Air Sealing and Insulating Common Walls (Party Walls) in Multi-Family Buildings - Code Compliance Brief

Overview:

The intent of this brief is to provide code-specific information about air sealing and insulating common walls in multi-family buildings to help ensure that the measures will be accepted as being in compliance with the code. Providing the same information to all interested parties (e.g., code officials, builders, designers, etc.) is expected to result in increased compliance and fewer innovations being questioned at the time of plan review and/or field inspection.

A common wall, or other known terminologies such as a party wall, fire wall, fire separation wall, townhouse separation wall, or tenant separation wall, can be described as a fire-resistance rated wall that extends continuously from the foundation to the underside of fire protected roof sheathing, or it may extend through the roof to a parapet closure. The purpose of a common wall is to prevent the spread of fire from one unit to another, and to allow the collapse of a unit that is on fire without structurally impacting the adjacent unit.

There are several identified codes and standards barriers related to common walls in low-rise multi-family buildings (structures containing more than two dwelling units and three stories or less above grade), and workable approaches exist for resolving these barriers without the need for time consuming, expensive fire testing in a lab. Ultimately however, eventual code changes related to these barriers will be needed to bring these issues to finalize resolution. These barriers include, but are not limited to, the following:

- No clear definition is included in the International Energy Conservation Code (IECC) and International Residential Code (IRC) for any of the terms used to describe a common wall.
  - The International Building Code [IBC] defines a fire wall as, “A fire-resistance rated wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.”

- Air leakage testing required in the IECC and IRC.
  - Air leakage test requirements are based on a total building thermal envelope leakage to the outdoors. This is not the case for multi-family and single-family, attached housing. For these types of housing, a distinction between total leakage and leakage to the outside is necessary. Some practitioners and program administrators prefer fully guarded tests (FGTs). This test method requires all neighboring units to be pressurized or depressurized at the same time and to the same pressure as the unit being tested to eliminate any transfer of air between units and isolate only the air leakage to the outdoors. In retrofit situations, performing guarded blower door testing is by far more expensive, time consuming, and intrusive to occupants than testing an individual unit. The simpler and more common method for measuring air leakage in attached dwellings is to use a single blower door to pressurize and/or depressurize the test unit. This “single unit”, “total” or “solo” (SO) test method measures the combination of air leakage between adjacent units through common surfaces as well as air leakage to the outside. Two significant limitation of the SO leakage test are:
    - For retrofit work, if total leakage is assumed to be all to the outside, energy benefits of air sealing can be significantly overpredicted.
    - For new construction, the total leakage value may result in failing to meet an energy based house tightness program criterion. (O. Faakye, L. Arena, and D. Griffiths, July 2013).

- Proper air sealing of these assemblies to meet air leakage rates of 3 or 5 ACH50 depending on climate zone.
Air sealing has proven to be challenging for multi-family dwellings because it is difficult to identify all the locations that need to be sealed and the appropriate materials needed to seal the areas. Gap-sealing materials used in the perimeter of these walls must meet applicable testing and fire rating standards. In frame construction, gypsum common walls are most normally used. Gypsum common walls may be load-bearing walls, but cannot attach structurally to adjacent units. They are most generally constructed of two layers of 1 inch thick gypsum liner panels, held together by a network of metal “C” and “H” channels, and are held in place vertically by aluminum breakaway clips screwed to the metal channels and to the frame wall. The breakaway clips are designed to allow the frame wall to fall away without disturbing the common wall. Common walls are fire tested according to ANSI/UL 263 (ASTM E119) [1] without any frame wall on the fire side because that wall is assumed to have already fallen away. The referenced test method, UL 263, has no provisions in the test to assess air leakage.

According to the IRC, dwelling units in two-family dwellings should be separated from each other by wall and floor assemblies having not less than 1-hour fire-resistance rating where tested in accordance with UL 263 or ASTM E119. Fire-resistance-rated floor/ceiling and wall assemblies should extend to and be tight against the exterior wall, and the wall assemblies should extend from the foundation to the underside of the roof sheathing. A common interpretation of “tight” would be “no gap through which air could flow;” however, in practice, that would be essentially impossible to achieve without a sealant material to span inevitable gaps between rigid framing materials installed by even the most skilled practitioners. Yet the UL 263 tested assemblies make no explicit provision for the application of specific sealant materials to achieve this “tight” status between the rated and exterior walls. The problem to be addressed is that code officials typically interpret the “U” Designs as having no approved method or material to seal them at the ¾” air space perimeter of the common wall. Common walls not sealed at the perimeter location makes these walls porous to air flow coming from the exterior or an attached garage. However, some of the “U” Designs do allow for different types of sealant as optional methods for air sealing:

- See UL Fire Resistance Ratings – ANSI/UL 263 Design No. U366 [2], item #8, allows “Caulk/Sealant”
- See ASTM C834 Type OP, Grade 0° C or -18° C allows Latex Sealant at the Shaftliner and C-Track (Item 1) and H-Stud (Item 2) framing locations
- See UL Fire Resistance Ratings – ANSI/UL 263 Design No. U334 [3], item #6, allows acoustical sealant at perimeter of gypsum

The model energy codes do not address minimum insulation requirements for common walls because the common wall is not defined as part of the building thermal envelope.[2] Many builders are insulating these walls fully for sound proofing purposes per the International Building Code (IBC), Section 1207, Sound Transmission walls, partitions, and floor/ceiling assemblies separating dwelling units from each other must have a sound transmission class (STC) of not less than 50 for airborne noise when tested in accordance with ASTM E 90.

- Insulating these walls will contribute to a more appropriate building thermal envelope boundary and reduce heat loss. Adjacent units may become vacant, and there is no control over the timing or duration of the vacancy (e.g., winter months in the colder climates). Insulating the common wall adjacent to a vacant dwelling can reduce the amount of energy used for heating and cooling. Some states have currently adopted amendments that require minimum insulation R-values for common walls (e.g., 2014 New York Residential Energy Conservation Code, Section 402.2.12, which mandates a minimum R-10 cavity insulation for the common wall). However, the common wall would not be considered as part of the building thermal envelope for compliance with the New York energy code (yet another potential code barrier for New York).

- New York’s new code language: 402.2.12 Tenant separation walls. (Mandatory). Fire separations between dwelling units in two-family dwellings and multiple single-family dwellings (e.g., townhouses) shall be insulated to no less than R-10 and the walls shall be air sealed in accordance with Section 402.4.1 of this chapter (402.4 Air leakage [Mandatory]).

- 402.4.1 Building thermal envelope. The building thermal envelope shall be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weather stripped or otherwise sealed with an air barrier material, suitable film or solid material:

1. All joints, seams, and penetrations
2. Site-built windows, doors, and skylights
3. Openings between window and door assemblies and their respective jambs and framing
4. Utility penetrations
5. Dropped ceilings or chases adjacent to the thermal envelope
6. Knee walls
7. Walls and ceilings separating a garage from conditioned spaces
8. Behind tubs and showers on exterior walls
9. Common walls between dwelling units
10. Attic access openings

11. Rim joist junctions

12. Sill plates and headers. Foam plastic (spray foam insulation) shall be permitted to be spray applied to a sill plate, header, and rim joists without the thermal barrier as specified in the Residential Code of New York State, Section 314.4 subject to all of the following:
   a. The maximum thickness of the foam plastic shall be 3\frac{1}{4}\text{ inches} (83\text{ mm}).
   b. The density of the foam plastic shall be in the range of 0.5 to 2.0 pounds per cubic foot (8 to 32 kg/m$^3$).
   c. The foam plastic shall have a flame spread index of 25 or less and an accompanying smoke developed index of 450 or less when tested in accordance with ASTM E 84.

13. Other sources of infiltration.

The overall issue is providing reasonable cost-effective approaches to either air sealing common walls or to air seal and insulate the frame wall adjacent to common walls. Air sealing and insulating the frame walls adjacent to common walls would be a more complete solution considering the ultimate best practices goal of compartmentalizing the dwelling unit.

Dwelling Unit Compartmentalization Recommendation

The 2012 International Energy Conservation Code (IECC) mandates 3 ACH50 measured air leakage requirements for all units within multi-family buildings. The Leadership in Energy & Environmental Design (LEED) certification program, ASHRAE Standard 189, and ASHRAE 62.2 all have comparable compartmentalization requirements. Fire-resistance rated wall assemblies (or common walls) have been identified as the major source of difficulty in air sealing/compartmentalization. Building owners are challenged with constructing to significantly tighter levels, addressing compartmentalization issues between units, and adopting test procedures to prove compliance.

Guidance and details have been developed to aid builders to comply with 2012 IECC air leakage requirements based on field test results. Even with best practice guidance, field tests show that achieving the 3 ACH50 target (used for both single and multi-family buildings) is very difficult. Achievement of the 0.30 CFM50/ft$^2$ airtightness target was achievable and may be a better metric for the smaller areas found in apartments. Research of an innovative new approach to apartment compartmentalization air sealing with aerosol-based sealing processes showed 60%-85% air leakage reduction (see Relevant Publications for additional resources on multi-family compartmentalization).

If these fire walls or fire-resistance rated walls separating portions of the building were truly considered to be a separate building, then, from an air sealing perspective, the six sided enclosure of those portions should be air sealed as if they were exposed to outdoors. True compartmentalization of each dwelling unit would be to gain control of the pressure boundary on all six sides of the attached dwelling unit as if it were an unattached unit. Dwelling unit compartmentalization provides a number of health and safety, energy efficiency, and comfort advantages.

- In a fire situation, less air leakage between dwelling units means less transfer of smoke and hot gas in one direction, and less oxygen to feed the fire in the other direction.
- Energy efficiency is improved by reducing infiltration and the energy required to condition that air.
- Comfort is improved by reducing 1) cold drafts, 2) odor and contaminated air transfer from adjacent units or common areas, and 3) sound transfer between units.
- Units also become more resistant to effects external to their unit; for example, if lobby doors or unit windows are left open, compartmentalization greatly reduces or eliminates the chimney or stack effect upward through the building.
- Properly isolating and air sealing common walls between dwelling units can be critical for preventing the potential infiltration of carbon monoxide and other contaminants into the home from adjacent units.
- It affords better control of the indoor environment by space-conditioning equipment.
- It inhibits the transmission of damaging moisture-laden air through building assemblies, which may prevent the decay of building components and increase the life of the building.
- It improves the effectiveness of many common insulation materials.


[2] The term “building thermal envelope” in the 2015 IECC/IRC, is defined as the basement walls, exterior walls, floor, roof, and any other building elements that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.

Plan Review:
This section lists applicable code requirements and details helpful for plan review regarding the provisions to meet the requirements for air sealing common walls. It also includes insulation provisions that would be applicable if the common wall is treated as a separate structure by compartmentalizing it to gain control of the pressure boundary on all six sides of the attached dwelling unit as if it were an unattached unit.

Per the IECC/IRC, Section R103.3/R106.3 Examination of Documents. The code official/building official must examine or cause to be examined construction documents for code compliance.

- **Construction Documentation.** Review the construction documents for details describing wall construction, insulation, air sealing, materials and installation, and construction techniques.

- **2015 IECC/IRC, Section R103.2/N1101.5, Information on Construction Documents.** Construction documents should include:
  - Fire blocking sealants and installation details
  - Air sealing materials and installation details
  - Insulation materials and their R-values and installation details

- **2015 IRC, Section R302.2 Townhouses.** Common walls separating townhouses should be assigned a fire-resistance rating in accordance with Section R302.2, Item 1 or 2. The common wall shared by two townhouses should be constructed without plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. The wall should be rated for fire exposure from both sides and extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations should be in accordance with Chapters 34 through 43. Penetrations of the membrane of common walls for electrical outlet boxes should be in accordance with Section R302.4
  - Where a fire sprinkler system in accordance with Section P2904 is provided, the common wall should be not less than a 1-hour fire-resistance-rated wall assembly tested in accordance with ASTM E 119 or UL 263.
  - Where a fire sprinkler system in accordance with Section P2904 is not provided, the common wall should be not less than a 2-hour fire-resistance-rated wall assembly tested in accordance with ASTM E 119 or UL 263.

- **2015 IRC, Section R302.2.1 Continuity.** The fire-resistance-rated wall or assembly separating townhouses should be continuous from the foundation to the underside of the roof sheathing, deck, or slab. The fire-resistance rating should extend the full length of the wall or assembly, including wall extensions through and separating attached enclosed accessory structures.

- **2015 IRC, Section R302.2.4 Structural Independence.** Each individual townhouse should be structurally independent.

Exceptions:

1. Foundations supporting exterior walls or common walls
2. Structural roof and wall sheathing from each unit fastened to the common wall framing
3. Nonstructural wall and roof coverings
4. Flashing at termination of roof covering over common wall
5. Townhouses separated by a common wall as provided in Section R302.2, Item 1 or 2.

- **2015 IRC, Section R302.3 Two-family Dwellings.** Dwelling units in two-family dwellings should be separated from each other by wall and floor assemblies having not less than 1-hour fire-resistance rating where tested in accordance with ASTM E 119 or UL 263. Fire-resistance-rated floor/ceiling and wall assemblies should extend to and be tight against the exterior wall, and the wall assemblies should extend from the foundation to the underside of the roof sheathing.
  Exceptions:

1. A fire-resistance rating of one-half hour should be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13.
2. Wall assemblies need not extend through attic spaces where the ceiling is protected by not less than 5/8 inch Type X gypsum board, an attic draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the dwellings and the structural framing supporting the ceiling is protected by not less than ½ inch gypsum board or equivalent.
• **R302.3.1 Supporting Construction.** Where floor assemblies are required to be fire-resistance rated by Section R302.3, the supporting construction of such assemblies should have an equal or greater fire-resistance rating.

• **R302.4 Dwelling Unit Rated Penetrations.** Penetrations of wall or floor-ceiling assemblies required to be fire-resistance rated in accordance with Section R302.2 or R302.3 should be protected in accordance with this section.

• **R302.4.1 Through Penetrations.** Through penetrations of fire-resistance rated wall or floor assemblies should comply with R302.4.1.1 or R302.4.1.2

**Exception:** Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space should be protected as follows:

1. In concrete or masonry wall or floor assemblies concrete, grout or mortar should be permitted where installed to the full thickness of the wall or floor assembly or the thickness required to maintain the fire-resistance rating, provided that both of the following are complied with:
   1. The nominal diameter of the penetrating item is a maximum of 6 inches.
   2. The area of the opening through the wall does not exceed 144 square inches.

2. The material used to fill the annular space should prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E 119 or UL 263 time temperature fire conditions under a positive pressure differential of not less than 0.01 inch of water (e Pa) at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

• **R302.4.1.1 Fire-Resistance-Rated Assembly.** Penetrations should be installed as tested in the approved fire-resistance-rated assembly.

• **R302.4.1.2 Penetration Firestop System.** Penetration should be protected by an approved penetration firestop system installed as tested in accordance with ASTM E 814 or UL 1479, with a positive pressure differential of not less than 0.01 inch of water (e Pa) and should have an F rating of not less than the required fire-resistance rating of the wall or floor-ceiling assembly penetrated.

• **R302.4.2 Membrane Penetrations.** Membrane penetrations should comply with Section R302.4.1. Where walls are required to have a fire-resistance rating, recessed fixtures should be installed so that the required fire-resistance rating will not be reduced.

**Exceptions:**

1. Membrane penetrations of maximum 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches in area provided the aggregate area of the openings through the membrane does not exceed 100 square inches in any 100 square feet of wall area. The annular space between the wall membrane and the box shall not exceed 1/2 inch. Such boxes on opposite sides of the wall should be separated by one of the following:
   1.1 By horizontal distance of not less than 24 inches where the wall or partition is constructed with individual non-communicating stud cavities
   1.2 By a horizontal distance of not less than the depth of the wall cavity when the wall cavity is filled with cellulose loose-fill, rockwool or slag mineral wool insulation
   1.3 By solid fireblocking in accordance with Section R302.11
   1.4 By protecting both boxes with listed putty pads
   1.5 By other listed materials and methods.

2. Membrane penetrations by listed electrical boxes of any materials provided the boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the wall membrane and the box shall not exceed 1/2 inch unless listed otherwise. Such boxes on opposite sides of the wall shall be separated by one of the following:
   2.1 By horizontal distance specified in the listing of the electrical boxes
   2.2 By solid fireblocking in accordance with Section R302.11
   2.3 By protecting both boxes with listed putty pads
   2.4 By other listed materials and methods.
3. The annular space created by the penetration of a fire sprinkler provided it is covered by a metal escutcheon plate.

- **R302.11 Fireblocking.** In combustible construction, fireblocking should be provided to cut off both vertical and horizontal concealed draft and to form an effective fire barrier between stories, and between a top story and the roof space. Fireblocking should be provided in wood-frame construction in the following locations:

1. In concealed spaces of stud walls and partitions, including furred spaces and parallel rows of studs or staggered studs, as follows:
   1. Vertically at the ceiling and floor levels.
   2. Horizontally at intervals not exceeding 10 feet

2. At interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.

3. In concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairs should comply with Section R302.7.

4. At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion. The material filling this annular space should not be required to meet the ASTM E 136 requirements.

5. For fireblocking of chimneys and fireplaces, see Section R1003.19.

6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.

- **R302.11.1 Fireblocking Materials.** Except as provided in Section R302.11, Item 4, fireblocking should consist of the following materials. Two-inch nominal lumber.

  1. Two thicknesses of 1-inch nominal lumber with broken lap joints.
  2. One thickness of \( \frac{23}{32} \)-inch wood structural panels with joints backed by \( \frac{23}{32} \)-inch wood structural panels.
  3. One thickness of \( \frac{3}{4} \)-inch particleboard with joints backed by \( \frac{3}{4} \)-inch particleboard.
  4. One-half-inch gypsum board.
  5. One-quarter-inch cement-based millboard.
  6. Batts or blankets of mineral wool or glass fiber or other approved materials installed in such a manner as to be securely retained in place.
  7. Cellulose insulation installed as tested in accordance with ASTM E 119 or UL 263, for the specific application.

- **R302.11.1.1 Batts or Blankets of Mineral or Glass Fiber.** Batts or blanket of mineral or glass fiber or other approved non-rigid materials should be permitted for compliance with the 10-foot horizontal fireblocking in walls constructed using parallel rows of studs or staggered studs.

- **R302.11.1.2 Unfaced Fiberglass.** Unfaced fiberglass batt insulation used as fireblocking should fill the entire cross section of the wall cavity to a minimum height of 16 inches measured vertically. When piping, conduit or similar obstructions are encountered, the insulation should be packed tightly around the obstruction.

- **R302.11.1.3 Loose-Fill Insulation Material.** Loose-fill insulation material should not be used as a fireblock unless specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and to retard the spread of fire and hot gases.

- **R302.11.2 Fireblocking Integrity.** The integrity of all fireblocks should be maintained.

**Air Leakage and Insulation.** Review the construction documents and confirm that the insulation material, R-value, and air-sealing technique meet applicable code requirements.

- **2015 IECC/IRC, Section R402.4/N1102.4 Air Leakage (Mandatory).** The building thermal envelope should be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1/N1102.4.1 through R402.4.4/N1102.4.4.
The building thermal envelope should comply with Sections R402.4.1/N1102.4.1.1 and R402.4.1.2/N1102.4.1.2. The sealing methods between dissimilar materials should allow for differential expansion and contraction.

**R402.4.1.1/N1102.4.1 Installation.** The components of the building thermal envelope as listed in the Air Barrier and Insulation Installation Table R402.4.1.1/N1102.4.1.1 should be installed in accordance with the manufacturer’s instructions and the criteria listed as applicable to the method of construction. Where required by the building official, an approved third party should inspect all components and verify compliance.

**R402.4.1.1/N1102.4.1.1 Air Barrier and Insulation Installation Table**

- **Air Barrier General Requirements.** A *continuous air barrier* should be installed in the building envelope. The exterior thermal envelope contains a *continuous air barrier*. Breaks or joints in the *air barrier* should be sealed.

- **Air Barrier Criteria:**
  - **Walls** – The junction of the foundation and sill plate should be sealed. The junction of the top plate and top of exterior walls should be sealed.
  - **Rim joists** – rim joists should include the air barrier
  - **Garage separation** – Air sealing should be provided between the garage and conditioned space.

**Insulation Installation:**

- **Walls** – Cavities within corners and headers of frame walls should be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls should be installed in substantial contact and continuous alignment with the *air barrier*.

- **Narrow cavities** – Batts in narrow cavities should be cut to fit, or narrow cavities should be filled by insulation that on installation readily conforms to the available cavity space.

- **Rim joists** – rim joists should be insulated.

**2012 IECC/IRC, R402.4/N1102.4 Air Leakage.** The *building thermal envelope* should be constructed to limit air leakage.

- **R402.4.1/N1102.4.1 Building Thermal Envelope.** The sealing methods between dissimilar materials should allow for differential expansion and contraction.

- **R402.4.1.1/N1102.4.1.1 Installation.** The components listed in the Air Barrier and Insulation Table should be installed in accordance with the manufacturer’s instructions and the criteria listed as the applicable method of construction. Below are the components from the table that are applicable to sealing and insulating attached garage walls.

**R402.4.1.1/N1102.4.1.1 Air Barrier and Insulation Installation Table**

- **Walls** – Corners and headers should be insulated and the junction of the foundation and sill plate should be sealed. The junction of the top plate and top of exterior walls should be sealed. Exterior thermal envelope insulation for framed walls should be installed in substantial contact and continuous alignment with the *air barrier*.

- **Garage separation** – Air sealing should be provided between the garage and conditioned spaces.

- **Narrow Cavities** – Batts in narrow cavities should be cut to fit, or narrow cavities should be filled by insulation that on installation readily conforms to the available cavity space.

- **Rim joists** – rim joists should include the air barrier and be insulated.

**2009 IECC/IRC, 402.4.1 Air Leakage, Building Thermal Envelope**

- The *building thermal envelope* should be constructed to limit air leakage. The sealing methods between dissimilar materials should allow for differential expansion and contraction. Sources of infiltration should be caulked, gasketed, weather stripped, or otherwise sealed with an air barrier material, suitable film, or solid material:
  - All joints, seams, and penetrations
  - Site-built windows, doors and skylights
  - Openings between window and door assemblies and their respective jambs and framing
  - Utility penetrations
  - Walls and ceilings separating a garage from conditioned spaces
  - Rim joist junction
  - Common wall
  - Other sources of infiltration.
• 2015 IECC/IRC, Section R402.1.2/N1102.1.2 Insulation Criteria. The building thermal envelope must meet the requirements of Table R402.1.2/N1102.1.2, based on the climate zone specified in Chapter 3 and the building assemblies associated with the exterior wall(s) that are considered part of the building thermal envelope.

• 2015 IECC/IRC, Section R402.1.3/N1102.1.3 or 2012 IECC/IRC, Section R402.1.2/N1102.1.2 R-Value Computation. Insulation material used in layers, such as framing cavity insulation, or continuous insulation should be summed to compute the corresponding component R-value. The manufacturer’s settled R-value should be used for blown insulation. Computed R-values should not include an R-value for other building materials or air films. (2015 IECC/IRC new language added: Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table R402.1.2/N1102.1.2, the manufacturer’s labeled R-value for insulated siding should be reduced by R-0.6.)

Excerpt from the Insulation and Fenestration Requirements by Component Tables

2015 IECC/IRC, Table R402.1.2/N1101.1.2 or 2012 IECC/IRC, Table R402.1.1/N1102.1.1

(R-values are the same for both versions, but, the footnotes have changed from 2012 to 2015 IECC/IRC)

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4 Except Marine</th>
<th>5 and Marine 4</th>
<th>6</th>
<th>7, 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Frame Wall R-value</td>
<td>13</td>
<td>13</td>
<td>20 or 13+5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>20 or 13+5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>20 or 13+5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>20+5 or 13+10</td>
<td>20+5 or 13+10</td>
</tr>
</tbody>
</table>

<sup>a</sup>2015 IECC/IRC footnote: The first value is cavity insulation, the second value is continuous insulation, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation.

<sup>b</sup>2012 IECC/IRC footnote: First value is cavity insulation, second is continuous insulation or insulated siding, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation or insulated siding. If structural sheathing covers <= 40% of the exterior, continuous insulation R-value should be permitted to be reduced by no more than R-3 in the locations where structural sheathing is used to maintain a consistent total sheathing thickness.

• 2015 IECC/IRC, Section R402.1.4/N1102.1.4 or 2012 IECC/IRC Section R402.1.3/N1102.1.3 U-Factor Alternative. An assembly with a U-factor equal to or less than that specified in Equivalent U-factor Tables should be permitted as an alternative to the R-value in Insulation and Fenestration Requirements by Component Tables of the IECC/IRC.

Excerpt from the Equivalent U-factor Tables

2015 IECC/IRC, Equivalent U-factor Table R402.1.4/N1101.1.4

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4 Except Marine</th>
<th>5 and Marine 4</th>
<th>6</th>
<th>7-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Frame Wall U-factor</td>
<td>0.084</td>
<td>0.084</td>
<td>0.060</td>
<td>0.060</td>
<td>0.060</td>
<td>0.045</td>
<td>0.045</td>
</tr>
</tbody>
</table>

2012 IECC/IRC, Equivalent U-factor Table R402.1.3/N1102.1.3

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4 Except Marine</th>
<th>5 and Marine 4</th>
<th>6</th>
<th>7-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Frame Wall U-factor</td>
<td>0.082</td>
<td>0.082</td>
<td>0.057</td>
<td>0.057</td>
<td>0.057</td>
<td>0.048</td>
<td>0.048</td>
</tr>
</tbody>
</table>

Excerpt from the 2009 IECC/IRC Insulation and Fenestration Requirements by Component Table 402.1.1/N1102.1

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Frame Wall R-value</td>
<td>R-13</td>
<td>R-13</td>
<td>R-13</td>
<td>R-13</td>
<td>R-20 or 13+5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>R-20 or 13+5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>R-21</td>
</tr>
</tbody>
</table>

<sup>a</sup>"13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers <= 25% of the exterior, insulated sheathing is not required where structural sheathing is used. If structural sheathing covers > 25% of exterior, structural sheathing should be supplemented with insulated sheathing of at least R-2.

[1] "Continuous air barrier" is defined as a combination of materials and assemblies that restrict or prevent the passage of air
through the building thermal envelope.

[2] “Air Barrier” is defined as material(s) assembled and joined together to provide a barrier to air leakage through the building thermal envelope. An air barrier may be a single material or a combination of materials.

Field Inspection:

Per the 2015 IECC, Section R104 Inspections, construction or work for which a permit is required is subject to inspection. Construction or work is to remain accessible and exposed for inspection purposes until approved. Required inspections include footing and foundation, framing and rough-in work, plumbing rough-in, mechanical rough-in, and final inspection.

For the 2015 IRC, Section R109 Inspections. The wording is somewhat different in that for onsite construction, from time to time the building official, upon notification from the permit holder or his agent, can make or cause to be made any necessary inspections. Further details are provided for inspections regarding foundation, plumbing, mechanical, gas and electrical, floodplain, frame and masonry, and final inspection. Any additional inspections are at the discretion of the building official.

This section provides details for inspecting to the specific provisions for sealing and insulating common walls where one or more specific type of inspection per the IECC or IRC may be necessary to confirm compliance. Verifying code compliance for sealing and insulating common walls would typically be at the framing and rough-in work inspection.

- Confirm insulation material meets ratings approved on the construction documents.
- Confirm insulation has been installed properly with a continuous air barrier per manufacturer specifications and approved construction documents.
- Confirm fire blocking sealant and other sealing materials meet installation details per manufacturer specifications and approved construction documents.

Technical Validation(s):

This section provides additional related information and references to materials that are applicable to the provision.

- Underwriters Laboratory (UL) Online Certifications Directory, wall opening protective materials, [1]


Author(s): ICC
Organization(s): ICC
Publication Date: May 2014
This code establishes a baseline for energy efficiency by setting performance standards for the building envelope (defined as the boundary that separates heated/cooled air from unconditioned, outside air), mechanical systems, lighting systems, and service water heating systems in homes and commercial businesses.

Author(s): ICC
Organization(s): ICC
Publication Date: May 2014
This code for residential buildings creates minimum regulations for one- and two-family dwellings of three stories or less. It brings together all building, plumbing, mechanical, fuel gas, energy, and electrical provisions for one- and two-family residences.
Author(s): ICC
Organization(s): ICC
Publication Date: January 2012
This code establishes a baseline for energy efficiency by setting performance standards for the building envelope (defined as the boundary that separates heated/cooled air from unconditioned, outside air), mechanical systems, lighting systems, and service water heating systems in homes and commercial businesses.

2012 IRC—International Residential Code for One and Two Family Dwellings [8]
Author(s): ICC
Organization(s): ICC
Publication Date: January 2012
This code for residential buildings creates minimum regulations for one- and two-family dwellings of three stories or less. It brings together all building, plumbing, mechanical, fuel gas, energy, and electrical provisions for one- and two-family residences.

Author(s): ICC
Organization(s): ICC
Publication Date: January 2009
This code establishes a baseline for energy efficiency by setting performance standards for the building envelope (defined as the boundary that separates heated/cooled air from unconditioned, outside air), mechanical systems, lighting systems, and service water heating systems in homes and commercial businesses.

Author(s): ICC
Organization(s): ICC
Publication Date: January 2009
This code for residential buildings creates minimum regulations for one- and two-family dwellings of three stories or less. It brings together all building, plumbing, mechanical, fuel gas, energy and electrical provisions for one- and two-family residences.

Measure Guideline: Air Sealing Attics in Multifamily Buildings
Author(s): Otis, Maxwell
Organization(s): CARB, NREL
Publication Date: June 2012
This document provides an understanding of the importance of the different types of multifamily building attics and their unique challenges, and outlines strategies and materials used in air sealing them.

New Whole-House Solutions Case Study: Zero Energy Ready Home Multifamily Project: Mutual Housing at Spring Lake
Organization(s): Alliance for Residential Building Innovation (ARBI)
Publication Date: September 2015
Building cost effective, high performance homes that provide superior comfort, health, and durability is the goal of the Department of Energy's (DOE's) Zero Energy Ready Homes (ZERH) program. This case study describes the development of a 62-unit multifamily community constructed by nonprofit developer Mutual Housing at the Spring Lake subdivision in Woodland, California. The Spring Lake project is expected to be the first ZERH-certified multifamily project nationwide.

Implementing a Zero Energy Ready Home Multifamily Project
Author(s): David Springer and Alea German
Organization(s): Alliance for Residential Building Innovation (ARBI)
Publication Date: August 2015
An objective of this project was to gain a highly visible foothold for residential buildings built to the U.S. Department of Energy's Zero Energy Ready Home (ZERH) specification that can be used to encourage participation by other California builders. This report briefly describes two single family homes that were ZERH-certified, and focuses on the experience of working with developer Mutual Housing on a 62 unit multi-family community at the Spring Lake subdivision in Woodland, California.

Technology Solutions Case Study: Predicting Envelope Leakage in Attached Dwellings
Organization(s): Consortium for Advanced Residential Buildings (CARB)
Publication Date: November 2013
The most common method of measuring air leakage is to perform single (or solo) blower door pressurization and/or depressurization test. In detached housing, the single blower door test measures leakage to the outside. In attached housing, however, this “solo” test method measures both air leakage to the outside and air leakage between adjacent units through common surfaces. In an attempt to create a simplified tool for predicting leakage to the outside, Building America team Consortium for Advanced Residential Buildings (CARB) performed a preliminary statistical analysis on blower door test results from 112 attached dwelling units in four apartment complexes.
Predicting Envelope Leakage in Attached Dwellings
Author(s): O. Faakye, L. Arena, D. Griffiths
Organization(s): Consortium for Advanced Residential Buildings (CARB)
Publication Date: July 2013

The most common method for measuring air leakage is to use a single blower door to pressurize and/or depressurize the test unit. In detached housing, the test unit is the entire home and the single blower door measures air leakage to the outside. In attached housing, this 'single unit', 'total', or 'solo' test method measures both the air leakage between adjacent units through common surfaces as well air leakage to the outside.

Relevant Publications: