



INSPECTION PROCEDURES FOR 2009 RESIDENTIAL ENERGY CODE VISUAL INSPECTION OPTION

Air Barriers

New term in the 2009 code

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

Verification Methods

- Visual Option



- Testing Option



Compliance Alternatives

- ⦿ Testing option
- ⦿ Visual Inspection Option
- ⦿ Documentation of nationally recognized energy certification program (Earthcraft, Energy Star, etc.)
- ⦿ This presentation focuses on the Visual Inspection Option.

Testing Option



- Tested air leakage is less than 7 ACH when tested with a blower door at a pressure of 50 pascals (0.007 psi). Testing shall occur after rough-in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation and combustion appliances.

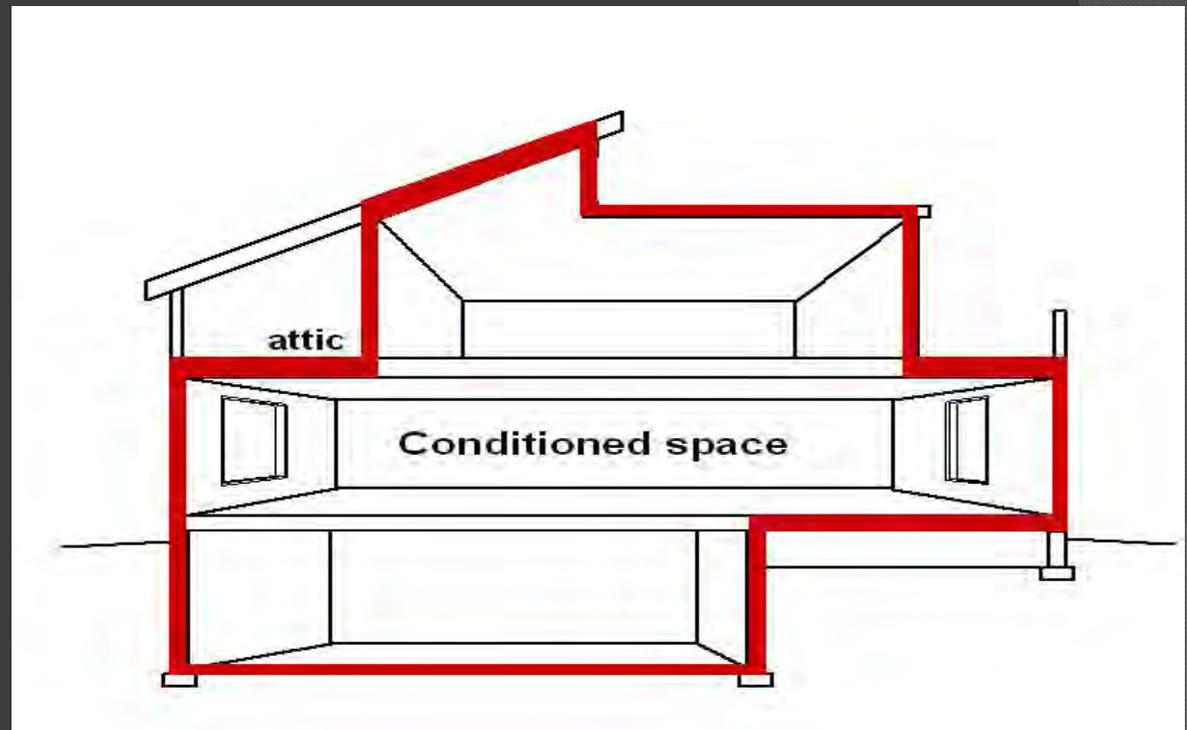
- During testing:
 1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed;
 2. Dampers shall be closed, but not sealed; including exhaust, intake, makeup air, back draft, and flue dampers;
 3. Interior doors shall be open;
 4. Exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
 5. Heating and cooling system(s) shall be turned off;
 6. HVAC ducts shall not be sealed; and
 7. Supply and return registers shall not be sealed.

Visual Inspection Option



Building Envelope Requirements

Building thermal envelope separates conditioned from unconditioned space.



N1102.4.1 Building Thermal Envelope

- Sealed with caulking materials or
- Closed with gasketing systems
- Joints, seams, and penetrations sealed or weatherstripped
- Or otherwise sealed with an air barrier material, film or solid material



Mandatory Requirements

- Section 402.4.1 Building Envelope
- Caulked, gasketed, weatherstripped or otherwise sealed
 - All joints, seams and penetration
 - Site-built windows, doors, skylights
 - Openings between windows and doors and their jambs and framing
 - Utility penetrations
 - Dropped ceilings or chases adjacent to the thermal envelope
 - Knee Walls
 - Walls and ceilings separating a garage from conditioned spaces
 - Behind tubs and showers on exterior walls
 - Common walls between dwelling units
 - Attic access openings
 - Rim joist junction
 - Other sources of infiltration

Visual Option

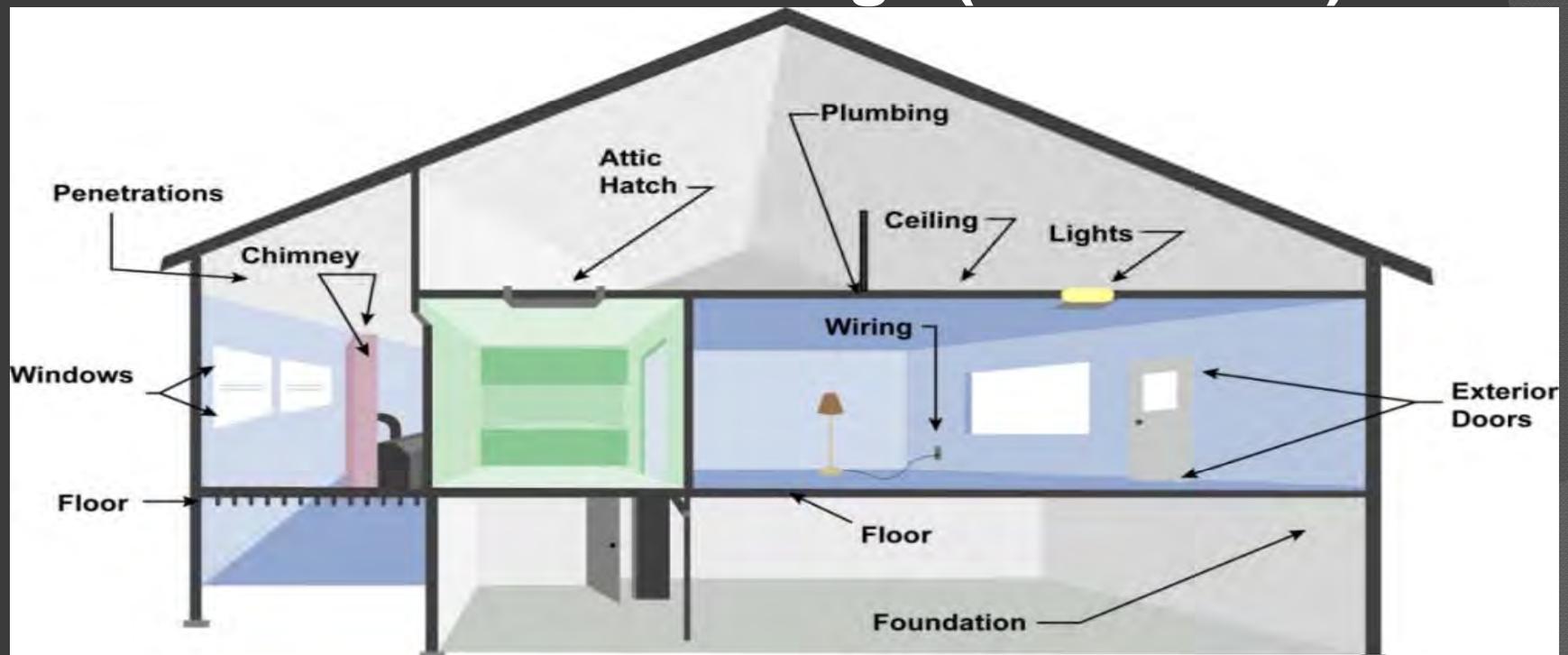
- List of components that are necessary to create an acceptable air barrier and achieve code compliance
- Field verified when the Visual Inspection option is chosen

Table N1102.4.2

COMPONENT	CRITERIA
Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks or joints in the air barrier are filled or repaired. Air-permeable insulation is not used as a sealing material.
Ceiling/attic	Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.
Walls	Corners and headers are insulated. Junction of foundation and sill plate is sealed.
Windows and doors	Space between window/door jambs and framing is sealed.
Rim joists	Rim joists are insulated and include an air barrier.
Floors (including above garage and cantilevered floors)	Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of floor.
Crawlspace walls	Insulation is permanently attached to walls. Exposed earth in unvented crawlspaces is covered with Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.
Narrow cavities	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.
Garage separation	Air sealing is provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures are airtight, IC rated and sealed to drywall. Exception—fixtures in conditioned space.
Plumbing and wiring	Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.
Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.
Electrical/phone box on exterior wall	Air barrier extends behind boxes or air sealed type boxes are installed.
Common wall	Air barrier is installed in common wall between dwelling units.
HVAC register boots	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.
Fireplace	Fireplace walls include an air barrier.

402.4/N1102.4 Air Leakage

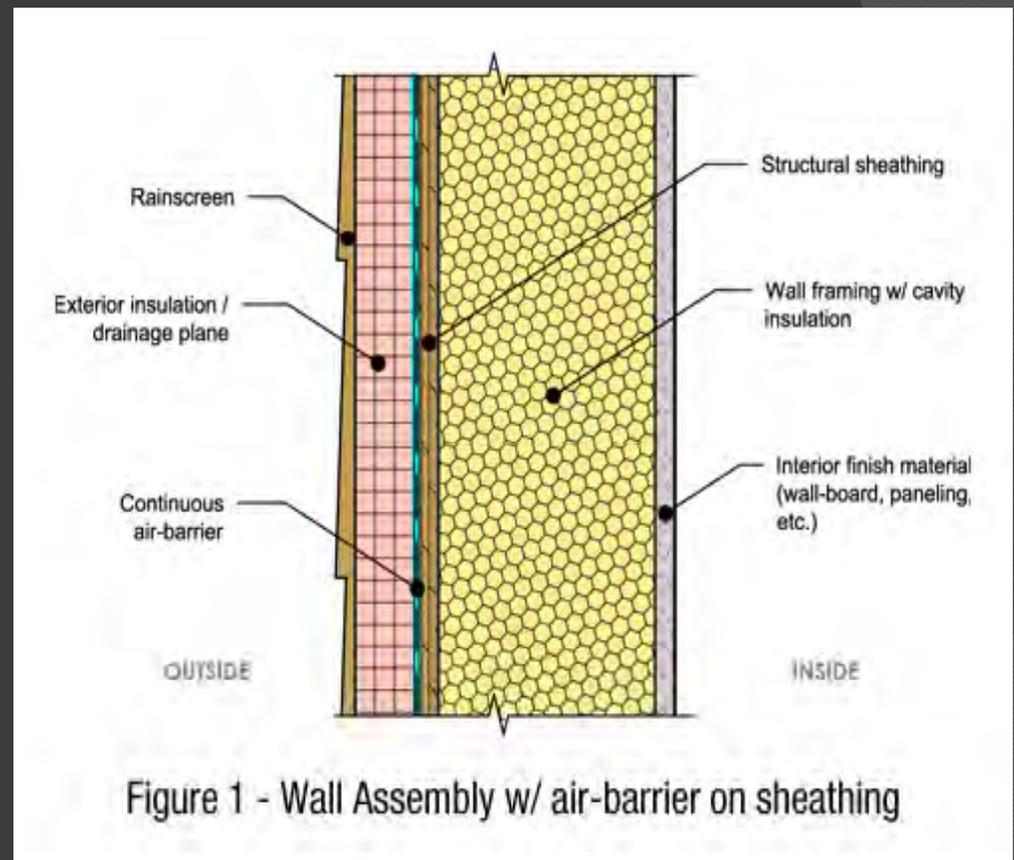
Areas for air leakage (Infiltration)



Infiltration Points
Typical Sources of Air Leakage in the Home

Air Barrier

- Blocks random air movement through building cavities
- Helps control moisture in a home
- Types
 - Membranes
 - Caulk and seal
 - Drywall



Air Barrier

During framing or separate wrap inspection

Air barrier and thermal barrier

Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier.

Breaks or joints in the air barrier are filled or repaired.

Air-permeable insulation is not used as a sealing material.



House Wraps

- **Tyvek® or Other House Wraps**

If the product is cut to extend from the bottom plate to the top plate without any seams, then the four edges (top, bottom and right and left) must be nailed and/or sealed by caulks or sealant to remove any possibility for air to enter in along any of these four sides. If the material is installed in two or more sections, the upper portion should overlap the bottom to prevent water intrusion. The horizontal seam should be sealed by a product that will remain sealed for the life of the building.

DuPont™ Tyvek® Water-Resistive and Air Barriers Installation Guidelines

Installation Instructions

Start at the bottom of the structure to ensure proper shingling throughout the installation. Proper shingling is required to shed water and to prevent water from entering the wall system.

STEP 1

UNWRAP roll at corner, leaving 6" to 12" vertical overlap. Printed stud marks are available on some DuPont™ Tyvek® WRBs to aid in aligning with the studs. (e.g. studmarks are 8" apart for DuPont™ Tyvek® HomeWrap®)

STEP 2

Roll should be plumb. Bottom edge of roll should extend over sill plate interface at least 2". For maximum air leakage reduction (when installing as an air barrier), seal wrap at the bottom of the wall with sealant (i.e. DuPont™ Residential, DuPont™ Commercial Sealant or recommended sealant), DuPont™ Tyvek® Tape, DuPont™ StraightFlash™ or DuPont™ Flashing Tape. Extend to bottom of sill plate for slab on grade foundations. For stucco exteriors integrate with weep screed.

STEP 3

Secure DuPont™ Tyvek® WRB to the stud or other nail-base material (i.e. wood sheathing). Fasteners should be spaced no closer than 6" and no farther than 18" on vertical stud lines. This may involve penetrating bandboard or other horizontal members to maintain proper spacing. Use one or more of the recommended fasteners below for use with DuPont™ Tyvek® WRBs:

- DuPont™ Tyvek® Wrap Cap nails
- DuPont™ Tyvek® Wrap Cap screws
- DuPont™ Tyvek® Wrap Cap Staples for Stinger™*
- 1.0 inch minimum crown staples*

*Except when installing DuPont™ Tyvek® WRE over foam and other non-nail-base sheathings.

Please see "Use of Temporary Fastening Methods" later in this guide for more information on alternative fastening schedules and requirements.

NOTE: Do not fasten within 9" of rough opening head.

STEP 4

Unroll directly over windows and doors. Upper layer of DuPont™ Tyvek® WRB should overlap bottom layer by a minimum of 6". Refer to the DuPont™ Flashing Systems Installation Guidelines to prepare and flash window and door openings.

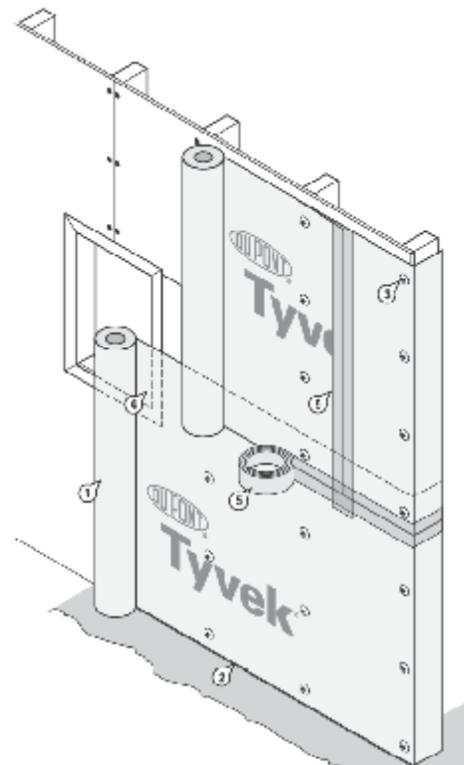
NOTE: If windows are already installed, the DuPont™ Tyvek® WRB must be integrated with proper shingling with window flashings. If DuPont™ FlexWrap™ NF and apron are used, install the DuPont™ Tyvek® WRB under the apron to ensure proper shingling. If non-self adhering sill flashing is used, install the WRB under the bottom of the sill flashing to maintain proper shingling.

STEP 5

All vertical seams shall be taped with DuPont™ Tyvek® Tape. When installing as an air barrier, also tape all horizontal seams. Taping all vertical and horizontal seams, and taping or sealing all terminations (including, but not limited to, roof-wall interfaces and sill plates) is required when installing DuPont™ Tyvek® WRBs as air barriers. Use 3" DuPont™ Tyvek® Tape when taping horizontal laps of DuPont™ Tyvek® StuccoWrap® and DuPont™ Tyvek® DrainWrap™. Use DuPont™ Tyvek® Metalized Tape when taping DuPont™ Tyvek® ThermoWrap™.

STEP 6

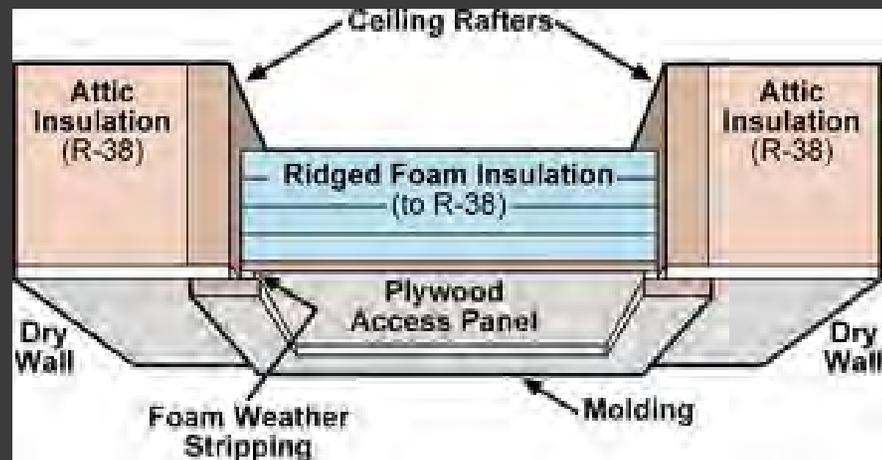
After DuPont™ Tyvek® WRB is installed refer to the DuPont™ Flashing Systems Installation Guidelines, Installation Instructions for Windows and Doors AFTER Water-Resistive Barrier (WRB) is installed to prepare and flash windows and doors.



Ceiling/Attic

Framing or Final Building

Ceiling/attic	Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.
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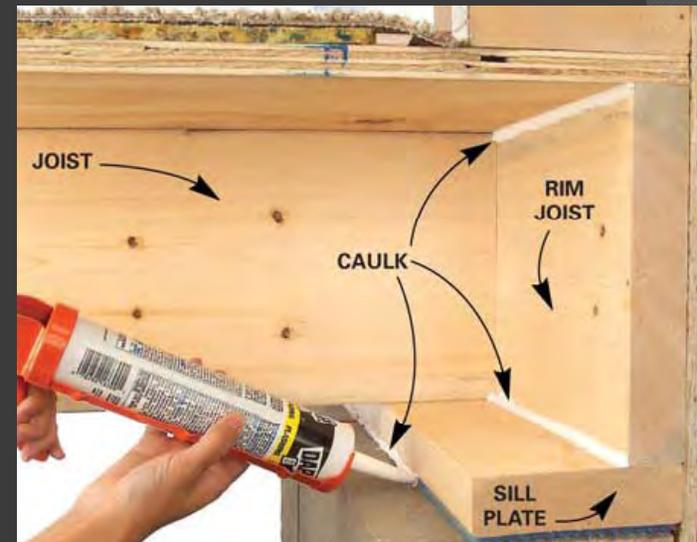
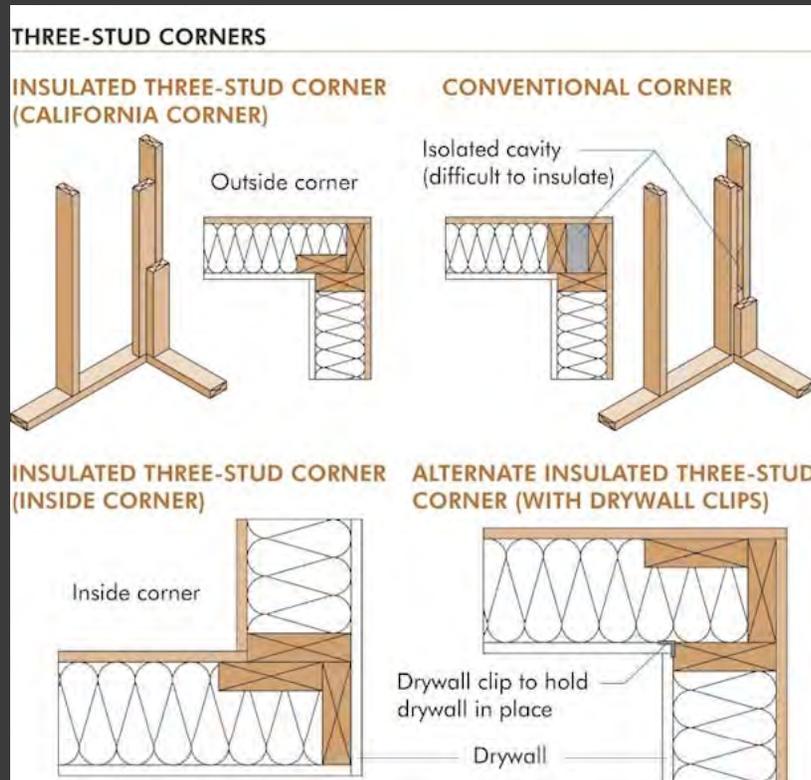


Walls

Framing/Insulation Inspection

Walls

Corners and headers are insulated.
Junction of foundation and sill plate is sealed.

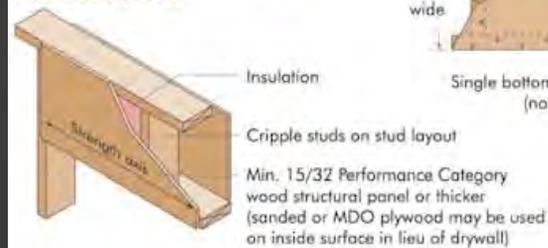


Insulated Headers

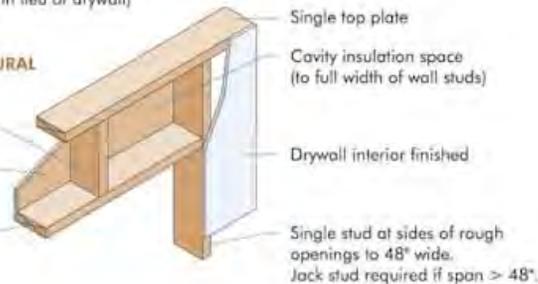
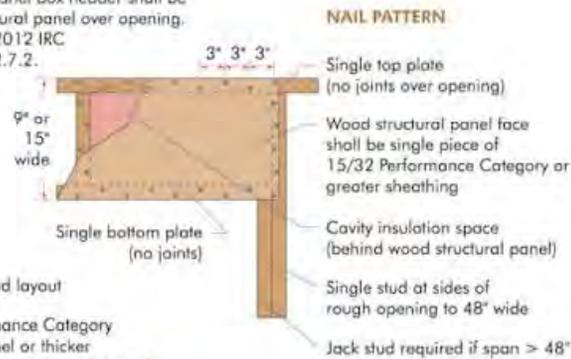
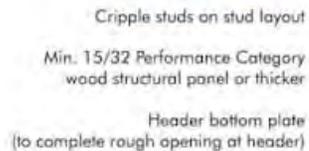
WOOD STRUCTURAL PANEL BOX HEADER FOR LOAD-BEARING WALLS

The top and bottom plates of the wood structural panel box header shall be continuous with no vertical joints in the wood structural panel over opening. For construction details and maximum spans, see 2012 IRC Section R602.7.2, Figure R602.7.2 and Table R602.7.2.

TWO-SIDED WOOD STRUCTURAL PANEL BOX HEADER



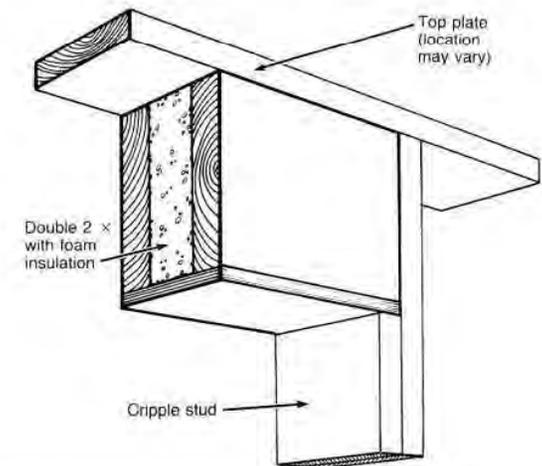
ONE-SIDED WOOD STRUCTURAL PANEL BOX HEADER



Notes:

1. Framing fastening per code.
2. For engineered box headers with wood structural panels, refer to Nailed Structural-Use Panel and Lumber Beams, Form Z416.

90 Construction Details



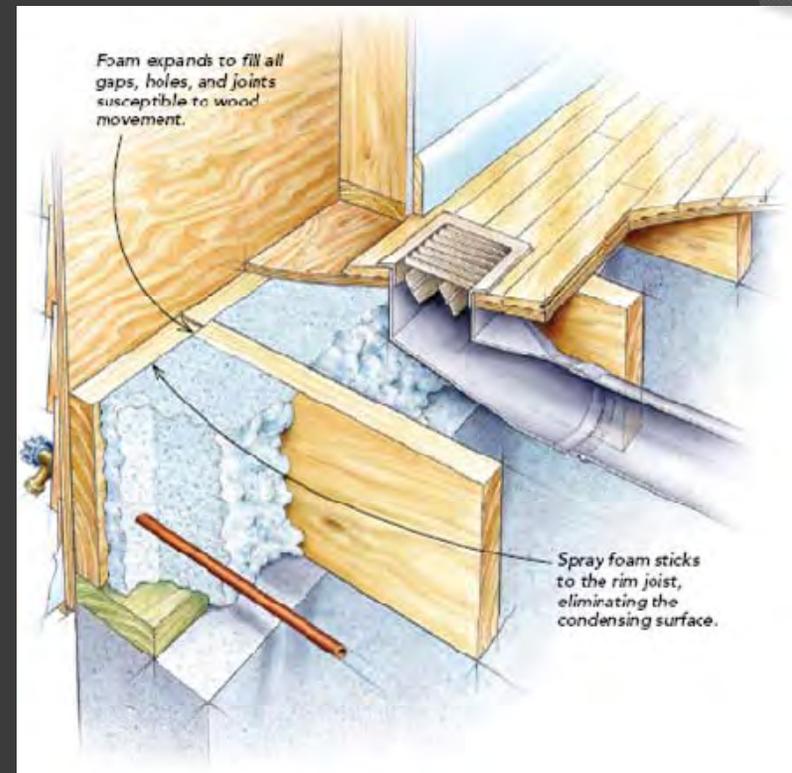
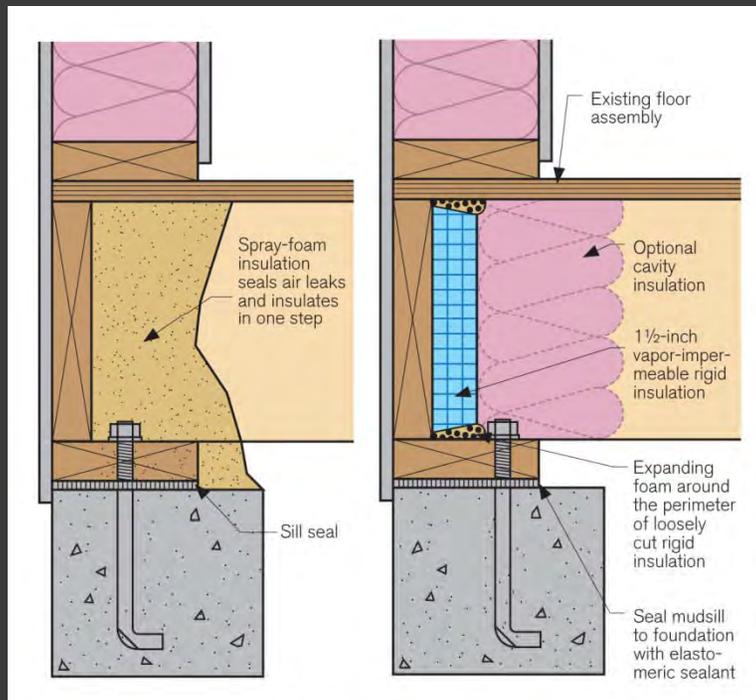
10-8. Double-insulated headers.

Rim Joists

Framing/Insulation/Final

Rim joists

Rim joists are insulated and include an air barrier.

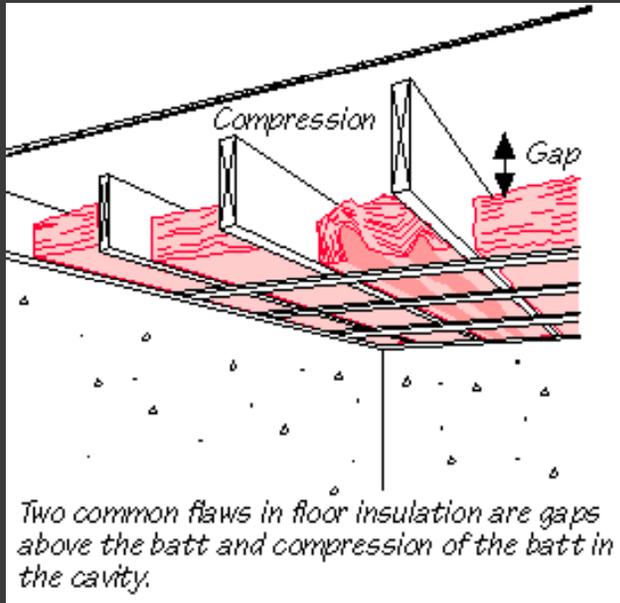


Floors

Insulation/Framing

Floors (including above garage and cantilevered floors)

Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of floor.



Crawlspace walls

Insulation/Final

Crawlspace walls

Insulation is permanently attached to walls.

Exposed earth in unvented crawlspaces is covered with Class I vapor retarder with overlapping joints taped.



Shafts and Penetrations

Rough-in/Framing/Wrap

Shafts, penetrations

Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.

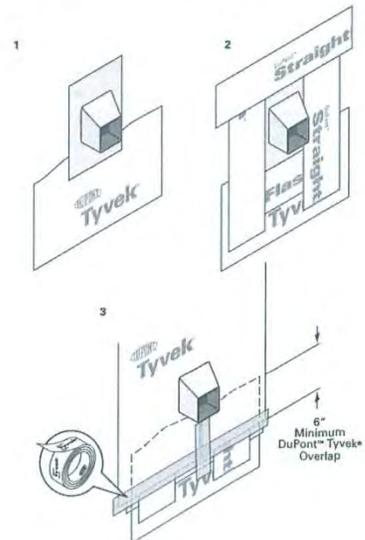
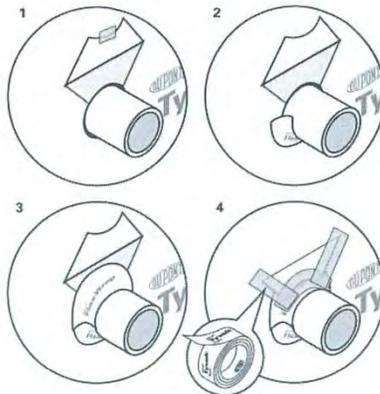
Penetrations

There are many types of penetrations including dryer vents, bathroom exhaust fans, exterior electrical outlets, exterior lights, gas lines, etc.

Seal around all electrical, HVAC and plumbing penetrations with DuPont™ Flashing Systems products, DuPont™ Tyvek® Tape, DuPont™ Residential Sealant, DuPont™ Commercial Sealant or recommended sealant.

Start flashing or taping at bottom of penetrations, shingling upper tape over bottom tape.

Products that have flanges should be integrated into the DuPont™ Tyvek® WRB using DuPont™ Tyvek® Tape or DuPont™ Flashing Systems products.



Narrow Cavities

Insulation

Narrow cavities

Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.

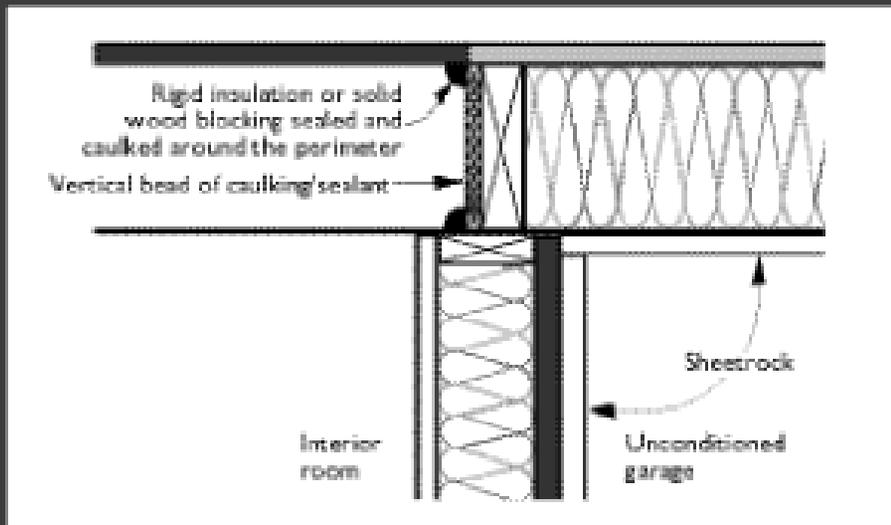


Garage Separation

Framing/Insulation/Final

Garage separation

Air sealing is provided between the garage and conditioned spaces.

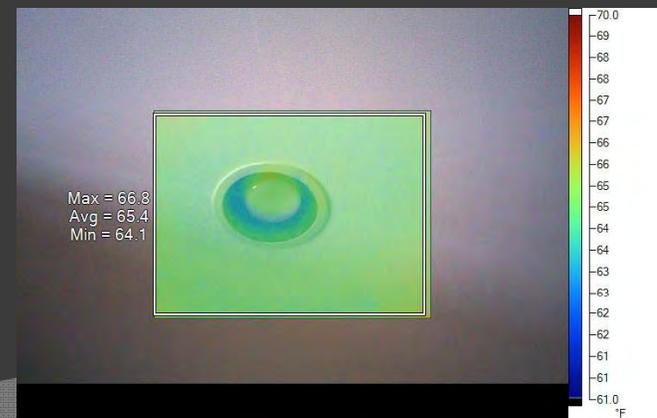
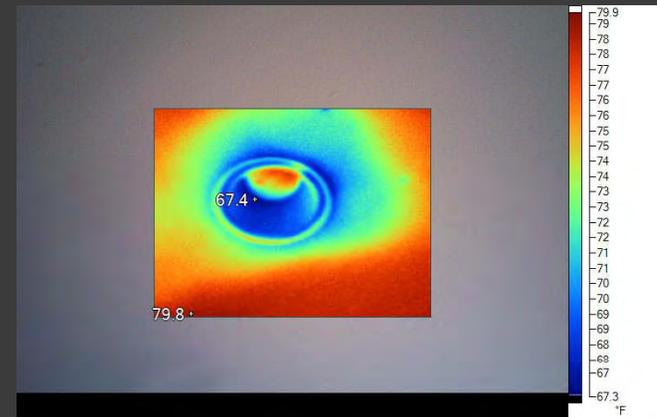
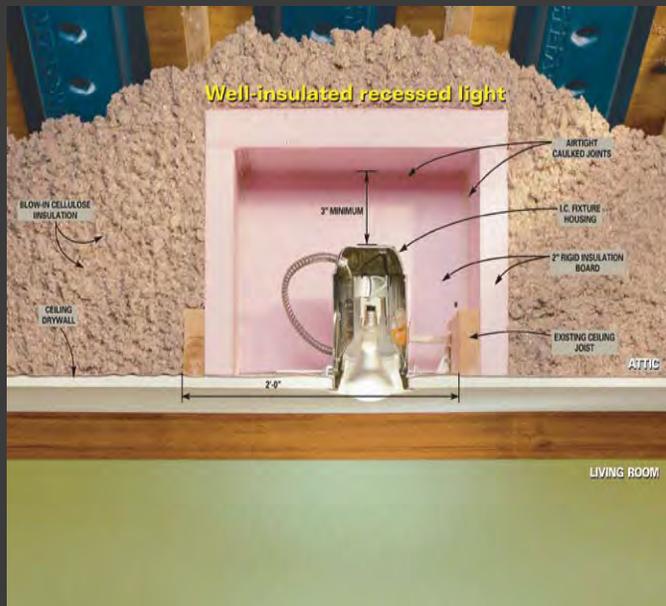


Recessed Lighting

Elec. Rough/Final

Recessed lighting

Recessed light fixtures are airtight, IC rated and sealed to drywall.
Exception—fixtures in conditioned space.



Plumbing and Wiring

Trade Rough/Insulation

Plumbing and wiring

Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.



Shower/Tub on Exterior Wall

Insulation

Shower/tub on exterior wall

Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.



Electrical/Phone Boxes on Exterior Walls

Elec. Rough/Framing

Electrical/phone box on exterior wall

Air barrier extends behind boxes or air sealed type boxes are installed.



Common Walls

Framing

Common wall

Air barrier is installed in common wall between dwelling units.



HVAC Register Boots

Mech Rough/Final

HVAC register boots

HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.

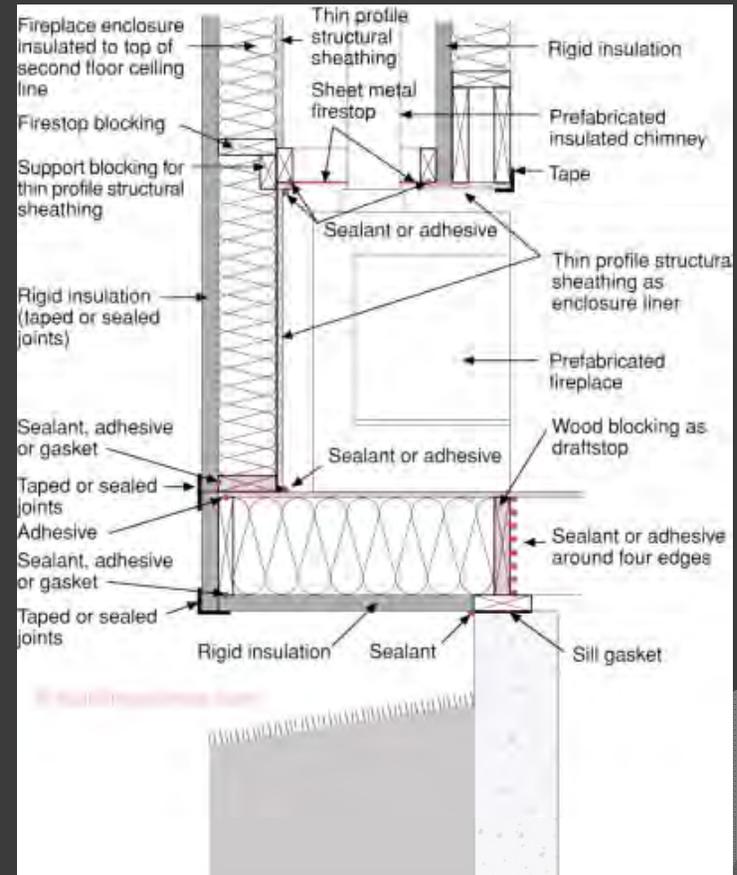
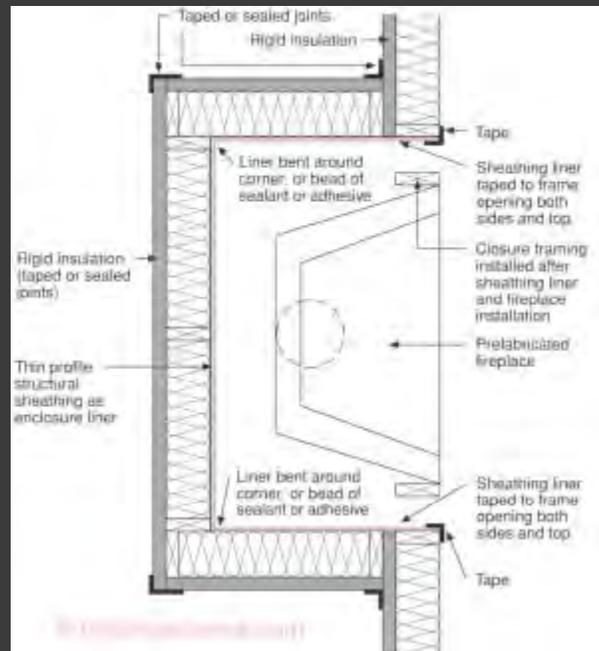


Fireplace

Framing

Fireplace

Fireplace walls include an air barrier.



Duct Sealing and Testing

N1103.2



Verification Alternatives

- Testing Option
 - Rough-in test or
 - Post-Construction
 - May be performed by approved individuals, agencies or contractors
- Visual option
 - Visual checks during construction
 - Joints and seams sealed per N1601.4.1
 - May require verification from a 3rd party (other than the installer)

EXCEPTION:

Not required if both equipment and ducts are within the conditioned area.



M1601.4.1

M1601.4.1 Joints and seams.

Joints of duct systems shall be made substantially airtight by means of tapes, mastics, liquid sealants, gasketing or other *approved closure systems*.



Application Form



Statement of Energy Code Compliance

Address	<input type="text"/>	Phone Number	<input type="text"/>
Contractor/Owner Name	<input type="text"/>	Permit #	<input type="text"/>

I hereby attest that I will be using the following method of compliance for my HVAC duct sealing inspection as required by Section 403.2.2 of the 2009 Virginia Energy Conservation Code (VECC):

- I will perform a Post Construction or Rough-in duct tightness test (duct blaster) and supply the prescribed test results for verification with section 403.2.2.1 of the 2009 VECC prior to my final Mechanical Inspection.
- I will call for a Mechanical rough-in inspection on my ductwork at which time a visual inspection will be done for the sealing method on the ductwork prior to wrapping with insulation.
- Duct insulation will be inspected at the time of building insulation inspection or as otherwise arranged with the Inspector

I hereby attest that I will be using the following method of compliance for my Blower Door/Envelope Air Leakage Inspection as required by Section 402.4.2 of the 2009 Virginia Energy Conservation Code (VECC):

- I will perform a Blower Door Test per section 402.4.2.1
- To comply with this section, blower door test results must be submitted on a testing company supplied form with evidence provided that the company is using raters certified by an approved agency. Compliance with this section of the VECC shall be certified.
- I will schedule a visual inspection of the air barrier and penetrations per section 402.4.2.2 of the 2009 VECC .
- 402.4.2.2 of the 2009 VECC.
- Using one of the following methods: House Wrap Caulk & Seal Drywall
- An Insulation Inspection must also be scheduled either at the same time or at a later date. All trade rough-in inspections must be completed prior to scheduling the insulation inspection.
- I will utilize a nationally recognized energy efficiency program and submit appropriate documentation upon completion in accordance with N1101.8

Signature	<input type="text"/>	Date	<input type="text"/>
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Q&A

