

## Chapter 4: Insulation

In the *Washington State Energy Code (WSEC)*, insulation levels expressed in R-values are determined by the compliance path as explained in Chapter 1, *Compliance*. For below-grade walls and slab-on-grade insulation details see Chapter 2, *Foundations*. For above-grade wall construction and insulation details, see Chapter 3, *Framing*. General insulation requirements, regardless of compliance path, are outlined in this chapter.

Installing the proper amount of insulation is important, but correct installation techniques are of equal importance to achieve specified R-values.

[502.1.4.6]

**Completely Fill All Exterior Wall Cavities and Insulate to the Full Required R-Value.** Exterior wall cavities are considered to be any wall separating a heated space from an unheated space. Areas that are sometimes overlooked are:

- Behind shower or bathtub enclosures (see Figure 4-1).
- Where interior and exterior walls meet.
- Corners.
- Stairwells to unheated basements.
- Skylight chases through attics.
- HVAC ductwork in exterior walls, floors and ceilings cannot displace required insulation.

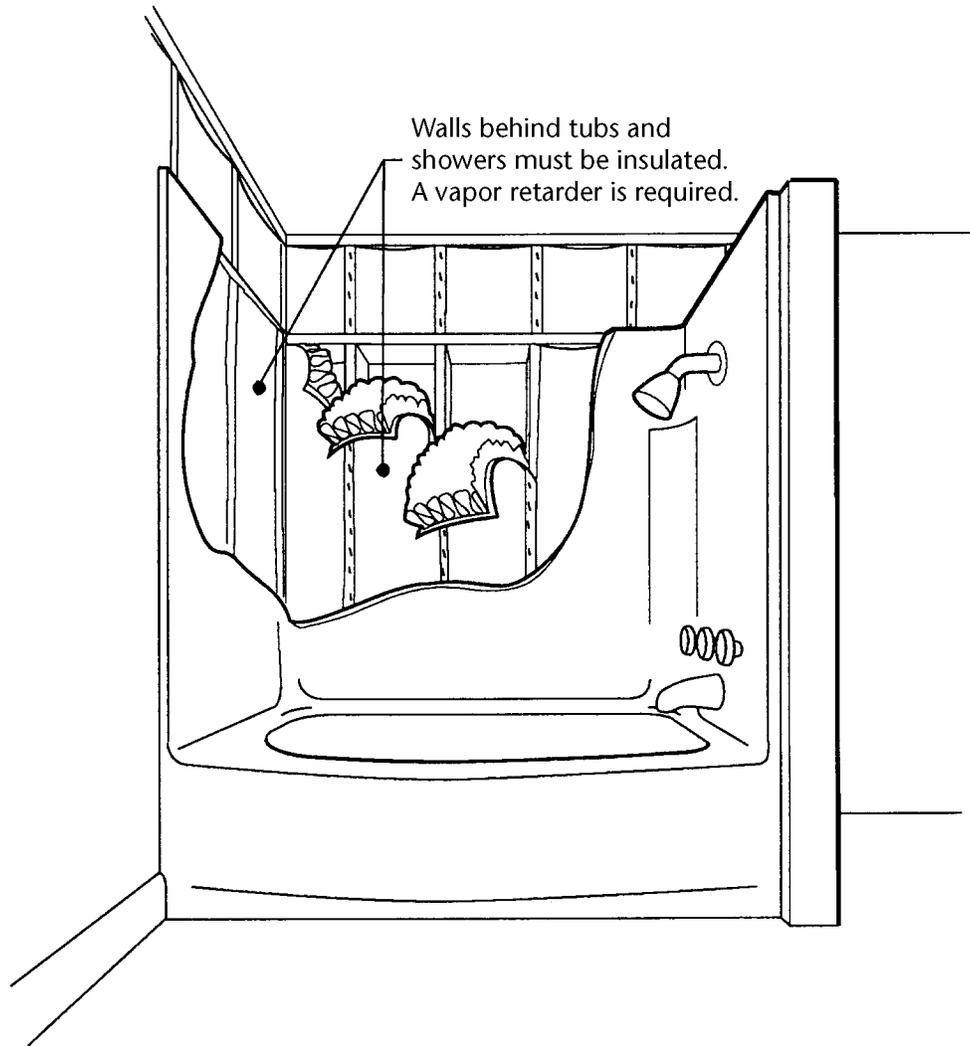
***Exception:***

A framed cavity can be empty or partially filled, provided both of the following conditions are met:

- The wall assembly calculations are performed along with a completed performance calculation for the whole building.
- Insulation installed in partially filled cavities is not included in the performance calculation.

Figure 4-1

## Tub Enclosure on Exterior Wall



[502.1.4.1]

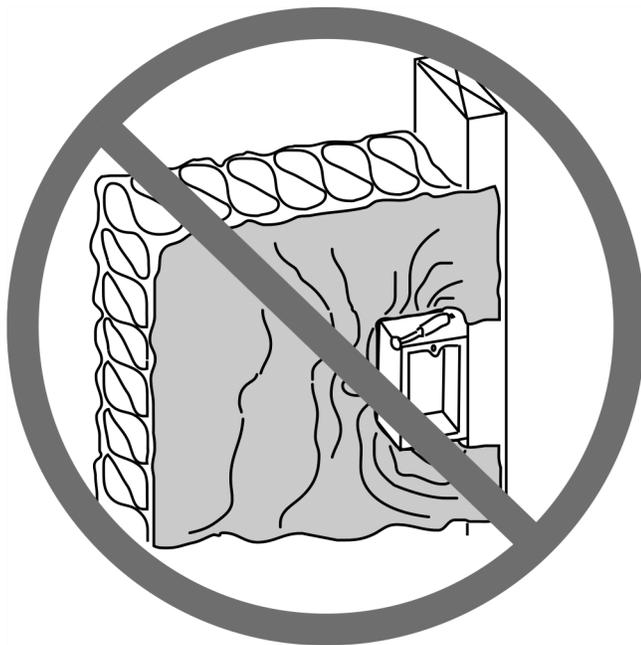
**Don't Compress the Insulation.** Compression of insulation will cause it to be less efficient. For example, if you compress an R-19 batt in half, you reduce the R-value by almost 50 percent. Common areas of compression are:

- Behind outlet and switch boxes.
- Behind plumbing pipes and wiring.

Compression problems can be avoided in these situations by cutting and fitting insulation around outlet and switch boxes (see Figure 4-2). Slicing about halfway through a batt will allow it to fit around a wire or pipe.

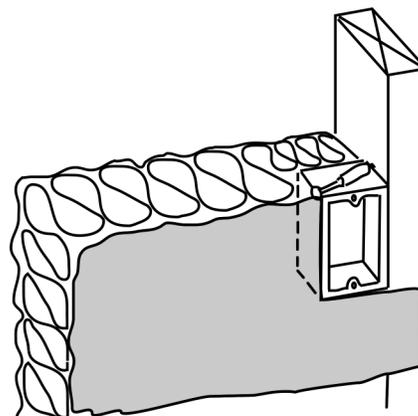
Figure 4-2

### Electrical Box Insulation Details



**Wrong!**  
Insulation is  
smashed behind  
the junction box

**Correct**  
Insulation is carefully  
cut to fit behind the  
junction box and  
snugly at sides

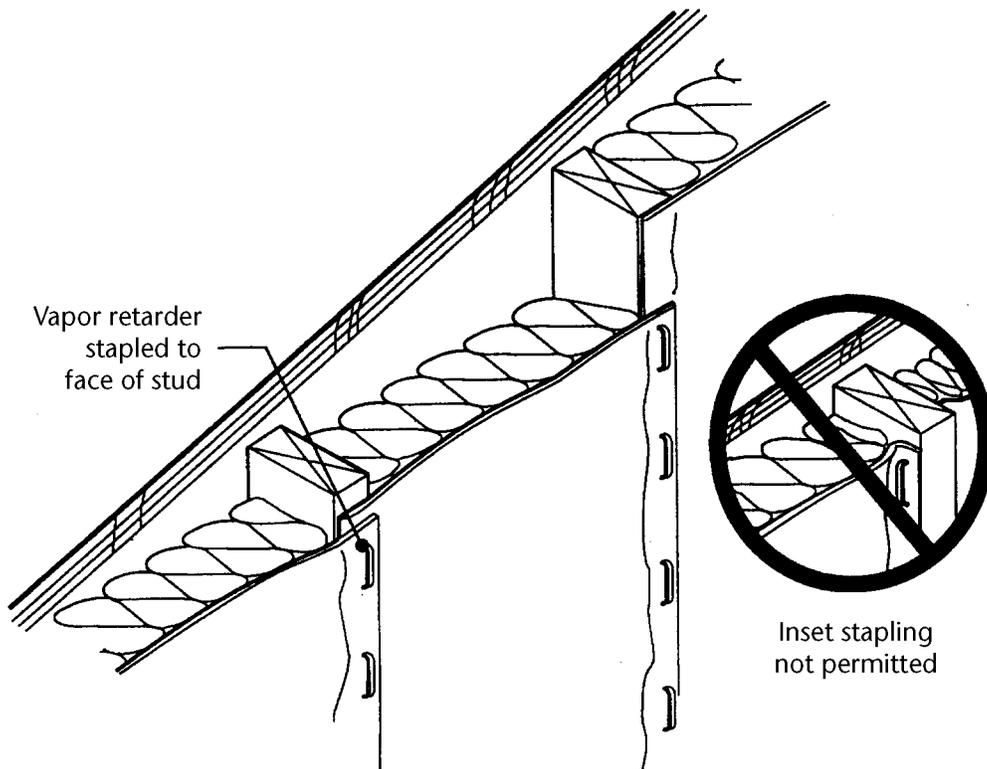


[502.1.4.6]

**Inset Stapling Faced Batts is not Allowed.** If faced batts are used (kraft paper or foil facing material) and if they have a stapling tab, they must be stapled directly to the face of the stud. Stapling to the side of the stud compresses the insulation and creates a convective air channel that reduces the effectiveness of the insulation (see Figure 4-3).

Figure 4-3

### Face Stapling



[502.1.4.5]

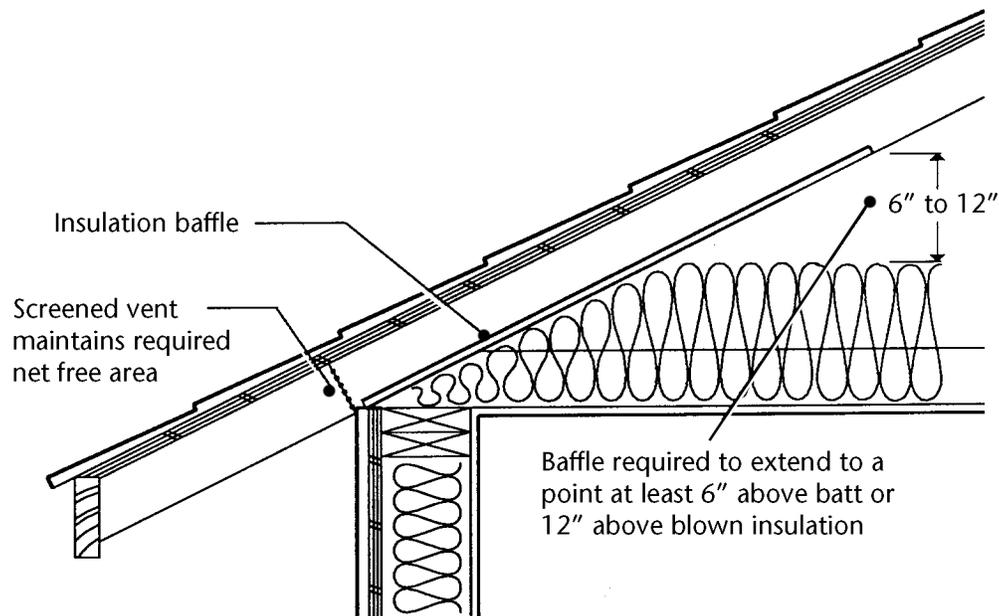
**Attic Baffles.** Baffles are necessary to maintain airspace between the insulation and the roof sheathing when soffit or bird block venting is used (see Figure 4-4). This promotes cross-ventilation of the attic, helping to remove unwanted moisture. It minimizes potential rot problems, and ice damming in winter.

Baffles are made of weather resistant material, typically wax-impregnated cardboard. Baffles must extend:

- 6 inches (vertically) above non-compressed batt type insulation.
- 12 inches (vertically) above full depth blown-in insulation.

Figure 4-4

### Attic Baffles in Standard Frame Ceiling



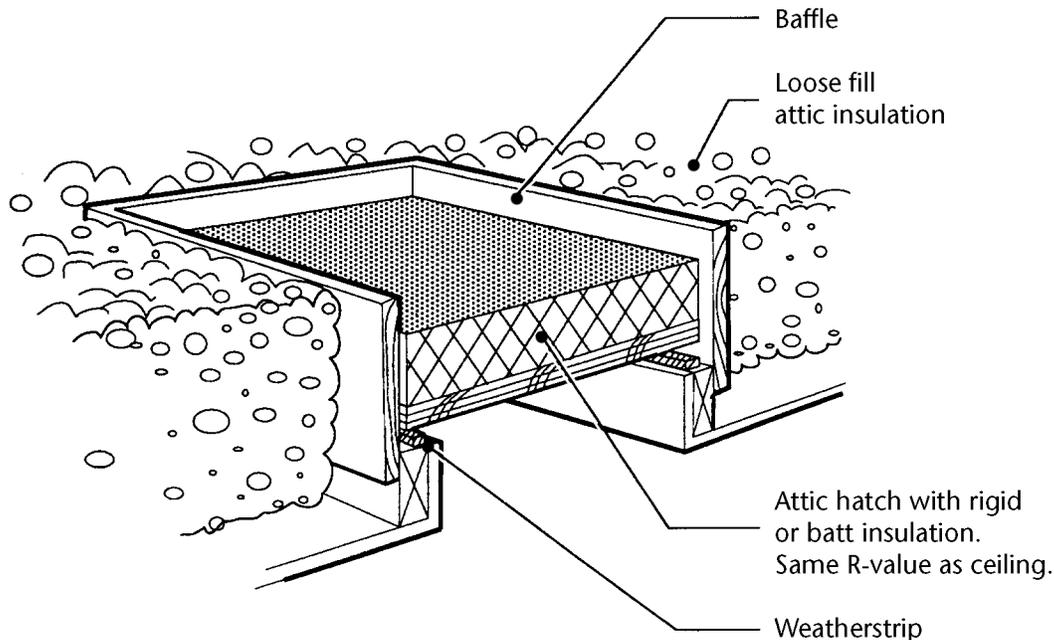
[502.1.4.4]

**Attic Access.** A baffle or dam around an attic access hatch is also required when loose-fill or blown-in insulation is installed (see Figure 4-5). Requirements for access hatches and doors are:

- Wood frame, or equivalent, baffle installed around the opening. Cardboard is not acceptable.
- The hatch must be insulated to the same R-value as the surrounding ceiling with batt or rigid insulation.
- The hatch must be weatherstripped to stop air leakage between the attic and the interior.

Figure 4-5

### Attic Hatch



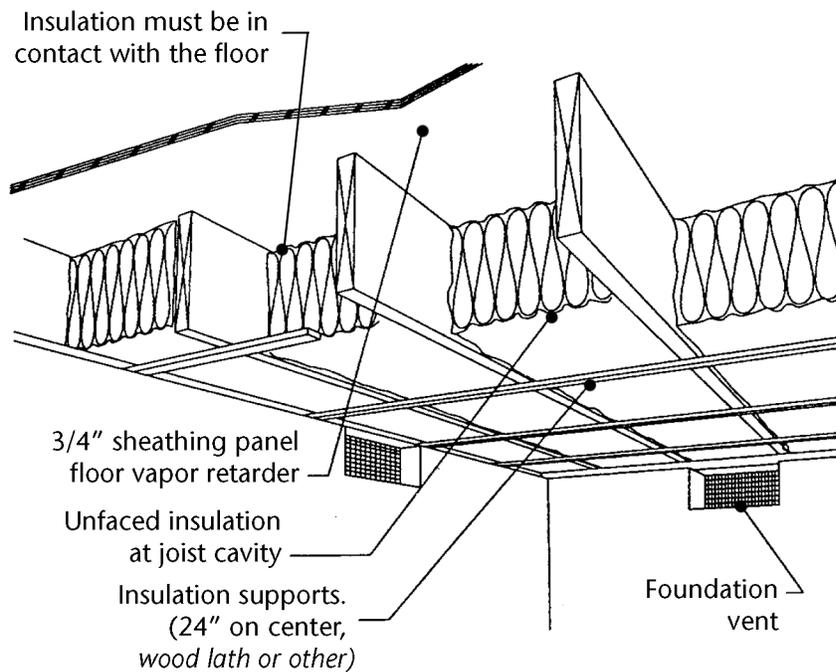
[502.1.4.1,  
502.1.4.7]

**Floor Insulation Supports.** Floor insulation must be installed in a permanent manner and in substantial contact with the surface being insulated (see Figures 4-6, 4-7 and 4-8). Insulation can be held in place using:

- Polyethylene twine.
- Lath.
- Other approved material.

Figure 4-6

### Floor Insulation Supports

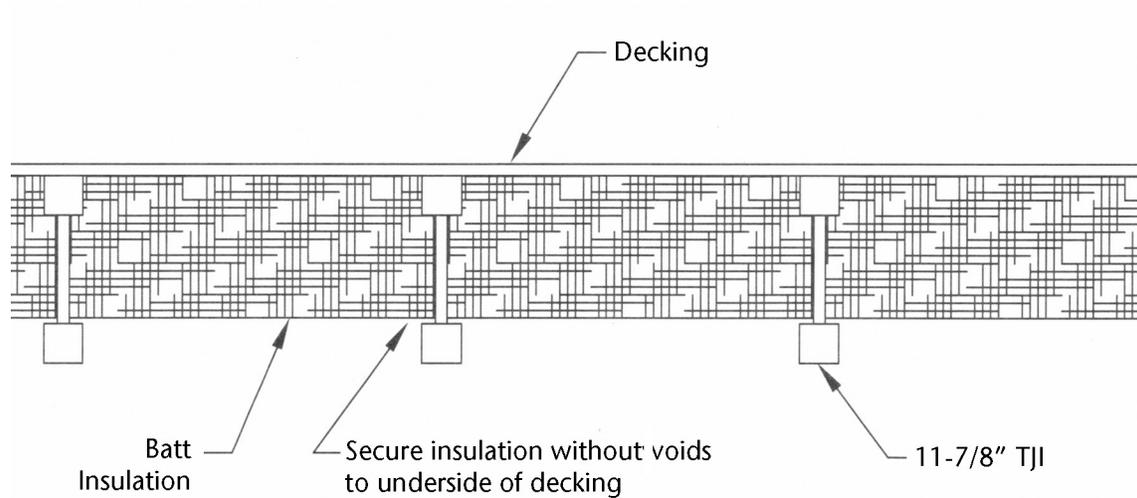


Supports are required to be a maximum of 24 inches apart. If the insulation thickness is more or less than the depth of the joist, hangers are available to hold the insulation to the floor surface without compressing it. Metal rods or other supports that compress the insulation are not acceptable.

If insulation depth is less than the depth of the joist, inset twining or supports are required (see Figure 4-7).

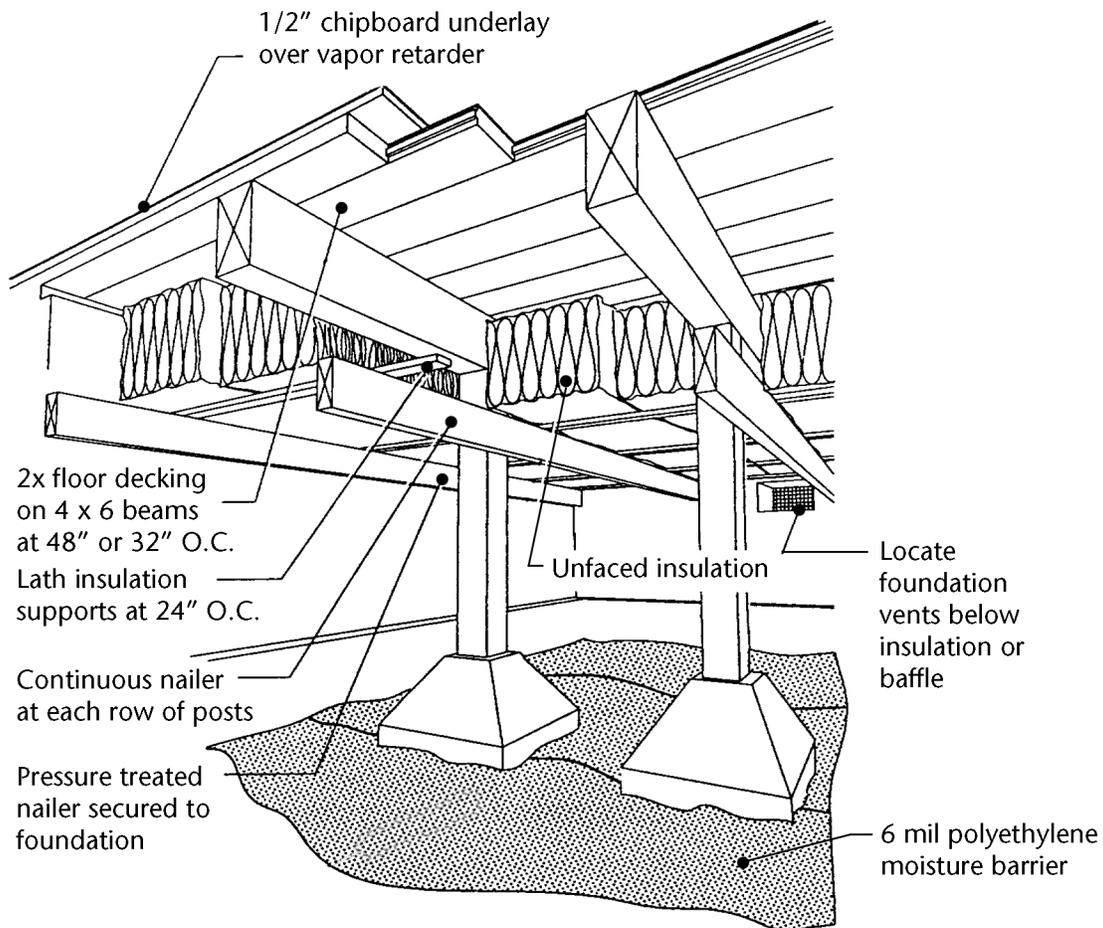
Figure 4-7

### Underfloor Insulation



Post and beam floors require a different insulation attachment approach. The insulation is supported by lath and supports are attached to the posts and foundation wall (see Figure 4-8).

Figure 4-8  
**Post and Beam Insulation Supports**



[502.1.4.7,  
 Exception]

In either type of floor, when insulation abuts a foundation vent, a baffle must be installed to deflect the incoming air below the insulation level. These baffles are typically made of plywood or wax impregnated cardboard installed at a 30° angle (refer back to Figure 2-2).

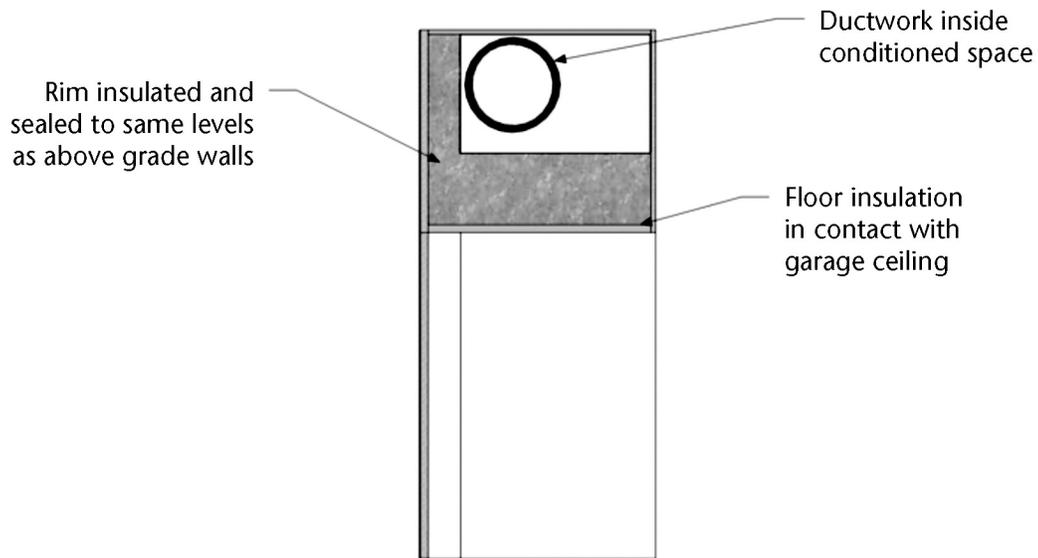
[502.1.4.7,  
 Exception]

Substantial contact with the surface being insulated is not required in a floor/ceiling assembly containing ductwork when full depth insulation is installed between the duct and exterior surfaces. This exception only applies

to enclosed floor/ceiling assemblies with an air barrier exterior of the insulation, separating the assembly from unconditioned space (see Figure 4-9).

Figure 4-9

### Substantial Contact Exception



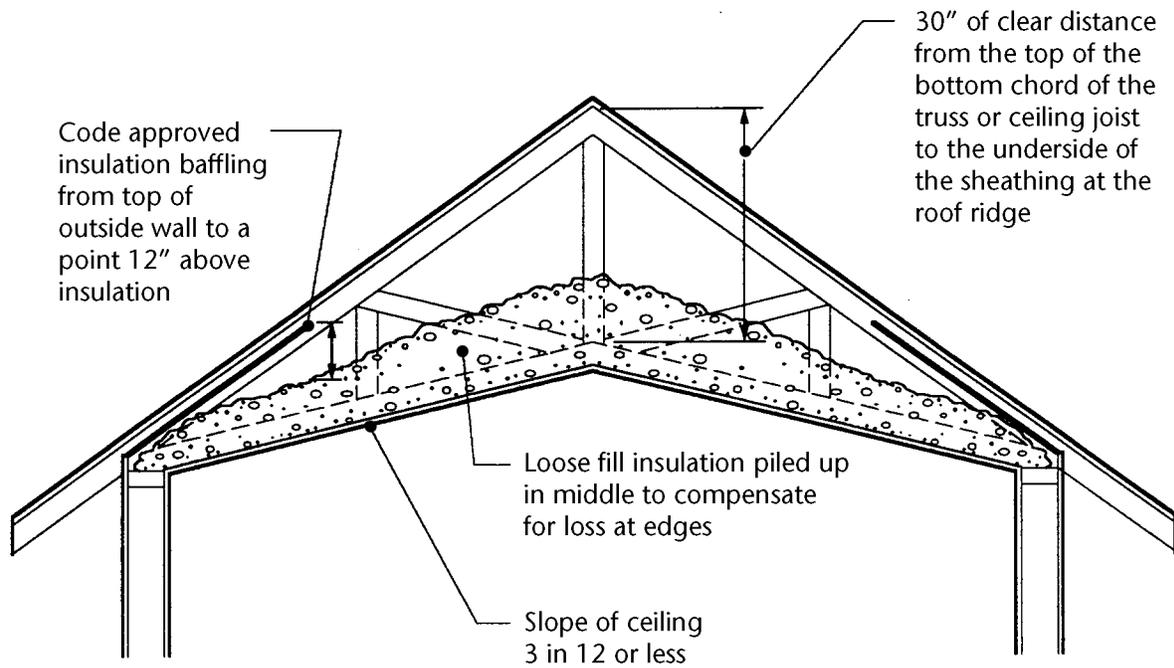
[502.1.4.5,  
502.1.4.1]

**Loose-Fill Insulation.** Loose-fill or blown-in insulation is commonly installed in ceilings (see Figure 4-10). The following requirements apply when using loose-fill insulation:

- The ceiling pitch must be 3-in-12 or less.
- Code-approved baffles must be installed.
- There must be a minimum of 30 inches of clear distance from the bottom chord of the truss to the sheathing at the ridge.
- The insulation material must comply with the IBC for flame spread and smoke density requirements.
- R-value markers must be installed every 300 sq.ft.

Figure 4-10

## Loose-fill Insulation Requirements

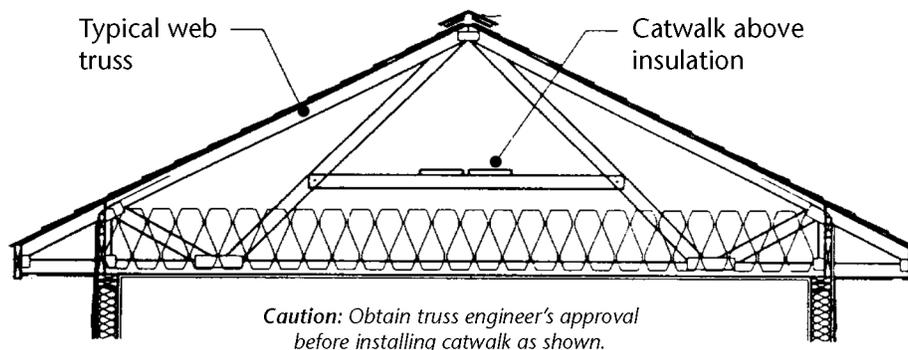


[502.1.4.4]

If areas of the attic need to be accessible for equipment maintenance, a catwalk should be constructed and supported above the loose-fill insulation (see Figure 4-11).

Figure 4-11

## Cat Walk



**Skylight Walls.** Skylight walls are insulated to the same level as the other walls in the house. Due to construction methods and close proximity of roof trusses, these walls are more difficult to insulate than a standard exterior wall.

A common skylight wall insulation technique is to tack insulation batts on the outside of the framed walls and secure it in place with twine. *Remember, a vapor retarder is required.* The vapor retarder faces the inside, or warm side, as explained in Chapter 5, page 5-1.

[502.1.4.5] When two or more layers of rigid board insulation are used in a roof assembly, the vertical joints between each layer are staggered.