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

Personal Preparation
- Personal Appearance
  - Professional
  - Look like an inspector
- Proper equipment and tools
- Proper attitude

Discuss the inspection of residential projects
- Based on 2018 International Residential Code
Professionalism

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

Develop a Reputation

- Tough
- Knowledgeable
- Fair
- Reasonable
- Understands construction
- A jerk
- Hard to work with
- Unreasonable
- Arrogant
- Doesn't know the code
- #&*@$@%#

Paperwork

- Keep good records
- Keep work up to date
- Be consistent with paperwork
- Streamline forms

Records

- Follow basic criteria for developing reports, letters, field cards, notes
  - Keep legal action in mind
- Set up efficient file system
- Destroy old files when permitted
Time Management

- Inspections
  - Number per day
  - Difficult projects
  - Unskilled persons
  - Phone calls, messages
  - Set time of day
  - Cell phone?
- Report writing
  - In field or office
- Meetings
  - Staff, contractors, designers

Field Relations

- Identify yourself
  - Name
  - Building Inspector
  - Jurisdiction
  - Deal with person in authority
    - Superintendent
    - Foreman

Field Relations

- Arrive Promptly
  - If appointment was set
  - Phone if delayed
- Be courteous
- Be helpful
- Be professional

Field Relations

- Corrections
  - Write all corrections
    - Correction notice
    - Inspection report
    - Include code section
    - Bear legal action in mind
  - Explain corrections
    - Reason for requirement
    - Not “because the code requires it”
Field Relations

• Corrections
  • Be consistent
    • Same interpretation for all
    • Enforce the code, no more and no less
  • Offer alternatives if appropriate
  • Follow up promptly
    • Time is money

Field Relations

• Resolve differences without argument
  • Maintain professionalism
  • Don't raise your voice
  • Leave if your safety is in question
  • Notify your superior

Field Relations

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

Stop Work Orders

• Issue when necessary
  • Local policy
  • Be professional
    • Identify yourself
    • Explain reason for issuing order
  • Be Right!
  • Follow up promptly
Favors

• **DO NOT ACCEPT FAVORS!**
  • Illegal
  • Compromises all inspector’s reputation
  • Almost always backfires

Tools/Equipment

• Personal Protection
  • Work Boots
    • Steel toe
    • Good support
  • Work Clothes
    • Full pants
    • Appropriate shirt
  • Hard Hat
  • Safety Glasses
  • Ear Protection

Tools/Equipment

• Inspection Tools
  • Clipboard
  • Pen/Pencil
  • Measuring Tape
  • Flashlight
  • Ladder
  • Binoculars
  • Mirror
  • Outlet Tester (GFCI and or AFCI)

Tools/Equipment

• Miscellaneous Tools
  • Screwdriver
  • Multi-Purpose tool
  • Staple Gun
  • Tape
  • Gloves
Tools/Equipment

- Code Book!
- Code References

Inspection Procedures

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

When Does Inspection Begin?

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

Address/Permit

- Street Address
  - Is there one?
  - Can it be seen from the street?
- Permit
  - Is there one?
  - Correct for work being inspected and done?
  - Posted so it can be seen
Property Lines

- Identify property lines
  - Staked?
  - Batter boards
- Identify setbacks
  - Are they per the plans
- Property fenced?
  - Required by local ordinance

Site Condition

- Site grade
  - Sloped away from building
  - Safe to access
- Job Cleanliness
  - Trash contained
  - Safe to access

Inspection Record Card

- On the job?
- Correct permit?
- All previously required inspections completed?

Project Plans

- Correct Set
- Changes approved?
- Deferred submittals
- Manufacturer's installation instructions
Light, Ventilation & Heating R303

- Habitable Rooms
  - Aggregate glazing area of 8 percent of floor area of room
  - Natural ventilation via openings to the outdoor air shall be 4 percent of the floor area.

- Exceptions
  - Artificial light permitted with mechanical ventilation
  - Average illumination of 6 foot-candles over the room at a height of 30 inches above the floor.

Bathrooms R303.3

- 3 square feet of glazing with 1/2 of window openable
- Exception:
  - Artificial light & mechanical ventilation permitted
    - 50 cfm intermittent
    - 20 cfm continuous
    - exhausted outside

R303.7

Interior stairway illumination

- Interior stairways shall be provided with an artificial light source to illuminate the landings and treads. The light source shall be capable of illuminating treads and landings to levels of not less than 1 foot-candle as measured at the center of treads and landings. There shall be a wall switch at each floor level to control the light source where the stairway has six or more risers.
R303.8
Exterior stairway illumination

- Exterior stairways shall be provided with an artificial light source located at the top landing of the stairway.
- Exterior stairways providing access to a basement from the outdoor grade level shall be provided with an artificial light source located at the bottom landing of the stairway.

Ceiling Height
R305

- 7 Feet
  - Habitable rooms
  - hallways
  - corridors
  - bathrooms
  - toilet rooms
  - laundry rooms
  - basements
  - measured to lowest projection

Ceiling Height Exceptions

- Beams > 4 ft. OC
  - may project 6 in.
- Basements w/o habitable space
  - 6 ft. 8 in.
  - beams 6 ft. 4 in.
- Sloped ceilings for not more than 50% of room area
- Bathrooms 6’ 8” over & at front of fixture
- Showers 6’ 8” above 30” X 30” at shower head

Figure R307.1
Minimum Fixture Clearances

- Bathtub and shower floors and walls above bathtubs with installed shower heads and in shower compartments shall be finished with a nonabsorbent surface.
  - 6 feet above the floor.
Glazing R308

- Identification
  - Acid etched, sandblasted, ceramic fired, embossed mark, or other non-removable application
- Exception:
  - Certificate to building official
  - Spandrel glass

R308.4.2 Glazing adjacent to doors

- Glazing in an individual fixed or operable panel adjacent to a door shall be considered to be a hazardous location where the bottom exposed edge of the glazing is less than 60 inches above the floor or walking surface and it meets either of the following conditions:

R308.4.2 Glazing adjacent to doors (2018)

- 1. Where the glazing is within 24 inches of either side of the door in the plane of the door in a closed position.
- 2. Where the glazing is on a wall is less than 180° from the plane of the door in a closed position and within 24 inches of the hinge side of an in-swinging door.
Hazardous Locations R308.4.3

- Fixed or operable panel
- > 9 square feet
- Bottom edge < 18 inches above floor
- Top edge > 36 inches above floor
- Walking surface within 36 inches
- Railings
- Enclosing pools, hot tubs, spas

R308.4.5 – Glazing and Wet Surfaces

- Glazing in walls, enclosures, or fences containing OR FACING:
  - Bathtubs
  - Showers
  - Whirlpools, saunas, steam rooms, indoor and outdoor pools
  - Shall be safety glazing is less than 60” AFF

R308.4.5 – Glazing and Wet Surfaces

- Exception:
  - Glazing that is more than 60” measured horizontally and in a straight line from the water's edge of a bathtub, hot tub, spa, whirlpool, or swimming pool or from the edge of a shower, sauna or steam room.

R308.4.6 – Glazing Adjacent to Stairs and Ramps

- Changes hazardous location of glazing along stairs to 36” from walking surfaces of stairways, landings between flights, and ramps.
  - Formerly 60”
R308.4.7 Glazing adjacent to the bottom stair landing

- Glazing adjacent to the landing at the bottom of a stairway where the glazing is less than 36 inches above the landing and within a 60-inch horizontal arc less than 180 degrees from the bottom tread nosing shall be considered to be a hazardous location.

Garages & Carports R302.5

- No openings into sleeping room
- Other openings
  - solid wood door 1 3/8"
  - honeycomb core steel door 1 3/8"
  - 20-minute fire-rated
  - Self-Closing
  - Ducts
    - 26 gauge or other approved material

Dwelling-garage fire separation R302.6

- The garage shall be separated as required by Table R302.6.

Emergency Escape & Rescue Openings R310

- Basements with habitable space and every sleeping room shall have at least one openable emergency escape and rescue opening. Such opening shall open directly into a public street, public alley, yard or court.
  - Except Basements used only to house mechanical equipment and not exceeding total floor area of 200 square feet.
Egress Opening Dimensions R310.2

- 5.7 square feet net clear opening
  - 5 square feet at grade floor opening
- > 24 inches height
- > 20 inches wide
- Operational from inside w/o key or tools
- 44 inch to opening from floor

Window Wells R310.2.3

- 9 square feet net clear opening
  - min. 36” horizontal projection
  - ladder may encroach 6 inches
  - Shall allow the opening to be fully opened

Ladders & Steps R310.2.3.1

- Ladder or steps required if vertical depth exceeds 44 inches
  - permanently affixed
  - not required to meet R314 & R315
  - inside width 12 inches
  - project 3 inches from wall
  - 18 inches O.C. vertically

R310.2.3.2 – Window Well Drainage

- Window wells shall be designed for proper drainage by connecting to the building’s foundation drainage system or by and approved alternate method.
R310.2.3.2 – Window Well Drainage

- Exception
- Not required on well drained soil or sand gravel mixture classified as Group I soils
  - United Soil Classification System
  - Table R405.1

R310.3 Emergency Escape/Rescue Doors (2018)

Where a door is provided as the required emergency escape and rescue opening, it shall be permitted to be a side-hinged door or a slider.

Where the opening is below the adjacent ground elevation grade, it shall be provided with a bulkhead enclosure. An area well is required.

R310.3.1 Minimum door opening size

- The minimum net clear height opening for any door that serves as an emergency and escape rescue opening shall be in accordance with Section R310.2.1. (Egress openings)

R310.3.2 Area wells

Area wells shall have a width of not less than 36 inches. The area well shall be sized to allow the emergency escape and rescue door to be fully opened.
**R310.3.2.1 Ladders and steps (2018)**

Required if area well greater than 44” deep

Need not comply with R311.7 or R311.8 (Stairways)

Ladders or rungs

- Inside ≥ 12”
- Project ≥ 3”
- Rung spacing ≤ 18”

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**Egress door R311.2**

- Not less than one egress door shall be provided for each dwelling unit.
- The egress door shall be side-hinged, and shall provide a clear width of not less than 32 inches where measured between the face of the door and the stop, with the door open 90 degrees.
- The clear height of the door opening shall be not less than 78 inches in height measured from the top of the threshold to the bottom of the stop.

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**Egress door R311.2**

- Other doors shall not be required to comply with these minimum dimensions.
- Egress doors shall be readily openable from inside the dwelling without the use of a key or special knowledge or effort.

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**Landings at Doors R311.3**

- There shall be a floor or landing on each side of each exterior door.
- The floor or landing at the exterior door shall not be more than 1.5 inches lower than the top of the threshold.
- The landing shall be permitted to have a slope not to exceed 0.25 unit vertical in 12 units horizontal (2-percent).
Floor elevations at the required egress doors - R311.3.1

- Landings or finished floors at the required egress door shall not be more than 1 ½ inches lower than the top of the threshold.
- Exception: The landing or floor on the exterior side shall not be more than 7 3/4 inches below the top of the threshold provided the door does not swing over the landing or floor.

Floor elevations for other exterior doors R311.3.2

- Doors other than the required egress door shall be provided with landings or floors not more than 7 3/4 inches below the top of the threshold.
- Exception: A landing is not required where a stairway of two or fewer risers is located on the exterior side of the door, provided the door does not swing over the stairway.

Treads & Risers R311.7.5

- Maximum rise 7 3/4"
  - leading edges of adjacent treads
- Minimum tread 10"
  - leading edges of the foremost projection of adjacent tread's leading edge
- Winders
  - 10" at 12" from narrower side
  - Minimum tread depth 6"

Tolerances R311.7

- Normal Stairs
  - 3/8” tolerance for treads and risers
- Winders
  - 3/8” measured at 12” walk line
R311.7.3 Vertical rise

- A flight of stairs shall not have a vertical rise larger than 147 inches between floor levels or landings.
- 19 risers X 7 ¾ inches = 147.25 inches

Landings for Stairways R311.7.6

- Top and bottom of stairs
  - except interior where door does not swing over
- As wide as stair
- Minimum of 36" in direction of travel

Handrails R311.7.8

- At least one side of each continuous run of treads or flight with four or more risers
- 34” - 38” above tread
- Continuous full length of stairs from top riser to bottom riser in the same flight
  - newel posts permitted
- Ends returned or terminate at newel post or safety rail
  - use of volute, turnout or starting easing allowed at lowest tread
- 1.5 inch space at wall

Handrail Grip Size R311.7.8.3

- Type I.
  - Circular cross section
    - outside diameter 1¼ inches to than 2 inches.
  - Non-circular cross section
    - perimeter dimension of at least 4 inches to 6¼ inches
    - maximum cross section of 2¼ inches.
Handrail Grip Size R311.7.8.3

- **Type II.**
- Perimeter greater than 6¼ inches
- Provide a graspable finger recess area on both sides of the profile.
- Begin within a distance of ¾ inch measured vertically from the tallest portion of the profile and achieve a depth of at least 5/16 inch within 7/8 inch below the widest portion of the profile.
- This required depth shall continue for at least 3/8 inch to a level that is not less than 1¾ inches below the tallest portion of the profile.
- The minimum width of the handrail above the recess shall be 1¼ inches to a maximum of 2 ¾ inches.
- Edges shall have a minimum radius of 0.01 inches.

Guards Required R312.1.1

- Guards shall be located along open-sided walking surfaces, including stairs, ramps and landings, that are located more than 30 inches measured vertically to the floor or grade below at any point within 36 inches horizontally to the edge of the open side.

Height R312.1.2

- Required guards at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches in height as measured vertically above the adjacent walking surface or the line connecting the leading edges of the treads.

Guard Required R312.1.2

1. Guards on the open sides of stairs shall have a height not less than 34 inches measured vertically from a line connecting the leading edges of the treads.

2. Where the top of the guard also serves as a handrail on the open sides of stairs, the top of the guard shall not be less than 34 inches and not more than 38 inches measured vertically from a line connecting the leading edges of the treads.
Guard Opening Limitations R312.1.3

- Required guards shall have intermediate rails or ornamental closures that do not allow passage of a sphere 4 inches in diameter.
  
  - Exceptions:
    - 6 inch sphere permitted at riser/tread triangle
    - 4 3/8” on sides of stair treads

Smoke Alarms R314

- Smoke alarms required:
  - Each sleeping room
  - Outside of each separate sleeping area
  - Each additional story including basements but not including crawl spaces and uninhabitable attics
R314.2.2 Alterations, repairs and additions

Where alterations, repairs or additions requiring a permit occur, the individual dwelling unit shall be equipped with smoke alarms located as required for new dwellings.

Exceptions:

1. Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of a porch or deck.
2. Installation, alteration or repairs of plumbing or mechanical systems.

Smoke Alarms R314.4

- When more than one smoke alarm is required the alarm devices shall be interconnected.
- The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.
- Installed per NFPA 72

Power Source R314.2

- New Construction
  - building wiring
  - battery backup
  - battery operated when commercial power not provided
- Alterations, repairs, additions not required to be hard wired & buildings w/o commercial power
  - battery operated permitted

R315 Carbon monoxide alarms

- R315.2 Where required. Carbon monoxide alarms shall be provided in accordance with Sections R315.2.1 and R315.2.2.
R315.2.1 New construction

• For new construction, carbon monoxide alarms shall be provided in dwelling units where either or both of the following conditions exist:
  • 1. The dwelling unit contains a fuel-fired appliance.
  • 2. The dwelling unit has an attached garage with an opening that communicates with the dwelling unit.

R315.2.2 Alterations, repairs and additions

• Where alterations, repairs or additions requiring a permit occur, or where one or more sleeping rooms are added or created in existing dwellings, the individual dwelling unit shall be equipped with carbon monoxide alarms located as required for new dwellings.

• Exceptions:
  • 1. Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, is exempt from the requirements of this section.
  • 2. Installation, alteration or repairs of plumbing or mechanical systems.

R315.3 Location

• Carbon monoxide alarms in dwelling units shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms.

• Where a fuel-burning appliance is located within a bedroom or its attached bathroom, a carbon monoxide alarm shall be installed within the bedroom.
Carbon Monoxide Alarms

R315.5 Interconnectivity (2018)

- When more than one required
  Shall be interconnected (same as Smoke Detectors)

Exception:
Interconnection of carbon monoxide alarms in existing areas
shall not be required where alterations or repairs do not result
in removal of interior wall or ceiling finishes exposing the
structure, unless there is an attic, crawl space or basement
available that could provide access for interconnection
without the removal of interior finishes.

R315.4 Combination alarms

- Combination carbon monoxide and smoke alarms shall be
  permitted to be used in lieu of carbon monoxide alarms.

R302.1 Exterior Walls

- Construction, projections, openings and penetrations of exterior walls of
dwellings and accessory
buildings shall comply with Table R302.1(1); or
dwellings equipped throughout with an
automatic sprinkler system installed in accordance
with Section P2904 shall comply with Table
R302.1(2).
R302.2 Townhouses  (2018)

Walls separating townhouse units shall be constructed in accordance with Section R302.2.1 or R302.2.2.

R302.2.1 Double walls  (2018)

Each townhouse shall be separated by two 1-hour fire-resistance-rated wall assemblies tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.

R302.2.2 Townhouses  (2015/2018)

- Common walls separating townhouses shall be assigned a fire-resistance rating in accordance with Section R302.2, Item 1 or 2.
  - 1. Sprinklers = 1-hour
  - 2. No Sprinklers = 2 hours
- 2018 added IBC section 703.3

Continuity R302.2.3  (unchanged)

- The fire-resistance-rated wall or assembly separating townhouses shall be continuous from the foundation to the underside of the roof sheathing, deck or slab. The fire-resistance rating shall extend the full length of the wall or assembly, including wall extensions through and separating attached enclosed accessory structures.
Parapet R302.2.4 (unchanged)

- Where roof surfaces adjacent to the wall or walls are at the same elevation, the parapet shall extend not less than 30 inches above the roof surfaces.

Parapet R302.2.4 (unchanged)

- A parapet is not required in two situations
  - Roof is covered with a minimum class C roof covering
  - Roof sheathing is noncombustible materials or approved fire-retardant-treated wood for a distance of 4 feet on each side of the wall or walls,
  - or one layer of 5/8-inch Type X gypsum board is installed directly beneath the roof sheathing for a distance of 4 feet on each side of the wall or walls.

Parapet R302.2.4 (unchanged)

A parapet is not required:

- Different elevations and the higher roof is more than 30 inches above the lower roof.
- Common wall construction from the lower roof to the underside of the higher roof deck shall not have less than a 1-hour fire-resistant rating.

Structural Independence R302.2.4 (2015)

- Each townhouse shall be structurally independent
- Exceptions:
  - foundations
  - roof & wall sheathing may fasten to common wall
  - nonstructural wall coverings
  - flashing
  - Townhouses separated by a common wall as provided in Section R302.2.2, Item 1 or 2.
Dwelling Unit Separation R302.3

- Two-family dwellings
  - One-hour fire-resistive wall and/or floor assembly
    - ASTM E119 / UL263
    - Extend to and against exterior wall and to underside of roof sheathing
      - Exception: 1/2 hour permitted with NFPA 13 sprinkler system.
    - Supporting construction same protection
  - Exception:
    - 5/8” ceiling, ½” Support, Arctic Draftstop

Garages & Carports R302.5

- No openings into sleeping room
- Other openings
  - solid wood door 1 3/8”
  - honeycomb core steel door 1 3/8”
  - 20-minute fire-rated
  - Self-closing
- Ducts
  - 26 gauge or other approved material

Separation Required R302.6

Table R302.6 Dwelling/Garage Separation

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<tr>
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<th>MATERIAL</th>
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<tbody>
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<td>From the residence and attic</td>
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<td>Not less than 6” gyp board or equivalent</td>
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Under Stair Protection R302.7

• Enclosed accessible space under stairs shall have walls, under stair surface and any soffits protected on the enclosed side with 1/2-inch gypsum board.

Protection Against Decay R317.1

• Approved species of wood or treated lumber required if:
  • Joists <18” to ground
  • Beams <12” to ground
  • Wood framing members resting on concrete/masonry exterior walls within 8” of exposed ground
  • Girders entering masonry or concrete <1/2” air space
  • Siding, sheathing, framing within 6” of ground
  • Members supporting moisture permeable floors
  • Furring strips on concrete without vapor barrier

Let’s Look at the Building!

FOUNDATIONS
CHAPTER 4
DRAINAGE
R401.3

- Diverted to a storm sewer conveyance or other approved point of collection.
- Drain away from foundation
- Grade shall fall 6” within first 10’

Exception:
- Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, drains or swales shall be provided to ensure drainage away from the structure.

FOOTING MINIMUM DEPTH
R403.1.4

- Must extend at least 12 inches below undisturbed ground
- Frost Protection
  - Table 301.2
  - Frost protected shallow foundations
  - ASCE 32-01
  - Erected on solid rock

FOUNDATION ANCHORAGE
R403.1.6

- Braced Walls Panels supported on continuous foundation shall be anchored to foundation with anchor bolts
  - Spaced a maximum of 6 feet O.C.
  - Minimum two bolts per plate section
  - Located within 12” or less than 7 bolt diameters from the ends of each plate section.
  - Bolts shall be at least 1/2” in diameter and shall extend a minimum of 7” into masonry or concrete.

HEIGHT ABOVE FINISHED GRADE
R404.1.6

- 4 inches for masonry veneer
- 6 inches elsewhere
BACKFILL PLACEMENT
R404.1.7
Backfill shall not be placed against the wall until the wall has sufficient strength and has been anchored to the floor above, or has been sufficiently braced to prevent damage by the backfill.
Except walls supporting less than 4’ of unbalance backfill.

FOUNDATION DRAINAGE
R405
Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade.
Except in well-drained ground or sand-gravel soils.

FOUNDATION DAMPROOFING
R406
Except where required to be waterproofed by R406.1, foundation walls that retain earth and enclose habitable or usable spaces located below grade shall be damproofed from the top of the footing to the finished grade.

COLUMNS
R407.3
The columns shall be re-strained to prevent lateral displacement at the bottom end.
Except Seismic A, B, & C columns <48” in height on a pier or footing within enclosed foundation.
UNDER FLOOR VENTILATION

R408

- 1/150 square feet
- One ventilating opening shall be within 3 feet of each corner of the building.

R408.3 UNVENTED CRAWL SPACE.

Ventilation openings...

specified in Sections R408.1 and R408.2 shall not be required where the following items are provided:

... a Class I vapor retarder is installed. Joints shall overlap by 6 inches and shall be sealed. The edges of the vapor retarder shall extend not less than 6 inches up the stem wall and shall be attached and sealed to the stem wall or insulation.

Provide ventilation:
Exhaust 1 cfm per 50 sf or
Conditioned air at the same rate.
R408.3 UNVENTED CRAWL SPACE

New option in 2018:
2.4. Dehumidification sized to provide 70 pints of moisture removal per day for every 1,000 square feet of crawl space floor area.

CRAWLSPACE ACCESS
R408.4

- Minimum opening
  - 18” X 24” in floor
  - 16” X 24” in perimeter wall
  - 16” X 24” areaway required in access is below grade
- Mechanical equipment access

FLOORS CHAPTER 5

Load Bearing Lumber Grading
R502.1

- Preservative treated lumber
- Bending and subflooring
- Utility Grade lumber
- End-jointed lumber
- Grade Mark
- Prefabricated wood I-joists
- ASTM D 5055
- Structural Glued Laminated Timber
- AITC A190.1 and ASTM D3737
Drilling & Notching R502.8

- Sawn Lumber - Notches
  - Top & bottom
  - <1/6 depth of joist
  - No longer than 1/3 depth
- Ends
  - <1/4 joist depth
  - Cannot be located in middle third of span

Drilling & Notching R502.8

- Holes
  - Diameter must be <1/3 the depth of the joist
  - Cannot be located within 2" of top or bottom of joist or to any other hole or notch

Drilling & Notching R502.8

- Engineered wood products
  - Not permitted unless specifically considered in design of member

Drilling & Notching R502.8 Engineered Wood

- Chart A - Round Holes
  - Minimum distance from inside face of any support to nearest edge of hole
  - Depth x (in.) x (in.)
  - Round Hole (in.)
  - 9 x 150
  - 10 x 150
  - 11 x 150
  - 12 x 150
  - 13 x 150
  - 14 x 150
  - 16 x 150

© 2019 Colorado Code Consulting, LLC
Wood Trusses R502.11
- Designed using ANSI/TPI 1
- Truss drawings required
- Lateral bracing required
- Alterations require engineer review

Draftstopping Required R502.12 – 302.12
- Usable space above & below
- Suspended ceiling, open-web trusses
- No concealed area exceeds 1,000 s.f., divided equally

R302.13 – Fire Protection of Floors
- Non FR floor assemblies
- ...shall be provided with
- ½" Gypsum Board
- 5/8" Wood Structural Panel
- Or equivalent...
- ...on the underside of the floor framing member

R302.13 – Fire Protection of Floors
- Exception 1
- Floor assemblies located directly over a space protected by fire sprinklers
- P2904
- NFPA 13d

- Exception 2
- Floor assemblies located directly over a crawl space not intended for storage or fuel-fired equipment or electric-powered heating appliances.

- Exception 3
- Permits unprotected floor assemblies when:
  - 80sf area or less per story in aggregate
  - Fire blocking is provided in the cavity between the protected and unprotected portions
  - Intended to address mechanical areas with piping, ducts or other penetration issues.

- Exception 4
- Wood floor assemblies using 2x10 or greater dimension solid or composite lumber.
- Also permits testing for equivalency to these materials.

Concrete Floors R506

- Minimum 3.5” thick
- Fill shall be compacted
- Fill depths not to exceed: 24” clean sand or gravel
- 8” earth
- 4” base course required for slabs below grade
- except when slab is installed on well-drained or sand-gravel mixture soils.
Vapor Retarders
R506.2.3

- 6 mill polyethylene or approved vapor retarder shall be placed between the concrete floor slab and the base course or the prepared subgrade where no base course exists.
- Joints lapped 6 inches

May be omitted from:
- garages, utility buildings and other unheated accessory structures
- driveways, walks, patios
- where approved by building official based on local site conditions

Reinforcement Support
R506.2.4

- Where provided in slabs on ground, reinforcement shall be supported to remain in place from the center to upper one third of the slab for the duration of the concrete placement.

R507.2 Deck ledger connection to band joist

- Deck ledger connections to band joists shall be in accordance with this section, Tables R507.2 and R507.2.1, and Figures R507.2.1(1) and R507.2.1(2).
- For other grades, species, connection details and loading conditions, deck ledger connections shall be designed in accordance with Section R301.

R507.2.1 Ledger details

- Deck ledgers installed in accordance with Section R507.2 shall be a minimum 2-inch by 8-inch nominal, pressure-preservative treated southern pine, incised pressure-preservative treated Hem-fir, or approved, naturally durable, No. 2 grade or better lumber.
- Deck ledgers installed in accordance with Section R507.2 shall not support concentrated loads from beams or girders.
- Deck ledgers shall not be supported on stone or masonry veneer.
R507.2.2 Band joist details

- Band joists attached by a ledger in accordance with Section R507.2 shall be a minimum 2-inch nominal, solid-sawn, spruce-pine-fir lumber or a minimum 1-inch by 9 1/2-inch dimensional Douglas fir, laminated veneer lumber.
- Band joists attached by a ledger in accordance with Section R507.2 shall be fully supported by a wall or sill plate below.

R507.2.3 Ledger to band joist fastener details

- Fasteners used in deck ledger connections in accordance with Table R507.2 shall be hot-dipped galvanized or stainless steel and shall be installed in accordance with Table R507.2.1 and Figures R507.2.1(1) and R507.2.1(2).

R507.2.4 Deck lateral load connection

- The lateral load connection required by Section R507.1 shall be permitted to be in accordance with Figure R507.2.3(1) or R507.2.3(2).
- Where the lateral load connection is provided in accordance with Figure R507.2.3(1), hold-down tension devices shall be installed in not less than two locations per deck, within 24 inches of each end of the deck.
- Each device shall have an allowable stress design capacity of not less than 1,500 pounds.

R507.2.4 Deck lateral load connection

- Where the lateral load connections are provided in accordance with Figure R507.2.3(2), the hold-down tension devices shall be installed in not less than four locations per deck, and each device shall have an allowable stress design capacity of not less than 750 pounds.
R507.3 Plastic composite deck boards, stair treads, guards, or handrails

- ASTM D 7032
- Must be labeled
- Maximum 200 flame spread
- Decay resistant
- Termite resistant
- Installation per manufacturer’s instructions.

R507.7 Deck joist and deck beam bearing

- The ends of each joist and beam shall have not less than 1 ½ inches of bearing on wood or metal and not less than 3 inches on concrete or masonry for the entire width of the beam.
- Joist framing into the side of a ledger board or beam shall be supported by approved joist hangers.
- Joists bearing on a beam shall be connected to the beam to resist lateral displacement.

R507.7.1 Deck post to deck beam

- Deck beams shall be attached to deck posts in accordance with Figure R507.7.1 or by other equivalent means capable to resist lateral displacement.
- Manufactured post-to-beam connectors shall be sized for the post and beam sizes.
- All bolts shall have washers under the head and nut.
- Exception: Where deck beams bear directly on footings in accordance with Section R507.8.1.

R507.8.1 Deck post to deck footing

- Posts shall bear on footings in accordance with Section R403 and Figure R507.8.1.
- Posts shall be restrained to prevent lateral displacement at the bottom support.
- Such lateral restraint shall be provided by manufactured connectors installed in accordance with Section R507 and the manufacturers’ instructions or a minimum post embedment of 12 inches in surrounding soils or concrete piers.
WOOD WALL FRAMING

R602

- Grade Mark Required
- End-Joint lumber may be used (Grade Stamp)
- Studs min. no. 3, standard or stud grade
  - Bearing studs not supporting floors & non bearing studs may be utility grade

EXTERIOR WALLS

R602.3

- Double Top Plate Required
  - Overlapped at corners and intersections of bearing walls
  - End joints of plates offset 24"
- Single Top Plate
  - Permitted if tied at joints with 3”x6” steel plate each side
- Bottom Plate
  - Nominal 2” thick with width same as stud

INTERIOR WALLS R602.4 & R602.5

- Load bearing interior walls same as exterior walls
- Nonbearing
  - 2X3 24"
  - 2X4 16” OC flat when not part of braced wall lines
  - Single top plate
NOTCHING
R602.6

• NOTCHING
  • EXTERIOR & BEARING
    • CANNOT EXCEED 25% OF STUD WIDTH
  • NON-BEARING
    • UP TO 40% OF STUD WIDTH

• DRILLING
  • MAX. 40% OF STUD
  • MIN. 5/8" FROM EDGE

DRILLING/NOTCHING OF TOP PLATE
R602.6.1

• TOP PLATE CUT BY MORE THAN 50 %
  • GALVANIZED METAL TIE
    • MINIMUM 0.054 INCH THICK (16 GAGE)
    • 1 1/2 INCHES WIDE
    • FASTENED TO EACH PLATE WITH NOT LESS THAN EIGHT 10D NAILS AT EACH SIDE OR EQUIVALENT

NONBEARING WALLS
R602.7.4

• LOAD BEARING HEADERS NOT REQUIRED
  • SINGLE FLAT 2X4 UP TO 8 FEET IN WIDTH
  • LESS THAN 24 INCHES VERTICAL DISTANCE FROM HEADER TO PLATE
  • CRIPPLES/BLOCKING NOT REQUIRED
R302.11
FIREBLOCKING

• CODE PREVIOUSLY PLACED REQUIREMENT IN “WOOD WALL FRAMING”
• NOW PREFACE IS “IN COMBUSTIBLE CONSTRUCTION”

FIRE BLOCKING
R602.8 – R302.11

• IN CONCEALED SPACES OF STUD WALLS AND PARTITIONS, INCLUDING FURRED SPACES AND PARALLEL ROWS OF STUDS OR STAGGERED STUDS; AS FOLLOWS:
  • 1.1. VERTICALLY AT THE CEILING AND FLOOR LEVELS.
  • 1.2. HORIZONTALLY AT INTERVALS NOT EXCEEDING 10 FEET

FIRE BLOCKING
R602.8 – R302.11

• AT ALL INTERCONNECTIONS BETWEEN CONCEALED VERTICAL AND HORIZONTAL SPACES SUCH AS OCCUR AT SOFFITS, DROP CEILINGS AND COVE CEILINGS.

FIRE BLOCKING
R602.8 – R302.11

• IN CONCEALED SPACES BETWEEN STAIR STRINGERS AT THE TOP AND BOTTOM OF THE RUN.
  • ENCLOSED SPACES UNDER STAIRS SHALL COMPLY WITH SECTION R311.2.2.
FIRE BLOCKING
R602.8 – R302.11

• AT OPENINGS AROUND VENTS, PIPES, AND DUCTS AT CEILING AND FLOOR LEVEL, WITH AN APPROVED MATERIAL TO RESIST THE FREE PASSAGE OF FLAME AND PRODUCTS OF COMBUSTION.

FIRE BLOCKING
R602.8 – R302.11

• FOR THE FIRE BLOCKING OF CHIMNEYS AND FIREPLACES, SEE SECTION R1001.16.

FIRE BLOCK MATERIAL
R602.8.1 – R302.11

• 2" NOMINAL LUMBER OR TWO 1"
• 23/32" STRUCTURAL PANEL BACKED
• 3/4" PARTICLE BOARD BACKED
• 1/2" GYPSUM BOARD
• 1/4" CEMENT BASED MILLBOARD
• LOOSE FILL INSULATION NOT APPROVED - EXCEPT-
FIRE BLOCK MATERIAL
R602.8.1 – R302.11

- CELLULOSE INSULATION INSTALLED AS TESTED IN ACCORDANCE WITH ASTM E 119 OR UL 263, FOR THE SPECIFIC APPLICATION.
- MINERAL OR GLASS FIBER BATTS
  - INSTALLED IN SUCH A MANNER AS TO BE SECURELY RETAINED IN PLACE SHALL BE PERMITTED AS AN ACCEPTABLE FIRE BLOCK.
- MINERAL OR GLASS FIBER BATTS OR OTHER APPROVED NON-RIGID MATERIALS PERMITTED FOR HORIZONTAL BLOCKING IN STAGGERED OR PARALLEL STUD WALLS.

UNFACED FIBERGLASS
R602.8.1.1 – R302.11

- UNFACED FIBERGLASS BATT INSULATION SHALL FILL THE ENTIRE CROSS SECTION OF THE WALL CAVITY TO A MINIMUM HEIGHT OF 16 INCHES MEASURED VERTICALLY.
- INSULATION SHALL BE PACKED TIGHTLY AROUND PIPING OR CONDUITS.

316 – FOAM PLASTICS

- IN CRAWL SPACES AND ATTICS
- ENTRY MADE ONLY FOR REPAIRS OR MAINTENANCE
- IGNITION BARRIER
  - 3/8” GYPSUM,
  - ¼” HARDBOARD

316 – FOAM PLASTICS

- THERMAL OR IGNITION BARRIER NOT REQUIRED RIMS OR BOX SILLS
- NOT MORE THAN 3 ¼” THICK
- 0.5 TO 2.0 POUNDS DENSITY
- FLAME AND SMOKE OF 25-450
WALL BRACING

- REVIEW PLANS
- INTERMITTENT BRACING
- CONTINUOUS SHEATHING
- ENGINEERED DESIGN

WINDOW SILLS

R312.2.1


- GLAZING BETWEEN THE FLOOR AND 24 INCHES SHALL BE FIXED OR HAVE OPENINGS THROUGH WHICH A 4-INCH-DIAMETER SPHERE CANNOT PASS.

WINDOW SILLS

R312.2

- EXCEPTIONS:
  1. WINDOWS WHOSE OPENINGS WILL NOT ALLOW A 4-INCH-DIAMETER SPHERE TO PASS THROUGH THE OPENING WHEN THE OPENING IS IN ITS LARGEST OPENED POSITION.

  2. OPENINGS THAT ARE PROVIDED WITH WINDOW FALL PREVENTION DEVICES THAT COMPLY WITH ASTM F 2090.

  3. WINDOWS THAT ARE PROVIDED WITH WINDOW OPENING CONTROL DEVICES THAT COMPLY WITH SECTION R312.2.2.
WALL COVERING
CHAPTER 7

LIMITATIONS
R702.3.8.1

• WATER RESISTANT GYPSUM BACKING BOARD SHALL NOT BE USED WHERE THERE WILL BE DIRECT EXPOSURE TO WATER, OR IN AREAS SUBJECT TO CONTINUOUS HIGH HUMIDITY.

GYPSUM BOARD
R702.3

• SUPPORTING FRAMING
  • WOOD FRAMING
    • 2” NOMINAL
    • 1X2 FURRING STRIPS OVER SOLID BACKING OR FRAMING 24” O.C.
  • STEEL FRAMING
    • 1.25” WIDE
    • INSULATING CONCRETE FOAM WALLS

CERAMIC TILE
R702.4

• GYPSUM BOARD BACKER
  • ASTM C630 OR C1178
  • W/R GYP. BD. PERMITTED ON CEILING
    • 1/2” FRAMING 12” O.C.
    • 5/8” FRAMING 16” O.C.
  • CUT OR EXPOSED EDGES SEALED PER MANUFACTURERS RECOMMENDATION
  • CANNOT BE USED
    • OVER A VAPOR BARRIER IN A SHOWER OR BATHTUB COMPARTMENT
    • WHERE THERE WILL BE DIRECT EXPOSURE TO WATER, OR IN AREAS SUBJECT TO CONTINUOUS HIGH HUMIDITY
BACKER BOARDS
R702.4.2

• MATERIALS USED AS BACKERS FOR WALL TILE IN TUB AND SHOWER AREAS AND WALL PANELS IN SHOWER AREAS SHALL BE OF MATERIALS LISTED IN TABLE R702.4.2, AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER’S RECOMMENDATIONS.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>STANDARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass mat gypsum backing panel</td>
<td>ASTM C 1176</td>
</tr>
<tr>
<td>Fiber-reinforced gypsum panels</td>
<td>ASTM C 1175</td>
</tr>
<tr>
<td>Nomex G foam-fiberglass backer board</td>
<td>ASTM C 1188 or ISO 1516, Category C</td>
</tr>
<tr>
<td>Nomex G foam-faced cementitious backer board</td>
<td>ASTM C 1336</td>
</tr>
</tbody>
</table>

GENERAL
R701.2

• R701.2 INSTALLATION.
  • PRODUCTS SENSITIVE TO ADVERSE WEATHER SHALL NOT BE INSTALLED UNTIL ADEQUATE WEATHER PROTECTION FOR THE INSTALLATION IS PROVIDED.
  • EXTERIOR SHEATHING SHALL BE DRY BEFORE APPLYING EXTERIOR COVER.

R703.1 GENERAL
EXTERIOR WALLS SHALL PROVIDE THE BUILDING WITH A WEATHER-RESISTANT EXTERIOR.
THE EXTERIOR WALL ENVELOPE SHALL INCLUDE FLASHING AS DESCRIBED IN SECTION R703.4.

R703.1.1 WATER RESISTANCE
SHALL BE DESIGNED AND CONSTRUCTED THAT PREVENTS THE ACCUMULATION OF WATER WITHIN THE WALL ASSEMBLY BY PROVIDING A WATER-RESISTIVE BARRIER AND A MEANS OF DRAINING TO THE EXTERIOR WATER THAT ENTERS THE ASSEMBLY.

R703.2 WATER-RESISTIVE BARRIER
ONE LAYER OF NO. 15 ASPHALT FELT COMPLYING WITH ASTM D 226 OR OTHER APPROVED WATER-RESISTIVE BARRIER MATERIAL SHALL BE APPLIED HORIZONTALLY, WITH THE UPPER LAYER LAPPED OVER THE LOWER LAYER NOT LESS THAN 2 INCHES LAPPED NOT LESS THAN 6 INCHES AT JOINTS SHALL BE CONTINUOUS TO THE TOP OF WALLS AND TERMINATED AT PENETRATIONS AND BUILDING APPENDAGES IN A MANNER TO MEET THE REQUIREMENTS OF THE EXTERIOR WALL ENVELOPE AS DESCRIBED IN SECTION R703.1.
R703.4 FLAShING

Approved corrosion-resistant flashing shall be applied shingle-fashion in a manner to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Shall be installed at the following locations…

1. Exterior window and door openings

2. At the intersection of chimneys or other masonry construction

3. Under and at the ends of masonry, wood or metal copings and sills.
4. CONTINUOUSLY ABOVE ALL PROJECTING WOOD TRIM.

5. WHERE EXTERIOR PORCHES, DECKS OR STAIRS ATTACH TO A WALL OR FLOOR ASSEMBLY OF WOOD-FRAME CONSTRUCTION.

6. AT WALL AND ROOF INTERSECTIONS
7. AT BUILT-IN GUTTERS.

WOOD, HARDBOARD, PANEL SIDING R703.5

- PANEL SIDING
  - VERTICAL OVER FRAMING MEMBERS
  - SHIPLAPPED OR BATTEN
  - HORIZONTAL JOINTS LAPPED OR Z-FLASHING WITH SOLID BLOCKING
- LAP SIDING
  - 1" LAP WITH ENDS CAULKED, BATTEN OR STRIP OF FLASHING

STONE/MASONRY VENEER R703.8

- MIN. 1" AIR SPACE
- MAX. 4"
- GROUT FILL
  - WEATHER RESISTIVE BARRIER REQUIRED
- FLASHING
- WEEP HOLES
  - 33" OC
  - 3/16" IN DIAMETER

ROOF-CEILING CONSTRUCTION Chapter 8
Roof Drainage
R801.3

In areas where expansive or collapsible soils are known to exist, all dwellings shall have a controlled method of water disposal from roofs that will collect and discharge all roof drainage to the ground surface at least 5 feet from foundation walls or to an approved drainage system.

Wood Truss Design Drawings
R802.10.1

- Slope, depth, span, spacing
- Location of joints
- Required bearing widths
- Design loads
- Adjustments to lumber & joint connectors design values for conditions of use
- Each reaction force and direction
- Joint connector type and description and dimensioned location of each connector
- Lumber size, species and grade for each member
- Connection requirements
- Calculated deflection ratio and/or maximum description for live & total load
- Maximum axial compression forces in the truss members
- Required permanent truss member bracing location

Designed to ANSI/TPI 1

Bracing
R802.10.3

- Trusses shall be braced to prevent rotation and provide lateral stability in accordance with the requirements specified in the construction documents for the building and on the individual truss design drawings.
- In the absence of specific bracing requirements, trusses shall be braced in accordance with accepted industry practice such as the SBCC Building Component Safety Information (BCSI) Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses.
Alterations to trusses

R802.10.4

- Truss members shall not be cut, notched, drilled, spliced or otherwise altered in any way without the approval of a registered design professional.
- Alterations resulting in the addition of load shall not be permitted without verification that the truss is capable of supporting such additional loading.

R802.11 – Roof Uplift Resistance

- Trusses shall be attached to the supporting wall assemblies by connections capable of resisting uplift forces as specified on the truss design drawings.

Roof Ventilation

R806

- Ventilation required
  - attic spaces
  - rafter spaces
- Min. area = 1:150
- 1:300 permitted
  - 50-80% of vents in upper portion
  - Remainder at eave or cornice
- 1” minimum clearance

R806.5 Unvented attic assemblies

- Unvented conditioned attic assemblies (spaces between the ceiling joists of top story and the roof rafters) are permitted under specific conditions.
R806.5 Unvented attic assemblies

1. Must be within the building thermal envelope.
2. No interior vapor barriers on ceiling side.
3. Wood shingles/shakes – ¼ inch air between sheathing.
4. Air-impermeable insulation on underside of roof deck (Climate Zones 5, 6, 7, and 8) must be a Class II vapor retarder or vapor retarder coating applied.

See 2018 IRC for climate zones 1, 2 and 3.

R806.5 Conditioned attic assemblies

- Either items 5.1, 5.2 or 5.3 shall be met, depending on the air permeability of the insulation directly under the structural roof sheathing.

Attic Access R807

- Combustible ceiling or roof construction
  - areas that exceed 30 square feet
  - 30” vertical height
- 22”X30” opening
  - hallway or readily accessible location
  - 30” min. headroom
  - M1305.1.3 mechanical access

ROOF ASSEMBLIES
CHAPTER 9
Flashing  
R903.2

- Flashings shall be installed in such a manner so as to prevent moisture entering the wall and roof through joints in copings, through moisture permeable materials, and at intersections with parapet walls and other penetrations through the roof plane.

Roof Drainage  
R903.4

- Unless roofs are sloped to drain over roof edges, roof drains shall be installed at each low point of the roof.

Roof Coverings  
R905

- Asphalt Shingles
- Clay & concrete tiles
- Metal roof shingles
- Mineral-surfaced roll roofing
- Slate shingles
- Wood shingles/shakes
- Built-up roofs
- Modified Bitumen
- Single-ply roofing
- Sprayed foam roofing
- Liquid-applied coatings

Asphalt Shingles R905.2

- 2:12 minimum slope
- Fasteners
  - Galvanized, stainless steel, aluminum, copper nails
  - Four per strip
    - Special methods in wind zones >110 mph
    - ¾” penetration into sheathing or through sheathing
    - Ice protection when average daily temperature in Jan. 23° F or less or when required by Table 301.2(1)
Asphalt Shingles R905.2

- Flashing
  - Manufacturers installation instructions
  - Crickets/saddles
  - Sidewall - step flashing

Clay & Concrete Tile R905.3

- Slope > 2.5:12
- Installed in accordance with manufacturer’s installation instructions
- Flashing

Chapter 2: Definitions

Building thermal envelope:
The basement walls, exterior walls, floor, roof, and any other building elements that enclose conditioned space or provides a boundary between conditioned space and exempt or unconditioned space.

General Requirements

C303.1.3 Fenestration product rating.
U Factors rated in accordance with NFRC 100 SHGC and VT rated in accordance with NFRC 200.

(Products lacking labels shall be assigned a default from the tables)
Residential Energy Efficiency

Building Thermal Envelope

Eave baffle R402.2.3

For air permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. The baffle shall maintain an opening equal or greater than the size of the vent, extend over the top of the insulation and be permitted to be any solid material.
**Define the Buildings Thermal Envelope**

**R402.4 Air Leakage (Mandatory)**
The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.4.

---

**R402.4.1.1 Installation.**
The components of the building thermal envelope as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer’s installation instructions. Where required by the building official, an approved third party shall inspect all components and verify compliance.

---

**Insulation Installation**

Blown in cellulose

---

**Insulation Installation**

BLOWN IN BATT (BIB)
A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.

Air-permeable insulation shall not be used as a sealing material.
Table R402.4.1.1

<table>
<thead>
<tr>
<th>Ceiling/attic</th>
</tr>
</thead>
<tbody>
<tr>
<td>The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.</td>
</tr>
</tbody>
</table>

The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Table R402.4.1.1

**Walls**

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>The junction of the foundation and sill plate shall be sealed.</td>
<td>The junction of the top plate and the top of exterior walls shall be sealed.</td>
</tr>
<tr>
<td>Knee walls shall be sealed.</td>
<td></td>
</tr>
<tr>
<td>Cavities within corners and headers of frame walls shall be insulated by</td>
<td>Completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum.</td>
</tr>
<tr>
<td>completely filling the cavity with a material having a thermal resistance</td>
<td>Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and</td>
</tr>
<tr>
<td>of R-3 per inch minimum.</td>
<td>continuous alignment with the air barrier.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Knee Walls

Table R402.4.1.1

Windows, skylights and doors

The space between window/door jambs and framing, and skylights and framing shall be sealed.
Table R402.4.1.1

<table>
<thead>
<tr>
<th>Rim joists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rim joists shall include the air barrier.</td>
</tr>
<tr>
<td>Rim joists shall be insulated.</td>
</tr>
</tbody>
</table>
Table R402.4.1.1
Floors (including above garage and cantilevered floors)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The air barrier shall be installed at any exposed edge of insulation.</td>
</tr>
<tr>
<td>Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing; and extends from the bottom to the top of all perimeter floor framing members.</td>
</tr>
</tbody>
</table>

Two options for floor insulation above unconditioned space

A. Conditioned living space above
   - Exterior
   - Unconditioned garage area
   - Conditioned living space adjacent

B. Conditioned living space above
   - Exterior
   - Unconditioned garage area
   - Conditioned living space adjacent

Option for floor insulation above rigid insulation

Airspace

Wood-based subfloor

Gypsum board

Rigid insulation

Cavity insulation
Table R402.4.1.1

<table>
<thead>
<tr>
<th>Crawl space walls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.</td>
</tr>
<tr>
<td>Where provided instead of floor insulation, insulation shall be permanently attached to the crawl space walls.</td>
</tr>
</tbody>
</table>
Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.

Table R402.4.1.1

Shafts, penetrations

Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.
Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.

Table R402.4.1.1
Garage separation
Air sealing shall be provided between the garage and conditioned spaces.
Table R402.4.1.1

Recessed lighting

Recessed light fixtures installed in the building thermal envelope shall be sealed to the drywall.

Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Insulation Installation
FIBERGLASS BATT NO-NO’S

Insulation Installation
Fiberglass batt no-no’s
Insulation Installation

Fiberglass
batt no-no's

Table R402.4.1.1

<table>
<thead>
<tr>
<th>Shower/tub on exterior wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from the showers and tubs.</td>
</tr>
<tr>
<td>Exterior walls adjacent to showers and tubs shall be insulated.</td>
</tr>
</tbody>
</table>
Table R402.4.1.1

| Electrical/phone box on exterior walls |

The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.
Table R402.4.1.1

<table>
<thead>
<tr>
<th>HVAC register boots</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.</td>
</tr>
</tbody>
</table>

Table R402.4.1.1

<table>
<thead>
<tr>
<th>Concealed sprinklers</th>
</tr>
</thead>
<tbody>
<tr>
<td>When required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.</td>
</tr>
</tbody>
</table>
Plan Review Light, Ventilation & Heating R303

R303.4 Mechanical ventilation.
Where the air infiltration rate of a dwelling unit is 5 air changes per hour or less where tested with a blower door at a pressure of 0.2 inch w.c (50 Pa)... the dwelling unit shall have whole-house mechanical ventilation in accordance with Section M1507.3.

Three basic types of Whole House Ventilation Systems

- **Exhaust Only**
- **Supply Only**
- **Balanced (with heat recovery) HRV or ERV**
Field Inspections

What is needed?

1. Duct Plan
2. Fittings used
3. Equipment Selection