Construction Details

- Block off drop soffits and stairwells to prevent loosefill from filling these areas.

Moisture Damage Prevention

Most attics do not experience moisture problems, however, the way homes are built may eventually lead to attic or roof damage. While each moisture case will have unique conditions, the following construction suggestions should be helpful in preventing moisture problems:

- Do not intentionally dump moisture laden air into the attic area. Bathroom vent fans, kitchen vent fans and clothes dryer exhausts should all be ducted to the outside.
- Heated air is buoyant and will rise to the ceiling. Air leakage from a heated space below will carry significant amounts of moisture into an attic and may overwhelm the best attic ventilation system. Make sure that air leakage paths are sealed around access doors, ceiling penetrations, and gaps in construction.
- Carefully evaluate the amount of moisture intentionally added into a house. Most new homes do not need humidifiers for comfort and their use may contribute to moisture problems.
- While ceiling air leakage causes most moisture damage, a ceiling vapor retarder should still be considered in northern climates. A vapor retarder helps prevent condensation by reducing the amount of water vapor which moves through the ceiling area into the attic.

Ice Dam Prevention

In northern climates, problems with ice build-up at the eave are possible. Snow cover on a roof can melt high on a roof and run down to the eave. If the eave is colder than the rest of the roof, the water may freeze, forming a dam which collects water. Water may then penetrate the roof and cause ceiling / wall damage.

Ice dams can be prevented by circulating cold outside air evenly under the entire roof deck. It is also important to eliminate air leakage from the heated space below. Seal all penetrations and close construction gaps.

Use WeatherLock® self adhesive water-proofing eave flashing to help prevent water damage where the average January temperature is 25°F or less. Local building codes may also require flashing. Check local building codes for flashing and other special requirements.

Further Reading

For more information on insulating attics, the following sources may be helpful:

- Handbook of Fundamentals, 1993; American Society of Heating, Refrigerating and Air-Condition Engineers, Inc. (ASHRAE)
- Model Energy Code, 1995; Council of American Building Officials (CABO)
- Recommendations for Installation in Residential and Other Light-Frame Construction, Fiber Glass Building Insulation, 12/94; North American Insulation Manufacturers Association (NAIMA), Pub. No. B1402
- Recommendations for Installation in Residential and Other Light-Frame Construction, Fiber Glass Loose Fill Insulation, 10/93; North American Insulation Manufacturers Association (NAIMA), Pub. No. B1403

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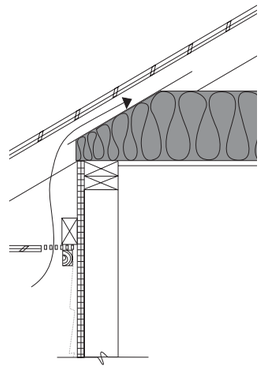
Residential
Attic Spaces

Construction Details



Most residential construction includes an attic space between the ceiling and roof deck. The structure that supports the roof and provides the ceiling plane is typically constructed with pre-assembled wood trusses. The structure can also be built on-site using traditional ceiling joists and roof rafters.

Properly insulating the attic is essential to reducing home energy consumption. Thermally isolating the attic from the rest of the house also increases the comfort of the living space below in both summer and winter.

Thermal Protection

Energy codes generally require that roof/ceiling areas are included in the treatment of the structure to reduce energy use.

The CABO Model Energy Code has minimum requirements for thermal protection of attic spaces. The ceiling joists or truss bottom cords are usually insulated to control energy transfer to the roof and outdoors. These requirements can be met for northern parts of the country with a minimum R-38 insulation (see Map Below).

Skylights are included in the roof/ceiling assembly thermal performance. The Model Energy Code, however, allows up to 1% of the roof area to be skylights without calculating their performance into the system. Skylight performance must be included in calculating roof/ceiling assembly performance when the total skylight area represents more than 1% of the total roof area.

The Model Energy Code does require uniform ceiling coverage of insulation. Thermal control can be reduced in one building area if it can be compensated for in another portion of the building. If there is an attic access door through the ceiling, it should be insulated to the same level as the rest of the ceiling.

Ventilation Requirements

Attic ventilation serves two purposes: prevention of moisture condensation in the winter and attic cooling in the summer. Ventilation during the heating season removes moisture laden air from the attic before it condenses. Summertime venting allows cooler air to flush heat out of an attic space. Attic venting is not only good design practice, but also may be a requirement of the local building code and your shingle manufacturer.

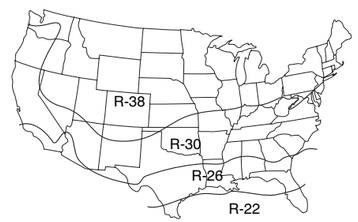
The major model building codes require attic spaces to be ventilated. The groups BOCA National Building Code, ICBO Uniform Building Code, SBCCI Standard Building Code were combined to form the ICC, International Code Council. However, many jurisdictions still refer to or follow their old code, and CABO One & Two Family Dwelling Code.

These code groups require 1 square foot of vent area for every 150 square feet of ceiling area. If 50% of the vent area is near the ridge and the remainder is at the eave, the ratio is reduced to 1 square foot of vent area for every 300 square feet of ceiling area. Furthermore, if a vapor retarder with a 1 perm rating is utilized at the ceiling, the 1 square foot to 300 square feet ratio may also be used.

The ideal solution is to have 50% of the required ventilation area high on the roof and 50% in the eave area. With properly spaced vents the attic will have good circulation.

In cases where a balanced system cannot be achieved, always provide more than 50% of the required ventilation at the eave and the balance high on the roof.

Meeting the Model Energy Code



There are many ways to meet the 1992 CABO Model Energy Code requirements. Values shown are but one solution. Map is highly generalized; requirements may vary.

Construction Details

To provide effective ventilation from the eave vents into the attic, a minimum 1 inch ventilation passageway between the ceiling insulation and the roof deck is recommended. Since roof rafters are typically notched at the top wall plate, baffles are commonly used to provide ventilation passageway clearance at the eave where insulation is likely to block air flow.

Eave vents come in a variety of designs and materials. Some vents provide continuous perforations along the entire length of eave. Others provide openings wherever needed.

Roof vents are also available in a variety of designs and materials. Ridge vents provide continuous openings along the top of the roof. Cap vents can also be used to provide ventilation high on the roof. Cap vents are typically placed out of view on the rear of the building.

A properly designed attic ventilation system provides adequate ventilation openings at the eave and peak, and airflow throughout the entire attic.

Eave Detailing

Proper insulation installation at the eave is critical to providing thermal and moisture control. Clearance for the ventilation passageway must be maintained between the insulation and roof deck for proper airflow (see Figure 1). The insulation, however, must extend out over the wall top plate. If insulation does not extend out over the wall top plate, the junction at the wall/ ceiling may be cold during the winter and cause condensation on the interior ceiling.

Air Tightness

The CABO Model Energy Code also requires that joints and openings in the exterior envelope be effectively sealed. For a ceiling assembly, this should include the following:

- Any access door into the attic area should be weather-stripped to prevent air movement from the conditioned space into the attic (see Figure 2).
- Non monolithic ceilings, like wood planking, require an air barrier to prevent air from moving through joints between planks and causing moisture damage in the attic above. Install drywall under planking, or use firmly anchored and sealed polyethylene film or housewrap.
- Seal gaps in construction that let air rise from the building below. This often occurs around masonry chimneys, fireplace chases, drop soffits, plumbing vent stacks, and double-stud walls. Use an appropriate fire stop around chimneys. Block other openings with plywood, drywall, or sealing materials.
- Seal penetrations through the ceiling. Use caulk or foam sealant around electrical boxes, wires and cables passing through the ceiling.

Figure 1

Proper installation at eave is critical to providing thermal and moisture control.

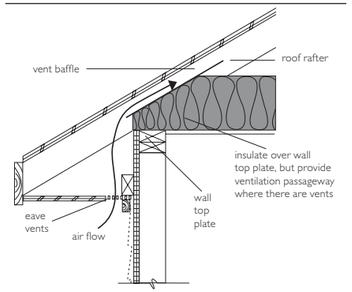
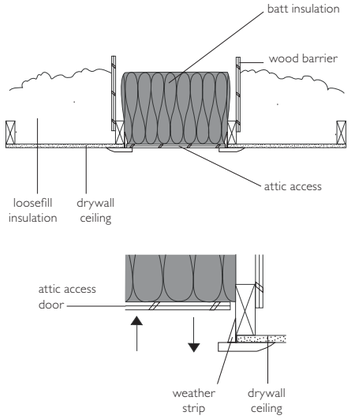


Figure 2

Weather-strip attic access doors.



- Seal attic heating or cooling ducts carefully with gaskets, mastic or an approved pressure sensitive tape before insulating the attic.
- Where interior wall cavities are used as air returns for HVAC equipment, seal penetrations in the top plate, and the joint between drywall and top plate.

Individual states may have requirements for insulation, ventilation, vapor retarders and air tightness. Check local building department for specific requirements.

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Figure 3

Batt installation at eave is critical to moisture and thermal control

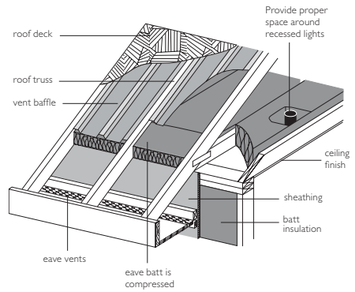
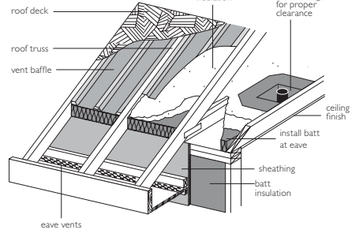


Figure 4

Maintain required distance between insulation and recessed lights.



Insulation Materials

Install attic insulation evenly, and eliminate all gaps and voids. Batts should be installed tightly adjacent to the next batt. The vapor retarder facing flange can be used for attachment to the wood framing on each side when installing from below. Batts should run out over the wall top plate. Assure proper ventilation passageway clearance is maintained at eaves (see Figure 3).

Do not install batt insulation on top of or within 3" of recessed lights, metal flues and other heat producing devices unless the device is designed for such use (see Figure 4).

When R-30 and R-38 ceiling batts are used, they should be either 16 or 24 inches wide to provide thermal protection over the top of the ceiling joist or truss bottom cord. Narrow batts should not be used, since they will leave gaps over the wood framing and reduce the performance of the ceiling system.

Utilize batt insulation for the best long-term thermal performance. Loosefill insulation may also be used, but requires careful installation by a professional contractor.

Where loosefill is used, it must be installed at the same thickness throughout the attic and to the manufacturer's specifications. Voids or low spots behind framing or other obstructions must be eliminated. The Insulation Contractors Association of America recommends the use of attic yardsticks to determine installed thickness of loosefill insulation.

The 1995 Model Energy Code requires the use of attic yardsticks marked for initial installed thickness, as well as settled thickness for those loosefill products that settle. One yard stick is required for every 300 square feet of ceiling area. Glass fiber loosefill insulation does not settle significantly, and does not require two thickness marks on yardsticks.

Loosefill installers must also post a signed and dated attic card displaying the R-value, thickness installed, coverage area, and number of bags used.

Loosefill insulation, by its very nature, will fill areas where insulation is not desired. The following guidelines will improve installation:

- Prevent loosefill from falling into the soffit area and provide additional thermal control at the eave by placing a minimum two foot section of batt insulation between the wall top plate and vent baffle (see Figure 3).
- If access to the attic is through the ceiling, install batts of the required R-value around the opening and blow loosefill beyond the batts. This prevents loosefill from spilling out when accessing the attic. Always attach a batt of the same R-value to the back of the access cover.
- Keep loosefill insulation clear of recessed lights, metal flues and other heat producing devices unless the device is designed for zero clearance. Batt insulation can be used to form a "dam" around a device as long as the minimum clearance between the device and batt insulation is maintained. Another option is to surround the device with a metal baffle extending at least 6 inches above the installed loosefill thickness. Check devices for minimum required clearance.
- Before installing loosefill insulation, temporarily cover devices where "dams" or metal baffles are used to prevent loosefill from filling the space. Remove cover after installation.