2009 International Energy Conservation Code

Code Air Barriers
Find This Presentation

http://www.kenergy.us/code-page

It will be posted under 2012 IECC
## What Does Code Require

<table>
<thead>
<tr>
<th>2009 IECC Air Leakage – Section 402.4</th>
<th>2012 IECC Air Leakage – Section 402.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Either visual inspection or testing</td>
<td>Requires Installation and Testing</td>
</tr>
<tr>
<td>Testing option: The building shall be less than 7 ACH at 50 Pascals</td>
<td>Testing: The building shall not exceed 3 ACH at 50 Pascals.</td>
</tr>
<tr>
<td>An approved party other than the installer could be required to inspect</td>
<td>A third party tester could be required for both the test and the air leakage installation inspection.</td>
</tr>
<tr>
<td>Common wall air barrier required</td>
<td>No longer includes common wall requirements</td>
</tr>
<tr>
<td></td>
<td>Adds log wall provision – ICC-400</td>
</tr>
<tr>
<td></td>
<td><strong>Must be CONTINUOUS</strong></td>
</tr>
</tbody>
</table>
What is an air barrier?

As Defined by the 2012 IECC

AIR BARRIER
Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or combination of materials.

CONTINUOUS AIR BARRIER
A combination of materials and assemblies that restrict or prevent the passage of air through the building thermal envelope.
Why an air barrier
What affects air leakage?

First - Openings (holes) in the Envelope

Drivers – Such as Wind
What affects air leakage?

Fans and Mechanical Systems

Stack Effect
What’s the Impact?

Air-sealing is twice as effective as increasing insulation alone
Air Leakage

Where Does the Air Move?

- Doors: 11%
- Fans and Vents: 4%
- Fireplace: 14%
- Windows: 10%
- Plumbing Penetrations: 13%
- Ducts: 15%
- Electric Outlets: 2%
- Floors, Walls, and Ceiling: 31%
Air leakage at wall/floor junction
Infrared shows poor insulation window spacers are expected to be cold
Infiltration Control

Best Practices
Infiltration Control

Best Practices
Areas for Air Leakage (Infiltration)

Windows and doors
Between sole plates
Floors and exterior wall panels
Plumbing
Electrical
Service access doors or hatches
Recessed light fixtures
Rim joist junction
Air Leakage

Air Sealing Trouble Spots

1. Air Barrier and Thermal Barrier Alignment
2. Attic Air Sealing
3. Attic Kneewalls
4. Shaft for Piping or Ducts
5. Dropped Ceiling/Soffit
6. Staircase Framing at Exterior Wall
7. Porch Roof
8. Flue or Chimney Shaft
9. Attic Access
10. Recessed Lighting
11. Ducts
12. Whole-House Fan
13. Exterior Wall Penetrations
14. Fireplace Wall
15. Garage/Living Space Walls
16. Cantilevered Floor
17. Rmr Joints, Sill Plate, Foundation, Floor
18. Windows & Doors
19. Common Walls Between Attached Dwelling Units

Figure 4: Building America—air sealing trouble spots
### Critical Details - Advanced Energy Corp. or NAIMA

**Best Practices**

#### Mistake Proofing Verification

**Verification**

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All shafts/chases are capped</td>
</tr>
<tr>
<td>2</td>
<td>All penetrating holes were cleanly cut using a saw and/or drill and are more than 1&quot; larger than the penetrating object to allow for proper air sealing.</td>
</tr>
<tr>
<td>3</td>
<td>Work site is broom cleaned and all safety precautions are taken prior to beginning work.</td>
</tr>
</tbody>
</table>

**Installer’s Name:**

**Build Name:**

**Builder’s Job #:**

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**Northwest Energy STAR Homes Tech Tip**

**Air Sealing Critical Details**

1. **Penetrations:** Plumbing/electrical/HVAC penetrations to exterior/unconditioned space are air sealed with foam, caulk, or mastic. No fiber insulation is used to fill holes.

2. **Penetrations:** Plumbing/electrical/HVAC penetrations to exterior/unconditioned space are air sealed with foam, caulk, or mastic. No fiber insulation is used to fill holes.

3. **Caps/Blocking:** All shafts/chases, conduits, and blocking are air sealed with a compressible sealant, caulk, foam, or mastic.

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This Verification form should be signed and filled out by the Installer. Signing this form certifies that all Critical Details are correct and are as designated.
Windows and Doors

DOORS & WINDOWS — Backer rod or low expansion foam is used to seal around windows and doors
Between Sole Plates

1. BOTTOM PLATES — Bottom plates of all exterior walls and party/common walls (ALL floors), and vertical members at foundation step downs are caulked, gasketed, or glued.
Floors and Exterior Wall Panels

FLOOR SYSTEMS — Floor framing is completely filled with insulation or insulation is installed to maintain permanent contact with the sub-floor decking (e.g. bonus room floor, crawl space, cantilever)

Best Practices

CRITICAL DETAILS by

NORTHWEST ENERGY STAR HOMES
PENETRATIONS — Plumbing/electrical/HVAC penetrations to exterior/unconditioned space are air sealed with foam, caulk, or mastic. NO fibrous insulation is used to fill holes.
Electrical

1 PDENTRATIONS — Plumbing/electrical/HVAC penetrations to exterior/unconditioned space are air sealed with foam, caulk, or mastic. No fibrous insulation is used to fill holes.
Service access doors or hatches

ATTIC ACCESS – Access panels to attic/kneewall or crawlspace, drop down stairs, and whole-house fans are weather stripped and insulated to the same R-value as the surrounding area when possible (min R-10)
Rim Joist Junction

2. CAPS/BLOCKING – All shafts/chases, cantilevers, and blocking are air sealed with a compressible sealant, caulk, foam, or mastic.
Fireplace

Best Practices
Montana Case Study on Air Sealing

Is air sealing a home a large incremental cost?

Problems occurring by not air sealing can be expensive – in this case $30,000
Montana Case Study on Air Sealing
Montana Case Study on Air Sealing 
Rim Joist Air Leakage
Montana Casestudy on Air Sealing Knee Wall
<table>
<thead>
<tr>
<th>NUMBER</th>
<th>COMPONENT</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Air barrier and thermal barrier</td>
<td>Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks or joints in the air barrier are filled or repaired. Air-permeable insulation is not used as a sealing material. Air-permeable insulation is inside of an air barrier.</td>
</tr>
<tr>
<td>2</td>
<td>Ceiling/attic</td>
<td>Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.</td>
</tr>
<tr>
<td>3</td>
<td>Walls</td>
<td>Corners and headers are insulated. Junction of foundation and sill plate is sealed.</td>
</tr>
<tr>
<td>4</td>
<td>Windows and doors</td>
<td>Space between window/door jamb and framing is sealed.</td>
</tr>
<tr>
<td>5</td>
<td>Rim joists</td>
<td>Rim joists are insulated and include an air barrier.</td>
</tr>
<tr>
<td>6</td>
<td>Floors (including above-garage and cantilevered floors)</td>
<td>Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of insulation.</td>
</tr>
<tr>
<td>7</td>
<td>Crawl space walls</td>
<td>Insulation is permanently attached to walls. Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.</td>
</tr>
<tr>
<td>8</td>
<td>Shafts, penetrations</td>
<td>Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.</td>
</tr>
<tr>
<td>9</td>
<td>Narrow cavities</td>
<td>Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.</td>
</tr>
<tr>
<td>10</td>
<td>Garage separation</td>
<td>Air sealing is provided between the garage and conditioned spaces.</td>
</tr>
<tr>
<td>11</td>
<td>Recessed lighting</td>
<td>Recessed light fixtures are air tight, IC rated, and sealed to drywall. Exception—light fixtures in conditioned space.</td>
</tr>
<tr>
<td>12</td>
<td>Plumbing and wiring</td>
<td>Insulation is placed between outside and pipes. Batts insulation cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.</td>
</tr>
<tr>
<td>13</td>
<td>Shower/tub on exterior wall</td>
<td>Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.</td>
</tr>
<tr>
<td>14</td>
<td>Electrical/phone box on exterior walls</td>
<td>Air barrier extends behind boxes or air sealed-type boxes are installed.</td>
</tr>
<tr>
<td>15</td>
<td>Common wall</td>
<td>Air barrier is installed in common wall between dwelling units.</td>
</tr>
<tr>
<td>16</td>
<td>HVAC register boots</td>
<td>HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.</td>
</tr>
<tr>
<td>17</td>
<td>Fireplace</td>
<td>Fireplace walls include an air barrier.</td>
</tr>
</tbody>
</table>
How to Create an Air Barrier

Air sealing key points:

1. Fan vented through exterior wall sealed at penetration.
2. Insulate and install sheet material behind bathtub.
3. Insulate headers.
4. Insulate exterior wall.
5. Window sealed into rough opening using backer rod.
6. Insulated exterior wall.
7. Narrow stud cavity batts are cut to fit.
8. Electric panel box, recommend install on interior (non-insulated) wall. If installed on exterior wall, air barrier shall extend behind box or air-sealed box shall be installed.
9. Ceiling insulation.
10. Insulated ceiling.
11. Seal tight IC-rated recessed light fixtures to drywall.
12. Seal penetrations (if ceiling is insulated).
13. Seal gap between electrical box and drywall.
14. Seal wiring and plumbing penetrations.
How to Create an Air Barrier
How to Create an Air Barrier

Shower/tub drain rough opening

13 Install and seal air barrier behind tub (required)

13 Seal bathtub drain penetration
How to Create an Air Barrier

Air Infiltration and Insulation

Appendix
2009 IECC

Air sealing key points continued

Window rough opening

Wall cross-section

1. Glue drywall to top plate (recommended)
2. Caulk bottom plate to subfloor
3. Glue drywall to top plate (recommended)
4. Use backer rod or spray foam (appropriate for windows) to fill gaps between window/door and rough opening
5. Caulk band joist to subfloor and plates
How to Create an Air Barrier

3. Glue drywall to bottom plate (recommended). Caulk bottom plate to subfloor, foundation, or slab.

5. Sill gasket or double-bead of caulk under bottom plate.

6. Insulation is permanently attached to walls.

7. Underfloor insulation must be installed in permanent contact with subfloor (air barrier required at any exposed edge of insulation).

Install exterior water resistant barrier as per IRC 703.2.

Sealed CLASS I vapor retarder required in crawlspace.

Disclaimer: This document is intended solely to help graphically demonstrate the air leakage provisions of section 402.4 of the 2009 IECC. It does not cover all air-sealing locations or techniques. Other code provisions may be applicable as well.
How to Create an Air Barrier

Air sealing key points

Combustion chase penetrations

1. Seal around chimney flues with sheet metal cap
2. Rigid foam option (recommend covering with ignition barrier for fire protection)
3. Internal air barrier (recommended)
4. Blocking above supporting wall for cantilevered floor (required)
5. Insulation above top plate of supporting wall
6. Underfloor insulation must be installed in permanent contact with subfloor (air barrier required at any exposed edge of insulation)

Combustion closet

- Combustion air inlets as per mechanical and/or fuel gas code
- Flue stack
- Insulated walls (not required unless walls are part of building thermal envelope)
- Insulated water heater (not required)
- Solid (non-louvered) door with weatherstripping
How to Create an Air Barrier

**Exterior penetrations**

8 12

Caulk exterior wall penetrations for refrigeration lines, condensate line, etc.

Install blocking and rafter baffle to prevent wind-washing if vented, insulated roofline (required)

Sealed attic-side air barrier (required)—OSB, insulated sheathing, etc.

1

Blocking - fit in joist cavity, caulked or foamed
How to Create an Air Barrier

**Attic knee-walls**

1. **Caulk and seal rough opening**
   - Rigid insulation (recommended)
   - Weather-strip door opening

**Two-level attic**

1. **Air barrier required, (rigid board recommended)**
2. **Attic knee wall requires R-18 insulation** (Georgia requirement)
   - Unconditioned space
   - Caulk
   - Glue
   - Blocking
   - Conditioned space
   - Conditioned space
How to Create an Air Barrier

Diagram showing:
- Garage (unconditioned)
- Web trusses
- Rigid foam (recommend covering with ignition barrier, if required)
- Basement (conditioned)
- Air barrier behind steps
- Garage to house door
How to Create an Air Barrier

- Garage (unconditioned)
- Web truss
- Air seal
- Sheath and insulate
- Rigid foam (recommend covering with ignition barrier, if required)
- Basement (conditioned)
Resources...

ICC Appendix for the 2009 IECC
Developed through and for the State of Georgia