air barrier is installed at any exposed edges of insulation and insulation is installed to maintain permanent contact with the underside of the floor sub floor decking.

3) Insulated floor above garage

Air dams at both ends of open joists under room over garage

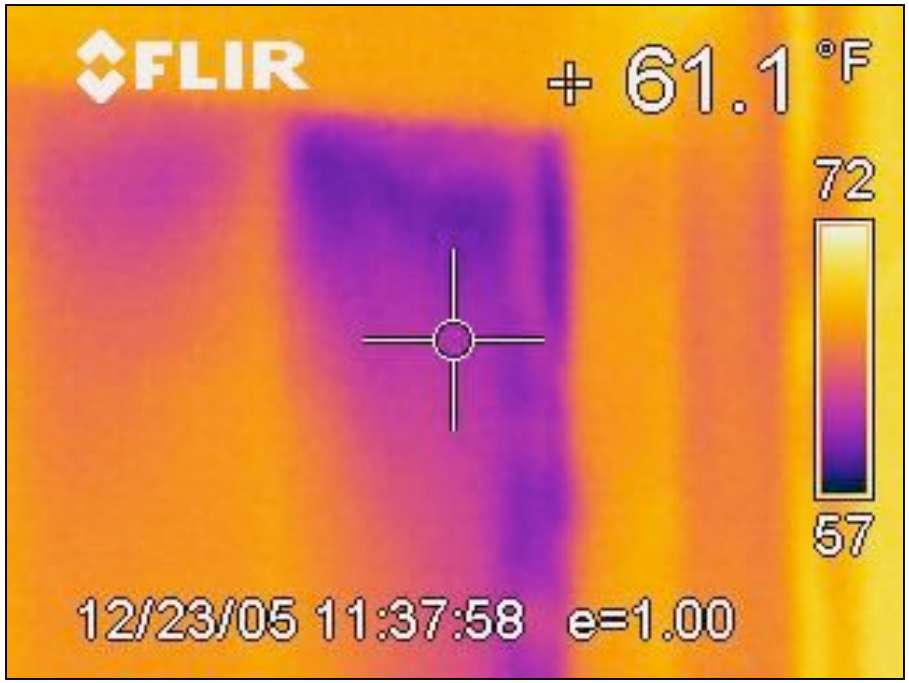
Air dams under exterior wall of room above garage

3) Insulated floor above garage

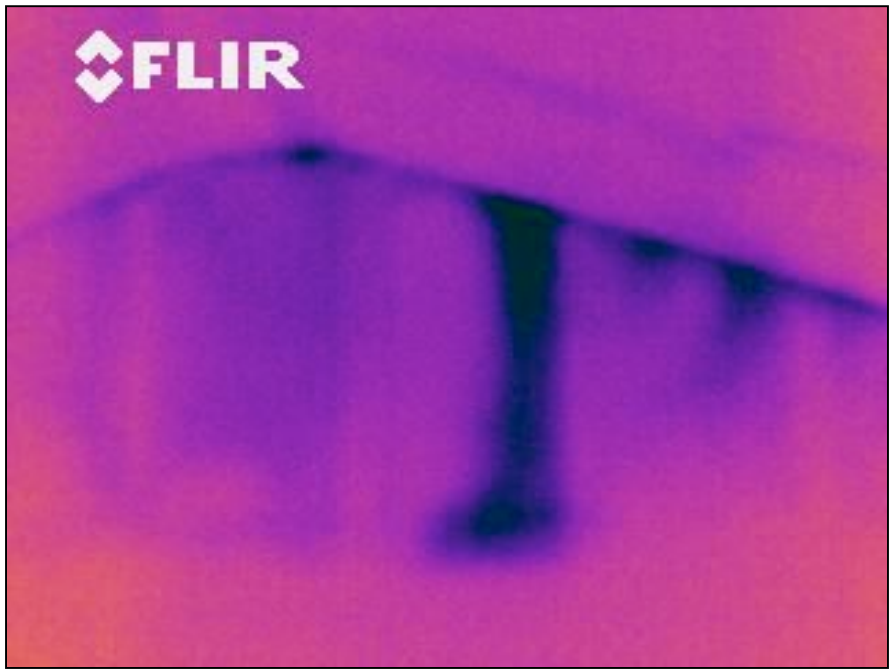
Improper insulation!
It must touch the surface it is intended to insulate

4) Attic Knee Walls

Continuous top and bottom plates are installed with an air barrier on an attic side of insulated walls, including exposed edges of insulation at joists and rafters, and insulation is in complete alignment with the interior finish and the attic side air barrier.



Batt falling from back of wall



Small gable party wall showing batt falling off the back of wall

4) Attic Knee Walls

Kneewall Open to Attic Rafters

Short Kneewall Covered

Tall Kneewall Covered

Kneewall Covered at Attic, Not Heated Space

4) Attic Knee Walls

Air damming of the floor cavity below a kneewall.

6th side on the wall above.

Sealed Tight.

4) Attic Knee Walls

Joist cavity open to attic on 2 sides - sealed tight.

Looking into the second floor kneewall joist cavity.

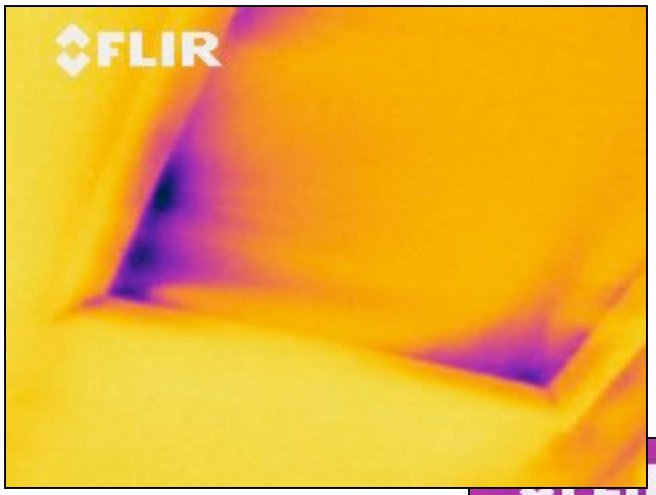
4) Attic Knee Walls

Tightly sealed ductwork.

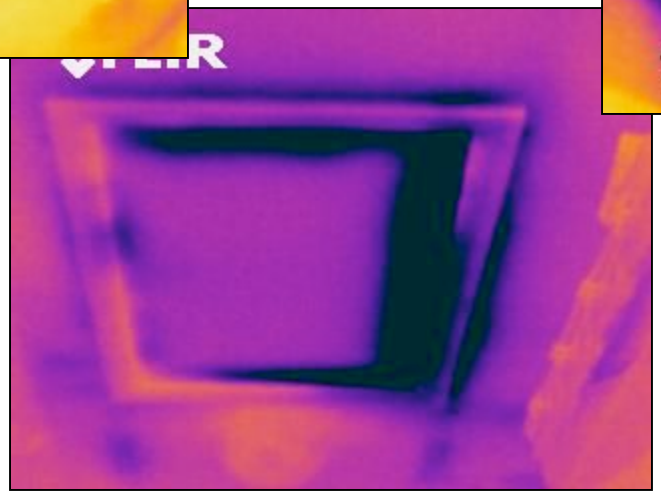
Looking from an attic kneewall into joist cavity.

5) Attic Access Panel/ Pull Down Stair

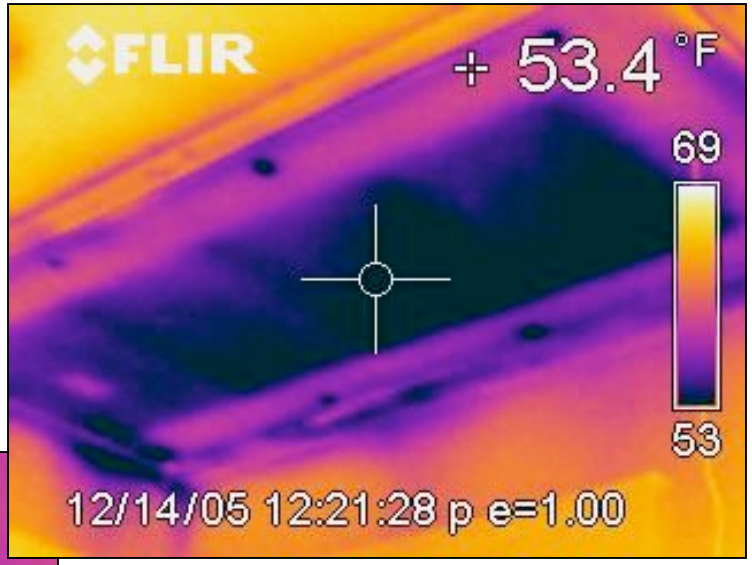
Attic access panel or stair is fully gasketed for an airtight fit, and covered with insulation that is attached and fits snugly in the framed opening



Attic hatch with no gasket.



Attic hatch with too small batt.



Pull down stair showing structural framing and bolts, no insulation - very difficult to gasket durably, and impossible to insulate adequately.

5) Attic Access Panel/ Pull Down Stair

Wrong way to insulate - air barrier and insulation not aligned.

Self-stick gasket material.

Insulation installed to edge of hatch cover.

6) Cantilevered Floor

Air barrier spans cantilever and any exposed edges of insulation, and floor framing is completely filled with insulation or it is installed to maintain permanent contact with sub floor decking.

Three bay windows and a rear overhang.

Two bay windows, a fireplace and rear overhang.

6) Cantilevered Floor

Cantilevered floor not sealed and not insulated properly.

Cantilever before siding – “j” channel will hide this.

6) Cantilevered Floor

Tight seal - now insulation will be installed full-depth.

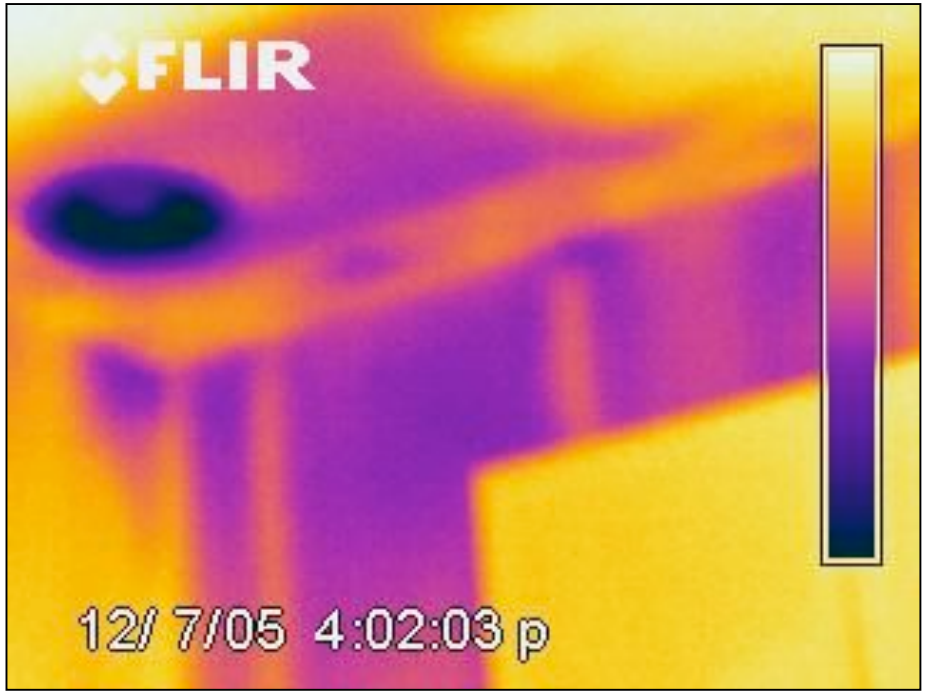
Daylight showing leaking cantilever.

6) Cantilevered Floor

Insulation - full depth of floor joist.

Alternative - overhang sealed and insulated first, then air dam sealed tight. In small overhangs, this tends to make floor colder.

7,8) Duct, Piping, Flue Shaft Penetrations
Opening is fully sealed with solid blocking, flashing foam and caulk, and clearance between flue and combustibles is properly closed with UL approved collars and sealed with fire-rated sealant.



Chase open from attic into interior wall.

Typical chase, no metal collar at flue with improper flue clearance to OSB.

7,8) Duct, Piping, Flue Shaft Penetrations

The mother of all chases.

9) Attic Eaves

Solid baffles are provided at framing bays to avoid wind washing of insulation.

10) Dropped Ceiling / Soffit

Duct soffit sealed with styrofoam and foam.

Kitchen soffit sealed with styrofoam and foam.

10) Dropped Ceiling / Soffit

Archway between 2 rooms forming ‘soffit’ - sealed inside with foam.

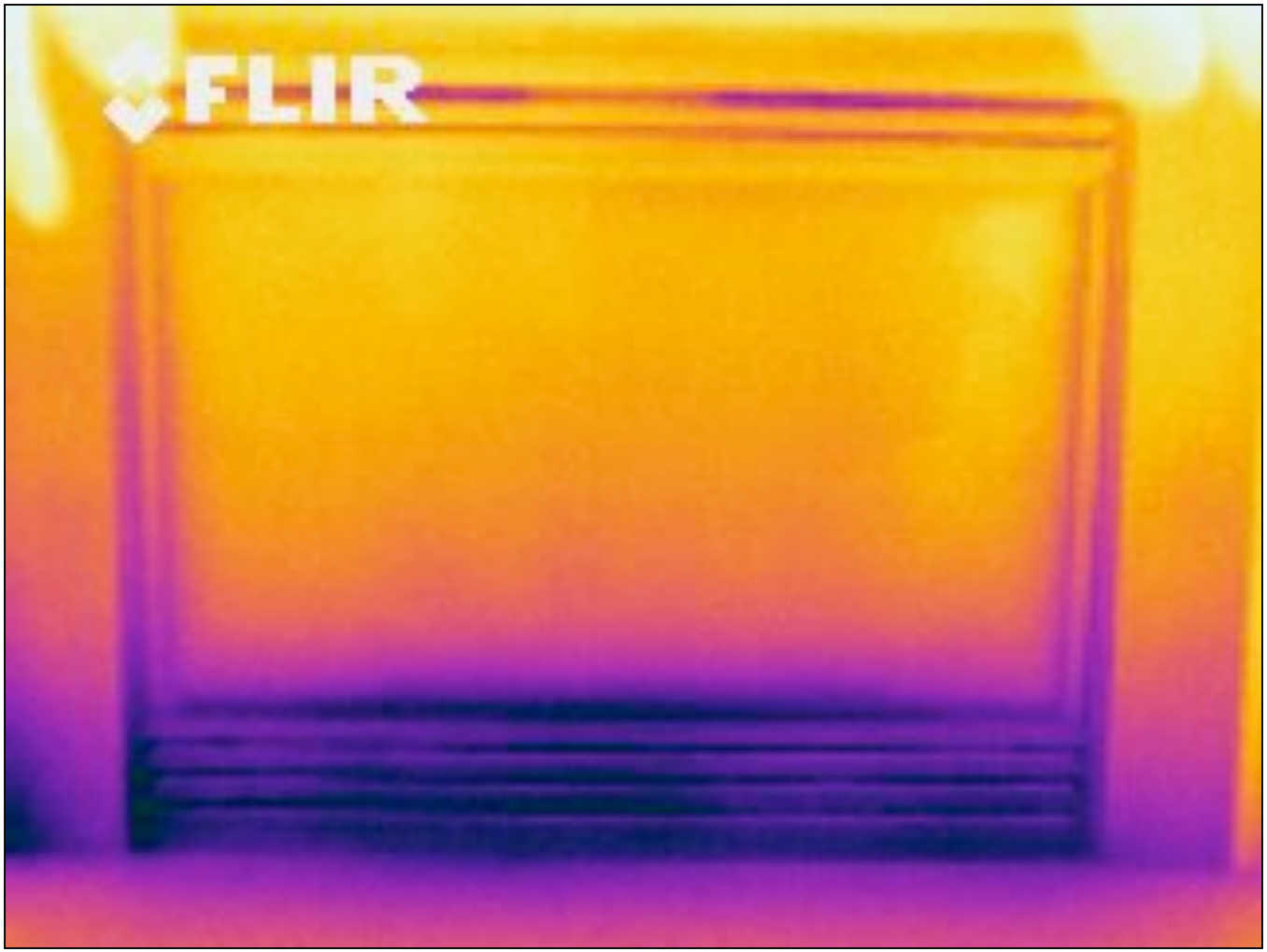
Kitchen soffit sealed at joist level with styrofoam & foam.

10) Dropped Ceiling / Soffit

Very difficult soffit - under heated space and open to unheated space. Duct is insulated ‘outside’ and not ‘inside’, wire runs ‘outside’ to ‘inside’. No thermal envelope.

11) Fireplace Wall

Air barrier is fully aligned with insulated framing in framed shaft behind fireplace, and any gaps are fully sealed with caulk foam, or tape.



11) Fireplace Wall

Typical fireplace chase. Treat this area like a little room. Every surface should be sealed & insulated.

Piece of Thermo-Ply, sheet metal, drywall, or other rigid material cut to fit, and installed with R-30 above.

11) Fireplace Wall

Seal every crack and hole in the chase.

Insulate the walls. ceiling is already done and under the floor will be insulated from the basement.

11) Fireplace Wall

Seal the flange at framing.

Seal the flue to the flange.

11) Fireplace Wall

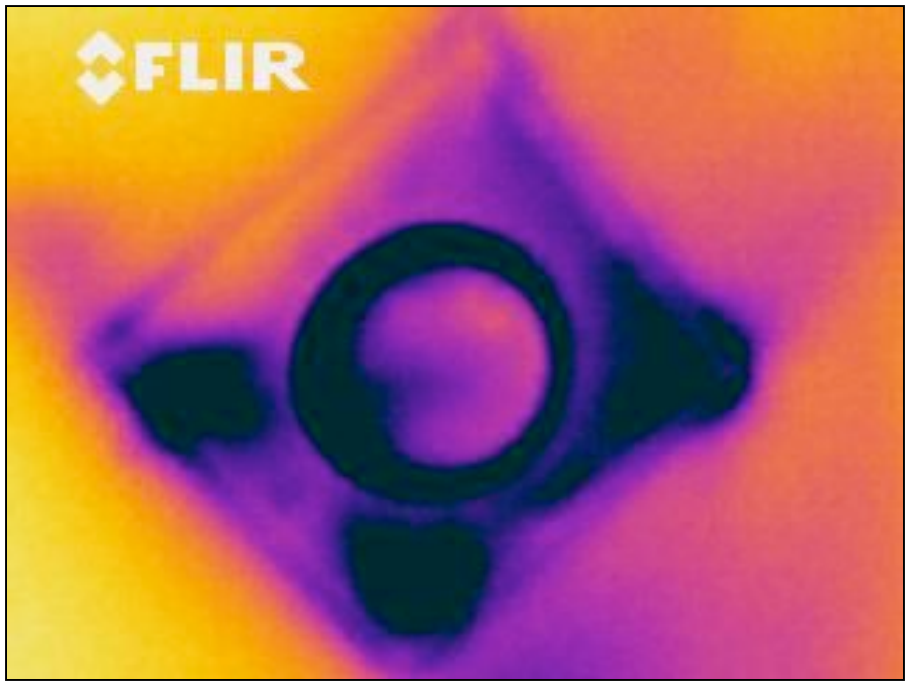
Wood burning fireplace -
3/4” furring strips open
to attic above

12) Staircase Framing at Exterior Wall/Attic
Air barrier is fully aligned with insulated framing and any gaps are fully sealed with caulk or foam.

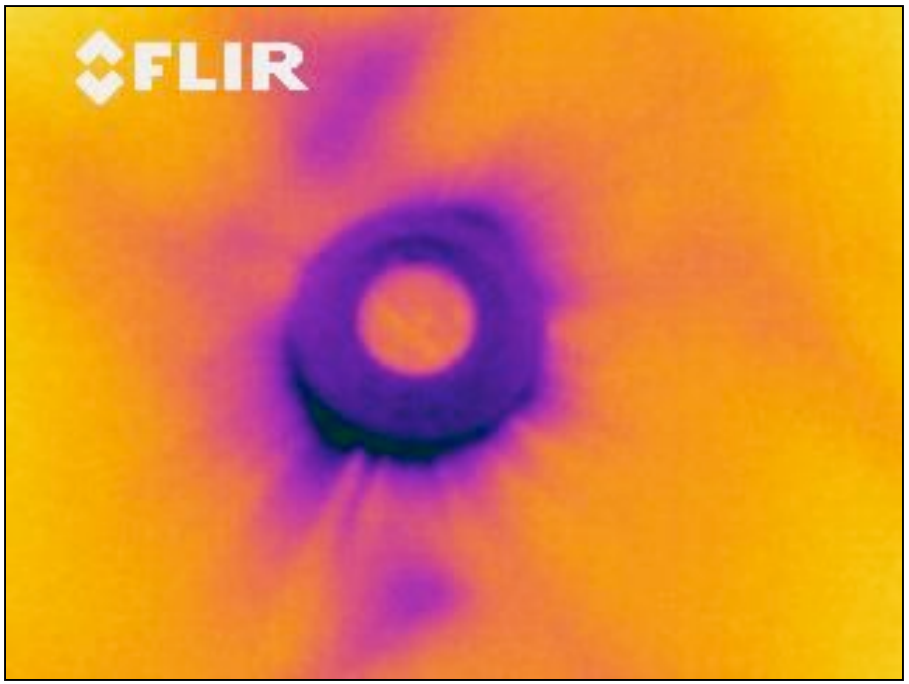
Stair to third floor open to kneewall and interior wall.

13) Recessed Lighting

Airtight IC-rated recessed light fixtures are sealed to drywall with gasket, caulk, or foam.

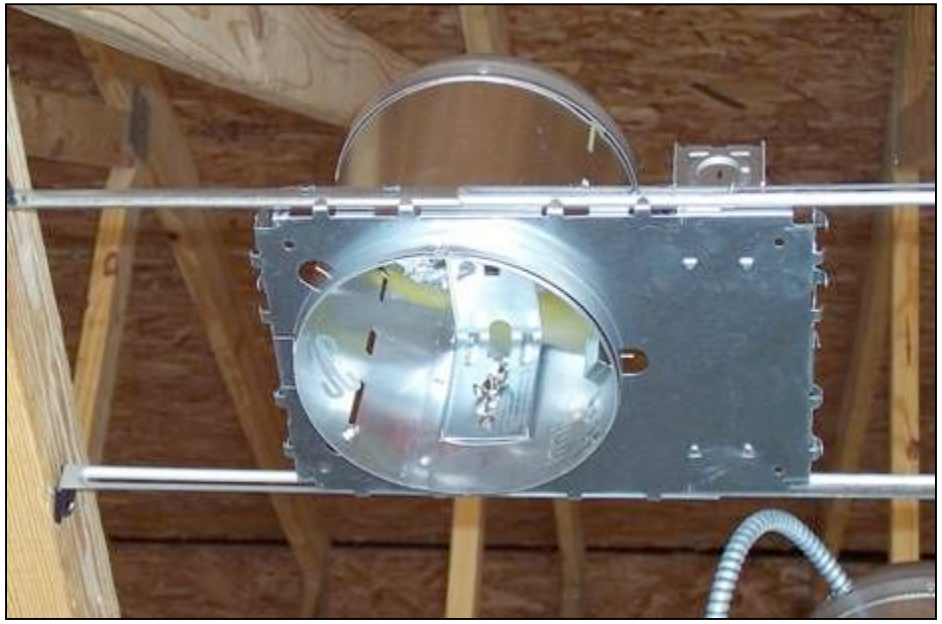


Poor insulation of an IC light.



Blower Door shows air leakage at drywall joint.

13) Recessed Lighting



Unacceptable. Does not meet most codes because of multiple holes.

Washington State Energy Code Approved.
Still need to gasket or caulk at drywall.

14) Porch Roof

Air barrier is installed at the intersection of the porch roof and exterior wall

Cold air between heated floors - coming in from porch across front of house.

14) Porch Roof

From outside, porch is open into ‘Cape Cod’ area of the second floor.

From inside, heated floor above is exposed to outside air.

14) Porch Roof

Air dams installed - ready for insulation.

14) Porch Roof

Air above vinyl porch ceiling can get into cavity between floors.

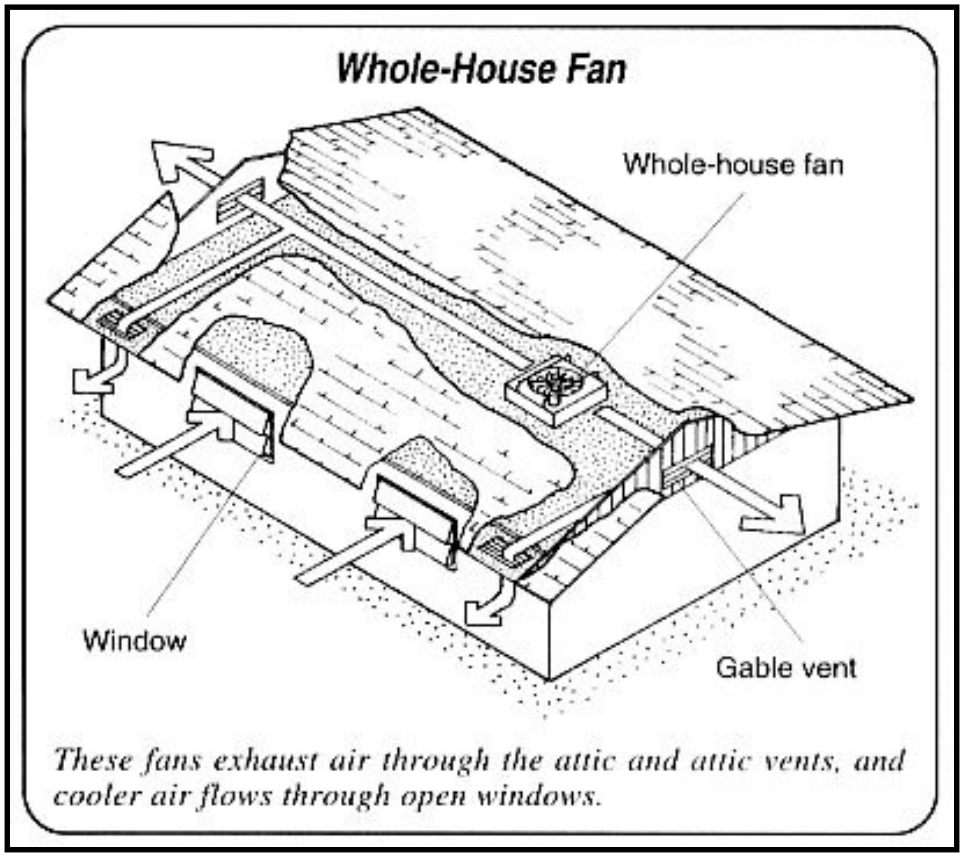
View into house from outside

Cavities open to house sealed

Porch ceiling around 2 sides of the house with open web trusses and no band board, sealed with styrofoam and foam

15) Whole House Fan Penetration at Attic

An insulated cover is provided that is gasketed or sealed to the opening from either the attic side or ceiling side of the fan

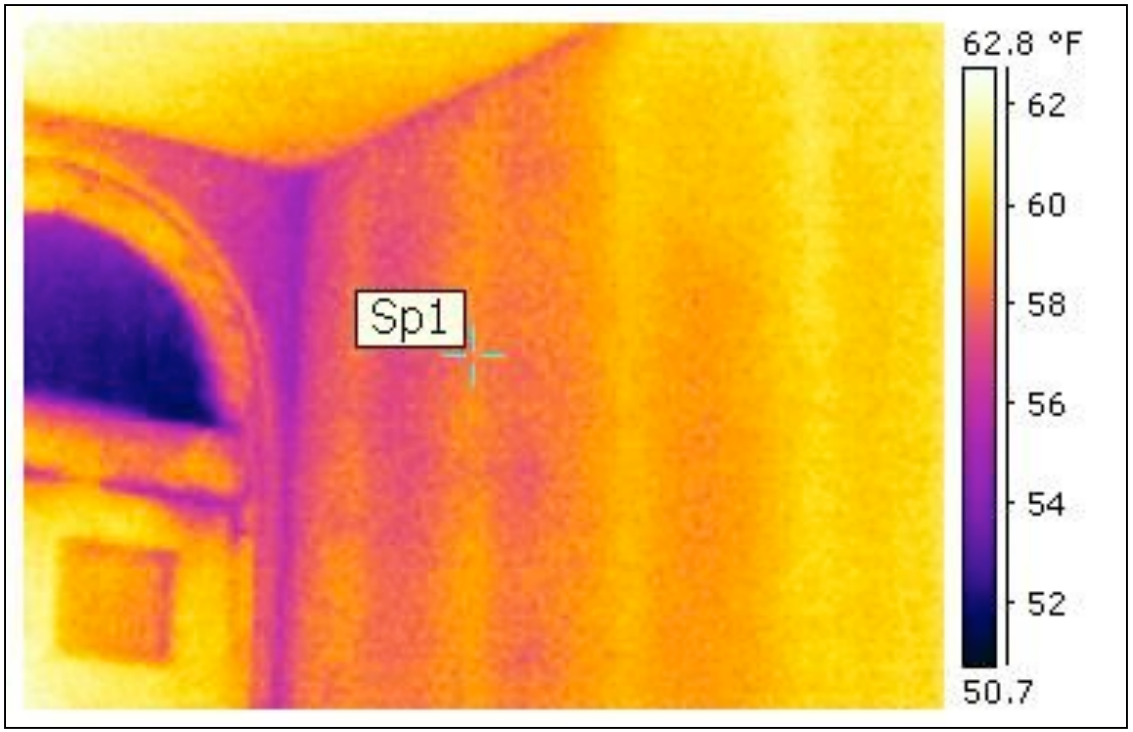


But we haven't seen one of these in a new house in the last 15 years

16) Common Walls Between Dwelling Units

Air barrier is installed to seal the gap between a gypsum shaft wall and the structural framing between units in duplex or townhouse construction.

Front door at party wall.



IR of air in 1st floor party wall of 2 story house.

16) Common Walls Between Dwelling Units

From the outside, corner between 2 units will get covered by 'J' channel siding, but will still leak air.

Same gap - from the inside.

Sealed party wall.

16) Common Walls Between Dwelling Units

Stud wall 1” from party wall

Area at band is just as important as the wall itself

Stud wall 1” from party wall

Stud wall 1” from block party wall

Remember the first item on the list?

1) Air barrier and Thermal Barrier in Alignment

The other 15 are really the same thing.

What You Don’t Want To See

Caulk where not necessary.

Caulk where not necessary.
Wasted time and money.

What You Don’t Want To See

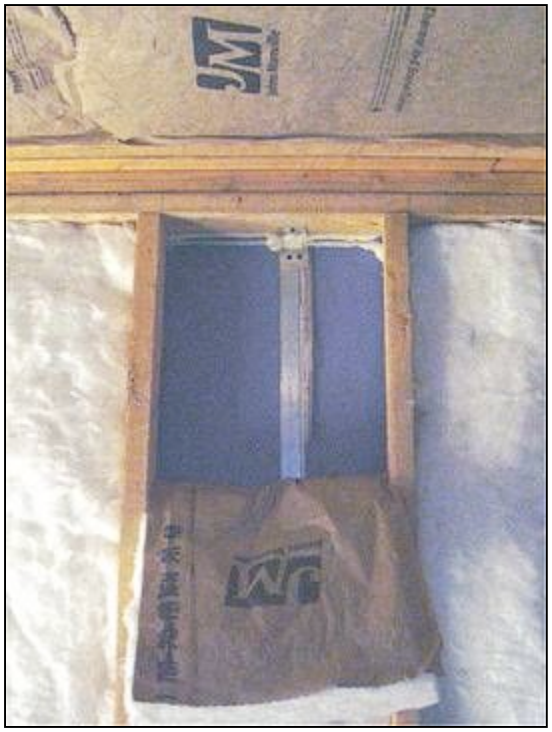
Airtight foam on pervious rock wool.

Plenty of caulk, but no airtight back on insulation in attic.

Inspecting

If you are not removing insulation to inspect these bypasses, you are missing them!

Sound insulation in place.



Party wall properly sealed.

The wire hole is sealed, but the party wall isn't.

Inspecting

Insulation in place.

End of front porch beam sealed.

Inspecting

Insulation in place.

Wall sealed.

Fireplace not sealed, insulation in the wrong place.

Inspecting

Insulation in place.

Band joist between floors sealed.

Thank You!

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