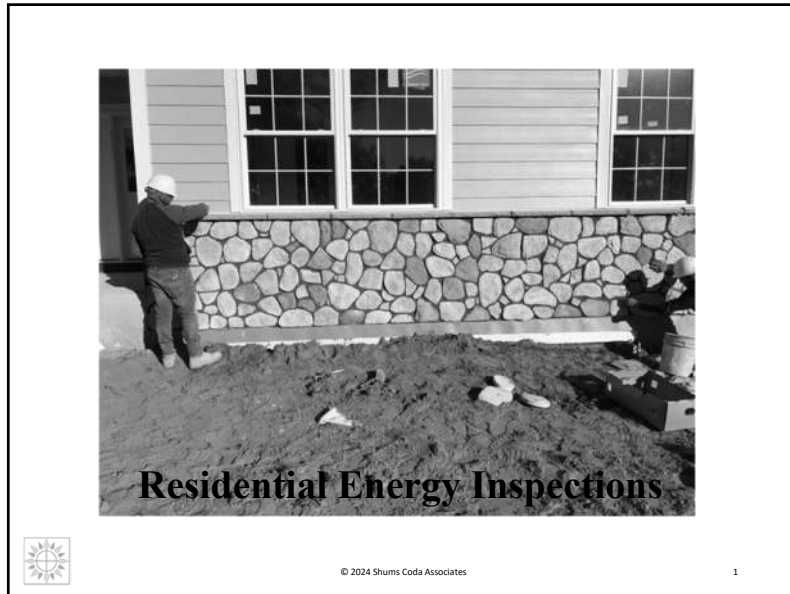




Residential Energy Inspections





Residential Energy Inspections



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Instructor

Gil Rossmiller
 In the construction industry for over 40 years
 ICC – IRC Plumbing & Mechanical Code Development Committee
 ICC – Commercial Energy Code Development Committee
 ICC – Residential Energy Code Development Committee
 2003-2016 Building Official
 Parker, Colorado



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Professionalism

- Professional manner
- Courteous
- Prompt
- Good frame of mind
- Refrain from criticism
- Work to limit complaints



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3

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Develop a Reputation

- Thorough
- Knowledgeable
- Fair
- Reasonable
- Understands construction

- A jerk
- Hard to work with
- Unreasonable
- Arrogant
- Doesn't know the code
- #&*@\$@&#%



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Field Relations

- Unskilled people
 - Be patient
 - Expect to spend more time doing inspection
 - Use opportunity to educate person about codes



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5

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Definitions

ABOVE-GRADE WALL

A wall more than 50 percent above grade and enclosing conditioned space. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts



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Definitions



AIR BARRIER

One or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.



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Definitions

BUILDING THERMAL ENVELOPE

The basement walls, exterior walls, floors, ceiling, roofs and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space



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Definitions

FENESTRATION. Products classified as either vertical fenestration or skylights.

Skylights

Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees from horizontal including unit skylights, tubular daylighting devices, and glazing materials in solariums, sunrooms, roofs and sloped walls.

Vertical fenestration

Windows that are fixed or operable, opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of not less than 60 degrees from horizontal.



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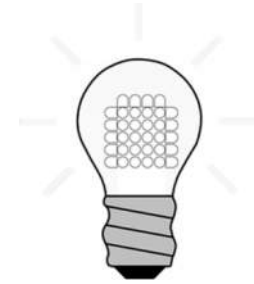
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Definitions

HIGH-EFFICACY LIGHT SOURCES

Any lamp with an efficacy of not less than 65 lumens per watt, or luminaires with an efficacy of not less than 45 lumens per watt.



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Definitions

DWELLING UNIT ENCLOSURE AREA

The sum of the area of ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. Wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above.



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Definitions

CAVITY INSULATION

Insulating material located between framing members



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Definitions

SUNROOM

A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof.



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Definitions

CONTINUOUS INSULATION (ci)

Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior, or is integral to any opaque surface, of the building envelope.



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Definitions

RESIDENTIAL BUILDING

For this code, includes detached one- and two-family dwellings and townhouses as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.



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Inspection Procedures

- Develop a routine
 - Top to Bottom
 - Bottom to Top
 - Clockwise
 - Counter clockwise
- Follow checklist until comfortable



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When Does Inspection Begin?

- As soon as you drive up to the job site
- When you walk in the front door



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R303.1.2 Insulation mark installation

Insulating materials shall be installed such that the manufacturer's R-value mark is readily observable at inspection. For insulation materials that are installed without an observable manufacturer's R-value mark, such as blown or draped products, an insulation certificate complying with Section R303.1.1 shall be left immediately after installation by the installer, in a conspicuous location within the building, to certify the installed R-value of the insulation material.



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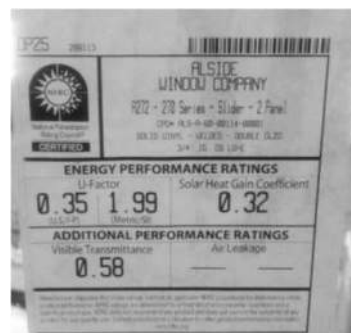
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R303.1.3 Fenestration product rating

U-factors of fenestration products such as windows, doors and skylights shall be determined in accordance with NFRC 100.

Exception: Where required, garage door U-factors shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

U-factors shall be determined by an accredited, independent laboratory, and labeled and certified by the manufacturer.



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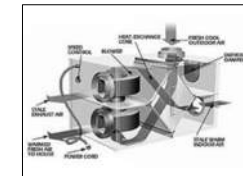


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R303.4 Mechanical Ventilation

Buildings and dwelling units complying with Section N1102.4.1 shall be provided with mechanical ventilation in accordance with Section M1505, or with other approved means of ventilation.



- Where the air infiltration rate of a dwelling unit is less than 5 air changes per hour when tested with a blower door at a pressure of 0.2 inch w.e. (50 Pa) buildings complying in accordance with Section N1102.4.1.2, the dwelling unit shall be provided with whole-house-mechanical ventilation in accordance with Section M1507.3.

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R408.8 Under-floor vapor retarder



- In Climate Zones 1A, 2A and 3A below the warm-humid line, a continuous Class I or II vapor retarder shall be provided on the exposed face of air-permeable insulation installed between the floor joists and exposed to the grade in the under-floor space.
- The vapor retarder shall have a maximum water vapor permeance of 1.5 perms when tested in accordance with Procedure B of ASTM E96.
 - Exception: The vapor retarder shall not be required in unvented crawl spaces constructed in accordance with Section R408.3.



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R702.7 Vapor retarders

- Vapor retarder materials shall be classified in accordance with Table R702.7(1).
- A vapor retarder shall be provided on the interior side of frame walls of the class indicated in Table R702.7(2), including compliance with Table R702.7(3) or R702.7(4) where applicable.
- An approved design using accepted engineering practice for hygrothermal analysis shall be permitted as an alternative.
- The climate zone shall be determined in accordance with Section N1101.7.



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R702.7 Vapor retarders

- Exceptions:
 1. Basement walls.
 2. Below-grade portion of any wall.
 3. Construction where accumulation, condensation or freezing of moisture will not damage the materials.
 4. A vapor retarder shall not be required in Climate Zones 1, 2 and 3.



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TABLE R702.7(1)
VAPOR RETARDER MATERIALS AND CLASSES

CLASS	ACCEPTABLE MATERIALS
I	Sheet polyethylene, nonperforated aluminum foil or other approved materials with a perm rating less than or equal to 0.1.
II	Kraft-faced fiberglass batts, vapor retarder paint or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 0.1 and less than or equal to 1.0.
III	Latex paint, enamel paint or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 1.0 and less than or equal to 10.0.

TABLE R702.7(2)
VAPOR RETARDER OPTIONS

CLIMATE ZONE	VAPOR RETARDER CLASS		
	CLASS I ^a	CLASS II ^b	CLASS III
1, 2	Not Permitted	Not Permitted	Permitted
3, 4 (except Marine 4)	Not Permitted	Permitted ^c	Permitted
Marine 4, 5, 6, 7, 8	Permitted ^d	Permitted ^d	See Table R702.7(3)

- Class I and II vapor retarders with vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B) shall be allowed on the interior side of any frame wall in all climate zones.
- Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design.
- Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with Table R702.7(4) and the Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B).



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R702.7.1 Spray foam plastic insulation for moisture control with Class II and III vapor retarders

- For purposes of compliance with Tables R702.7(3) and R702.7(4), spray foam with a maximum permeance of 1.5 perms at the installed thickness applied to the interior side of wood structural panels, fiberboard, insulating sheathing or gypsum shall be deemed to meet the continuous insulation moisture control requirement in accordance with one of the following conditions:
 - 1. The spray foam R-value is equal to or greater than the specified continuous insulation R-value.
 - 2. The combined R-value of the spray foam and continuous insulation is equal to or greater than the specified continuous insulation R-value.



**TABLE R702.7(3)
CLASS III VAPOR RETARDERS**

CLIMATE ZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^{a,b}
Marine 4	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with R-value ≥ 2.5 over 2 × 4 wall. Continuous insulation with R-value ≥ 3.75 over 2 × 6 wall.
5	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum. Continuous insulation with R-value ≥ 5 over 2 × 4 wall. Continuous insulation with R-value ≥ 7.5 over 2 × 6 wall.
6	Vented cladding over fiberboard.
	Vented cladding over gypsum. Continuous insulation with R-value ≥ 7.5 over 2 × 4 wall. Continuous insulation with R-value ≥ 11.25 over 2 × 6 wall.
7	Continuous insulation with R-value ≥ 10 over 2 × 4 wall. Continuous insulation with R-value ≥ 15 over 2 × 6 wall.
	8

a. Vented cladding shall include vinyl, polypropylene, or horizontal aluminum siding, brick veneer with a clear airspace as specified in Table R703.8.4(1), and other approved vented claddings.
b. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class III vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of Chapter 11.



**TABLE R702.7(4)
CONTINUOUS INSULATION WITH CLASS II VAPOR RETARDER**

CLIMATE ZONE	CLASS II VAPOR RETARDERS PERMITTED FOR: ^a
3	Continuous insulation with R-value ≥ 2.
4, 5 and 6	Continuous insulation with R-value ≥ 3 over 2 × 4 wall. Continuous insulation with R-value ≥ 5 over 2 × 6 wall.
	Continuous insulation with R-value ≥ 5 over 2 × 4 wall. Continuous insulation with R-value ≥ 7.5 over 2 × 6 wall.
8	Continuous insulation with R-value ≥ 7.5 over 2 × 4 wall. Continuous insulation with R-value ≥ 10 over 2 × 6 wall.

a. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class II vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of Chapter 11.



R402.2 Specific insulation requirements

R402.2.3 Eave baffle

For air-permeable insulation in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain a net free area opening equal to or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material. The baffle shall be installed to the outer edge of the exterior wall top plate so as to provide maximum space for attic insulation coverage over the top plate.

Where soffit venting is not continuous, baffles shall be installed continuously to prevent ventilation air in the eave soffit from bypassing the baffle





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R402.2 Specific insulation requirements

R402.2.4 Access hatches and doors

Access hatches and doors from conditioned to unconditioned spaces such as attics and crawl spaces shall be insulated to the same R-value required by Table R402.1.3 for the wall or ceiling in which they are installed



Exceptions:



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R402.2 Specific insulation requirements



R402.2.4 Access hatches and doors

Exceptions:

1. Vertical doors providing access from conditioned spaces to unconditioned spaces that comply with the fenestration requirements of Table R402.1.3 based on the applicable climate zone specified in Chapter 3.
2. Horizontal pull-down, stair-type access hatches in ceiling assemblies that provide access from conditioned to unconditioned spaces in Climate Zones 0 through 4 shall not be required to comply with the insulation level of the surrounding surfaces provided the hatch meets all of the following:
 - 2.1. The average U-factor of the hatch shall be less than or equal to U-0.10 or have an average insulation R-value of R-10 or greater.
 - 2.2. Not less than 75 percent of the panel area shall have an insulation R-value of R-13 or greater.
 - 2.3. The net area of the framed opening shall be less than or equal to 13.5 square feet (1.25 m²).
 - 2.4. The perimeter of the hatch edge shall be weatherstripped.

The reduction shall not apply to the total UA alternative in Section R402.1.5.

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R402.2 Specific insulation requirements

R402.2.4.1 Access hatches and door insulation installation and retention

Vertical or horizontal access hatches and doors from conditioned spaces to unconditioned spaces such as attics and crawl spaces shall be weatherstripped.

Access that prevents damaging or compressing the insulation shall be provided to all equipment.

Where loose-fill insulation is installed, a wood-framed or equivalent baffle, retainer, or dam shall be installed to prevent loose-fill insulation from spilling into living space from higher to lower sections of the attic and from attics covering conditioned spaces to unconditioned spaces. The baffle or retainer shall provide a permanent means of maintaining the installed R-value of the loose-fill insulation



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R402.2 Specific insulation requirements

R402.2.7 Floors

Floor cavity insulation shall comply with one of the following:

1. Installation shall be installed to maintain permanent contact with the underside of the subfloor decking in accordance with manufacturer instructions to maintain required R-value or readily fill the available cavity space



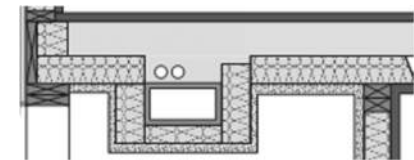
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R402.2 Specific insulation requirements

2. Floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing separating the cavity and the unconditioned space below. Insulation shall extend from the bottom to the top of all perimeter floor framing members and the framing members shall be air sealed



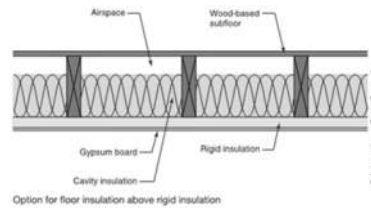
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R402.2 Specific insulation requirements

3. A combination of cavity and continuous insulation shall be installed so that the cavity insulation is in contact with the top side of the continuous insulation that is installed on the underside of the floor framing separating the cavity and the unconditioned space below. The combined R-value of the cavity and continuous insulation shall equal the required R-value for floors. Insulation shall extend from the bottom to the top of all perimeter floor framing members and the framing members shall be air sealed.



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R402.2 Specific insulation requirements

R402.2.8 Basement walls

Basement walls shall be insulated in accordance with Table R402.1.3.

Exception:

Basement walls associated with unconditioned basements where all of the following requirements are met:

Exception:



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R402.2 Specific insulation requirements

R402.2.8 Basement walls

Exception: Basement walls associated with unconditioned basements where all of the following requirements are met:

1. The floor overhead, including the underside stairway stringer leading to the basement, is insulated in accordance with Section R402.1.3 and applicable provisions of Sections R402.2 and R402.2.7.
2. There are no uninsulated duct, domestic hot water, or hydronic heating surfaces exposed to the basement.
3. There are no HVAC supply or return diffusers serving the basement.
4. The walls surrounding the stairway and adjacent to conditioned space are insulated in accordance with Section R402.1.3 and applicable provisions of Section R402.2.
5. The door(s) leading to the basement from conditioned spaces are insulated in accordance with Section R402.1.3 and applicable provisions of Section R402.2, and weatherstripped in accordance with Section R402.4.
6. The building thermal envelope separating the basement from adjacent conditioned spaces complies with Section R402.4.



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R402.2 Specific insulation requirements

R402.2.8.1 Basement wall insulation installation

Where basement walls are insulated, the insulation shall be installed from the top of the basement wall down to 10 feet below grade or to the basement floor, whichever is less.



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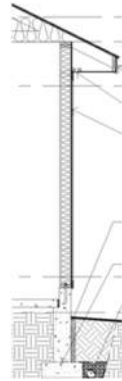
R402.2 Specific insulation requirements

R402.2.9 Slab-on-grade floors

Slab-on-grade floors with a floor surface less than 12 inches below grade shall be insulated in accordance with Table R402.1.3.

Exception

Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation



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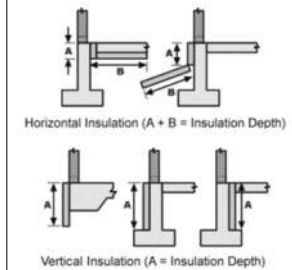
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R402.2 Specific insulation requirements

R402.2.9.1 Slab-on-grade floor insulation installation

Where installed, the insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table R402.1.3 or the distance of the proposed design, as applicable, by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by not less than 10 inches of soil.

The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree angle away from the exterior wall.



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R402.2 Specific insulation requirements

R402.2.10 Crawl space wall

Crawl space walls shall be insulated in accordance with Table R402.1.3.

Exception

Crawl space walls associated with a crawl space that is vented to the outdoors and the floor over-head is insulated in accordance with Table R402.1.3 and Section R402.2.7.



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R402.2 Specific insulation requirements

R402.2.10.1 Crawl space wall insulation installations

Where crawl space wall insulation is installed, it shall be permanently fastened to the wall and shall extend downward from the floor to the finished grade elevation and then vertically or horizontally for not less than an additional 24 inches.

Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder in accordance with the International Building Code or International Residential Code, as applicable.

Joints of the vapor retarder shall overlap by 6 inches and be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches up stem walls and shall be attached to the stem walls.



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R402.2 Specific insulation requirements

R402.2.12 Sunroom and heated garage insulation

Sunrooms enclosing conditioned space and heated garages shall meet the insulation requirements of this code.

Exception

For sunrooms and heated garages provided thermal isolation, and enclosed conditioned space, the following exceptions to the insulation requirements of this code shall apply:

1. The minimum ceiling insulation R-values shall be R-19 in Climate Zones 0 through 4 and R-24 in Climate Zones 5 through 8.
2. The minimum wall insulation R-value shall be R-13 in all climate zones. Walls separating a sunroom or heated garage with thermal isolation from conditioned space shall comply with the building thermal envelope requirements of this code.



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R402.4 Air leakage

R402.4 Air leakage

The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.4.1 Building thermal envelope

The building thermal envelope shall comply with Sections R402.4.1.1 through R402.4.1.3. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.



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R402.4 Air leakage

R402.4.1.1 Installation

The components of the building thermal envelope as indicated in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1, as applicable to the method of construction.

Where required by the code official, an approved third party shall inspect all components and verify compliance.

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope.	Air-permeable insulation shall not be used as a sealing material.
Roofs	Roofs shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.	Roofs shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.
Walls	Walls shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.	Walls shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.
Windows, doors and other openings	Windows, doors and other openings shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.	Windows, doors and other openings shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.
Basement walls and floors	Basement walls and floors shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.	Basement walls and floors shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.
Attic	Attic shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.	Attic shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.
Garage	Garage shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.	Garage shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.
Unfinished spaces	Unfinished spaces shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.	Unfinished spaces shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.
Lighting	Lighting shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.	Lighting shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.
Other	Other shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.	Other shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1.



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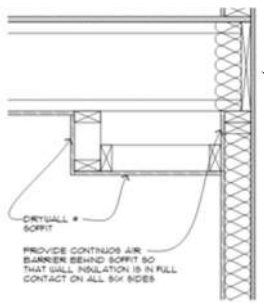
R402.4 Air leakage

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.

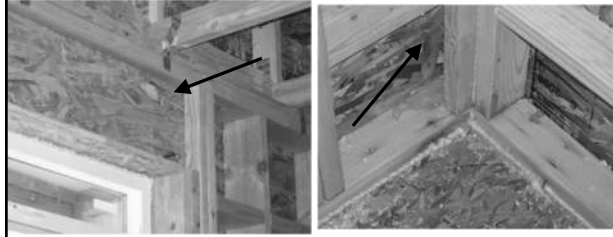


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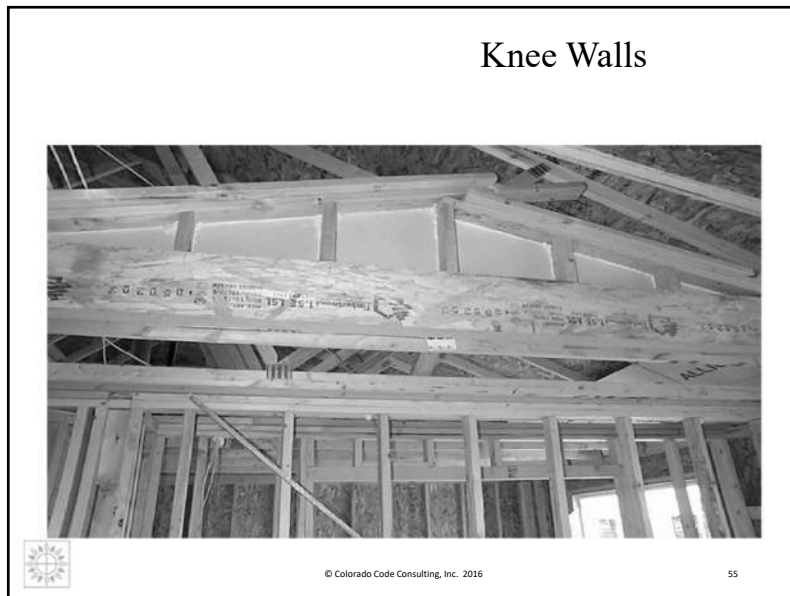
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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Ceiling/attic	<p>The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed.</p> <p>Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.</p>	<p>The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.</p> 

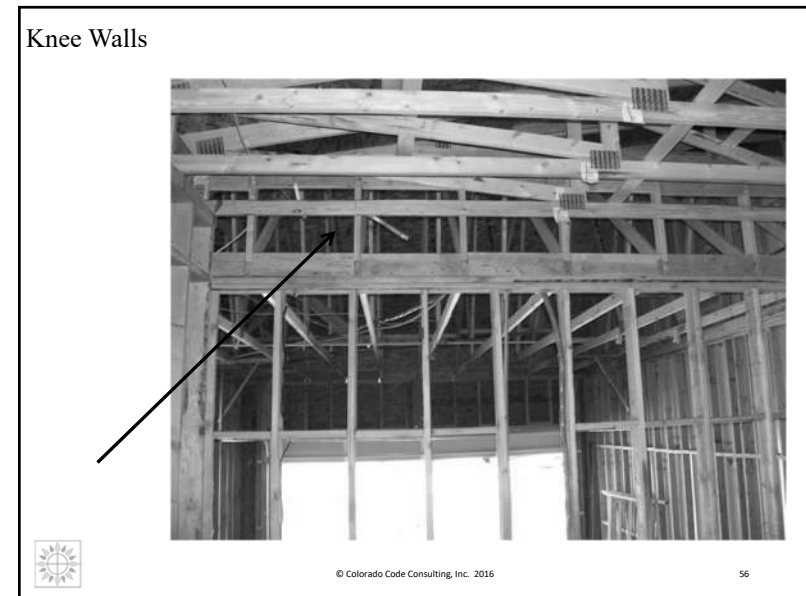
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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Walls	<p>The junction of the foundation and sill plate shall be sealed.</p> <p>The junction of the top plate and the top of exterior walls shall be sealed.</p> <p>Knee walls shall be sealed.</p>	<p>Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.</p>
		


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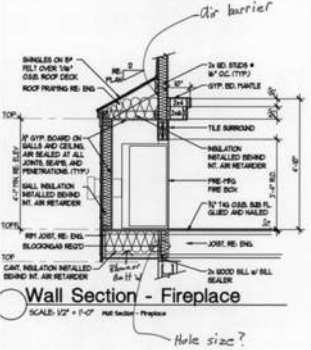
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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
		

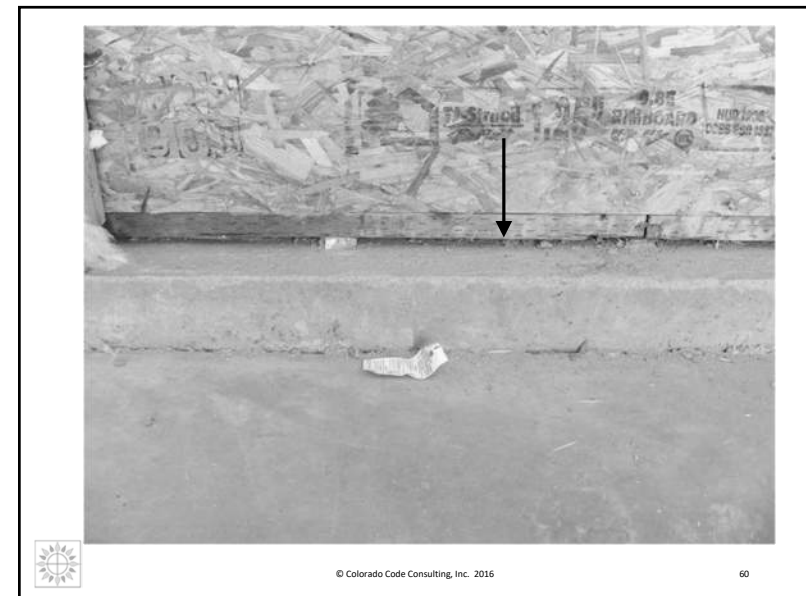
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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Rim joists	<p>Rim joists shall include an exterior air barrier.^b</p> <p>The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.</p>	<p>Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board.^b</p>
		

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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extending from the bottom to the top of all perimeter floor framing members.
		

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Walls and ceilings separating a garage from conditioned spaces.



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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Basement crawl space and slab foundations	<u>Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section R402.2.10.</u>	<u>Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section R402.2.10.</u>
	<u>Penetrations through concrete foundation walls and slabs shall be air sealed.</u>	<u>Conditioned basement foundation wall insulation shall be installed in accordance with Section R402.2.8.1.</u>
	<u>Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7 of the International Residential Code.</u>	<u>Slab-on-grade floor insulation shall be installed in accordance with Section R402.2.10.</u>



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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Shafts, penetrations	<u>Duct and flue shafts to exterior or unconditioned space shall be sealed.</u>	<u>Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the building thermal envelope to maintain required R-value.</u>
	<u>Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.</u>	



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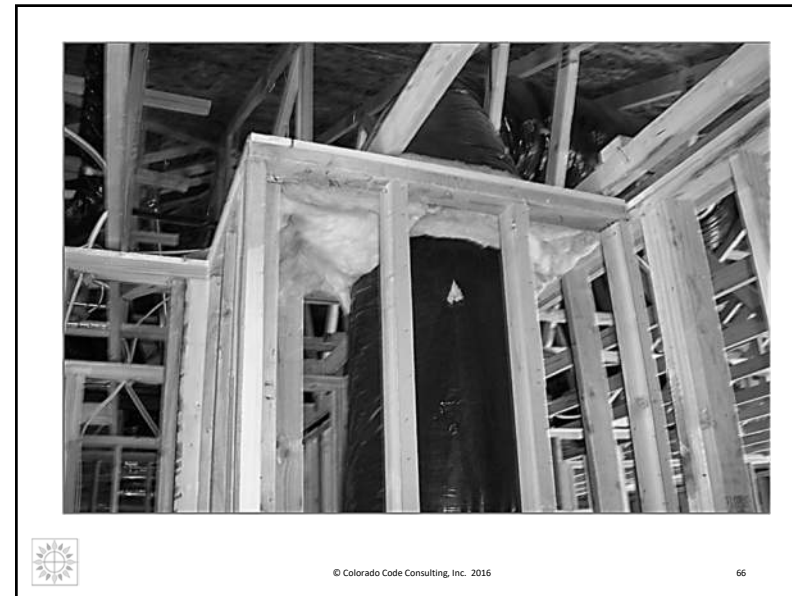
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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.

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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections R303 and R402.2.7.

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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.4.5.	Recessed light fixtures installed in the building thermal envelope shall be airtight and IC rated, and shall be buried or surrounded with insulation.

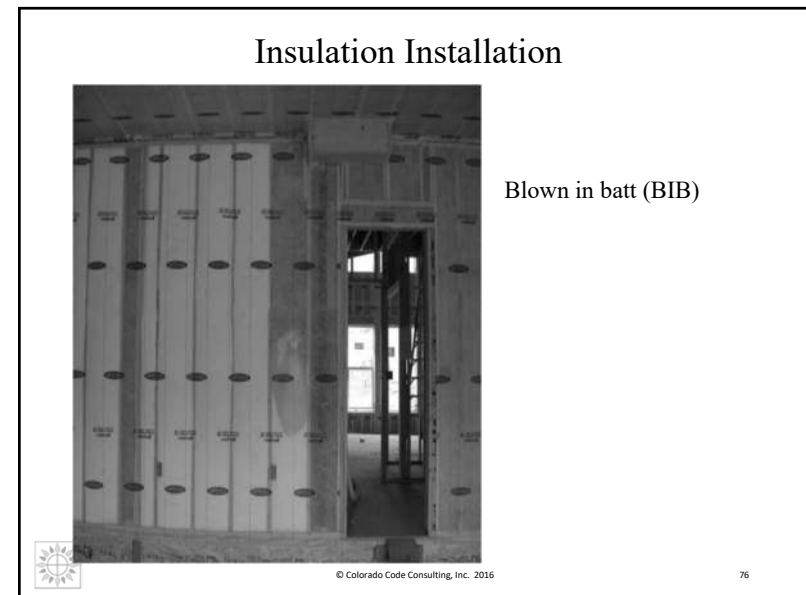
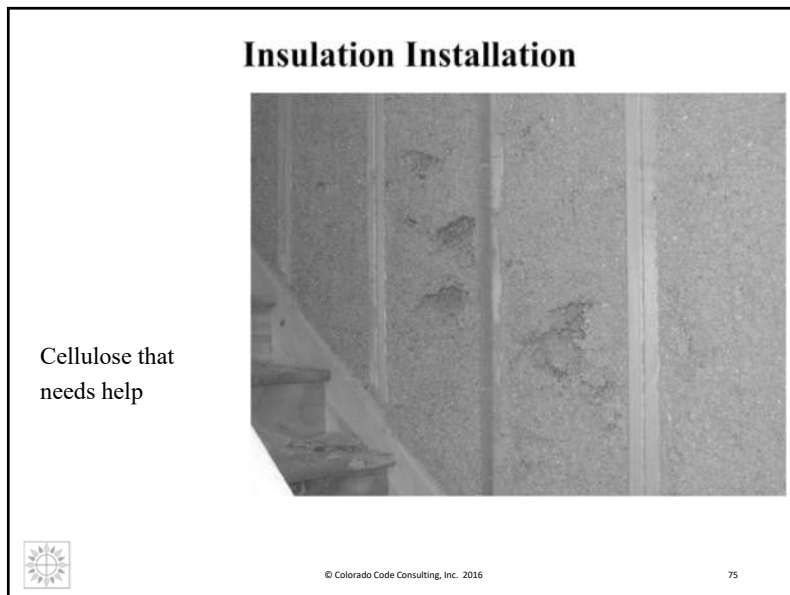
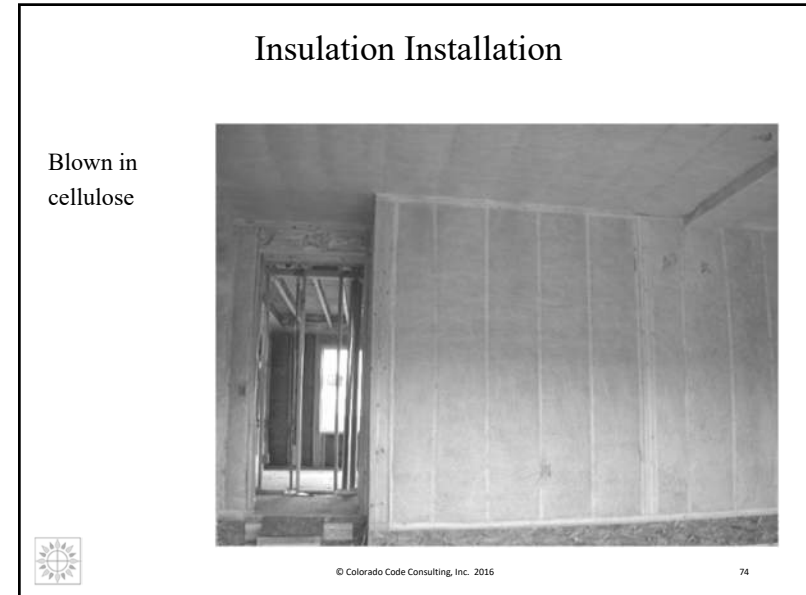
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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION *		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Plumbing, wiring or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air sealed.	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required R-value can be met by installing insulation and air barrier systems completely to the exterior side of the obstructions.

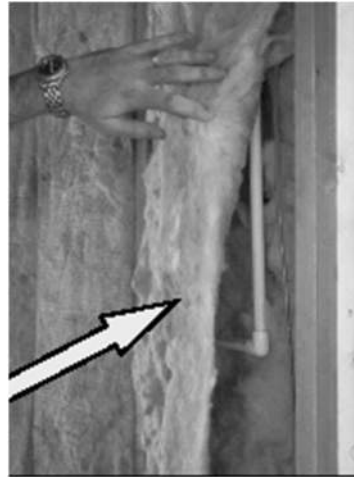


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Insulation Installation

Unfaced fiberglass batt



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Insulation Installation

Kraft faced fiberglass batt



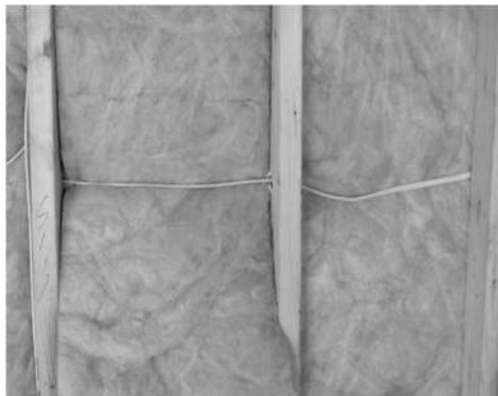
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Insulation Installation

Fiberglass batt no-no's



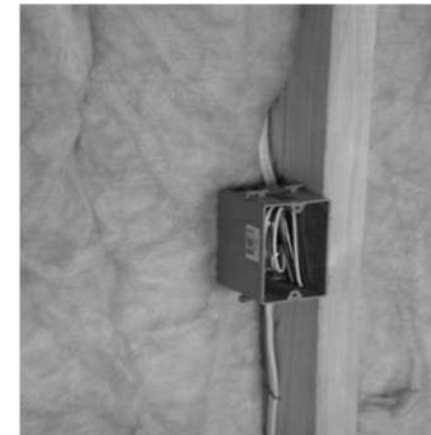
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Insulation Installation

Fiberglass batt no-no's



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Insulation Installation

Fiberglass
batt no-no's



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Insulation Installation

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batt no -no's



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Insulation Installation

Fiberglass
batt no -no's



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Fiberglass
batt no -no's




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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.



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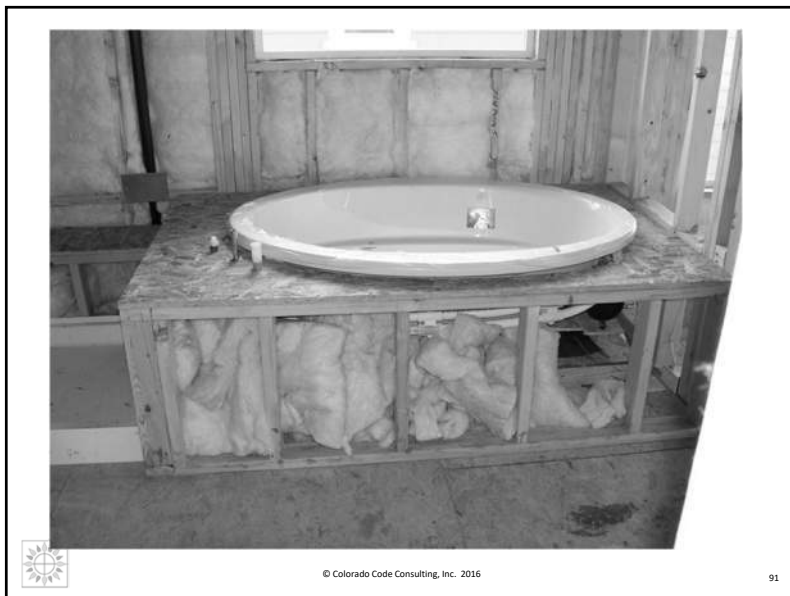
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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively , air-sealed boxes shall be installed.	—

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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—



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TABLE R402.4.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION ^a		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Concealed sprinklers	Where 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.	—



a. Inspection of log walls shall be in accordance with the provisions of ICC 400.
b. Air barrier and insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

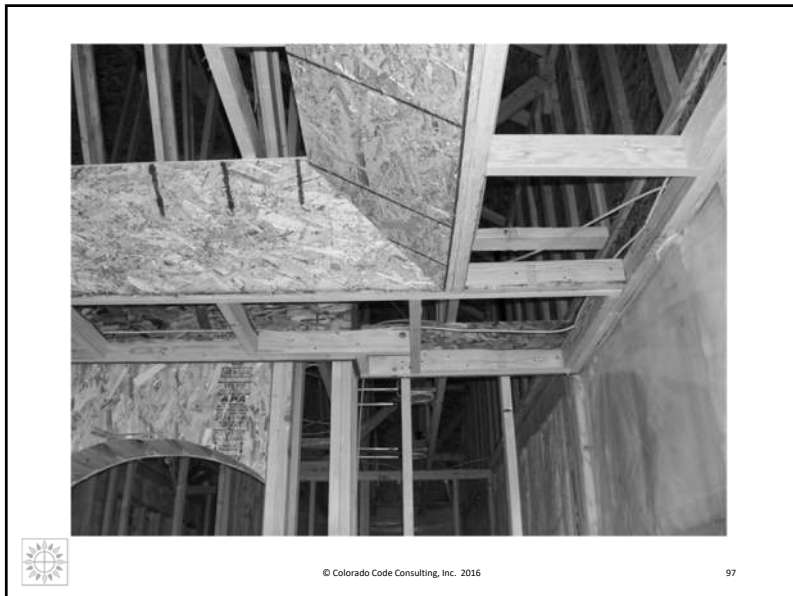
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R402.4 Air leakage

R402.4.1.2 Testing

The building or dwelling unit shall be tested for air leakage. The maximum air leak-age rate for any building or dwelling unit under any compliance path shall not exceed 5.0 air changes per hour or 0.28 cubic feet per minute (CFM) per square foot of dwelling unit enclosure area. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals)

Exception....



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R402.4 Air leakage

Exception

For heated, attached private garages and heated, detached private garages accessory to one-and two-family dwellings and townhouses not more than three stories above grade plane in height, building envelope tightness and insulation installation shall be considered acceptable where the items in Table R402.4.1.1, applicable to the method of construction, are field verified.

Where required by the code official, an approved third party independent from the installer shall inspect both air barrier and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be thermally isolated from all other habitable, conditioned spaces in accordance with Sections R402.2.12 and R402.3.5, as applicable



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R402.4 Air leakage

During testing

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Exception

When testing individual dwelling units, an air leakage rate not exceeding 0.30 cubic feet per minute per square foot of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be permitted in all climate zones for:

1. Attached single and multiple-family building dwelling units.
2. Buildings or dwelling units that are 1,500 square feet or smaller.



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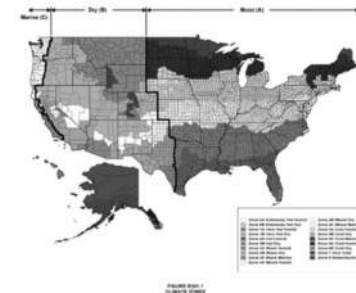
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R402.4 Air leakage

R402.4.1.3 Leakage rate

When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 0, 1 and 2, and 3.0 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.



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Montana Amendment

(g) Subsection R402.4.1.2, Testing, is deleted and replaced with the following: The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding four air changes per hour in Climate Zone 6. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals).

Where required by the code official, testing shall be conducted by an approved party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

During testing:

- "(i) exterior windows and doors, fireplace and stove doors shall be closed, but not sealed;
- "(ii) dampers shall be closed, but not sealed, including exhaust, intake, makeup air, back draft and flue dampers;
- "(iii) interior doors shall be open;
- "(iv) exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
- "(v) heating and cooling system(s) shall be turned off;
- "(vi) "B" or "L" vents, combustion air vents, and dryer vents shall be sealed; and
- "(vii) supply and return registers, where installed at the time of test, shall be fully open.



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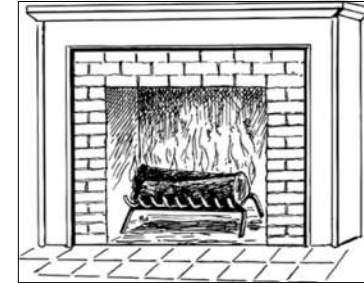
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R402.4 Air leakage

R402.4.2 Fireplaces

New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air. Where using tight-fitting doors on factory-built fireplaces listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace.



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R402.4 Air leakage

R402.4.3 Fenestration air leakage

Windows, skylights and sliding glass doors shall have an air infiltration rate of not greater than 0.3 cfm per square foot, and for swinging doors, not greater than 0.5 cfm per square foot, when tested in accordance with NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled by the manufacturer



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R402.4 Air leakage

R402.4.4 Rooms containing fuel-burning appliances

In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.2, where the walls, floors and ceilings shall meet not less than the basement wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.



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R402.4 Air leakage

R402.4.5 Recessed lighting

Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. Recessed luminaires shall be IC-rated and labeled as having an air leakage rate of not greater than 2.0 cfm when tested in accordance with ASTM E283 at a pressure differential of 1.57 psf.

Recessed luminaires shall be sealed with a gasket or caulked between the housing and the interior wall or ceiling covering



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R402.4.6 Electrical and communication outlet boxes (air-sealed boxes)

Electrical and communication outlet boxes installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. Electrical and communication outlet boxes shall be tested in accordance with NEMA OS 4, Requirements for Air-Sealed Boxes for Electrical and Communication Applications, and shall have an air leak-age rate of not greater than 2.0 cubic feet per minute at a pressure differential of 1.57 psf (75 Pa).

Electrical and communication outlet boxes shall be marked "NEMA OS 4" or "OS 4" in accordance with NEMA OS 4.

Electrical and communication outlet boxes shall be installed per the manufacturer's instructions and with any supplied components required to achieve compliance with NEMA OS 4

R402.4 Air leakage



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R403.1 Controls

R403.1.1 Programmable thermostat

The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of day and different days of the week.

This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures of not less than 55°F to not greater than 85°F.

The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70°F and a cooling temperature setpoint of not less than 78°F



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R403.1 Controls

R403.1.2 Heat pump supplementary heat

Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load



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R403.1 Controls

R403.2 Hot water boiler temperature reset

The manufacturer shall equip each gas, oil and electric boiler (other than a boiler equipped with a tankless domestic water heating coil) with automatic means of adjusting the water temperature supplied by the boiler to ensure incremental change of the inferred heat load will cause an incremental change in the temperature of the water supplied by the boiler. This can be accomplished with outdoor reset, indoor reset or water temperature sensing.



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R403.3 Ducts

R403.3.1 Ducts located outside conditioned space

Supply and return ducts located outside conditioned space shall be insulated to an R-value of not less than R-8 for ducts 3 inches in diameter and larger and not less than R-6 for ducts smaller than 3 inches in diameter.

Ducts buried beneath a building shall be insulated as required per this section or have an equivalent thermal distribution efficiency.

Underground ducts utilizing the thermal distribution efficiency method shall be listed and labeled to indicate the R-value equivalency.



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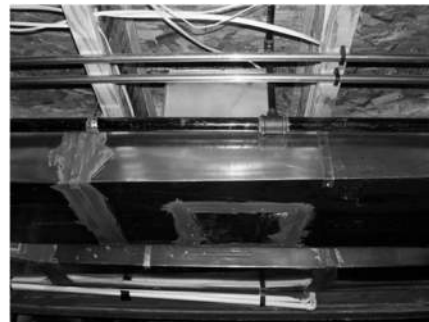
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R403.3 Ducts

R403.3.2 Ducts located in conditioned space

For ductwork to be considered inside a conditioned space, it shall comply with one of the following:

1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.



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R403.3 Ducts

2. Ductwork in ventilated attic spaces shall be buried within ceiling insulation in accordance with Section R403.3.3 and all of the following conditions shall exist:

2.1. The air handler is located completely within the continuous air barrier and within the building thermal envelope.



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R403.3 Ducts

2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.6, is less than or equal to 1.5 cubic feet per minute per 100 square feet of conditioned floor area served by the duct system.

2.3. The ceiling insulation R-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation R-value, less the R-value of the insulation on the duct.



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R403.3 Ducts

3. Ductwork in floor cavities located over unconditioned space shall comply with all of the following:

3.1. A continuous air barrier installed between unconditioned space and the duct.

3.2. Insulation installed in accordance with Section

R402.2.7.

3.3. A minimum R-19 insulation installed in the cavity width separating the duct from unconditioned space.



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R403.3 Ducts

4. Ductwork located within exterior walls of the building thermal envelope shall comply with the following:

4.1. A continuous air barrier installed between unconditioned space and the duct.

4.2. Minimum R-10 insulation installed in the cavity width separating the duct from the outside sheathing.

4.3. The remainder of the cavity insulation shall be fully insulated to the drywall side.



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Field Inspections



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R403.3 Ducts

R403.3.4 Sealing

Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the International Mechanical Code or International Residential Code,



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R403.3.4.1 Sealed air handler

Air handlers shall have a manufacturer's designation for an air leakage of not greater than 2 percent of the design airflow rate when tested in accordance with ASHRAE 193.



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R403.3 Ducts

R403.3.5 Duct testing

Ducts shall be pressure tested in accordance with ANSI/RESNET/ICC 380 or ASTM E1554 to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.
2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exception: A duct air-leakage test shall not be required for ducts serving ventilation systems that are not integrated with ducts serving heating or cooling systems



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R403.3 Ducts

R403.3.6 Duct leakage

The total leakage of the ducts, where measured in accordance with Section R403.3.5, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to 4.0 cubic feet per minute per 100 square feet of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3.0 cubic feet per minute per 100 square feet of conditioned floor area.
2. Postconstruction test: Total leakage shall be less than or equal to 4.0 cubic feet per minute per 100 square feet of conditioned floor area.
3. Test for ducts within thermal envelope: Where all ducts and air handlers are located entirely within the building thermal envelope, total leakage shall be less than or equal to 8.0 cubic feet per minute per 100 square feet of conditioned floor area.



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R403.3 Ducts

R403.3.7 Building cavities

Building framing cavities shall not be used as ducts or plenums.



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Montana Amendment

(i) Subsection R403.3.7,

Exception: Building framing cavities may be used for return ducts if there is no atmospherically vented furnace, boiler, or water heater located in the house outside of a sealed and insulated room that is isolated from inside the thermal envelope and if the duct system has been tested as having a maximum total leakage not greater than 4 cfm/(100?)SF. The room walls, floor, and ceilings shall be insulated in accordance with the basement wall requirements of Table R402.1.3. A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.



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R403.4 Mechanical system piping insulation

Mechanical system piping capable of carrying fluids greater than 105°F or less than 55°F shall be insulated to an R-value of not less than R-3



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R403.5 Service hot water systems

R403.5.1 Heated water circulation and temperature maintenance systems

Heated water circulation systems shall be in accordance with Section R403.5.1.1. Heat trace temperature maintenance systems shall be in accordance with Section R403.5.1.2. Automatic controls, temperature sensors and pumps shall be in a location with access. Manual controls shall be in a location with ready access



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R403.5 Service hot water systems

R403.5.1.1 Circulation systems

Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermosyphon circulation systems shall be prohibited.

Controls for circulating hot water system pumps shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

The controls shall limit the temperature of the water entering the cold water piping to not greater than 104°F.



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R403.5 Service hot water system

R403.5.1.1.1 Demand recirculation water systems

Where installed, demand recirculation water systems shall have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.



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R403.5 Service hot water system

R403.5.1.2 Heat trace systems.

Electric heat trace systems shall comply with IEEE 515.1 or UL 515. Controls for such systems shall automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.



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R403.5 Service hot water systems

R403.5.2 Hot water pipe insulation

Insulation for service hot water piping with a thermal resistance, R-value, of not less than R-3 shall be applied to the following:

1. Piping 3/4 inch (19.1 mm) and larger in nominal diameter located inside the conditioned space.
2. Piping serving more than one dwelling unit.
3. Piping located outside the conditioned space.
4. Piping from the water heater to a distribution manifold.
5. Piping located under a floor slab.
6. Buried piping.
7. Supply and return piping in circulation and recirculation systems other than cold water pipe return demand recirculation systems.



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Definitions (2021)

BALANCED VENTILATION

Any combination of concurrently operating mechanical exhaust and mechanical supply whereby the total mechanical exhaust airflow rate is within 10 percent of the total mechanical supply airflow rate.

BALANCED VENTILATION SYSTEM

A ventilation system where the total supply airflow and total exhaust airflow are simultaneously within 10 percent of their averages. The balanced ventilation system airflow is the average of the supply and exhaust airflows.



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R403.6 Mechanical ventilation

R403.6.1 Heat or energy recovery ventilation

Dwelling units shall be provided with a heat recovery or energy recovery ventilation system in Climate Zones 7 and 8.

The system shall be balanced with a minimum sensible heat recovery efficiency of 65 percent at 32°F at a flow greater than or equal to the design airflow.



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R403.6 Mechanical ventilation

R403.6.2 Whole-dwelling mechanical ventilation system fan efficacy

Fans used to provide whole-dwelling mechanical ventilation shall meet the efficacy requirements of Table R403.6.2 at one or more rating points. Fans shall be tested in accordance with HVI 916 and listed. The airflow shall be reported in the product listing or on the label.

Fan efficacy shall be reported in the product listing or shall be derived from the input power and airflow values reported in the product listing or on the label.

Fan efficacy for fully ducted HRV, ERC, balanced, and in-line fans shall be determined at a static pressure of not less than 0.2 inch w.c.

Fan efficacy for ducted range hoods, bathroom and utility room fans shall be determined at a static pressure of not less than 0.1 inch w.c.

**TABLE R403.6.2
WHOLE-DWELLING MECHANICAL VENTILATION
SYSTEM FAN EFFICACY***

FAN LOCATION	AIRFLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)
HRV, ERV	Any	1.2 cfm/watt
In-line supply or exhaust fan	Any	3.8 cfm/watt
Other exhaust fan	< 90	2.8 cfm/watt
Other exhaust fan	≥ 90	3.5 cfm/watt
Air-handler that is integrated to tested and listed HVAC equipment	Any	1.2 cfm/watt



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R403.6 Mechanical ventilation

R403.6.3 Testing

Mechanical ventilation systems shall be tested and verified to provide the minimum ventilation flow rates required by Section R403.6. Testing shall be performed according to the ventilation equipment manufacturer's instructions, or by using a flow hood or box, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals or grilles, outlet terminals or grilles, or in the connected ventilation ducts. Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official.

Exception

Kitchen range hoods that are ducted to the outside with 6-inch or larger duct and not more than one 90-degree elbow or equivalent in the duct run.



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Table M1505.4.3(1) Continuous whole-house mechanical ventilation system airflow rate requirements

DWELLING UNIT FLOOR AREA (square feet)	NUMBER OF BEDROOMS				
	0-1	2-3	4-5	6-7	> 7
	Airflow in CFM				
< 1,500	30	45	60	75	90
1,501-3,000	45	60	75	90	105
3,001-4,500	60	75	90	105	120
4,501-6,000	75	90	105	120	135
6,001-7,500	90	105	120	135	150
> 7,500	105	120	135	150	165

$$CFM = (.01 \times \text{conditioned floor area}) + [7.5 \times (\text{number of bedrooms} + 1)]$$



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M1505.4.3 Mechanical ventilation rate 2021

Exceptions:

1. Ventilation rate credit. The minimum mechanical ventilation rate determined in accordance with Table M1505.4.3(1) or Equation 15-1 shall be reduced by 30 percent, provided that both of the following conditions apply:

1.1. A ducted system supplies ventilation air directly to each bedroom and to one or more of the following rooms:

1.1.1. Living room.

1.1.2. Dining room.

1.1.3. Kitchen.

1.2. The whole-house ventilation system is a balanced ventilation system.

2. Programmed intermittent operation. The whole-house mechanical ventilation system is permitted to operate intermittently where the system has controls that enable operation for not less than 25 percent of each 4-hour segment and the ventilation rate prescribed in Table M1505.4.3(1), by Equation 15-1 or by Exception 1 is multiplied by the factor determined in accordance with Table M1505.4.3(2)

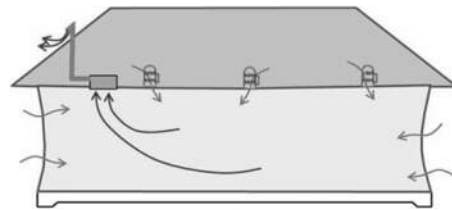


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Three basic types of Whole House Ventilation Systems



Exhaust Only



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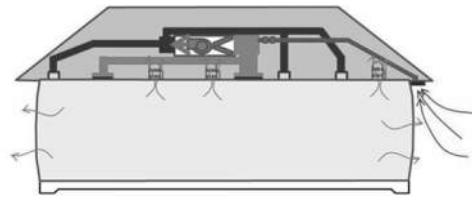
Exhaust Only Whole House Ventilation System



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Three basic types of Whole House Ventilation Systems



Supply Only



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Supply Only Whole House Ventilation System



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Supply Only



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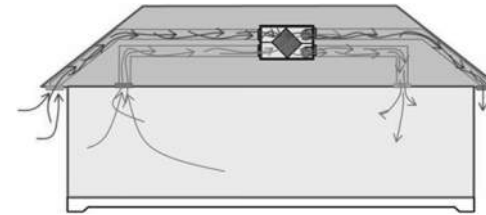
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Three basic types of Whole House Ventilation Systems

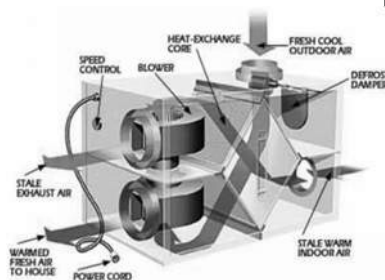


Balanced (with heat recovery) HRV or ERV

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Balanced

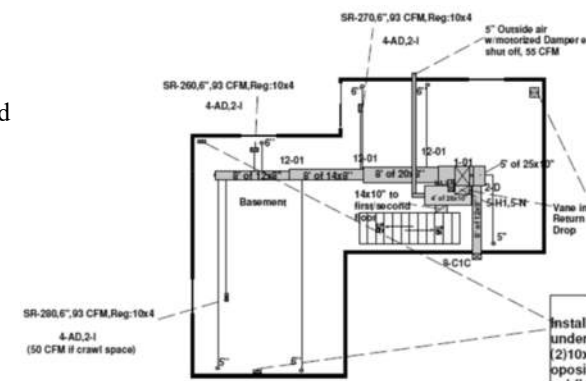
- Heat Recovery Ventilator (HRV) or
- Energy Recovery Ventilator (ERV)



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Field Inspections


- What is needed?
- 1. Duct Plan
- 2. Fittings used
- 3. Equipment Selection



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Field Inspections

	4H	50	Round floor boot, hard bend	 4AD EL = 60
	4I	10	Round floor boot, straight	
	2I	65 - 110	Round takeoff from top, equivalent length varies from 65 ft. (zero downstair branches) to 110 ft. (one downstair branch)	
	4AD	60	Round ceiling boot, segmented	



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Model Number 912SC6008S21A-A
 Bryant Heating & Cooling Systems
 7310 West Morris Street
 Indianapolis, IN 46221

Serial Number 4514A50710
 PRODUCT/PRODUIT 912SC6008S21A-A
 MODEL/MODELE 912SC6008S21

SERIES/SERIE A

SERIAL/SERIE 4514A50710

DATE OF MANUFACTURE / DATE DE FABRICATION NOV 2014

MOTOR H.P. 3/4
 FORCE W. 560

NATURAL GAS FACTORY ORIFICE / GAS NATUREL USINE EQUIPE
 MAX. UNIT AMP 44
 AMP'S MAX 8.8


115 VOLTS / 60 HZ / 1 PHASE

INPUT / ENTREE	See Note Below / Voir La Note ci-dessous	BTU/Hr	90,000	---	---
OUTPUT / SORTIE	See Note Below / Voir La Note ci-dessous	BTU/Hr	75,000	---	---
AIR TEMPERATURE RISE / AUGMENTATION DE LA TEMPERATURE DE L'AIR	DEG. F	35-65	---	---	---
CONDENS. MAX. OUTLET / COND. POUR UNE TEMPERATURE MAX. D'AIR DE SORTIE DE	DEG. F	170	---	---	---
	DEG. C	77	---	---	---



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GOODMAN COMPANY, L.P.
 5151 SAN FELIPE, STE 500
 HOUSTON, TX 77056

MODEL GSX130301DB SERIAL NO. 1202216418

A.C. VOLTS 208-230 PHASE 1 HERTZ 60

VOLTAGE RANGE MIN. 197 MAX. 253

MAX. FUSE AMPS OR MAX. CIRCUIT BREAKER (REQUIRED) 25

(TIME DELAY FUSE OR HACR CIRCUIT BREAKER REQUIRED)

MIN. CIRCUIT AMPS 16.7

FAN MOTOR FLA 0.7 H.P. 1/8
 LRA 12.8 LRA 64

COMPRESSOR

MAX. WORKING PRESSURE 76

FACTORY CHARGE OZ. R-410A

FACTORY TEST PRESSURE PSIG LOW 240 HIGH 450


WARNING
 DISCONNECT ALL ELECTRICAL POWER BEFORE SERVICING.

ADVERTISSEMENT
 COUPEZ TOUT LE COURANT AVANT TOUT ENTRETIEN OU REPARATION.

ADVERTENCIA
 DESCONECTE TODAS LAS FUENTES DE ENERGIA ELECTRICAS ANTES DE MANTENIMIENTO O SERVICIO TECNICO.

USE COPPER CONDUCTORS ONLY / THIS EQUIPMENT SUITABLE FOR OUTDOOR USE. PART NO. 83143124


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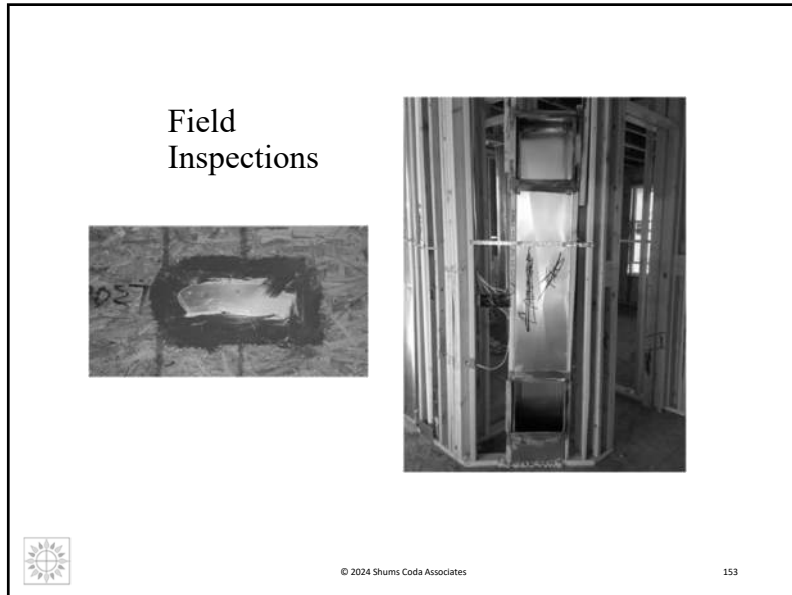
Field Inspections



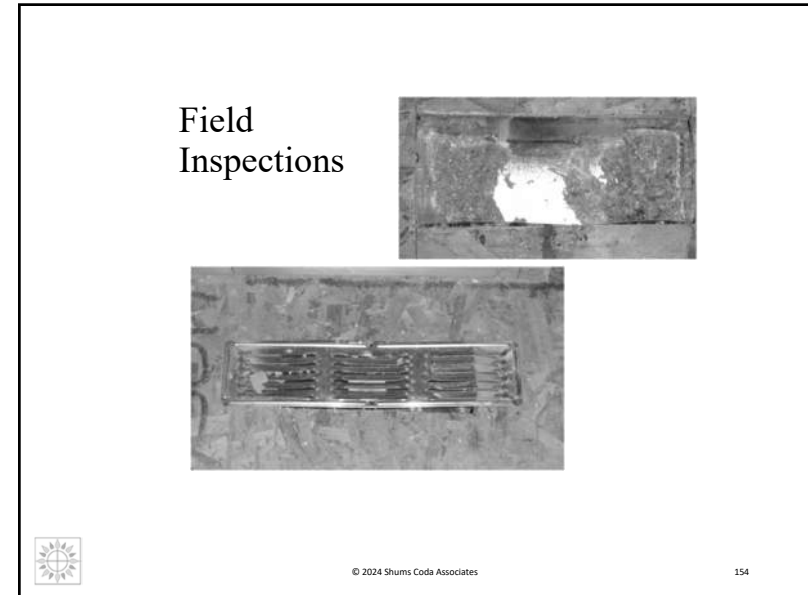


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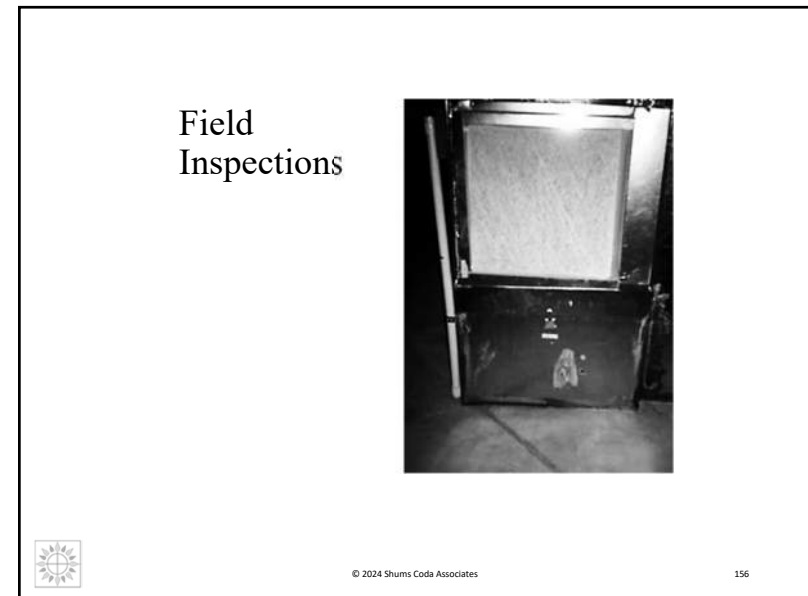
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Field Inspections



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Field Inspections



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Field Inspections



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Field Inspections



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R404 Electrical Power and Lighting Systems

R404.1 Lighting equipment

All permanently installed lighting fixtures, excluding kitchen appliance lighting fixtures, shall contain only high-efficacy lighting sources.



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R404 Electrical Power and Lighting Systems

R404.1.1 Exterior lighting

Connected exterior lighting for residential buildings shall comply with Section C405.5.

Exceptions:

1. Detached one- and two- family dwellings.
2. Townhouses.
3. Solar-powered lamps not connected to any electrical service.
4. Luminaires controlled by a motion sensor.
5. Lamps and luminaires that comply with Section R404.1



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R404 Electrical Power and Lighting Systems

R404.1.2 Fuel gas lighting equipment

Fuel gas lighting systems shall not have continuously burning pilot lights.



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R404 Electrical Power and Lighting Systems

R404.2 Interior lighting controls

Permanently installed lighting fixtures shall be controlled with either a dimmer, an occupant sensor control or other control that is installed or built into the fixture.

Exception

Lighting controls shall not be required for the following:

1. Bathrooms.
2. Hallways.
3. Exterior lighting fixtures.
4. Lighting designed for safety or security.



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R404 Electrical Power and Lighting Systems

R404.3 Exterior lighting controls

Where the total permanently installed exterior lighting power is greater than 30 watts, the permanently installed exterior lighting shall comply with the following:

1. Lighting shall be controlled by a manual on and off switch which permits automatic shut-off actions.

Exception

1. Lighting serving multiple dwelling units.
2. Lighting shall be automatically shut off when daylight is present and satisfies the lighting needs.
3. Controls that override automatic shut-off actions shall not be allowed unless the override automatically returns automatic control to its normal operation within 24 hours



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Questions?



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