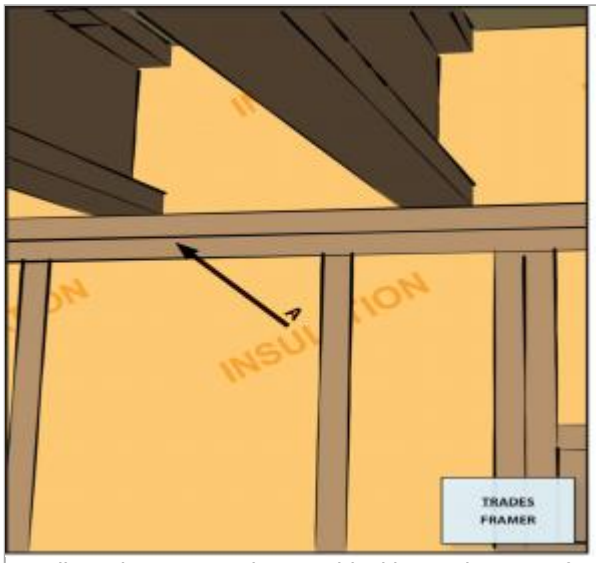
Top Plates or Blocking at Top of Walls Adjoining Unconditioned Spaces

Last Updated: 03/14/2016

Scope



Install continuous top plates or blocking at the tops of walls adjacent to conditioned space to minimize air leakage.

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- Design walls with top plates. Do not specify balloon framing.
- Install a continuous top plate at all full height walls.
- Where walls of varying heights meet, install blocking if needed in any wall cavities that are open to an unconditioned attic. Use rigid blocking material such as lumber, plywood, OSB, or rigid foam, caulked or sealed at edges.

See the **Compliance Tab** for related codes and standards requirements, and criteria to meet national programs such as DOE's Zero Energy Ready Home program, ENERGY STAR Certified Homes, and Indoor airPLUS.

Description

Most wall cavities are composed of a horizontal top plate, a horizontal bottom plate, and the vertical studs. When gypsum board and wall sheathing are caulked and fastened to the inside and exterior faces of these components, they create an air-tight six-sided wall cavity. If one element is missing from this assembly or is not adequately air sealed to the other elements, air will flow through the cavity, robbing any insulation present of its insulating value. Some wall designs have no top plate so the wall cavity is open to the area above, which may be an unconditioned attic. This opening can become a pathway allowing unconditioned air from the attic to flow down into the wall cavity and conditioned air from the wall to flow up into the attic. The result is unwanted heat loss or heat gain, cold spots in walls, and an increased potential for moisture problems in the wall or attic.

Missing top plates can sometimes occur when a room of one ceiling height abuts a room of a taller ceiling height. They can also occur when buildings are designed with balloon framing. Designers should not specify balloon framing. If the house design includes varying ceiling heights, blocking should be specified where the top of the lower wall meets the side of the higher wall if no top plate is present. This blocking material could be rigid foam, plywood, OSB, or lumber that is cut to fit. Alternately, the open stud cavities can be filled with fiberglass batting that is rolled and tucked into the cavity opening then covered with spray foam.

How to Air Seal a Wall with a Missing Top Plate

1. Identify missing top plates in adjoining walls with different ceiling heights.
2. Select a rigid air-blocking material (rigid foam insulation, plywood, OSB, lumber). Cut into pieces to fit each stud bay. Wrap a thin piece of strapping around the board to hold it in position while you glue each end with caulk or spray foam. Pull the strap out and glue the remaining two sides.
3. Or, roll a piece of unfaced fiberglass batt insulation for each cavity. Pressure fit the fiberglass batt roll into the top of the stud cavity. Cover the top with spray foam to air seal the roll and hold it in place.

Figure 1 - Ceiling heights may vary within a house design, for example, the ceiling in a hallway or bathroom may be lower than the ceiling in an adjoining dining room or bedroom. Where a lower ceiling meets the wall of a room with a higher ceiling, the lower wall may be missing a top plate, creating an open air pathway from the stud cavities to the attic space.

Reference

Image not found https://basc.pnnl.gov/sites/all/theme

Figure 2 - Top plates may be missing where a lower ceiling meets the wall of a room with a higher ceiling. The open wall cavities should be closed off with an air-blocking material like rigid foam, plywood, or dimensional lumber that is cut to fit the stud cavity and sealed in place with caulk or spray foam or fiberglass batt insulation that is rolled and friction fit into place and air sealed with spray foam. Reference

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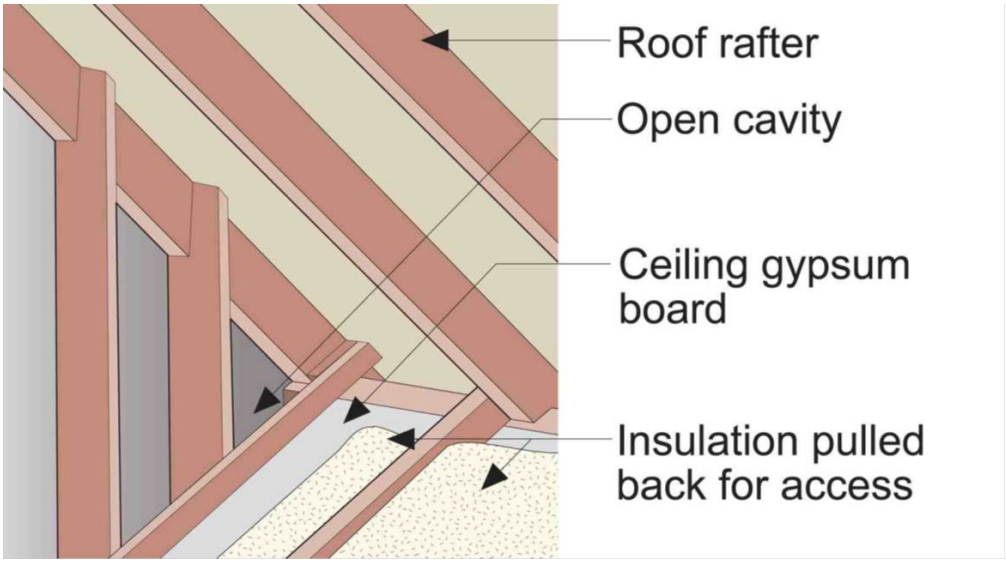
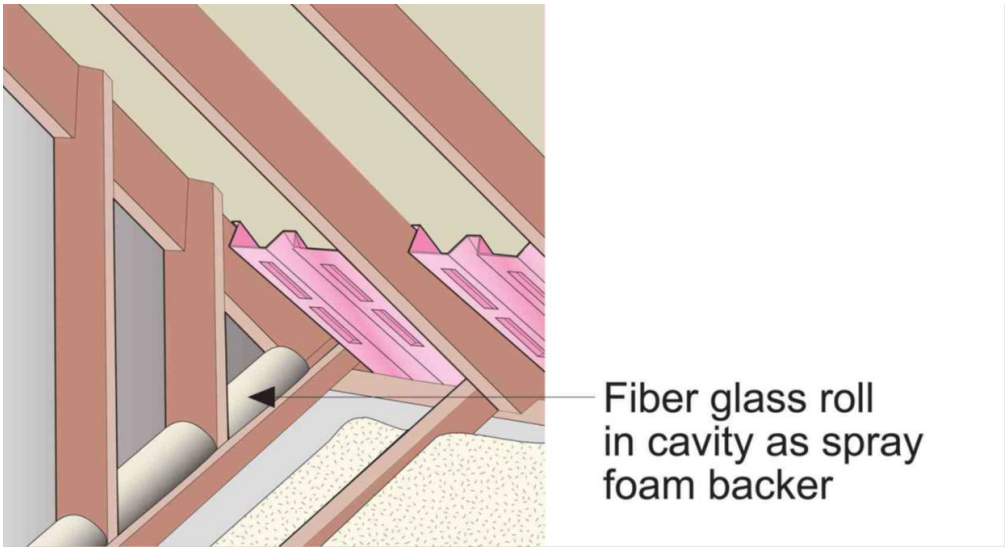
How to Air Seal Open Wall Cavities in Balloon-Framed Walls

1. Identify open wall cavities in balloon-framed walls. Note, balloon framed walls are walls that have no top plates so wall cavities are open from the bottom plate to the attic. This style of construction is not recommended.
2. Roll a piece of fiberglass batt and stuff it into place at the top of the wall where the top plate is missing.
3. Cover the roll of fiberglass batt with spray foam to air seal it in place.
4. Fill the attic with additional insulation.



Reference

Figure 3 - Balloon framing at a gable end wall allows air to flow from the attic down into the wall cavity Image not found https://basc.pnnl.gov/sites/all/theme



Reference

Figure 4 - The space at the top of the wall can be filled with a piece of fiberglass batt that is rolled up and stuffed in place Image not found https://basc.pnnl

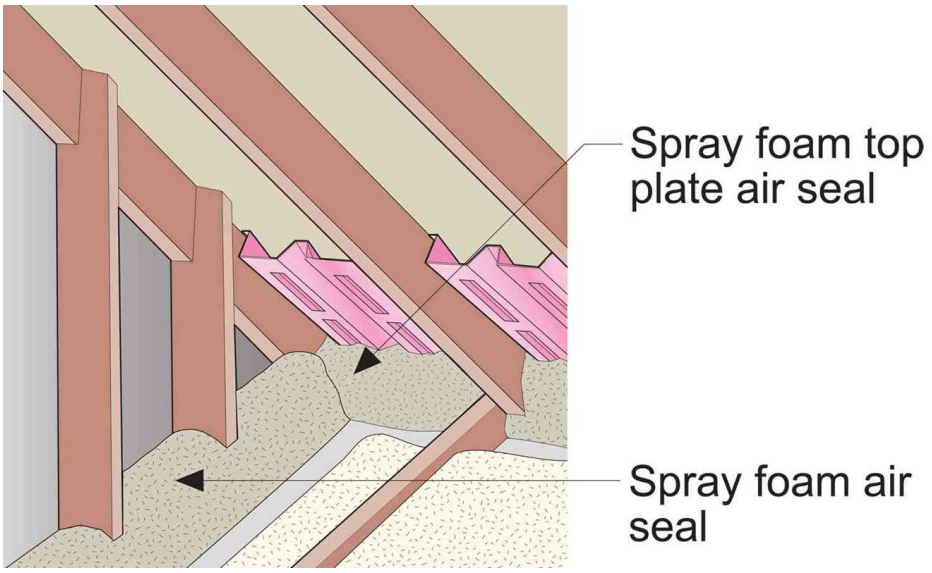


Figure 5 - The fiberglass roll is covered with spray foam to air seal the top of the wall. The top plate of the wall under the rafter can also be spray foamed between the ceiling gypsum and the bottom side of the rafter insulation baffle. Then the area can be covered with blown insulation. **Reference**

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https://basc.pnnl.gov/sites/all/themes/pnnl_btp/images/REF_icon.png

Ensuring Success

Design homes so that all full-height walls have a continuous top plate. If the house plan has some area where a top plate cannot practically be included in the framing design, such as where a room with a lower ceiling height abuts a room with a higher ceiling height, indicate on the plans that air-blocking material should be installed, then inspect that it is properly installed and sealed in place with caulk or spray foam.

Climate

No climate specific information applies.

Training

Right and Wrong Images

Display Image: ES_TESRC_5.2.2_PG142_291c_102811_0.jpg

Reference: Thermal Enclosure System Rater Checklist Guidebook

Author(s): EPA
Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

Display Image: ES_TESRC_5.2.2_PG142_291c_102811_0.jpg

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Reference: Thermal Enclosure System Rater Checklist Guidebook

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Organization(s): EPA

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Reference: Thermal Enclosure System Rater Checklist Guidebook

Author(s): EPA
Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

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Reference: Thermal Enclosure System Rater Checklist Guidebook

Author(s): EPA
Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

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Reference: Thermal Enclosure System Rater Checklist Guidebook

Author(s): EPA
Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

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Reference: Thermal Enclosure System Rater Checklist Guidebook

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Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

Display Image: JM_top-plate-air-seal-1_wrong_TE.jpg
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Courtesy Of: Jim Mackovyak

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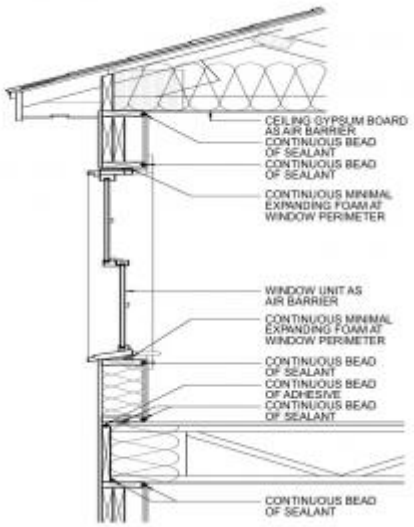
Courtesy Of: Jim Mackovyak

Display Image: JM_top-plate-air-seal-2_wrong_TE.jpg
Courtesy Of: Jim Mackovyak

CAD



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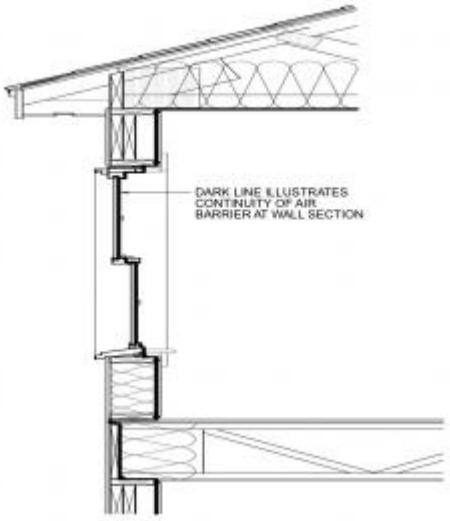
Reference: Building Plans for Advanced Framing

Author(s): Green Building Advisor
Organization(s): Green Building Advisor
Website providing CAD files and drawings of advanced framing details.



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Reference: Building Plans for Advanced Framing

Author(s): Green Building Advisor
Organization(s): Green Building Advisor
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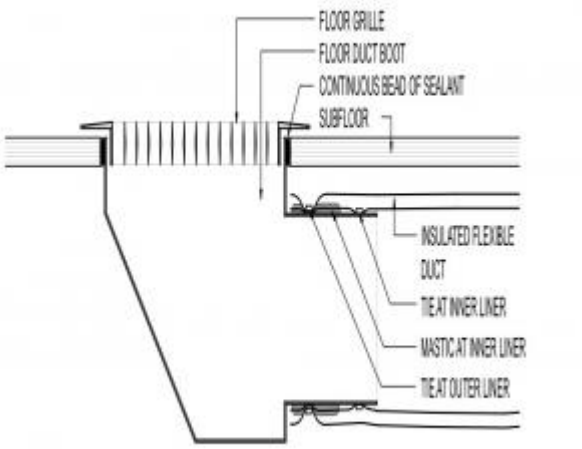

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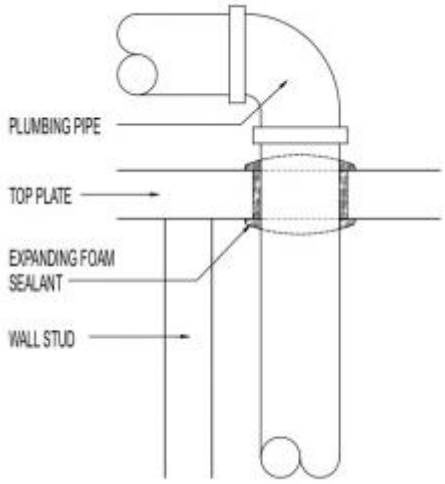
Reference: Building Plans for Advanced Framing

Author(s): Green Building Advisor
Organization(s): Green Building Advisor
Website providing CAD files and drawings of advanced framing details.



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Reference: Building Plans for Advanced Framing

Author(s): Green Building Advisor
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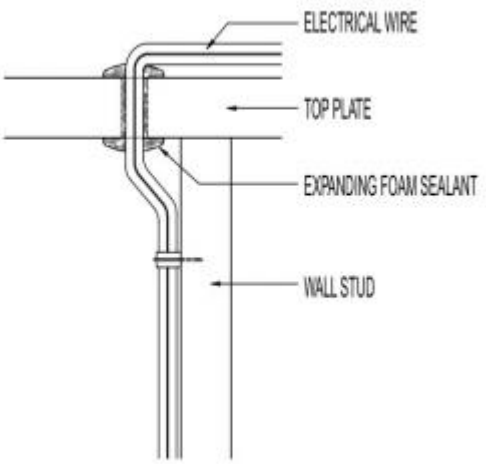

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Reference: Building Plans for Advanced Framing

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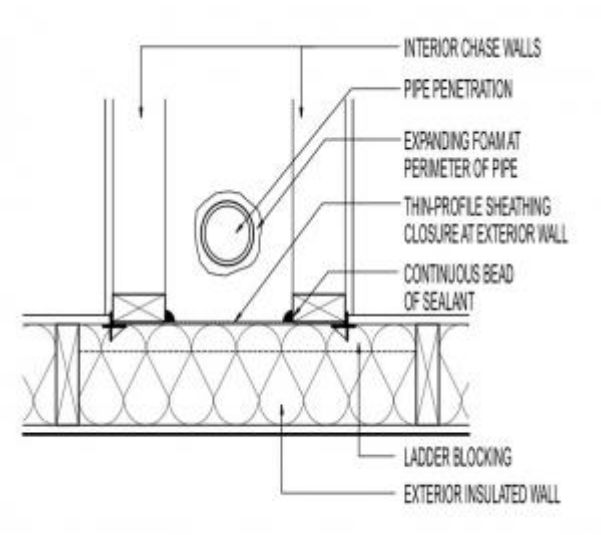

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Reference: Building Plans for Advanced Framing

Author(s): Green Building Advisor
Organization(s): Green Building Advisor
Website providing CAD files and drawings of advanced framing details.

Compliance

The Compliance tab contains both program and code information. Exact code language is copyrighted and may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

ENERGY STAR Certified Homes

ENERGY STAR Certified Homes (Version 3/3.1, Revision 08), Rater Field Checklist

Thermal Enclosure System:

4. Air Sealing (Unless otherwise noted below, "sealed" indicates the use of caulk, foam, or equivalent material):

4.4 Continuous top plate or blocking is at top of walls adjoining unconditioned space, and sealed.

ENERGY STAR Revision 08 requirements are required for homes permitted starting 07/01/2016.

DOE Zero Energy Ready Home

Exhibit 1: Mandatory Requirements. Certified under ENERGY STAR Qualified Homes Version 3

2009 IECC

Table 402.4.2 Air Barrier and Insulation Inspection Component Criteria, Walls: Corners, headers, narrow framing cavities, and rim joists are insulated.*

2009 IRC

Table N1102.4.2 Air Barrier and Insulation Inspection, Walls: Corners, headers, narrow framing cavities, and rim joists are insulated.*

2012 IECC

Table R402.4.1.1 Air Barrier and Insulation Installation, Walls: Junction of foundation and wall sill plates, wall top plate and top of wall, sill plate and rim-band, and rim band and subfloor are sealed. Corners, headers, and rim joists making up the thermal envelope are insulated.*

2012 IRC

Table N1102.4.1.1 Air Barrier and Insulation Installation, Walls: Junction of foundation and wall sill plates, wall top plate and top of wall, sill plate and rim-band, and rim band and subfloor are sealed. Corners, headers, and rim joists making up the thermal envelope are insulated.*

*Due to copyright restrictions, exact code text is not provided. For specific code text, refer to the applicable code.

2015 IECC

2015 IRC

More Info.

Access to some references may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

Case Studies

None Available

References and Resources*

1. **DOE Zero Energy Ready Home National Program Requirements**
   Author(s): DOE
   Organization(s): DOE
   Publication Date: August, 2015
   Standard requirements for DOE's Zero Energy Ready Home national program certification.

2. **ENERGY STAR Certified Homes, Version 3 (Rev. 08) National Program Requirements**
   Author(s): EPA
   Organization(s): EPA
   Publication Date: September, 2015
   Document outlining the program requirements for ENERGY STAR Certified Homes, Version 3 (Rev. 08).

3. **Guide to Attic Air Sealing**
   Author(s): Lstiburek
   Organization(s): BSC
   Publication Date: January, 2010
   Fact sheet providing detailed information about air sealing attics.

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

5. **Thermal Enclosure System Rater Checklist Guidebook**
   Author(s): EPA
   Organization(s): EPA
   Publication Date: October, 2011
   Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

*Publication dates are shown for formal documents. Dates are not shown for non-dated media. Access dates for referenced, non-dated media, such as web sites, are shown in the measure guide text.

Contributors to this Guide

The following Building America Teams contributed to the content in this Guide.

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