Excerpts From The 2015 Minnesota Energy Code

Presented by

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About Peter Kulczyk

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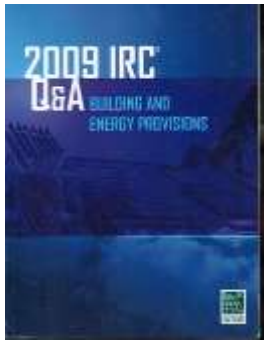
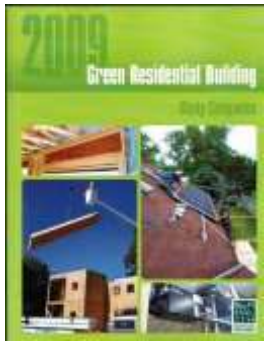
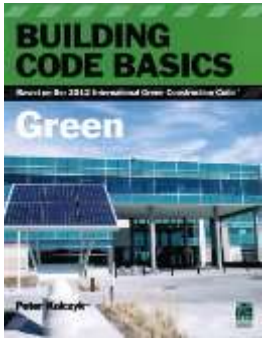






Adoption by Minnesota DLI

The Minnesota Department of Labor and Industry (DLI) has announced that:

January 24, 2015 is the effective date for the ***2015 Minnesota Residential Code***; and

February 14, 2015 is the effective date for the ***2015 Minnesota Residential Energy Code.***

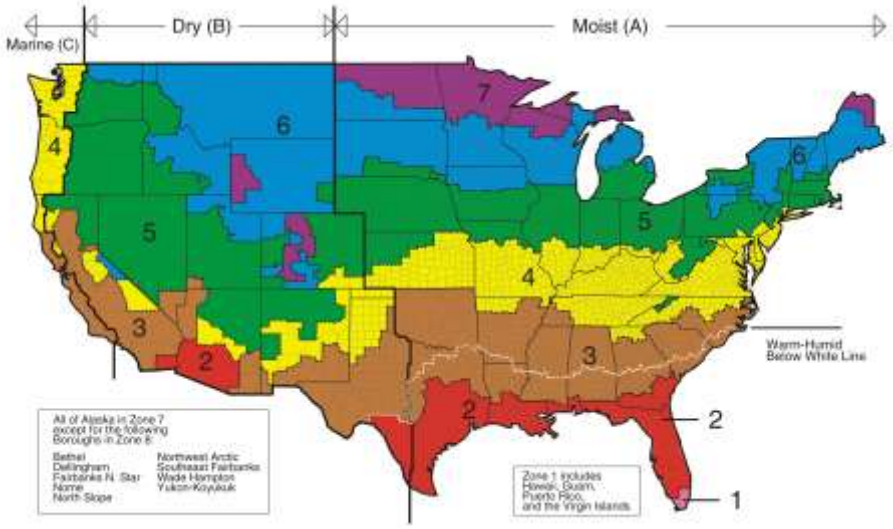
DLI 2014

Adoption by Minnesota DLI

The ***2015 Minnesota Energy Code*** is based on the *2012 International Energy Conservation Code* with State of Minnesota amendments.

Referred to as Minnesota Rules 1322 or MR1322

2015 MINNESOTA ENERGY CODE



Building Thermal Envelope

Definition of 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 unconditioned space.

IRC Section R202

Air Barrier

Material assembled and joined together to provide a barrier to air leakage through the building envelope.

IRC Section R202

R-Value (thermal resistance)

Definition of R-Value:

The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces.

IRC Section R202

U-Factor (Thermal Transmittance)

Definition of U-Factor:

The coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and the cold side air films.

IRC Section R202

Thermal Insulation Standards

Thermal insulation must shall conform to Minnesota Rules, Chapter 7640, Minnesota Thermal Insulation Standards, adopted by the Department of Commerce.

This chapter sets minimum standards for the product quality and safety of thermal insulation materials, testing procedures and installation.

MR 1309.0303
MR 7640.0130

Building Envelope Testing

The dwelling shall be tested and verified as having an air leakage rate of not exceeding 3 air changes per hour.

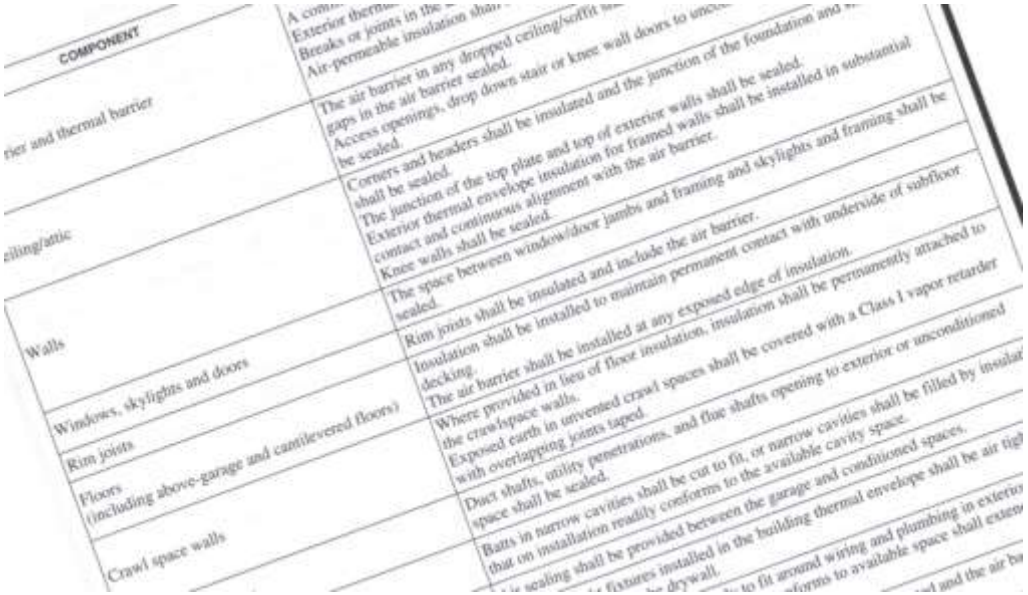
Testing shall be conducted with a blower door at a pressure of 0.2 inches water gauge (50 Pascals).

(continued)

MR 1322.0402
IECC Section R402.4.1

Building Envelope Testing

Testing is to basically determine if there are leaks in the interior air barrier.



COMPONENT	
ner and thermal barrier	Exterior thermal... Breaks or joints in the ... Air-permeable insulation shall...
	The air barrier in any dropped ceiling/soffit ... gaps in the air barrier sealed. Access openings, drop down stair or knee wall doors to unc... be sealed.
eiling/attic	Corners and headers shall be insulated and the junction of the foundation and ... shall be sealed. The junction of the top plate and top of exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.
Walls	The space between window/door jambs and framing and skylights and framing shall be sealed.
Windows, skylights and doors	Rim joists shall be insulated and include the air barrier.
Rim joists	Insulation shall be installed to maintain permanent contact with underside of subfloor decking.
Floors (including above-garage and cantilevered floors)	The air barrier shall be installed at any exposed edge of insulation. Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.
	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 insulat... that on installation readily conforms to the available cavity space.
	Batts shall be provided between the garage and conditioned spaces. ... sealing shall be provided between the building thermal envelope shall be air tig... fixtures installed in the building thermal envelope shall be air tig... ... to fit around wiring and plumbing in exterio... ... drywall. ... forms to available space shall exten... ... and the air ba...

MR 1322.0402

Building Envelope Testing

Where required by the code official, testing shall be conducted by an approved third party.

(continued)

MR 1322.0402

Building Envelope Testing

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 penetrations of the building thermal envelope.

MR 1322.0402

Duct Sealing

Ducts, air handlers, and filter boxes shall be sealed.

(continued)

IECC R403.2.2

Duct Tightness

Duct tightness shall be verified by either:

Rough-in or post-construction total leakage shall be less than or equal to 4 cfm per 100 square feet of conditioned floor area when tested at a pressure differential of 0.1 inches water gauge (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped and sealed during the test. …. (Or…..)

(continued)

IECC R403.2.2

Duct Tightness

Duct total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope.

Inside

outside

IECC R403.2.2

Construction Documents

Construction documents shall include:

- Insulation materials and their R-values
- Fenestration U-factors and SHGC
- Mechanical system design criteria
- Service water heating type, size, & efficiency
- Duct sealing & location/insulation of ducts/pipes
- Air-sealing details

MR 1322.0103

Prescriptive Thermal Envelope

The building thermal envelope shall meet the requirements of Table R402.1.1 with MN amendments. This table shown is the original, un-amended version.

TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

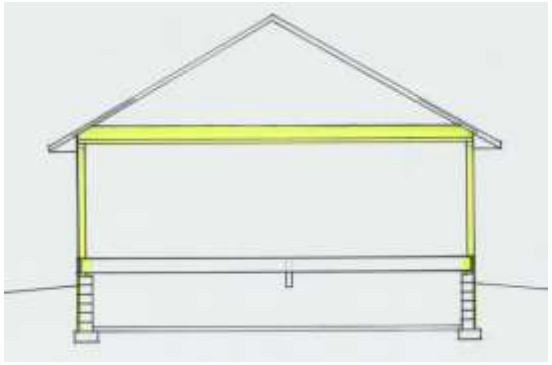
CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE[i]	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5[h]	8/13	19	10 /13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

MR 1322.0402

Ceiling Insulation

Climate Zone	6	7
Ceiling R-Value	49	49

This R-49 assumes that the insulation value is reduced at the exterior wall where there may only be a six-inch heel height, such as noted on the next slide.



MR 1322.0402

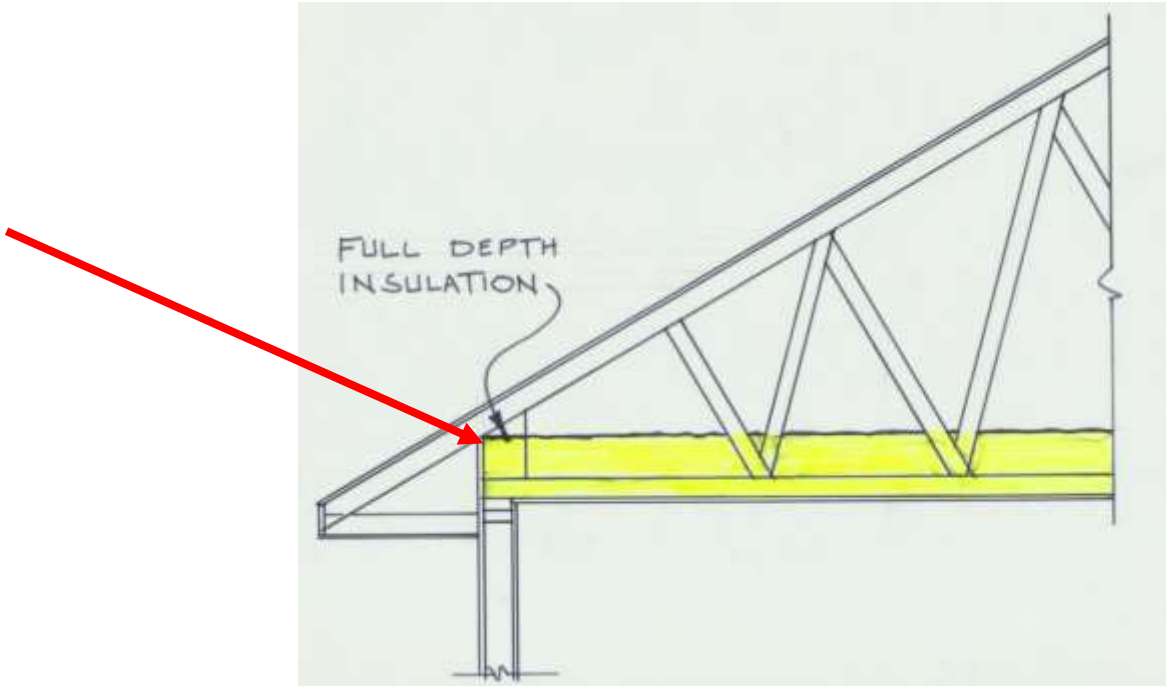
Ceiling Insulation

Roof/ceiling assemblies shall have a minimum six inch energy heel (*measured at the outside face)*

MR 1322.0402

Ceiling Insulation

R-38 shall be deemed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eave.



IECC Section R402.2

Ceiling Insulation Eave Baffle

For air permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents.

IECC Section R402.2

Wall Insulation

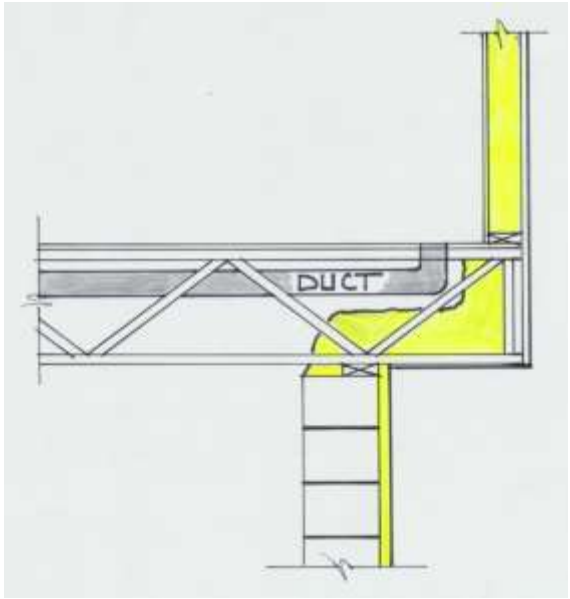
Climate Zone	6	7
Wall R-Value	*20	21

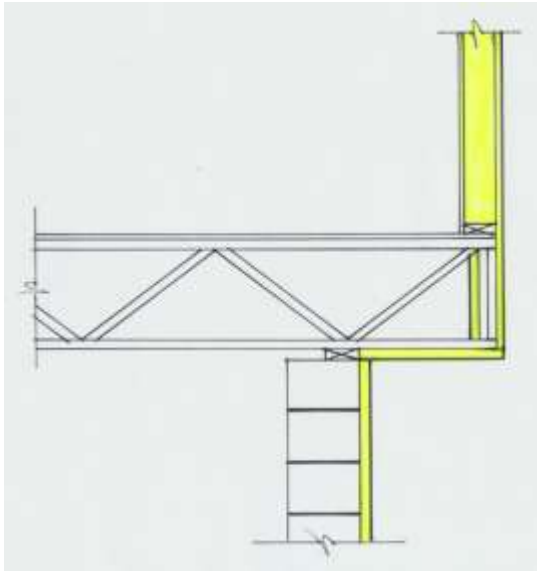
** R-13 + 5 insulated sheathing for 2 x 4 walls.*

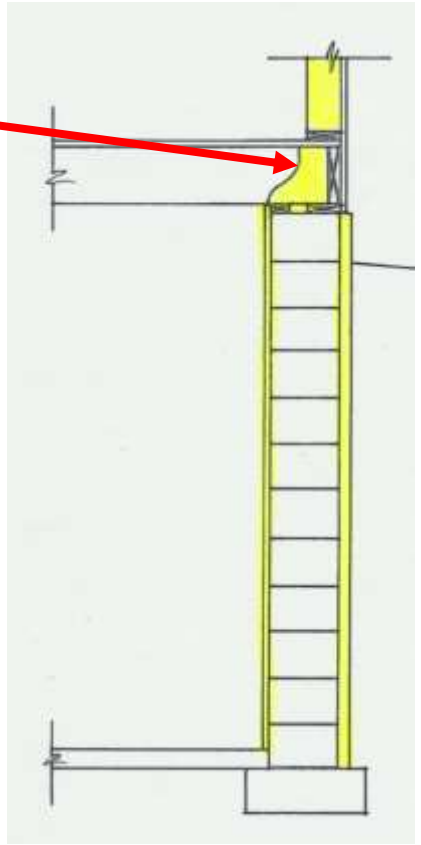
MR 1322.0402

Rim Joist Insulation

Climate Zone	6	7
Rim Joist R-Value	20	21







MR 1322.0402

Floor Insulation

Climate Zone	6	7
Floor R-Value	30	38

When the R-value above is not possible, Footnote "e" of Table R402.1.1 allows "or insulation sufficient to fill the framing cavity, R-19 minimum."

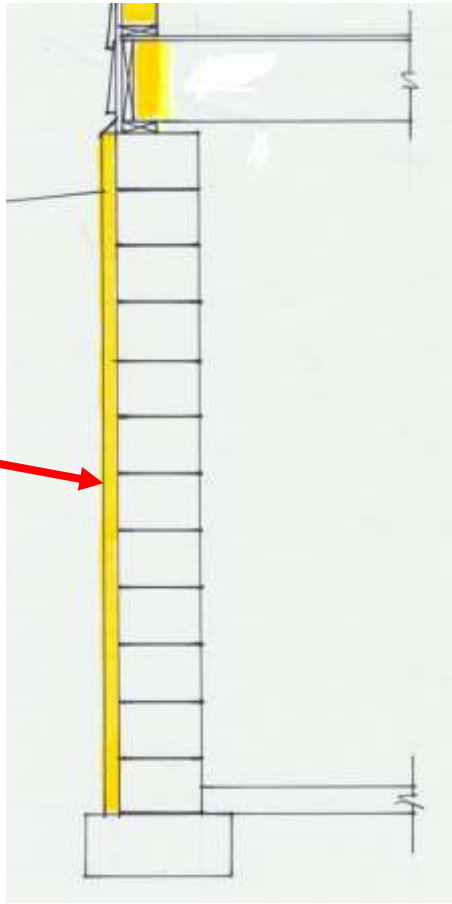
*This section in the code really addresses scenarios such as **Bonus Rooms** above unconditioned spaces such as **Tuck-Under Garages**.* (continued) **MR 1322.0402**

Basement Wall Insulation

A minimum of R-15 insulation for concrete and masonry foundations shall be installed for both Climate Zones 6 and 7.

This R-15 could be installed entirely on the exterior side of the foundation wall. ….. Or ….

(basement wall insulation continued)



MR 1322.0402

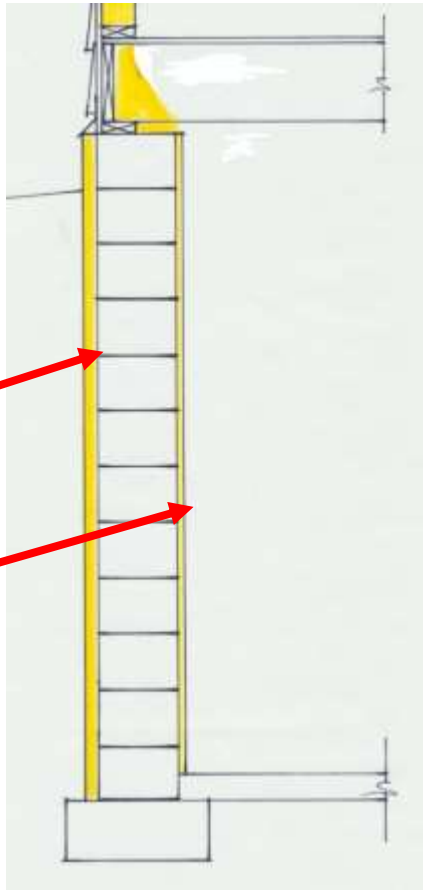
Basement Wall Insulation

This R-15 insulation could be split, with a minimum of a R-10 installed on the exterior side of the wall and at least R-5 insulation on the inside.

R-10 insulation on exterior side

R-5 insulation on interior side

(basement wall insulation continued)



MR 1322.0402

Basement Wall Insulation

Basement wall interior insulation, other than closed cell spray foam, shall not exceed R-11.

(basement wall insulation continued)

MR 1322.0402

Basement Wall Insulation

R-10 continuous insulation on the exterior of each foundation wall shall be permitted (instead of the R-15) if the tested air leakage rate does not exceed 2.6 air changes per hour and …(insulation continued)

MR 1322.0402

Basement Wall Insulation

… and the top of each foundation wall does not exceed 1.5 multiplied by the total lineal feet of each foundation wall that encloses conditioned space.

This 1.5 provision was submitted by BAM and placed into the energy code after the MN DLI Energy Committee had completed their work on the code.

MR 1322.0402

Basement Wall Insulation

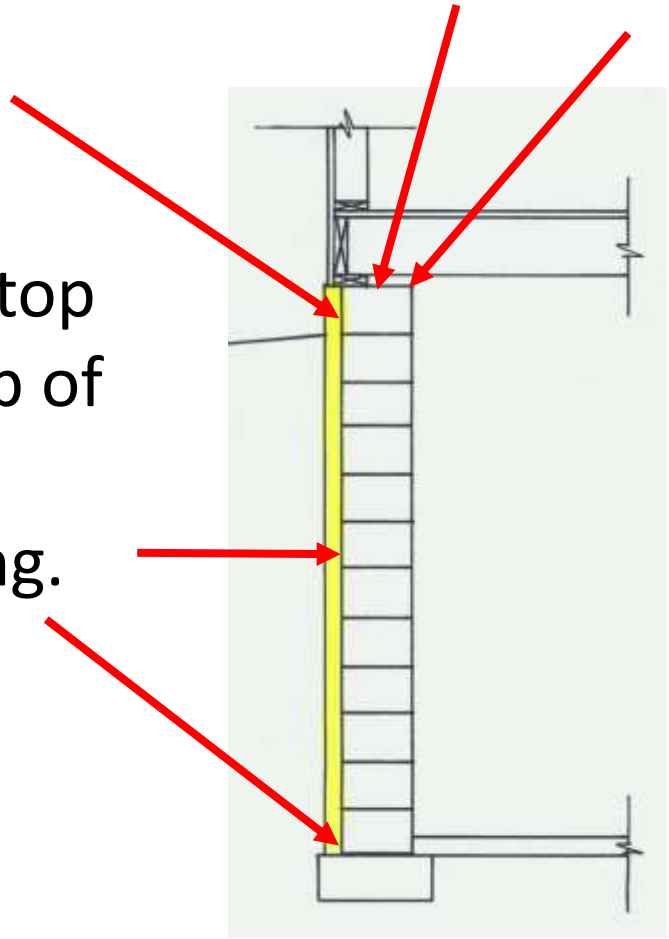
Basement walls associated with conditioned basements shall be insulated from the top of the basement wall down 10 feet below grade or to the top of the footing.

MR 1322.0402

Basement Wall Insulation

Cast-in-place concrete and masonry block foundation walls shall be waterproofed from the top interior wall edge, across the top of the wall, and down the exterior wall face to the top of the footing.

(exception to top of wall waterproofing follows on next slide)



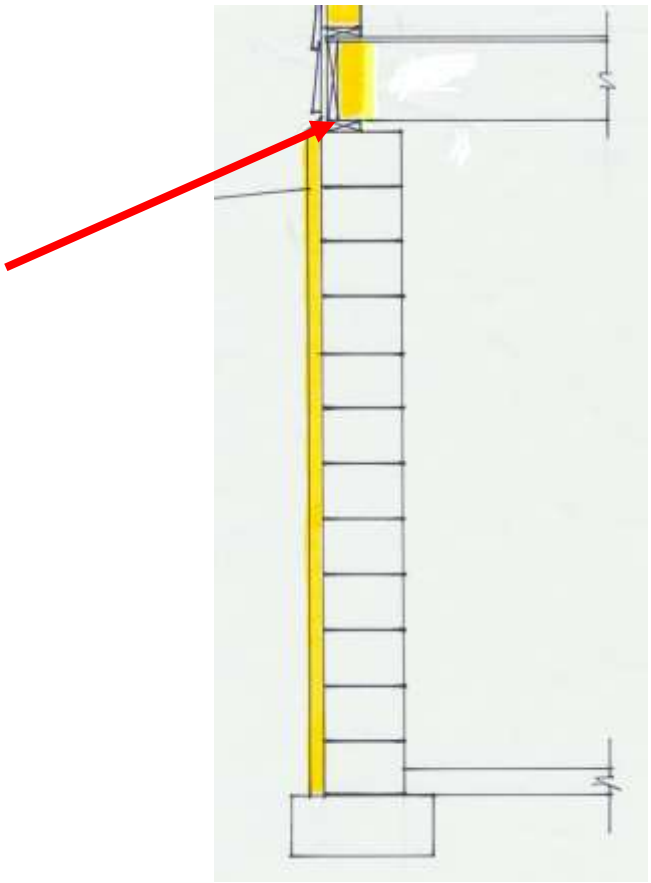
MR 1322.0402

Basement Wall Insulation

If a full width, closed cell material is installed to create a seal between the sill plate and the top of the foundation wall, the installation is deemed to meet the requirements for the top of the wall waterproofing.

What does "closed cell" refer to?

(continued on next slide)



MR 1322.0402

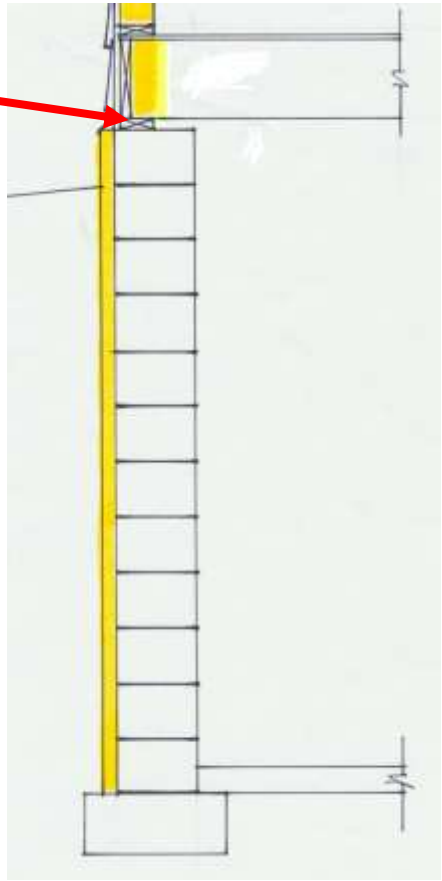
Basement Wall Insulation

What does "closed cell" refer to?

Does it make reference to the type of rim joist insulation? No.

This reference to "closed cell" was placed into the code language after the Committee work was done.

(refer to next slide for MN DLI and instructor opinion on this provision)



Instructor Opinion

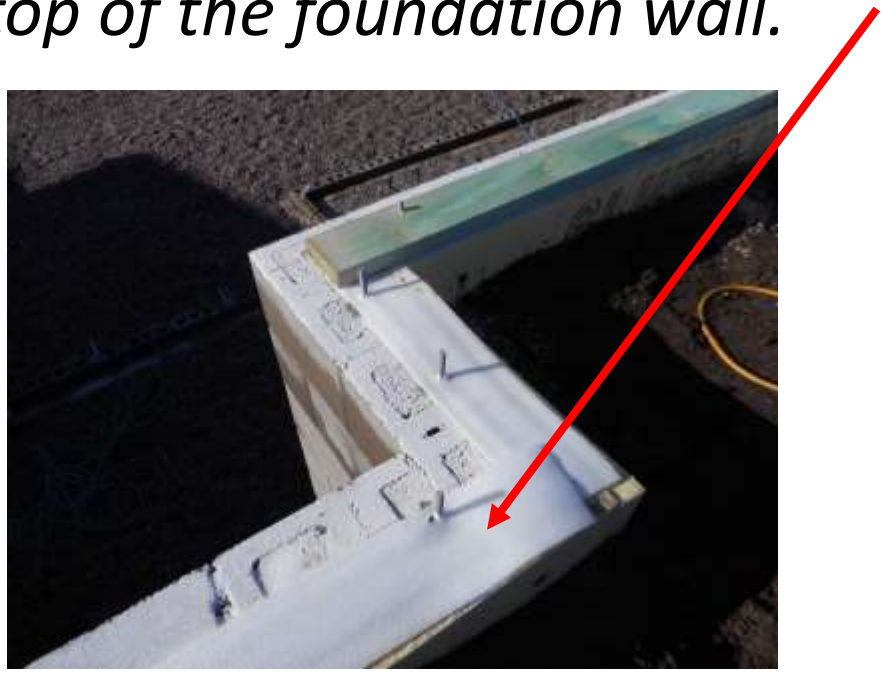
Basement Wall Insulation

According to DLI staff, the intent of this provision requires a top of wall foundation water-proofing material, such as Masonry paint (as shown in photograph), plus a standard foam type sill sealer (not fiberglass), as shown on next Slide.

(continued on next slide)

Basement Wall Insulation

According to DLI staff, this standard foam sill sealer (not required to be a closed-cell sill sealer) is only required under the actual width of the sill plate and not the full width of the top of the foundation wall.



Basement Wall Insulation

If the walls are exposed to the exterior environment, the waterproofing system shall have a rigid, opaque, and weather-resistant protective covering to prevent degradation of the waterproofing system… that extends a minimum of six inches below grade.

(basement wall insulation continued)

MR 1322.0402

Basement Wall Insulation

Any exterior draining foundation insulation assembly installed on the exterior side shall:

First, what is considered "draining" insulation?

MR 1322.0402

Basement Wall Insulation

Any exterior draining foundation insulation assembly installed on the exterior side shall:

- Be made of water-resistant materials
- Be installed according to the manufacturer
- All interior joints, edges and penetrations shall to be sealed against air and vapor penetration

(basement exterior wall insulation continued)

MR 1322.0402

Basement Wall Insulation

Any exterior non-draining foundation insulation assembly installed on the exterior side shall:

First, what is "non-draining" foundation insulation?

MR 1322.0402

Basement Wall Insulation

Any exterior non-draining foundation insulation assembly installed on the exterior side shall:

- Be made of water-resistant materials
- Be installed according to the manufacturer
- Be covered with a 6 mil poly slip sheet over the entire exterior surface
- Have a protective coating that extends at least 6 inches below grade

(basement wall insulation continued)

MR 1322.0402

Basement Wall Insulation

Any foundation insulation assembly installed on the interior shall meet the following requirements:

- Masonry foundation walls shall be drained through each block core to an approved interior drain

(basement interior wall insulation continued)

MR 1322.0402

Basement Wall Insulation

Any foundation insulation assembly installed on the interior shall meet the following requirements:

- If a frame wall is installed, it shall not be in direct contact with the foundation wall
- The insulation assembly shall comply with the interior air barrier requirements of R402.4

(basement interior wall insulation continued)

MR 1322.0402

Basement Wall Insulation

Any rigid interior insulation assembly shall meet the following requirements:

- Insulation to be in contact with foundation wall
- Vertical edges shall be sealed with acoustic sealant
- All interior joints, edges and penetrations shall be sealed against air and water vapor penetration

(basement wall rigid interior insulation continued)

MR 1322.0402

Basement Wall Insulation

Any rigid interior insulation assembly shall meet the following requirements:

- Continuous acoustic sealant shall be applied horizontally between the foundation wall and the insulation at the top of the foundation wall
- Continuous acoustic sealant shall be applied horizontally between the basement floor and the bottom insulation edge
- All penetrations are to be sealed

MR 1322.0402

Basement Wall Insulation

Any closed-cell spray-applied interior foam insulation shall comply with the following requirements:

- Shall have a permeance not greater than 0.8 and not less than 0.3
- Shall be sprayed directly onto the foundation wall
- There shall be a 1-inch minimum gap between the foundation wall surface and the framing
- All penetrations are to be sealed

MR 1322.0402

Basement Wall Insulation

Any open-cell spray-applied interior foam insulation shall comply with the following requirements:

- Shall be sprayed directly onto the foundation wall
- There shall be a 1-inch minimum gap between the foundation wall surface and the framing
- All penetrations are to be sealed
- A vapor retarder and air barrier shall be applied to the warm side with a perm rating not greater than 1.0 and not less than 0.3 (check ES report)

MR 1322.0402

Basement Wall Insulation

Any fiberglass batt insulation installed on the interior side shall comply with the following requirements:

- The above-grade exposed foundation wall shall not exceed 1.5 feet
- The top and bottom plates shall be air sealed to the foundation wall surface and basement floor

(fiberglass batt insulation on basement wall continued)

MR 1322.0402

Basement Wall Insulation

Any fiberglass batt insulation installed on the interior side shall comply with the following requirements:

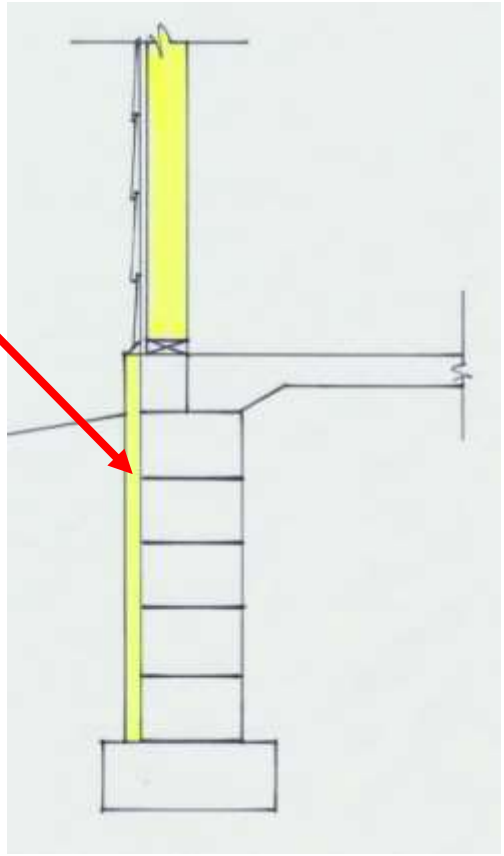
- A vapor retarder and air barrier shall be applied to the warm side with a perm rating not greater than 1.0 and not less than 0.3 and it is to be sealed to the top and bottom plates and around all utility boxes and other penetrations
- All vapor retarder seams to be overlapped at least 6 inches and sealed

MR 1322.0402

Slab-On-Grade Foundations

R-10 insulation for heated and non-heated slabs shall be installed to the depth indicated (42” or 60” frost depth) or to the top of the footing, whichever is less. *(in previous proposed amendments, a reference was also made to R-5 inside that was amended out and no longer required)*

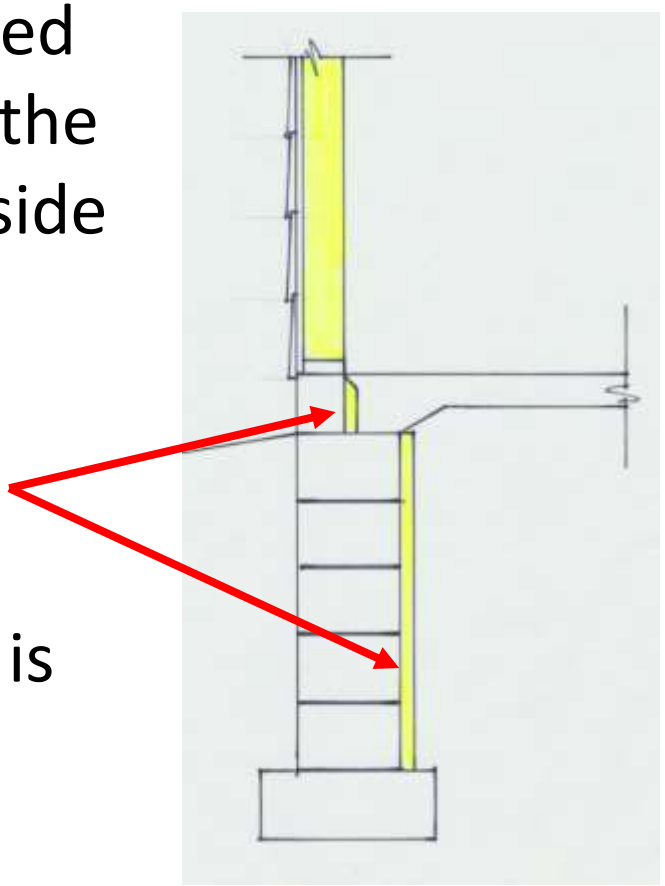
This insulation can be installed on the exterior side as shown, or….



MR 1322.0402

Slab-On-Grade Foundations

This R-10 insulation can be installed on the exterior side as shown on the previous slide, or on the interior side of the foundation wall as shown.



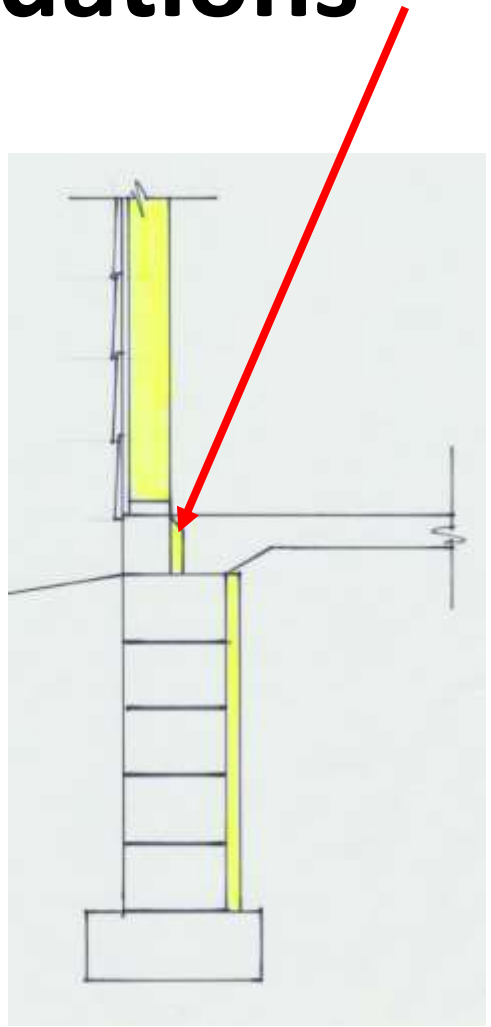
(interior slab-on-grade insulation is continued on next slide)

MR 1322.0402

Slab-On-Grade Foundations

Question: If this R-10 insulation is installed on the interior side of the foundation wall, is the insulation required on the vertical plane between the top course of block (curb block) and the interior concrete slab?

Answer: Yes. (continued)

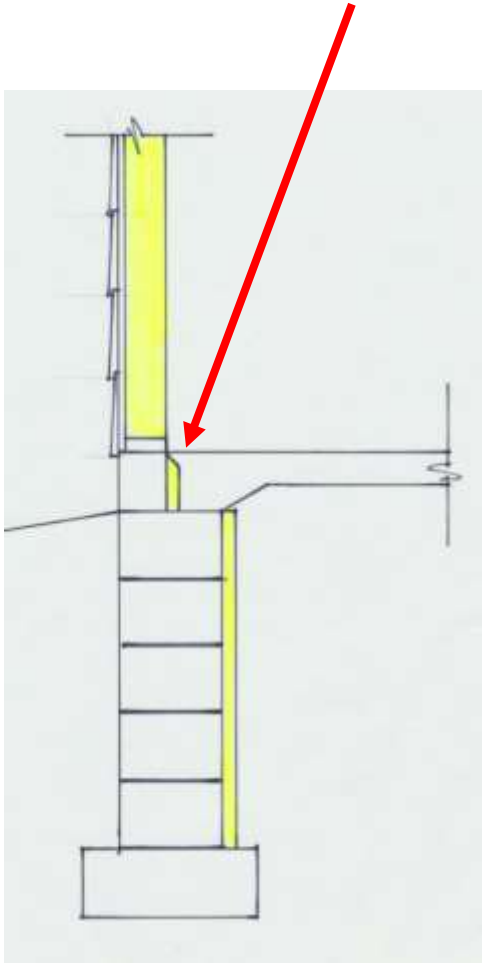


MR 1322.0402

Slab-On-Grade Foundations

Can the R-10 insulation on the vertical plane between the top course of block (curb block) and the interior concrete slab be cut back at a 45 degree angle away from the exterior wall?

Yes. (refer to close-up photograph on next slide for this detail)



IECC R402.2.9

Slab-On-Grade Foundations

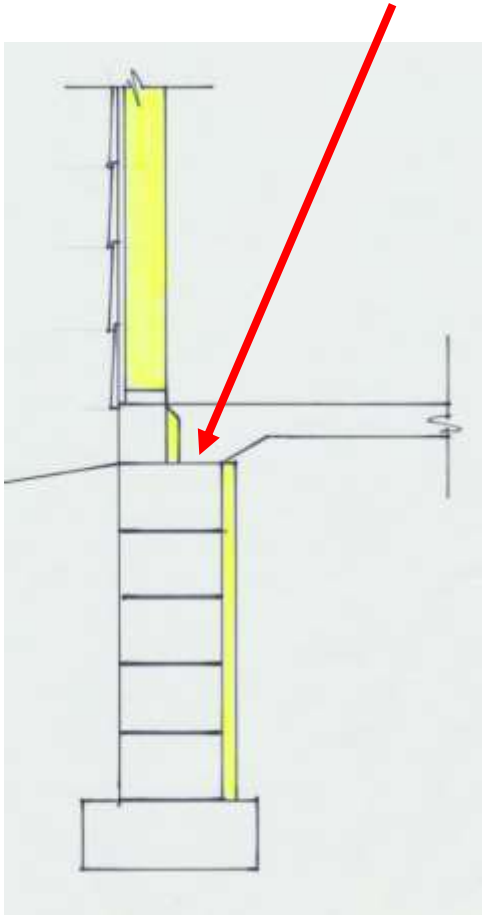
R-10 insulation on the vertical plane cut back at a 45 degree angle away from the exterior wall?

IECC R402.2.9

Slab-On-Grade Foundations

Question: If this R-10 insulation is installed on the interior side of the foundation wall, is the insulation required on the horizontal plane between the second course of block (from the top) and the bottom of the interior concrete slab?

Answer: No. (refer to photograph on next slide for this detail)



MR 1322.0402

Slab-On-Grade Foundations

Insulation is not required on the horizontal plane between the second course of block (from the top) and the bottom of the interior concrete slab.

MR 1322.0402

Basement Insulation

Any insulation assembly installed integral to the foundation walls shall be manufactured for that intended use and installed according to the manufacturer's installation instructions.

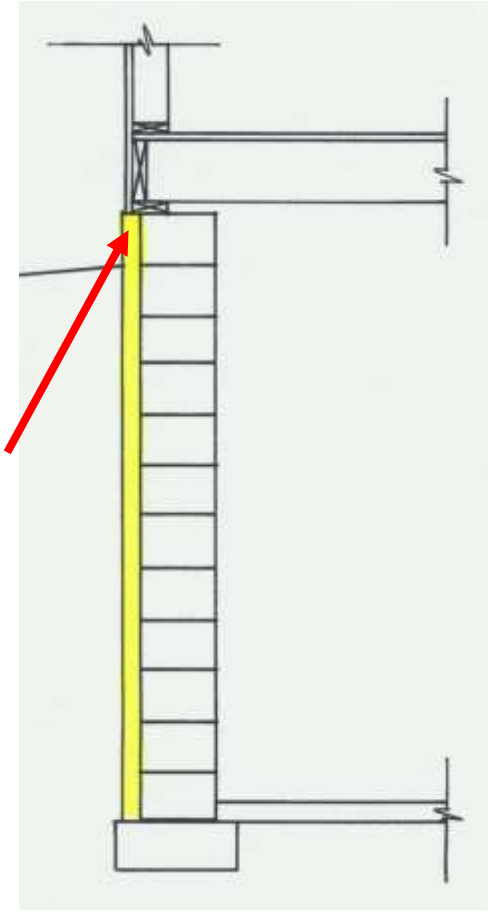
Example: ICF foundations

MR 1322.0402

Basement Insulation

Designer should consider both building code and structural issues related to cantilevered sill plates.

The local Building Official would also need to be consulted as they will need to evaluate the design as an alternate to the prescriptive provisions of the code.



Instructor Opinion

Basement Wall Insulation

A minimum R-value of 19 cavity insulation is required in wood foundation walls.

MR 1322.0402

Thermal Envelope Glazing

Climate Zone	6	7
Fenestration U-Factor	0.32	0.32

MR 1322.0402

Thermal Envelope Skylights

Climate Zone	6	7
Fenestration U-Factor (skylights)	0.55	0.55

MR 1322.0402

Vapor Retarders

Class I, Class II or Class III vapor retarders are required on the interior side of frame walls in Climate Zones 6 & 7.

(vapor retarders continued)

MR 1309.0702

Vapor Retarders

Class I vapor retarder 0.1 perm or less
(example: poly or aluminum foil)

Class II 0.1 to 1.0 perm
(Kraft-faced fiberglass batts)

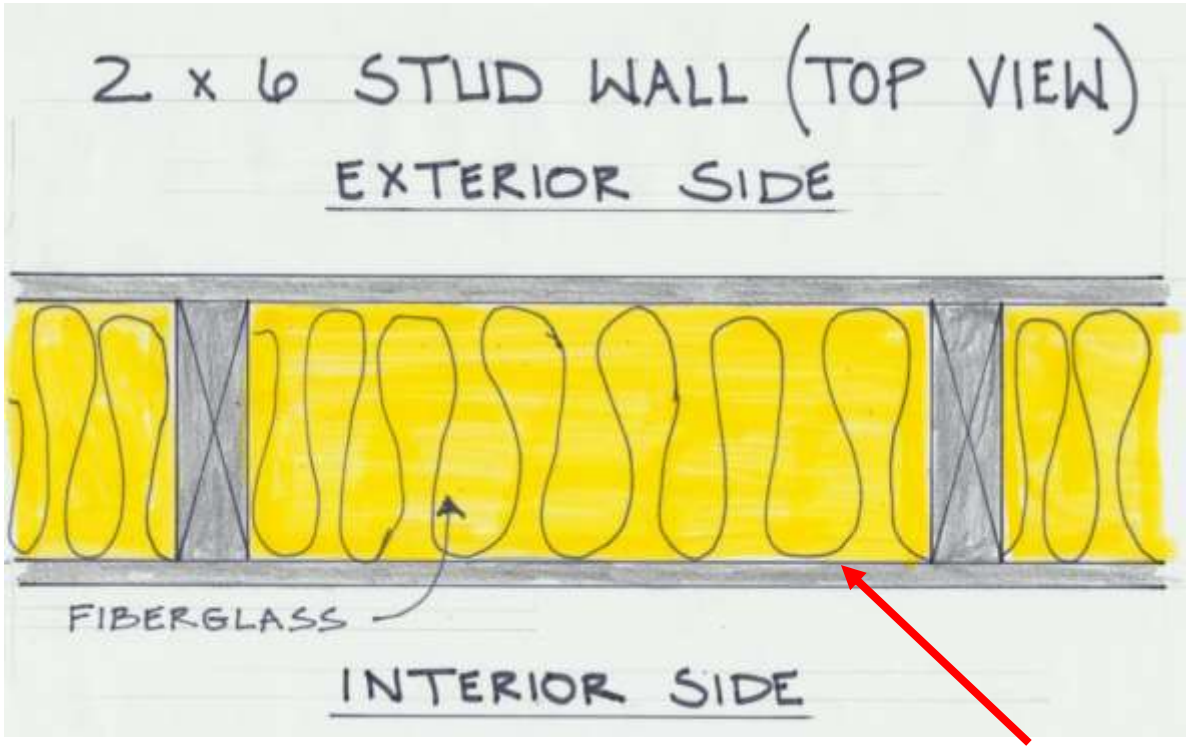
Class III 1.0 to less than 10 perm
(Latex or enamel paint)

MR 1309.0702

Vapor Retarders (example)

Vapor retarder required on warm-in-winter side.

(continued)

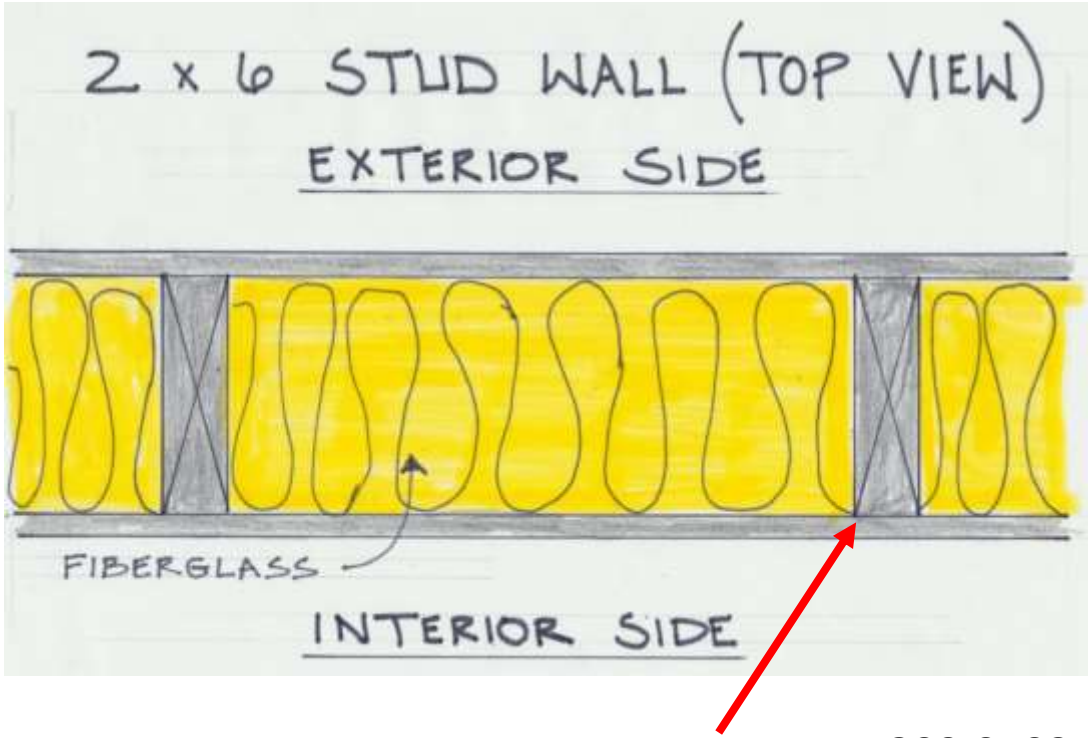


MR 1309.0702

Vapor Retarders (example)

The “facing” of a fiberglass batt is not required to extend over the face of the stud.

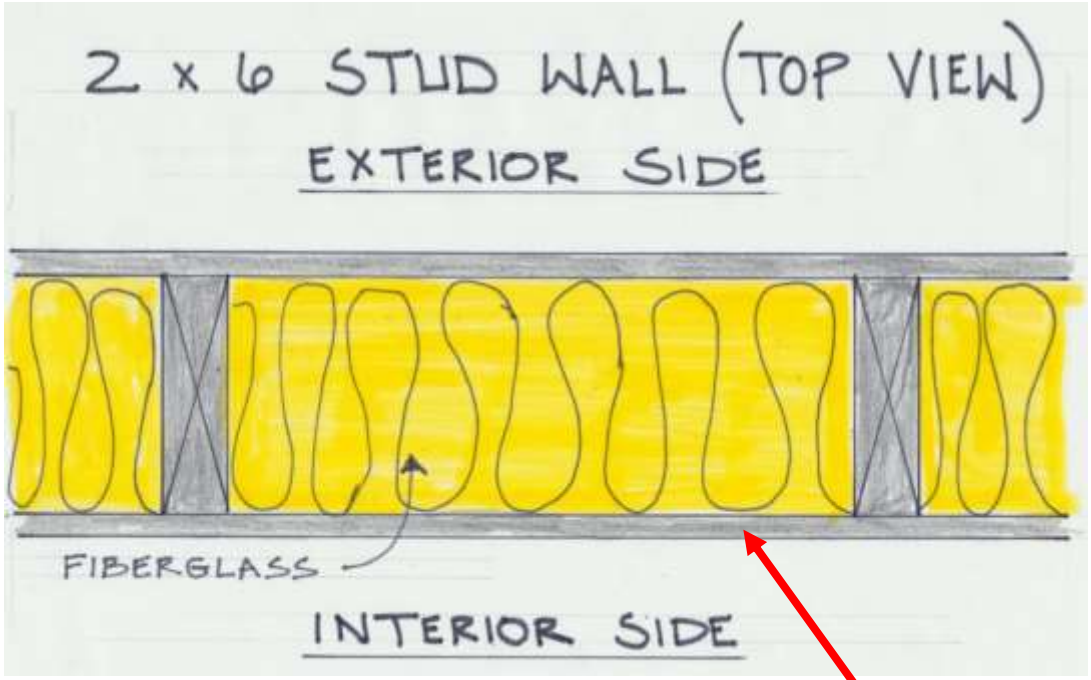
(continued)



MR 1309.0702

Vapor Retarders (example)

A poly vapor retarder is not required to be sealed unless it also serves as the continuous air barrier.

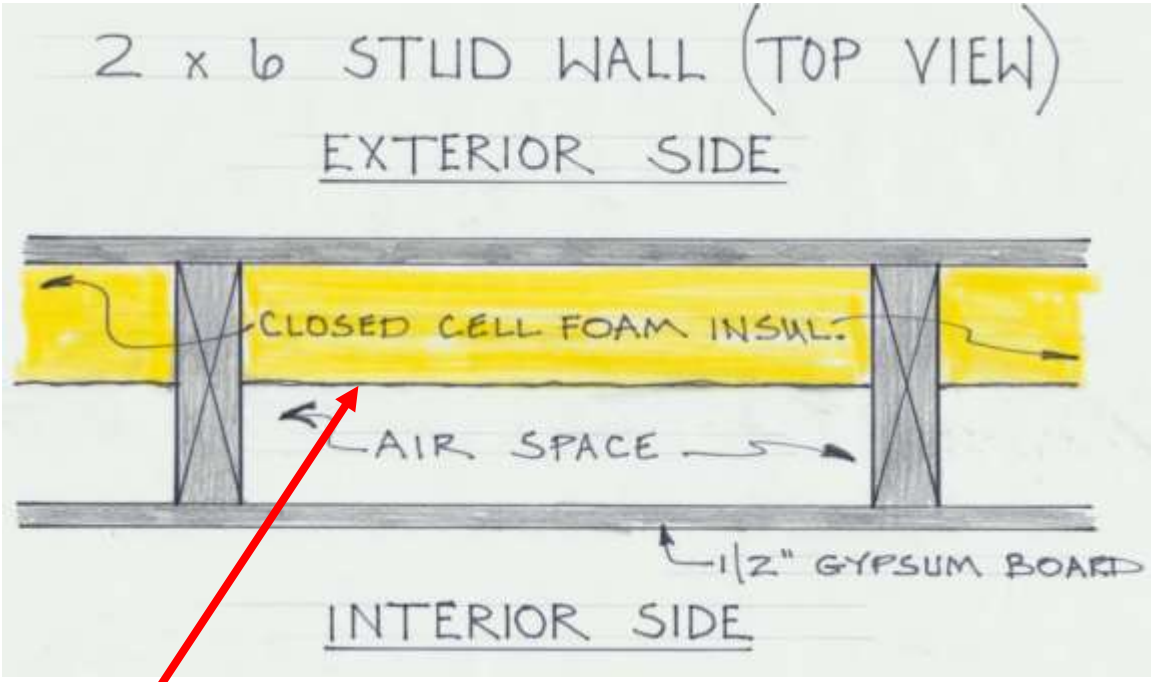


MR 1309.0702

Vapor Retarders (example)

Closed cell foam meeting the required R-value may already meet the requirement as a vapor retarder.

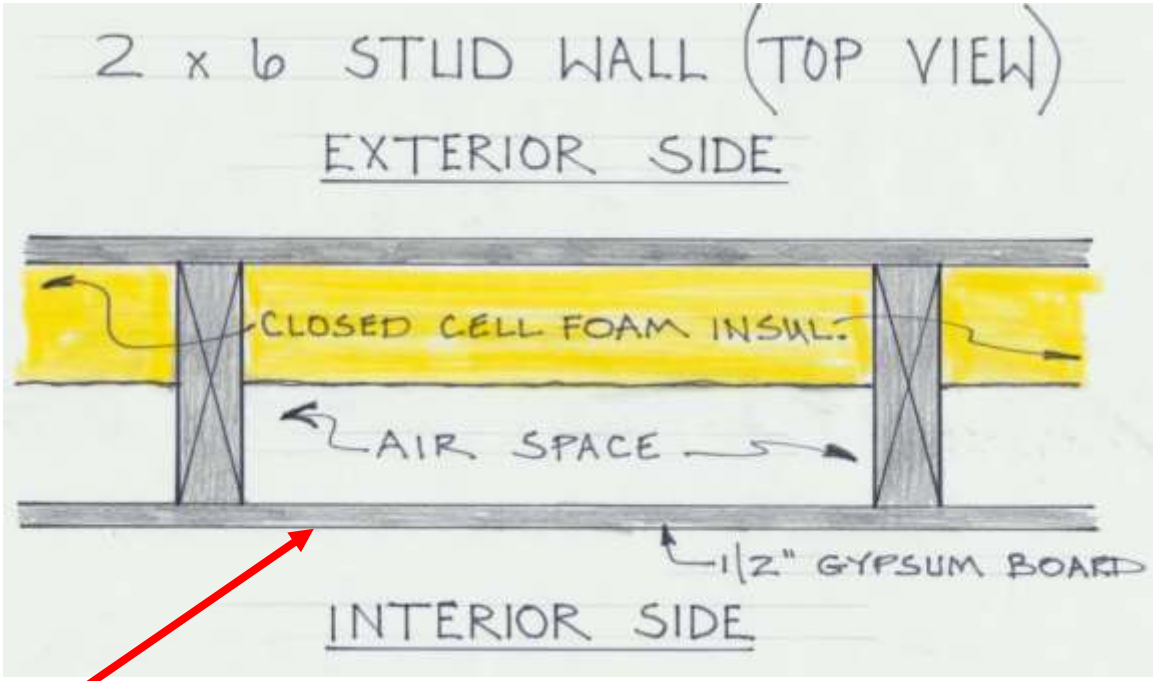
(continued)



MR 1309.0702

Vapor Retarders (example)

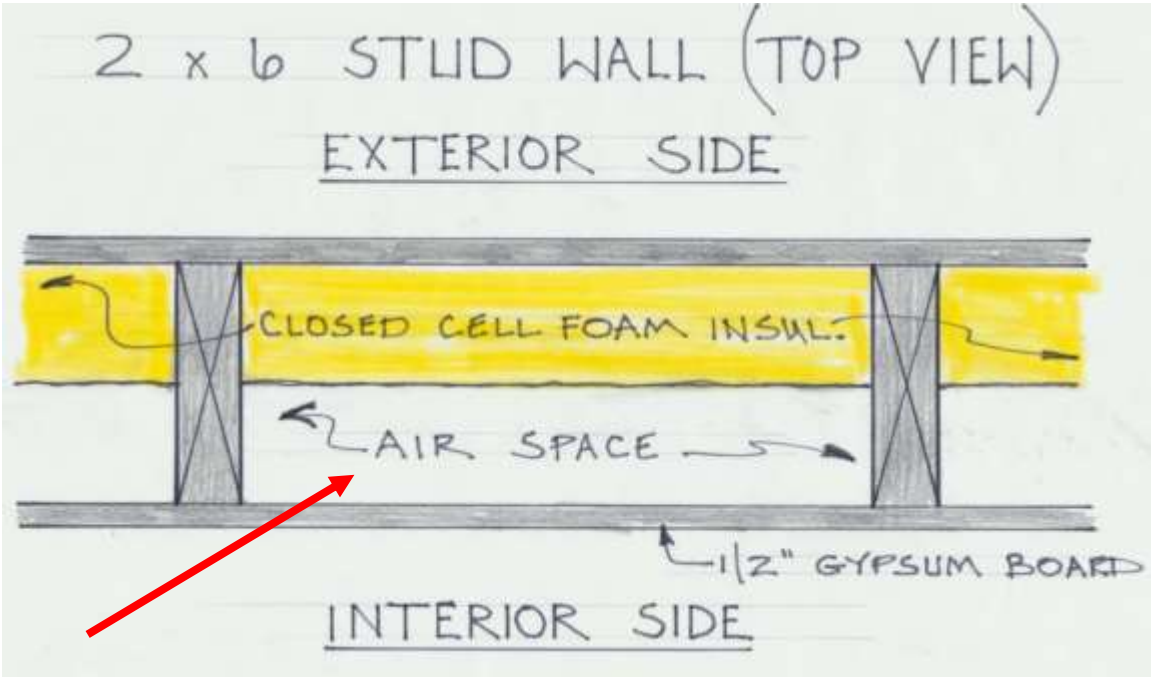
½ inch gypsum board is required to separate the foam from the interior. (continued)



MR 1309.0702

Vapor Retarders (example)

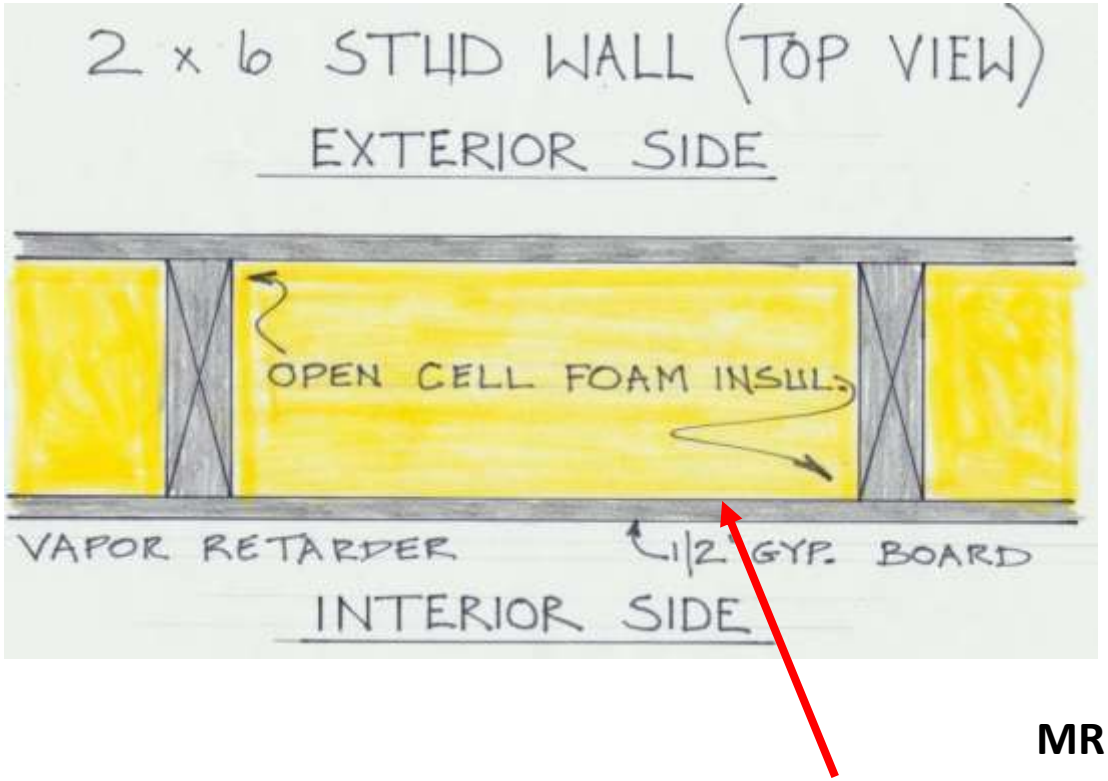
Considerations: Thermal barrier; Air space. (continued)



MR 1309.0702

Vapor Retarders (example)

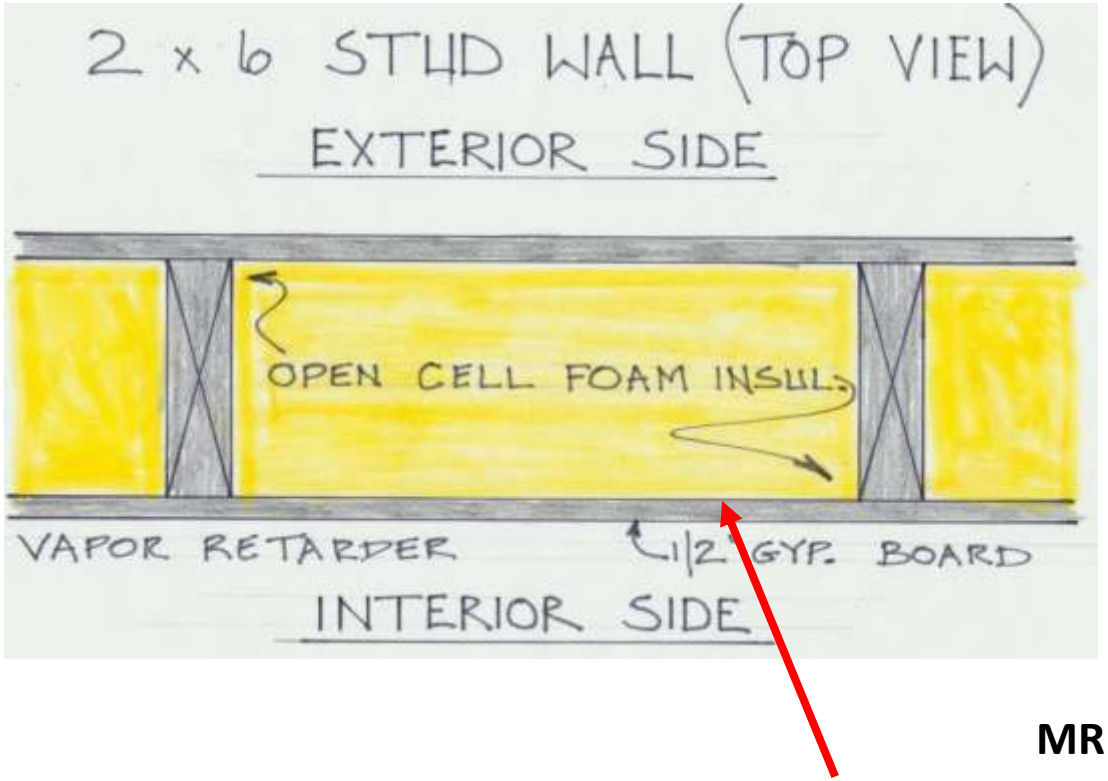
Open-cell spray foam will need a vapor retarder unless it qualifies as a Class III vapor retarder. (continued)



MR 1309.0702

Vapor Retarders (example)

Open-cell spray foam may serve as the required air barrier within the stud cavity. Check ES report.

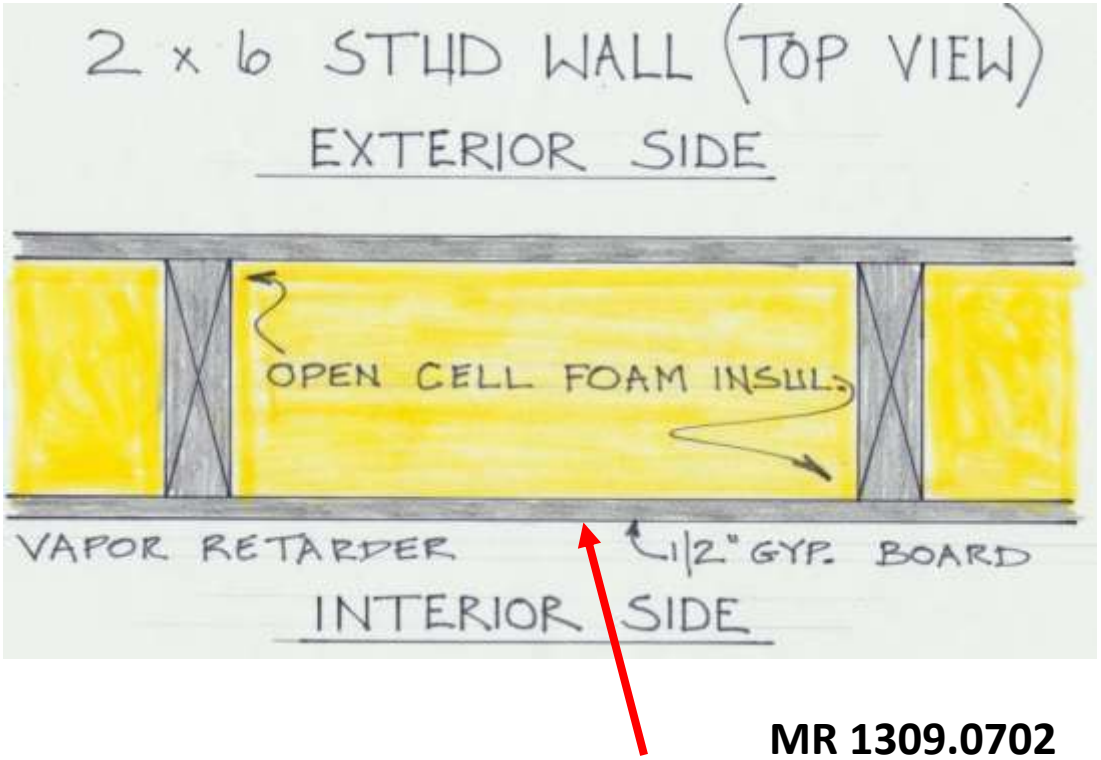


MR 1309.0702

Vapor Retarders (example)

Open-cell spray foam needs to be covered with ½ inch gypsum board or equal thermal barrier.

(continued)

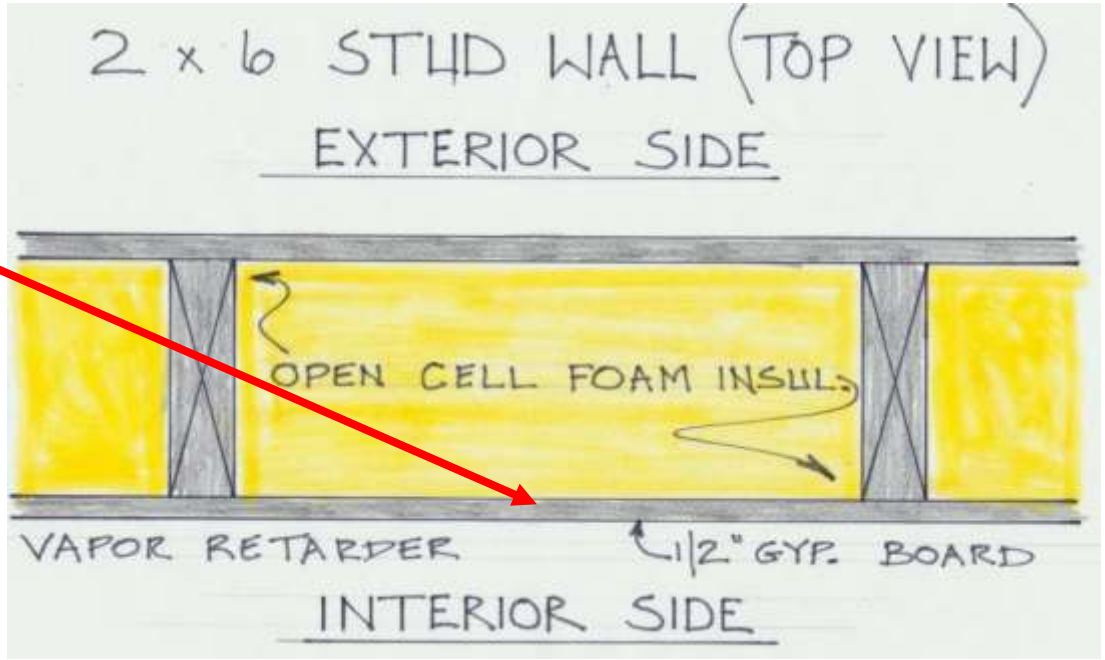


MR 1309.0702

Vapor Retarders (example)

Can the open-cell spray foam insulation be trimmed flush without negatively affecting the properties?

Yes.



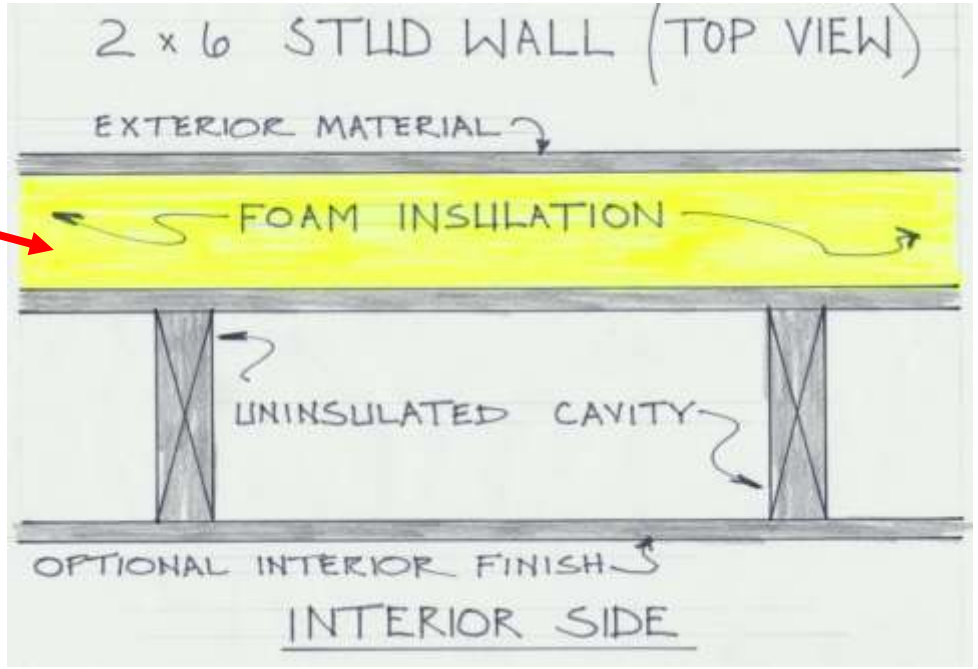
Instructor opinion

Vapor Retarders (example)

Could all of the required R-20 or R-21 insulation be placed on the exterior side of the wall framing?

Yes.

(continued)

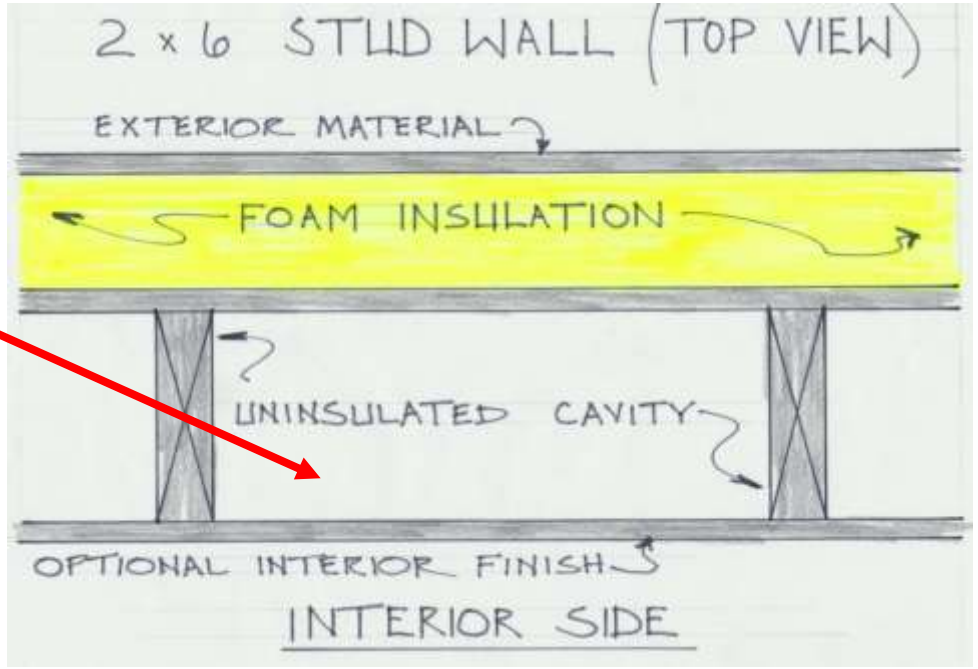


MR 1309.0702

Vapor Retarders (example)

If all of the insulation is on the exterior, can the wall cavity be left uninsulated?

Yes.

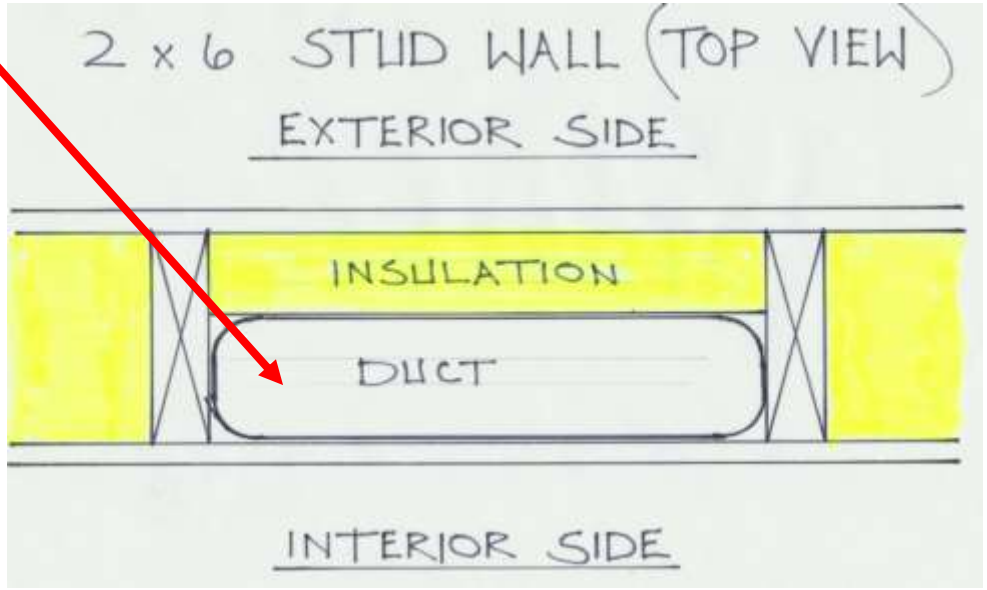


MR 1309.0702

Vapor Retarders (example)

Can ducts be placed within a 2 x 6 exterior wall stud cavity when R-10 foam insulation is placed between the duct and the exterior face of the wall?

Not unless there is at least R-20 or R-21 between the duct and the exterior cladding.



DLI staff opinion

Vapor Retarders

The Minnesota code does not contain any provisions for vapor retarders for floors, such as bonus rooms, over unconditioned spaces, such as tuck-under garages.

Vapor Retarders (example)

Question: Are the interior walls of an attached garage required to have a vapor retarder when insulated.

Answer: No.

Instructor Opinion

Duct Insulation

All exhaust, supply, and return air ducts and plenums shall be insulated:

Exterior of building	R-8
Attics, garages and ventilated crawl spaces	R-8
Outdoor air intakes within conditioned spaces	R-6
Exhaust ducts in attics, garages and crawl spaces	R-6
Exhaust ducts within conditioned spaces	R-6
Within cement slab or within ground	R-6

MR 1309.0403

Masonry Veneer

Insulation shall not be required on the horizontal portion of the foundation that supports a masonry veneer.

MR 1322.0402

Unvented Rafter Spaces

Unvented attic and unvented enclosed rafter assemblies … shall be permitted if:

The unvented attic space or unvented enclosed rafter space is completely contained within the building thermal envelope.

(continued)

IRC Section R806.5

Unvented Rafter Spaces

Unvented attic and unvented enclosed rafter assemblies … shall be permitted if:

No interior Class I vapor retarders are installed on the ceiling side of the unvented enclosed rafter assembly.

(continued)

IRC Section R806.5

Unvented Rafter Spaces

Unvented attic and unvented enclosed rafter assemblies … shall be permitted if:

Where wood shingles or shakes are used, a minimum ¼ inch vented air space separates the shingles or shakes and the roofing underlayment above the structural sheathing.

(continued)

IRC Section R806.5

Unvented Rafter Spaces

Unvented attic and unvented enclosed rafter assemblies … shall be permitted if:

When air-impermeable insulation is used, the insulation shall be applied in direct contact with the underside of the structural roof sheathing.

IRC Section R806.5

Bonus Rooms

How does the code address “Bonus Rooms,” also referred to as conditioned spaces, that are above tuck-under unconditioned residential garages?

Bonus Rooms

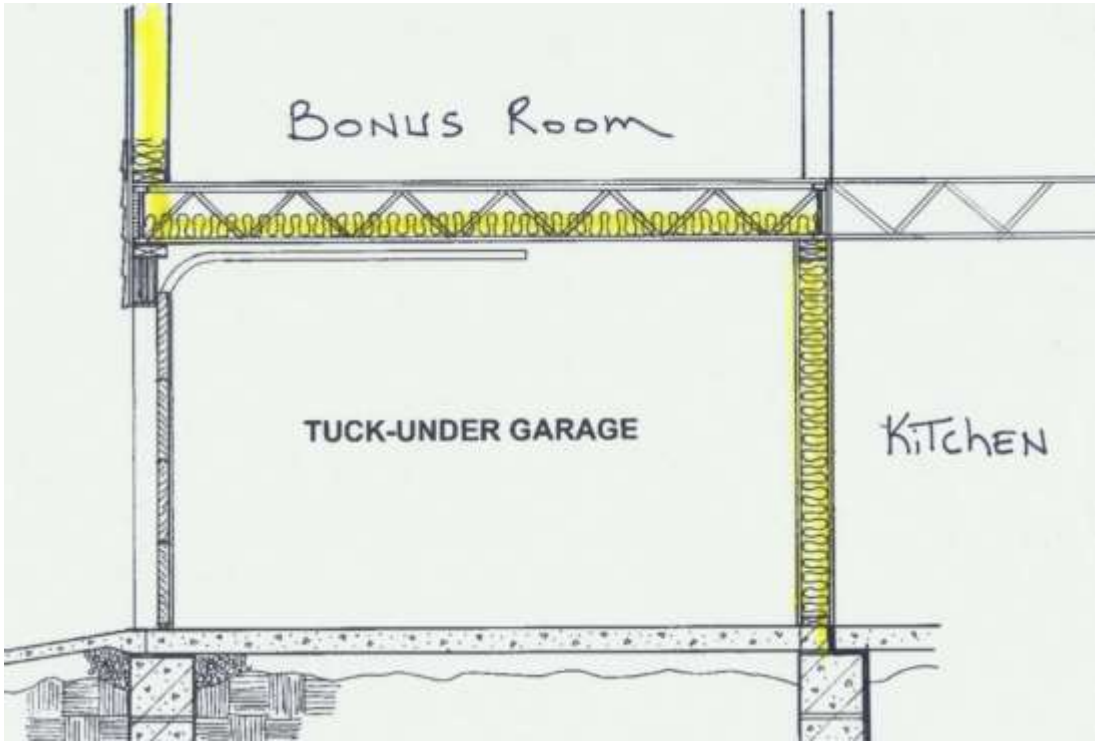
Bonus rooms have unique design issues such as:

- Air barriers
- Vapor management
- Ducts
- Insulation methods
- Best practices
- Durability
- Occupant comfort

Bonus Rooms

Q - Where is the air barrier?

Q - Where does the conditioned space start?

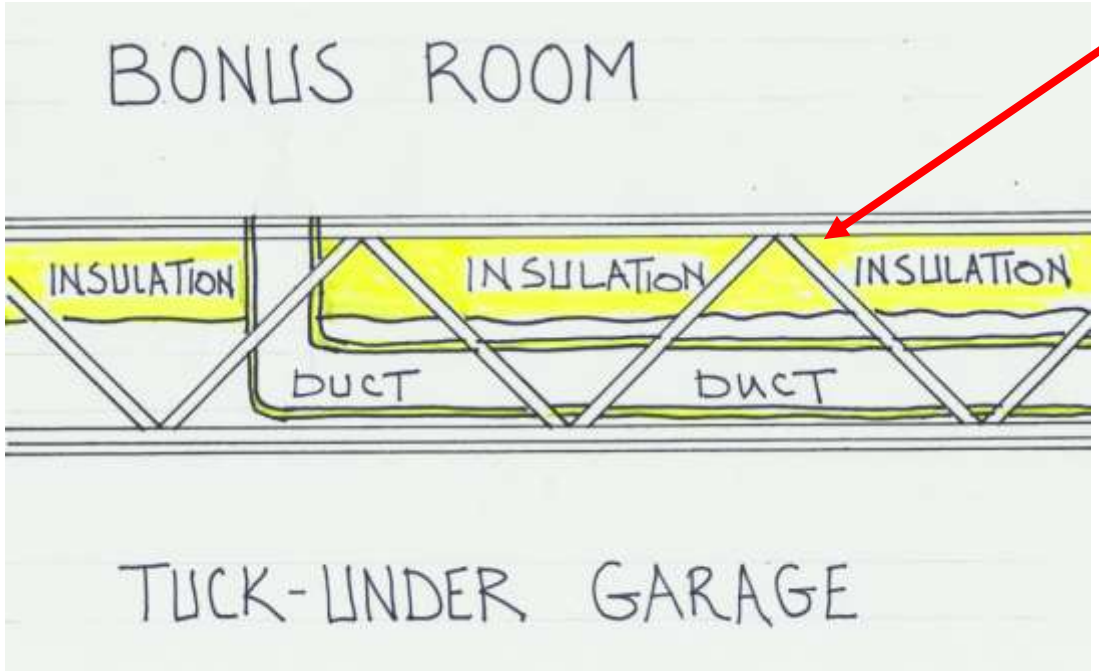


Bonus Rooms

Q - What types of insulation can be used within the floor area above unconditioned garages?

Bonus Rooms (example)

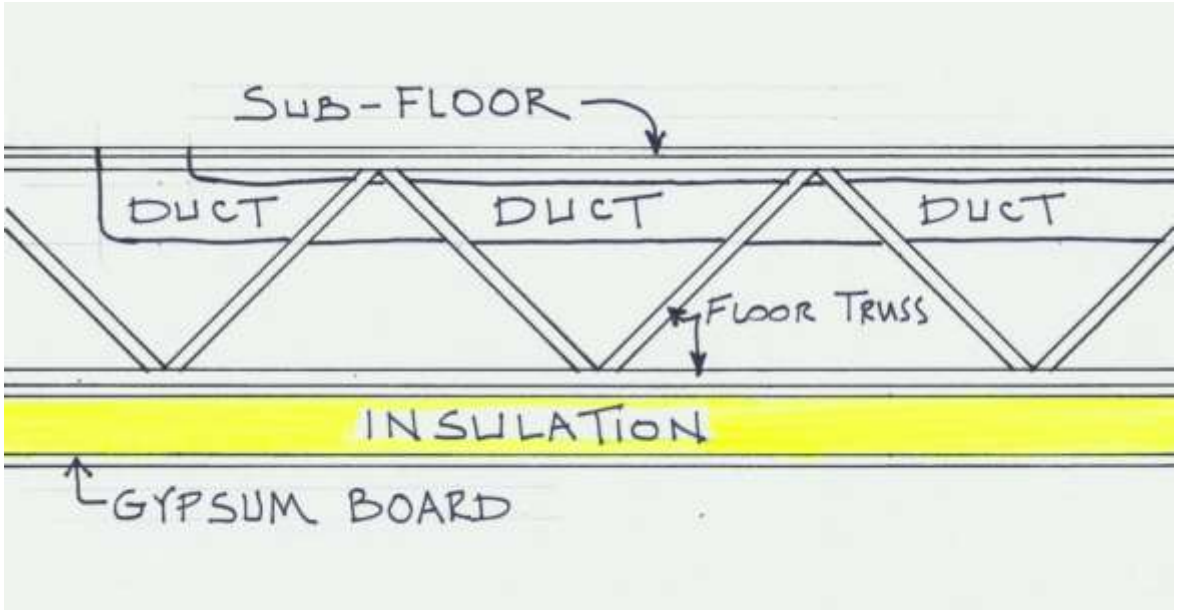
Floor insulation shall be installed to maintain permanent contact with the underside of the sub-floor decking. *(This duct is outside of conditioned space).* *<u>But</u>, …..*



IECC Sect R402.2.7

Bonus Rooms - Example

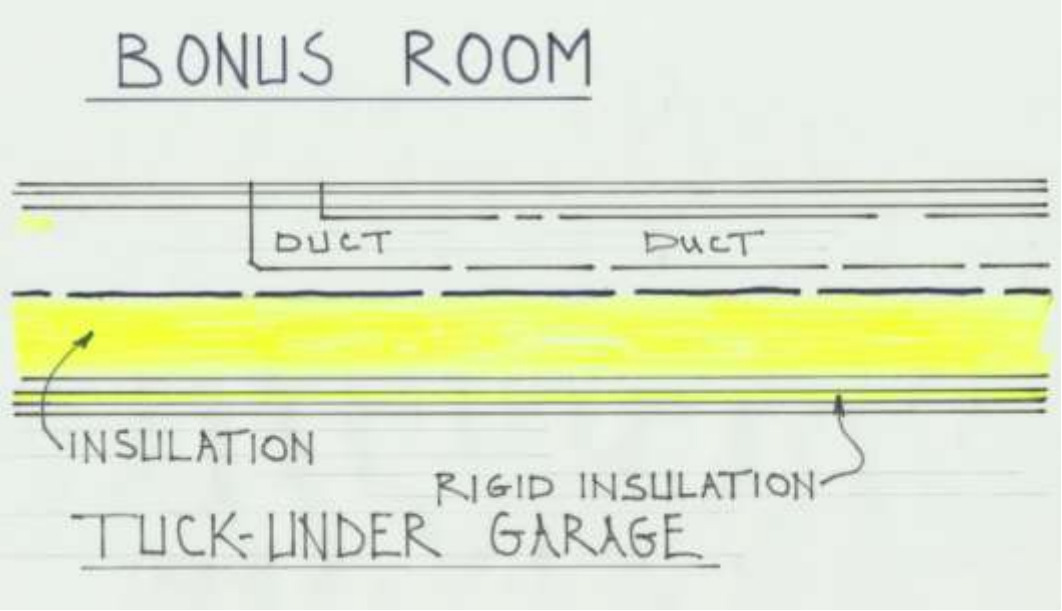
- R-30 (or R-38) rigid foam plastic on bottom
- Sealed (uninsulated) duct (within conditioned space)
- No insulation in floor cavity.



Instructor opinion

Bonus Rooms - Example

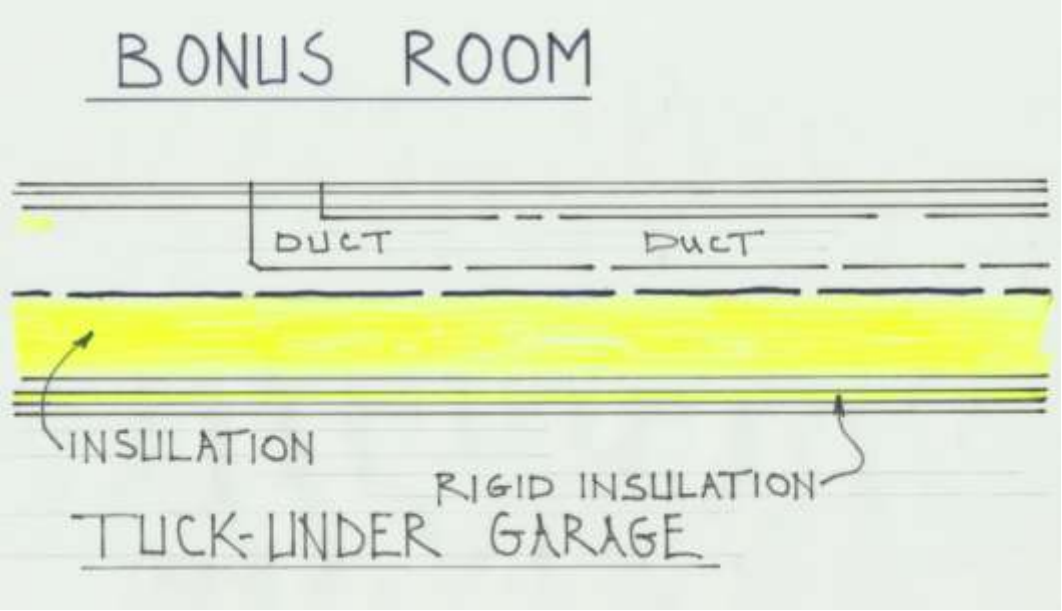
- Spray-foam insulation within bottom of truss space
- Rigid insulation on bottom side of truss
- Sealed (uninsulated) duct (within conditioned space)



Instructor opinion

Bonus Rooms - Example

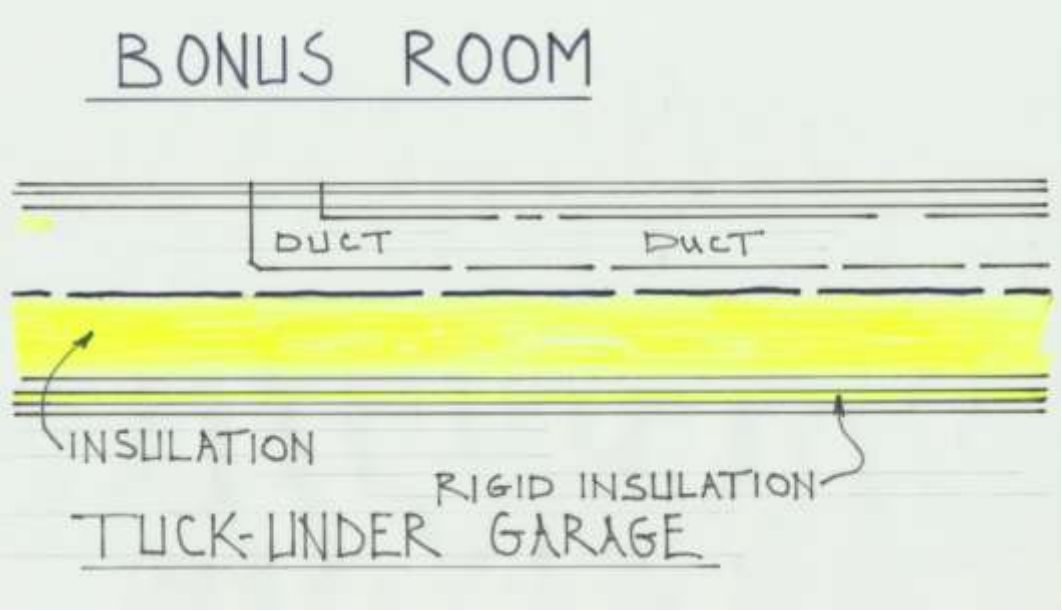
- Fiberglass insulation within bottom of truss space
- Rigid insulation on bottom side of truss
- Sealed (uninsulated) duct (within conditioned space)



Instructor opinion

Bonus Rooms - Example

- Cellulose insulation within bottom of truss space
- Rigid insulation on bottom side of truss
- Sealed (uninsulated) duct (within conditioned space)

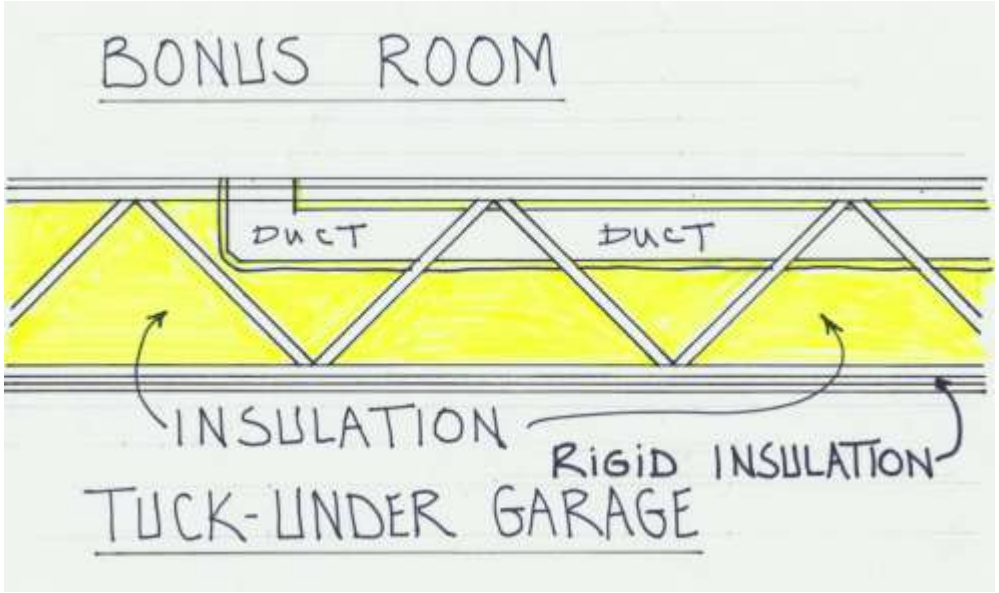


Instructor opinion

Bonus Rooms - Example

- Air-permeable or air-impermeable insulation (filled)
- Rigid insulation on bottom side of truss.
- Sealed duct (within conditioned space)

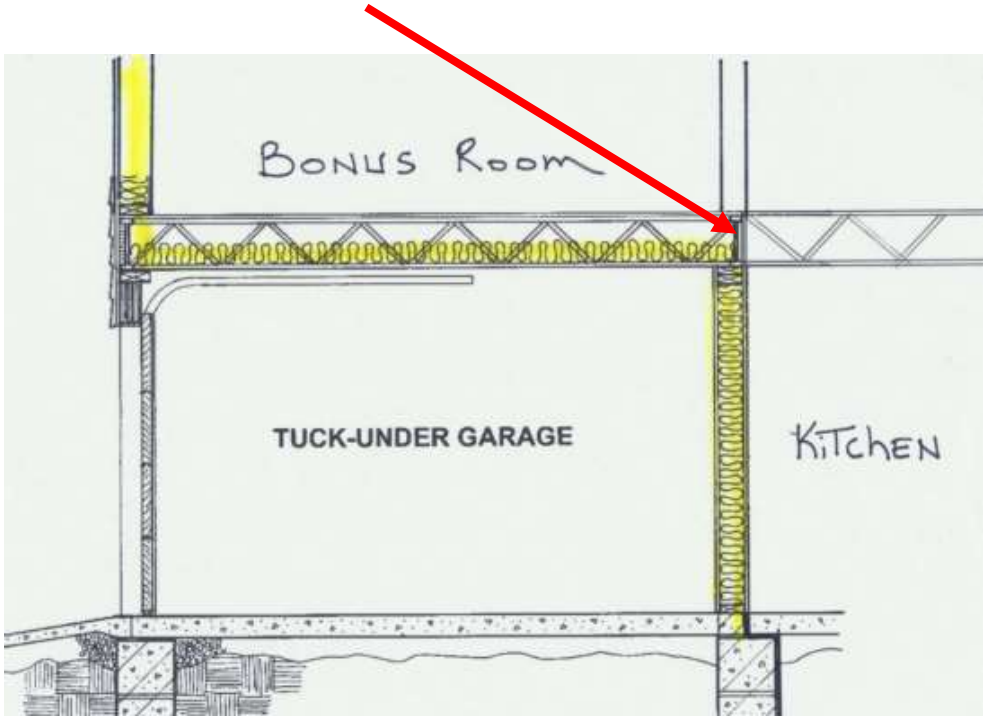
(This floor might be cooler than previous examples)



Instructor opinion

Bonus Rooms - Example

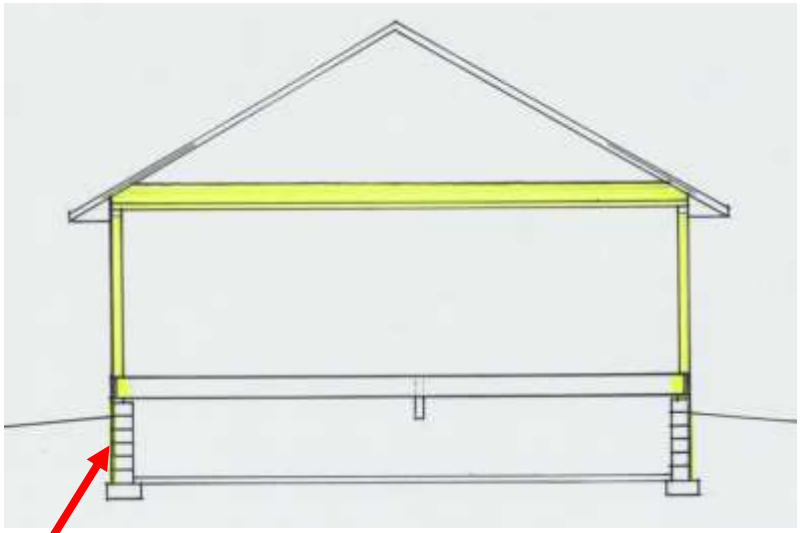
Should the floor cavity between the bonus room and adjoining rooms be left open or sealed closed?



Instructor opinion

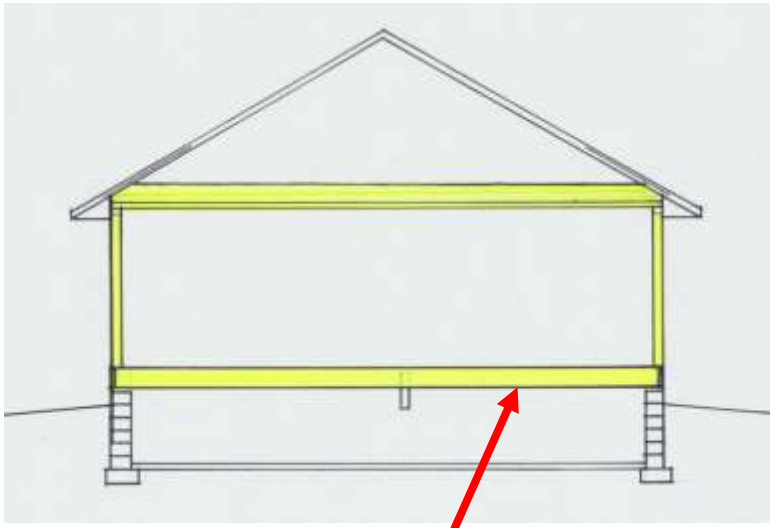
Crawl Space - Examples

Conditioned



Insulated wall at perimeter only

Unconditioned



Insulated floor above unconditioned crawl space

Questions?

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