<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>AIR BARRIER CRITERIA</th>
<th>INSULATION INSTALLATION CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General requirements</td>
<td>A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.</td>
</tr>
<tr>
<td>2</td>
<td>Ceiling/attic</td>
<td>The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.</td>
</tr>
<tr>
<td>3</td>
<td>Walls</td>
<td>The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.</td>
</tr>
<tr>
<td>4</td>
<td>Windows, skylights and doors</td>
<td>The space between window/door jambs and framing, and skylights and framing shall be sealed.</td>
</tr>
<tr>
<td>5</td>
<td>Rim joists</td>
<td>Rim joists shall include the air barrier.</td>
</tr>
<tr>
<td>6</td>
<td>Floors (including above garage and cantilevered floors)</td>
<td>The air barrier shall be installed at any exposed edge of insulation.</td>
</tr>
<tr>
<td>7</td>
<td>Crawl space walls</td>
<td>Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.</td>
</tr>
<tr>
<td>8</td>
<td>Shafts, penetrations</td>
<td>Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.</td>
</tr>
<tr>
<td>9</td>
<td>Narrow cavities</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Garage separation</td>
<td>Air sealing shall be provided between the garage and conditioned spaces.</td>
</tr>
<tr>
<td>11</td>
<td>Recessed lighting</td>
<td>Recessed light fixtures installed in the building thermal envelope shall be sealed to the drywall.</td>
</tr>
<tr>
<td>12</td>
<td>Plumbing and wiring</td>
<td>Wiring and plumbing penetrations shall be sealed.</td>
</tr>
<tr>
<td>13</td>
<td>Shower/tub on exterior wall</td>
<td>The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from the showers and tubs.</td>
</tr>
<tr>
<td>14</td>
<td>Electrical/phone box on exterior walls</td>
<td>The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.</td>
</tr>
<tr>
<td>15</td>
<td>HVAC register boots</td>
<td>HVAC register boots shall be sealed to the subfloor or drywall.</td>
</tr>
<tr>
<td>16</td>
<td>Concealed sprinklers</td>
<td>When required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.</td>
</tr>
<tr>
<td>17</td>
<td>Blocking between framing (e.g. beneath knee walls, cantilevered floors, garage separation walls)</td>
<td>Blocking shall be sealed to framing.</td>
</tr>
<tr>
<td>18</td>
<td>Common walls</td>
<td>Air barrier is installed in common wall between dwelling units.</td>
</tr>
<tr>
<td>19</td>
<td>Fireplaces</td>
<td>New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air.</td>
</tr>
</tbody>
</table>

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Air sealing key points

1. Insulate and install sheet material behind bathtub
2. Insulate headers
3. Insulate exterior wall
4. Window sealed into rough opening with backer rod and sealant
5. Seal lights and bath vent fans to ceiling drywall
6. Fan vented through exterior wall sealed at penetration
7. Insulate and air seal corners
8. Narrow stud cavity batts are cut to fit
9. Seal bottom plate to subfloor
10. Seal wiring and plumbing penetrations (if ceiling is insulated)
11. Seal airtight IC-rated recessed light fixtures to drywall
12. Seal gap between electrical box and drywall
13. Insulate and air seal recessed light fixtures to drywall
14. Seal wiring and plumbing penetrations
15. Concealed sprinklers - shall only be sealed as per manufacturer recommendations
16. Fan vented through exterior wall sealed at penetration

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**Electrical 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.

---

**Chases and common by-passes**

1. Seal top plate
2. Cap top of chase with solid air barrier and insulate above dropped soffit
3. Install air barrier on interior of all insulated walls
4. Seal electrical penetrations through sheathing
5. Seal bottom plate to subfloor and exterior sheathing
6. Seal penetrations in common wall
7. Seal electrical boxes and fixtures to drywall
8. Seal penetrations in common wall
9. Seal HVAC penetrations
10. Seal HVAC boot penetrations
11. Seal electrical penetrations
12. Seal plumbing penetrations
13. Seal electrical penetrations through sheathing
14. Seal electrical penetrations
15. Seal electrical penetrations
16. Seal electrical penetrations
17. Seal electrical penetrations
18. Seal penetrations in common wall

---

**Shower/tub drain rough opening**

1. Seal electrical penetrations
2. Cap top of chase with solid air barrier and insulate above dropped soffit
3. Install air barrier on interior of all insulated walls
4. Seal electrical penetrations through sheathing
5. Seal bottom plate to subfloor and exterior sheathing
6. Seal penetrations in common wall
7. Seal electrical boxes and fixtures to drywall
8. Seal penetrations in common wall
9. Seal HVAC penetrations
10. Seal HVAC boot penetrations
11. Seal electrical penetrations
12. Seal plumbing penetrations
13. Seal electrical penetrations through sheathing
14. Seal electrical penetrations
15. Seal electrical penetrations
16. Seal electrical penetrations
17. Seal electrical penetrations
18. Seal penetrations in common wall

---

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Air sealing key points continued

**Wall cross-section**

1. Seal drywall to top plate with caulk, gaskets or glue (recommended)
2. Seal bottom plate to subfloor and plates
3. Seal drywall to top and bottom plates with caulk, gaskets or glue (recommended)
4. Seal bottom plate to subfloor
5. Seal band joist to subfloor and plates
6. Underfloor insulation must be installed to maintain permanent contact with subfloor (air barrier required at any exposed edge of insulation)
7. Sill gasket or double-bead of caulk under bottom plate

**Window rough opening**

Use backer rod and sealant or spray foam appropriate for windows to fill gaps between window/door and rough opening

3-inch inspection gap

**Insulation**

- Sealed CLASS I vapor retarder required in crawlspace

- Insulation is permanently attached to walls

- 4 inches

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**Combustion chase penetrations**
- Seal around chimney flues with sheet metal cap
- Rigid or spray foam option (recommended covering with ignition barrier for fire protection)
- Internal air barrier (recommended) or air impermeable insulation
- Blocking above supporting wall for cantilevered floor (required)
- Underfloor insulation must be installed in permanent contact with subfloor (air barrier required at any exposed edge of insulation)

**Exterior penetrations**
- Seal exterior wall penetrations for refrigeration lines, condensate line, etc.

**Combustion closet**
- Combustion air inlets as per mechanical and/or fuel gas code
- Insulate water lines for freeze protection
- Seal gas and plumbing penetrations through walls
- Insulate walls per code (required if walls are part of building thermal envelope)
- Insulated water heater (not required)
- Door closes against solid threshold
- Solid (non-louvered) door with weatherstripping on all four edges

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Air sealing key points continued

1. Sealed attic-side air barrier (required for air permeable cavity insulation)—OSB, insulated sheathing, air impermeable cavity insulation, etc.
2. Weather-stripe door opening and threshold
3. Install blocking and rafter baffle to prevent wind-washing if vented, insulated roofline (required)
4. R-18 attic kneewall insulation (Georgia requirement)
5. R-13 cavity + R-5 continuous, R-15 cavity + R-3 continuous, or R-19 in 2x6 with sealed attic-side air barrier (eg. OSB/plywood)

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Air sealing key points continued

Attic scuttle

- Insulation dams prevent loose-fill insulation from falling through access
- Hatch lid pushes up and out of the way for access
- Rigid insulation plus batt or spray polyurethane foam (recommended), minimum R-19 (Georgia requirement)

Attic pull-down stairs

- Rigid insulation box forms lid for pull-down attic staircase (recommended)
- Insulation dams prevent loose-fill insulation from falling through access
- Cover box pushes up and out of the way for access
- Seal gap between frame and rough opening with caulk, backer rod, or foam
- Minimum R-5 (Georgia requirement)
- Insulated cover minimum R-5 (Georgia requirement)
- Boxed enclosure for staircase has rigid hinged lid with insulation on top
- Weatherstripping

Attic pull-down stairs

- Insulation board minimum R-5 (Georgia requirement)
- Weatherstripping
- Seal gap between frame and rough opening with caulk, backer rod, or foam

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Garage blocking and sealing key points

Blocking, air sealing and insulation required above garage separation wall
Air sealing key points continued

1. Web truss
2. Air seal
3. Seal bottom plate to subfloor
4. Garage (unconditioned)
5. Air barrier behind steps
6. Basement (conditioned)
7. Garage to house door
8. Rigid or sprayed foam (recommend covering with ignition barrier, if required)
9. Sheath and insulate
10. Rigid mineral wool board or cellulose blanket

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Duct Sealing key points

All seams in plenums, trunk lines and boots must be sealed with mastic or mastic tape.

Mastic at swivel joints (gores)

Seal joints and edges of sheet metal box with mastic

Seal flange with mastic

Seal elbow gores with mastic

Ceiling register

Caulk between drywall and boot

Mastic

Supply leakage

Mastic

Supply air

Seal box to subfloor

Seal boot seams and then insulate

Seal gaps between boot and drywall

Seal seams then install duct wrap

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Air Handler Sealing key points

1. **Mastic the permanent connections**
2. **Condensate line drain with “P-trap” and cleanout**
3. **Air-tight sealed/gasketed filter cover**
4. **Separate drain for pan**
5. **Pull insulation to plenum and cinch after applying mastic**
6. **Float switch**

For the **Supplementary Ducts**:

- **Use metal coupling for flex to connections**
- **Seal connections with mastic and straps**
- **Cover coupling with insulation**

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Multifamily Air-sealing Details

1. Cap and seal all chases including chases for grouped utility lines and radon vents.

2. Seal penetrations in mechanical closet including penetrations for the:
   - supply plenum
   - outside air ventilation
   - refrigerant line
   - plumbing
   - electrical
   - gas fuel

3. Seal band area at exterior sheathing side and all penetrations through band.

4. Seal all band joist penetrations.

5. UL-compliant air sealing at drywall finishing for any wall adjacent to stairwell or elevator. Air seal this gap at every change in floor level.

6. Seal miscellaneous clustered penetrations through building envelope (e.g. refrigerant lines).

Sheathing or water-resistive barrier on exterior sheathing

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Air sealing key points continued
Multifamily

1. Seal gap between levels
2. Cavity insulation plus exterior sheathing
3. Seal penetrations through exterior sheathing
4. Seal gap between levels
5. Recommend rigid foam between concrete masonry units and framed stud wall
6. Steel framing requirements
   - Thermal break (e.g. rigid foam) required if steel studs
7. Seal penetrations through exterior sheathing
8. Seal gap between levels
9. FRAMED MULTI-STORY LIVING UNITS
10. CONCRETE MASONRY UNIT STAIRWELL or ELEVATOR CHASE
11. Seal gap between concrete wall and framed units at each level

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Air sealing key points continued

Multifamily Mechanical Closet

- Seal plenum penetration through drywall
- Seal refrigerant penetration
- Seal plumbing penetration
- Seal perimeter of drain penetration
- Seal electrical and plumbing penetrations and perimeter of outside air ventilation duct
- Seal plenum penetration

- Utility chase capped and sealed at perimeter - at all levels
- Intermediate inline supply fan with controls to ensure concurrent air handler operation
- Seal electrical and plumbing penetrations
- Seal refrigerant penetration
- Seal plumbing penetration
- Seal perimeter of drain penetration
- Utility chase capped and sealed at perimeter - at all levels

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Building Thermal Envelope — The basement walls, exterior walls, floor, roof, and any other building element that enclose conditioned space. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space. —2015 IECC

The building thermal envelope is the barrier that separates the conditioned space from the outside or unconditioned spaces. The building envelope consists of two parts - an air barrier and a thermal barrier that must be both continuous and contiguous (touching each other). In a typical residence, the building envelope consists of the roof, walls, windows, doors, and foundation. Examples of unconditioned spaces include attics, vented crawlspace, garages, and basements with ceiling insulation and no HVAC supply registers.

Example 1 – Prescriptive Compliance

- Flat ceiling: R-38
- Exterior walls: R-13
- Floor over garage and basement/crawl: R-19 (climate zones 3 & 4)
- Ductwork sealed with mastic and insulated to R-8 in attic, R-6 in basement/crawl space
- Garage, attic and basement/crawl are unconditioned spaces

Prescriptive R-values

Example R-values

- Flat ceiling: R-38
- Kneewalls: R-18 (required)\(^5\) (R-13+ R-5, R-15 + R-3, R-19 in 2x6)
- Vaulted ceiling: R-20 air-permeable insulation plus R-5 rigid foam board\(^3\)
- Exterior walls: R-13
- Basement masonry walls: R-5
- Basement slab: R-6\(^4\)
- Ductwork sealed with mastic and insulated to R-8 in attic, R-6 in basement
- Garage and attic are unconditioned spaces

Example 2 – Alternate Compliance

- Garage
- Conditioned space
- Indirectly-conditioned space
- Important air sealing location
- Kneewall

If supply registers deliver conditioned air to basement, it is considered conditioned. With no supply air, it is considered an indirectly-conditioned space.

Example R-values

- Flat ceiling: R-38
- Kneewalls: R-18 (required)\(^5\) (R-13+ R-5, R-15 + R-3, R-19 in 2x6)
- Vaulted ceiling: R-20 air-permeable insulation plus R-5 rigid foam board\(^3\)
- Exterior walls: R-13
- Basement masonry walls: R-5
- Basement slab: R-6\(^4\)
- Ductwork sealed with mastic and insulated to R-8 in attic, R-6 in basement
- Garage and attic are unconditioned spaces

Example 3 – Alternate Compliance

- Garage
- Conditioned space
- Indirectly-conditioned space
- Top conditioned floor functions as a vaulted ceiling with interior walls although it appears to have kneewalls and a flat ceiling. An advantage of this approach is that all upstairs ductwork is located inside the building envelope.

The crawlspace walls are insulated and do not contain vents. The crawlspace ground is covered with 100% plastic and functions as a "mini-basement."

Example R-values

- Vaulted ceiling: R-20 air-impermeable foam insulation\(^3\)
- Exterior walls: R-13 + R-5 sheathing
- Crawlspace walls: R-5
- Ductwork sealed with mastic and insulated to R-6
- Garage is unconditioned space

1 R-values shown are examples and not necessarily prescriptive code requirements. Refer to the Georgia Energy Code for specific prescriptive insulation requirements.

2 An attic kneewall is any vertical wall that separates conditioned space from an unconditioned attic. In Georgia, kneewalls must be insulated to R-18. A sealed attic-side air barrier (OSB, foil-faced sheathing, etc.) is required when using air permeable insulation.

3 Requires trade-off since prescriptive ceiling requirement is R-38, see rooftop installed insulation options and section 806.5 of the 2012 IRC.

4 Slab insulation is not required in Georgia due to termite risk.

5 Although there is nothing to prevent the garage walls from being insulated, due to indoor air quality concerns, the garage should never be considered inside the building.
Insulation Details for Ceilings with Attic spaces

**Standard Truss**
with full height insulation (recommended)

**Energy Truss**
with full height insulation (recommended)

**Standard rafter and top plate**
with tapered insulation depth

**Rafter on raised top plate**
with full height insulation (recommended)

**NOTE:**
R-30 complete coverage is deemed equivalent to prescriptive R-38

---

**Energy Truss**
Soffit vent

**Standard rafter and top plate**
Soffit vent

**Rafter on raised top plate**
Soffit vent

---

**NOTE:**
Wind wash baffle and air-permeable insulation dam. For air permeable insulation in vented attics, baffles shall be installed adjacent to soffit and eave vents. A minimum of a 1-inch space shall be provided between the insulation and the roof sheathing and at the location of the vent. The baffle shall extend over the top of the insulation inward until it is at least 4 inches vertically above the top of the insulation. Any solid material such as cardboard or thin insulating sheathing shall be permissible as the baffle.

---

**Standard rafter and top plate**

- Insulation baffle
- Soffit dam (cardboard or rigid foam board)

**Rafter on raised top plate**

- Insulation baffle
- Soffit dam (cardboard or rigid foam board)
- Raised top plate

---

**Standard Truss**

- Insulation baffle
- Soffit dam (cardboard or rigid foam board)

---

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Roofline Installed Insulation Options

Reference Table 402.1.1 and 402.1.6 in the Georgia Energy Code amendments to the 2015 IECC and Section 806.5 “unvented attic assemblies” in the Georgia Amendments to the 2012 IRC

Vaulted unvented attic – roofline air-impermeable insulation (e.g., spray foam insulation)

Vaulted unvented attic – roofline air-permeable insulation (e.g., fiberglass, cellulose insulation)

Cathedralized vented ceiling – roofline air-permeable insulation (e.g., fiberglass, cellulose insulation)

Option 1
Air impermeable insulation continuous above rafters (e.g., rigid foam board) combined with air-permeable insulation (e.g., fiberglass, cellulose insulation)

Option 2
Air impermeable insulation between rafters (e.g., rigid foam board or spray foam) combined with air-permeable insulation (e.g., fiberglass, cellulose insulation)

Vent baffles and dams create a channel that fully extends from soffit to ridge vent

R-5 minimum in climate zones 2 & 3
R-15 minimum in climate zone 4

Air-permeable insulation (e.g., fiberglass, cellulose insulation) R-20 minimum if trade-offs are used (Georgia requirements)

Air impermeable insulation (e.g., open- or closed-cell spray foam)

½" drywall interior ceiling

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Appendix RA
2015 IECC (2019 Georgia Energy Code)

Georgia Insulation Installation – Passing Grade Details

Wall and ceiling insulation that makes up portions of the building thermal envelope shall be installed to Passing Grade quality.

Two criteria affect installed insulation grading: voids/gaps (in which no insulation is present in a portion of the overall insulated surface) and compression/incomplete fill (in which the insulation does not fully fill out or extend to the desired depth).

Voids/Gaps
- Voids or gaps in the insulation are < 1% of overall component surface area (only occasional and very small gaps allowed for Passing Grade)

Compression/Incomplete Fill
- Compression/Incomplete Fill for both air permeable insulation (e.g., fiberglass, cellulose) and air impermeable insulation (e.g., spray polyurethane foam) must be less than 1 inch in depth or less than 30% of the intended depth, whichever is more stringent. The allowable area of compression/incomplete fill must be less than 2% of the overall insulated surface to achieve a Passing Grade.
- Any compression/incomplete fill with a depth greater than the above specifications (up to 1” or 30% of the intended depth, whichever is more stringent) shall not achieve a Passing Grade.

Additional Wall Insulation Requirements
- All vertical air permeable insulation shall be installed in substantial contact with an air barrier on all six (6) sides.
  Exception: Unfinished basements, rim/band joist cavity insulation and fireplaces (insulation shall be restrained to stay in place).
  For unfinished basements, air permeable insulation and associated framing in a framed cavity wall shall be installed less than ¼” from the basement wall surface.
- Attic knee wall details – Attic knee walls shall be insulated to a total R-value of at least R-18 through any combination of cavity and continuous insulation. Air permeable insulation shall be installed with a fully sealed attic-side air barrier (e.g., OSB with seams caulked, rigid insulation with joints taped, etc.). Attic knee walls with air impermeable insulation shall not require an additional attic-side air barrier.

Underfloor insulation that makes up portions of the building thermal envelope shall be installed to Passing Grade quality.

Two criteria affect installed insulation grading: voids/gaps (in which no insulation is present in a portion of the overall insulated surface) and compression/incomplete fill (in which the insulation does not fully fill out or extend to the desired depth).

Voids/Gaps
- Voids or gaps in the insulation are minimal for Passing Grade (< 2% of overall component surface area)

Compression/Incomplete Fill
- Compression/Incomplete Fill for both air permeable insulation (e.g., fiberglass, cellulose) and air impermeable insulation (e.g., spray polyurethane foam) must be less than 1 inch in depth or less than 30% of the intended depth, whichever is more stringent. The allowable area of compression/incomplete fill must be less than 10% of the overall insulated surface to achieve a Passing Grade.
- Any compression/incomplete fill with a depth greater than the above specifications (up to 1” or 30% of the intended depth, whichever is more stringent) shall not achieve a Passing Grade.
- Air-permeable underfloor insulation shall be permanently installed against the subfloor decking. Adequate insulation supports (e.g., wire staves) for air permeable insulation shall be installed at least every 18-24”.
  Exception: The floor framing-cavity insulation shall be permitted to be in contact with the topside of sheathing or continuous insulation installed on the bottom side of floor framing where combined with insulation that meets or exceeds the minimum wood frame wall R-value and that extends from the bottom to the top of all perimeter floor framing members.

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**Wall Insulation** key points

**Voids / Gaps**

**Passing Grade**
- Insulation fully fills cavity at top and bottom
- Narrow cavity fully insulated

**Unacceptable Installation**
- Insulation does not extend to bottom of cavity
- Narrow cavity not insulated

**Compression / Incomplete Fill**

**Passing Grade**
- Insulation extends from front to back and fully fills entire cavity
- Proper width insulation fully fills narrow cavity

**Unacceptable Installation**
- Insulation is compressed behind electrical wire
- Improper width insulation is compressed into narrow cavity

---

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Ceiling Insulation key points

- **Airtight, IC-rated fixture sealed to drywall ceiling and completely covered by loose-fill insulation or fiberglass batt cut to fit**
- **Insulation batt in full contact with air barrier (ceiling drywall)**
- **Consistent, level insulation coverage for all insulation types**
- **Dam and vent baffle**
- **Vent baffles extend at least 4” above top of insulation**
- **Insulation dam at attic access maintains full height coverage of loose-fill insulation**
- **R-5 pull-down stairs with weather-stripping**
- **Attic depth guide (install facing attic access, one ruler per 300 sq.ft.)**

**ATTIC CARD**
- Brand X Fiberglass
- Initial Installed thickness: 14"
- Settled thickness: 12"
- Settled R-value: 38
- Installed density: 1.8 lb./ft³
- 1,800 sq.ft. @ 90 bags

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Ceiling Insulation key points

- Non-airtight fixture not sealed to drywall ceiling and insulation held back
- Insulation coverage tapered at soffit vent
- Insulation batt not slit around electrical wire
- No insulation dam at attic access means tapered coverage of loose-fill insulation
- Insulation batt not in full contact with air barrier (ceiling drywall)
- Incomplete coverage is lumpy, mounded, inconsistent or missing
- Standard pull-down stairs with no insulation or weather-stripping
- No insulation dam at attic access means tapered coverage of loose-fill insulation

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Floor Insulation key points

**Passing Grade**

- Installed insulation is in complete contact with air barrier (subfloor)
- Insulation coverage is complete
- Insulation is slit around plumbing and wiring and securely fastened with minimal compression

**Unacceptable Installation**

- Insulation is not installed in complete contact with air barrier (subfloor)
- Insulation coverage is incomplete due to obstructions (plumbing, electrical, ductwork, etc.)
- Insulation is compressed around plumbing and wiring and is not securely fastened

Disclaimer:
This document was created by Southface and is intended solely to help graphically demonstrate the air leakage and insulation provisions of the 2015 IECC (2019 Georgia Energy Code). It does not cover all air sealing locations, materials or techniques. Other code provisions may be applicable as well.