► TABLE OF CONTENTS

► INTRODUCTION

With the exception of new super-insulated houses, virtually every house has room for improvement when it comes to insulation, ventilation, caulking and weatherstripping. These will improve comfort levels and conserve energy.

Financial Considerations

Perhaps the best motivation for retrofitting is to save money. It is important to weigh the costs of retrofitting against the potential savings in fuel costs. There are usually some areas of the house where it makes financial sense to upgrade. However, in many older houses, certain types of retrofitting, such as insulating solid masonry exterior walls, are not economically viable.

Misconceptions

Insulation is misunderstood by some people. Comments in the middle of the winter such as, "This house must be really well insulated because it is really warm in here." show a definite lack of understanding. Almost any house can be warm if the thermostat is set high enough. The house might be uninsulated, the heating system grossly inefficient, and the heating bills might be exorbitant, but the house can still be warm.

Insulation

Insulation is only part of the story; however, it is a good place to start. Insulation slows the rate of heat loss from a house. The best insulating materials are light weight. That is because still air is a very good insulator. The problem is that air moves around by convection and wind, and the heat travels freely in the air. A good insulation material is one that limits the movement of the trapped air.

Air Barrier

Most insulations, however, let some air pass right through them. An air barrier (usually a sheet of plastic) will prevent, or at least reduce, air movement.

Vapor Barrier

As the temperature of air goes down, the relative humidity goes up. Air which starts out at 70°F and 40% relative humidity will reach 100% relative humidity as it is cooled to 45°F Therefore, air in the insulation can cool to the point that it deposits moisture in the insulation (whether it be in a wall or attic). This water reduces the effectiveness of the insulation because water is a good conductor of heat. But more importantly, water which gets trapped in the building structure can lead to rot and peeling paint. Therefore, a vapor barrier is required on the warm side of most insulations (a few do not require it because they are not permeable). A properly installed polyethylene air barrier or a good coat of oil based paint, for example, will suffice as a vapor barrier.

Ventilation

Regardless of how hard one tries, it is not possible to create a perfect air/vapour barrier. Therefore, wherever possible, the cold side of insulation should be ventilated to remove the moisture laden air which leaks through the insulation. This allows any moisture which does get through to the cold side to be carried out of the building quickly.

Caulking and Weather-Stripping

Insulation, complete with an air/vapor barrier will not be very effective if the air (and, therefore, the heat) can simply bypass the insulation. Caulking and weatherstripping go a long way towards preventing air leakage into and out of a home.

Of all the measures one can take to conserve energy (and money), and increase comfort (by reducing drafts), caulking and weatherstripping usually yield the highest return. It is relatively inexpensive, fairly easy to do and often has dramatic results.

► A. ATTICS

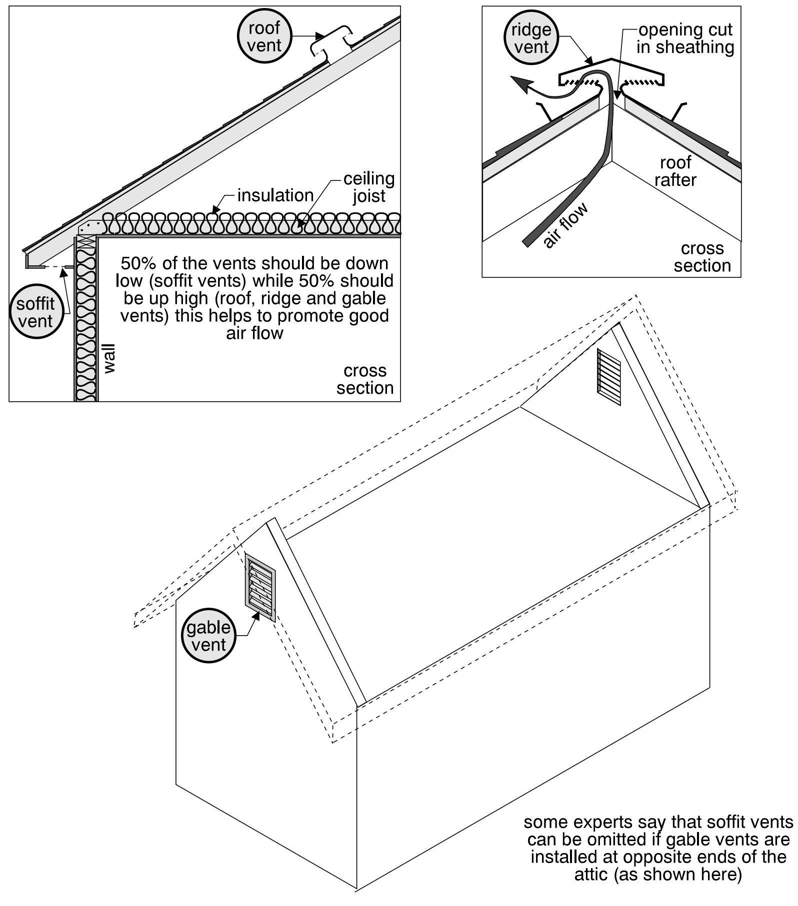
When insulating an unused attic area, the goal is to have the temperature in the attic the same as the outdoor temperature. This concept gives some people difficulty as they assume that to keep the house cozy, the attic should be as warm as the rest of the house. It is best to consider the attic space as part of the great outdoors and the sloped roof as nothing more than a large umbrella. Consequently, insulation should be provided on the floor of the attic rather than the underside of the roof.

Insulating the floor of the attic rather than the underside of the roof has several advantages. The first is gravity. It is much easier to install the insulation on the floor than tacking it to the underside of the roof, especially when considering large quantities. The second is heating costs. There is no percentage in heating unused attic space. The third reason is the prevention of condensation problems. Insulation on the floor of the attic allows for much easier ventilation of the attic space via roof vents and, in most cases, soffit vents. (Gable vents can also be used.) If there is lots of air movement through the attic space, any warm moist air from the interior of the house which has managed to find its way into the attic will be swept away. Refer to 15.0 "Ventilation" in this section.

Air/Vapor Barrier

An air/vapor barrier should be installed below (on the warm side of) the insulation. This is not easy on existing homes as usually there is some insulation in the attic already. As a general rule, a vapor barrier can be installed over existing insulation, if at least twice as much insulation is added on top (the cold side) of the vapor barrier. If there is not enough insu-lation on top of the vapor barrier, the vapor barrier will get cold and conden- sation could form immediately below it, damaging the house. Refer to 13.0, "Air/Vapor Barrier" in this section.

Types and locations of vents



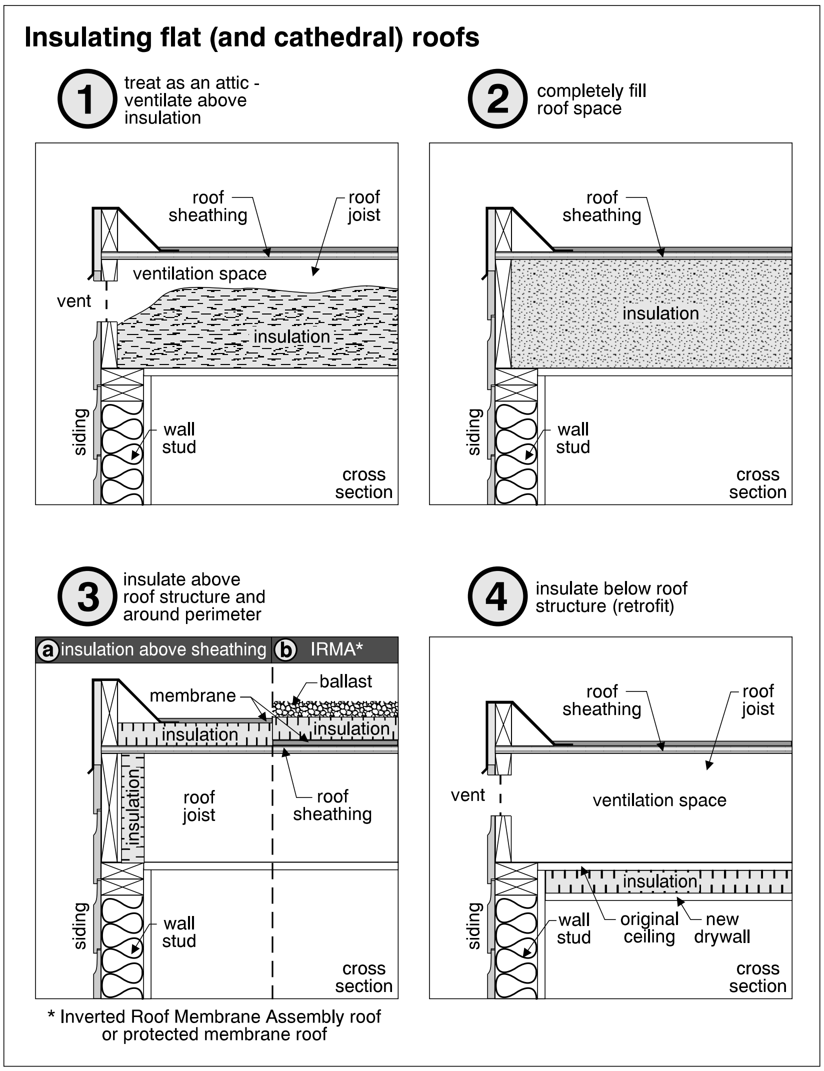
► B. FLAT ROOFS

On a retrofit basis, the decision to insulate a flat roof cavity is a difficult one. It is hard to get the insulation in place. It can be blown in from above or below; however, this requires drilling holes through the ceiling or roof membrane. In some cases, it can be blown in at the eaves. Regardless of the approach, assessing the quality of the completed job is impossible without using sophisticated equipment. Batt-type insulation can be installed; however, it requires the removal of the ceiling finish or roof sheathing. This is usually not cost-effective. With either approach, the amount of insulation is limited by the size of the roof cavity.

Ventilation

The next dilemma to be faced, is the question of ventilation. Unlike an attic space, where there is a significant amount of open space above the insulation, the flat roof cavity consists of a series of channels created by the roof joists which are sandwiched between the roof sheathing and the ceiling. To ventilate each channel would require at least two vents per channel and a reasonable air space above the insulation. This would further reduce the amount of insulation which could be installed and in some cases require a prohibitive number of roof vents. Even at that, the vents would not work very well because the roof has little or no slope. Roof vents rely on convection to allow warm air to escape from the higher vents and cool air to enter through the lower vents.

To help with these problems in new construction, some flat roofs are constructed using trusses which are deep enough to allow for adequate insulation and ventilation. Air movement is not restricted to the channels created by the trusses because the trusses are not solid. The spaces between the webs of the trusses allow for better air flow through the entire roof cavity. As an alternative, if conventional roof joists are used, they are strapped with wooden members running at right angles to the joists which are secured to the top of the joists. The roof sheathing is installed on top of the strapping. This approach deepens the roof cavity to allow for more insulation and allows ventilation between the channels. Using either of these approaches on a retrofit basis is prohibitively expensive.



Air/Vapor Barrier

Even if the insulation and ventilation problems could be solved, there is still the question of an air/vapor barrier. It is impossible to install one without providing a new ceiling surface. Vapor barrier paints can be provided on the existing ceiling; however, they do not provide an air barrier. Air leakage can be reduced by sealing around ceiling penetrations such as light fixtures and plumbing stacks. Since there is no access for periodic inspections, moisture damage within the cavity usually goes undetected until it is severe.

Insulation Above Roof Sheathing

An alternative to all of the above would be to install the insulation above the roof sheathing. This approach only makes sense if a new roof covering is required and, even at that, the amount of rigid insulation which can practically be installed falls short of current residential standards. Without insulating the ends (at the eaves) of the channels created by the roof joists (or at least ensuring that they are reasonably weathertight), the new insulation above the sheathing can be "short-circuited" by cold air travelling through the roof cavity.

Insulation Below Ceiling

This method of insulating flat roofs is fairly safe, but has other disadvantages. A rigid impermeable insulation board such as extruded polystyrene can be added on the underside of the ceiling and covered with new drywall. If the joints in the insulation and/or drywall are tight, there is better insulation, a good vapor barrier (the insulation itself), and a good air barrier.

The disadvantages are the loss of ceiling height (about one inch for each R-5 added), the relocation cost of ceiling light fixtures, and the cost of covering up perfectly good ceiling finishes. If the upper floor ceilings are in poor repair, perhaps this approach is workable.

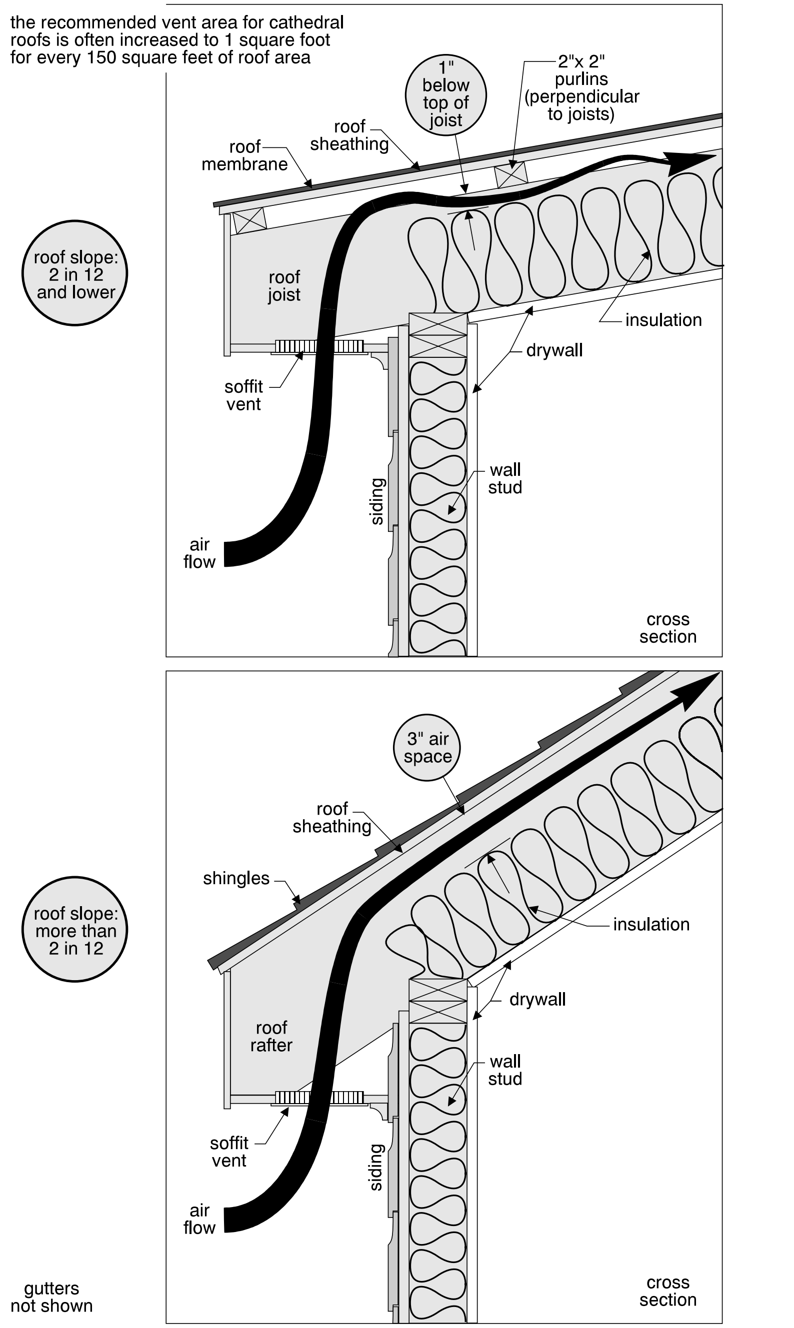
Summary

In summary, a flat roof cavity is an area that was never intended to be insulated. The cost is prohibitive and the potential for severe condensation problems is great. These spaces are often best left alone.

► C. CATHEDRAL ROOFS / SLOPED CEILINGS

Cathedral roofs and sloped ceilings have similar problems to flat roofs when adding insulation on a retrofit basis. Installing the insulation itself is difficult; however, the installation of a proper air/vapor barrier and adequate ventilation is, in some cases, next to impossible. Please refer to “Flat Roofs” above.

Venting cathedral roofs



► D. SKYLIGHT WELLS

Skylight wells are also known as light shafts. Depending upon the configuration of the roof and the ceilings below, it is very common for the light shaft to pass through an unheated attic area. If this is the case, the walls of the light shaft should have a proper air/vapor barrier and insulation. Batt-type insulation or rigid insulation is commonly used for this purpose.

E. KNEE WALLS

A knee wall is a vertical wall usually found in 1-1/2 or 2-1/2 storey houses. The knee wall separates the top floor living space from the side attic areas. The best way to insulate the area behind a knee wall is to insulate the unfinished rear side of the knee wall and to insulate the floor of the side attic in a similar fashion to the way the floor of a main attic would be insulated. Again, air / vapor barriers should be provided on the warm side of the insulation and the side attic spaces should be ventilated. No insulation is needed on the end (outside) walls of side attics, with this approach.

As an alternative, if the side attic areas are to be heated, insulation should be provided on the underside of the roof and across the portion of the floor which overhangs the exterior walls of the house (if any). The end walls of the side attic areas should also be insulated. With this arrangement, an air/ vapor barrier is still required on the warm side of all insulation; however, ventilation is not practical.

F. WOOD FRAME EXTERIOR WALLS

Pouring

Wood frame exterior walls can be insulated by pouring or blowing insulation into the cavity. Pouring insulation into wall cavities is usually only possible if the wall space is open in the attic and is continuous right down to the foundation walls. Even if this is the case, remember that some of the wall spaces will be interrupted by windows and doors and the areas below these will require blown-in insulation.

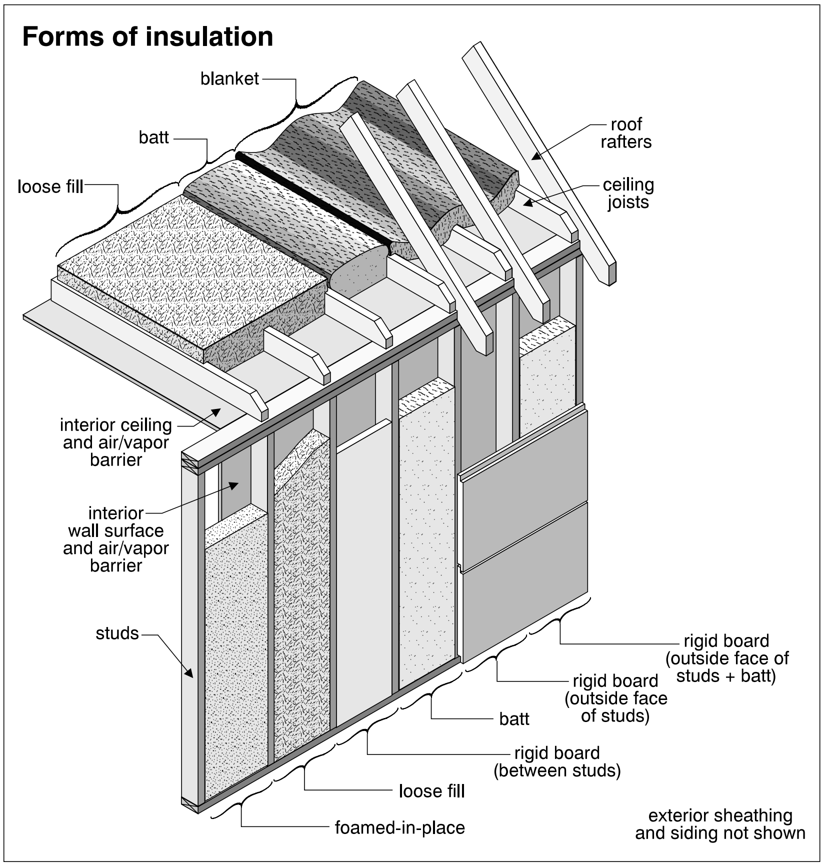
Blowing

If insulation is blown into the wall cavity, it must be blown into each stud space. This requires drilling more than one hole allowing access to each stud space or removing siding and sheathing at the top and bottom. Blown-in insulation can be installed from the inside or outside. In some cases, it is also possible to install from the basement or from the attic by drilling through the wall plates. Regardless of the approach, wall insulation should be installed by a qualified contractor. Installing a proper air/vapor barrier is also difficult without sandwiching the air/vapor barrier between the existing wall surfaces and new drywall. As an alternative, vapor barrier paint or vinyl or foil wallpaper can be used.

Blown or poured insulation in walls can settle leaving uninsulated spaces at the top.

Interior Approach

As an alternative to the above, interior finishes can be removed and a batt-type insulation can be installed in the stud cavities. An air/vapor barrier can also be installed. This approach only makes sense during major remodelling projects.



Exterior Approach

Exterior finishes and sheathing can also be removed and insulation can be installed from the exterior; however this approach is not viable unless re-siding was planned anyway.

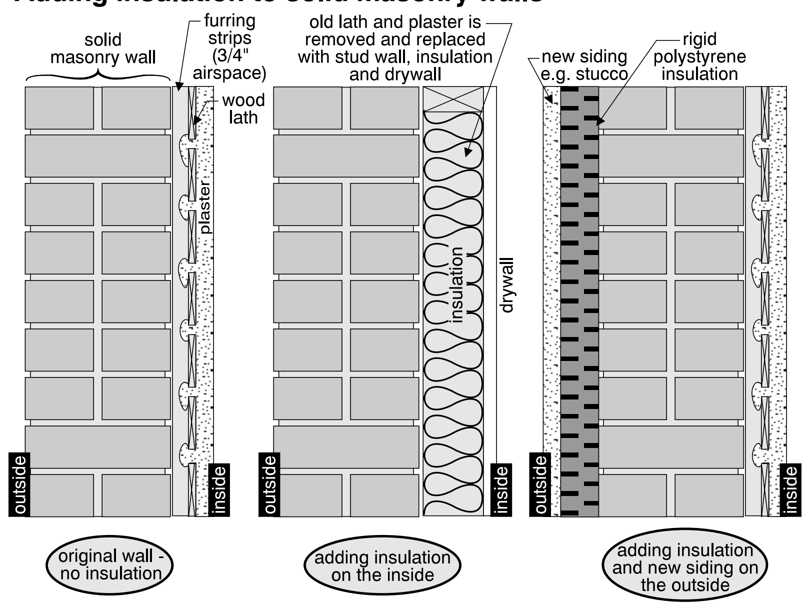
Installing strapping, insulation, and a new siding over the old is not advisable if the uninsulated wall cavity which still remains can "short-circuit" the new insulation by allowing cold air to circulate through it. Modifications needed to window and door trim as well as the cost of the new siding make this approach too expensive if the sole motivation is to reduce heating costs.

In summary, insulating existing wood-frame exterior walls is a tricky business that is often not cost-effective.

► G. MASONRY WALLS

Masonry walls usually consist of two thicknesses of brick or, a layer of brick and a layer of concrete block (or cinder block). There is sometimes a space between the two layers of masonry; however, the space is too small to provide any reasonable amount of insulation. There is also a small space between the inside layer of masonry and the interior wall finish. Again, this space is too small to insulate. Masonry walls can be insulated by providing a false wall on the interior or exterior of the existing wall. This will obviously change the outside appearance of the house or reduce interior room dimensions and affect such things as baseboards, windows, doors, electrical outlets, ceiling moldings, etc. In most cases, retrofitting wall insulation in masonry houses is not cost-effective.

Adding insulation to solid masonry walls



► H. LOG WALLS

Log walls are solid and provide no means of insulating inside the wall itself. Additional insulation could conceivably be provided on the interior or the exterior of the existing walls; however, this will change the outside appearance of the house or reduce interior room dimensions. Most softwoods (which is what most log houses are constructed of) have an R value of about 1.25 per inch. Therefore, an eight inch thick wall would have an R value of approximately 10 which is below modern standards, but is not low enough to warrant major modifications.

Rather than conduction through the wall system, most heat loss in buildings of this type is by air infiltration. Sealing leaks is far more cost-effective than adding wall insulation.

► I. BASEMENT WALLS-INTERIOR

Insulating the inside of basement walls is often appealing, because it is fairly inexpensive, and relatively easy to do, especially if the walls are unfinished. If the basement walls are already finished, one must usually remove the existing interior finishes to properly insulate the walls.

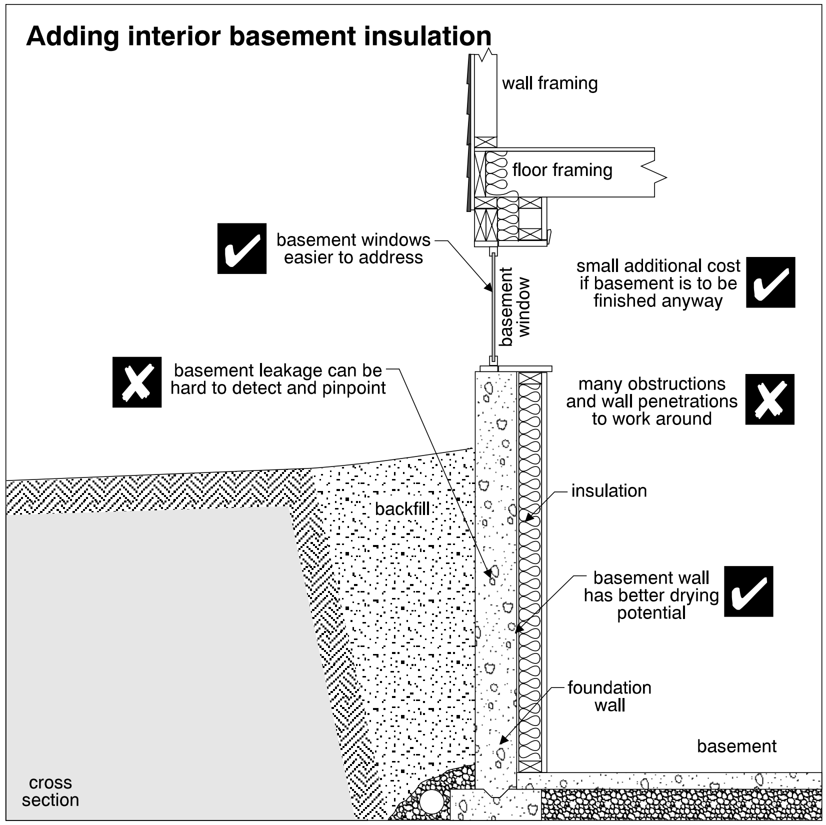
There are risks and some difficulties associated with insulating basement walls from the interior. Firstly, if the basement has chronic moisture problems, interior insulation should not be attempted. It is best to insulate on the outside, correcting the moisture problem at the same time. This is, of course, a much more expensive approach, but does protect the foundation walls as well as upgrading the insulation. Secondly, if the foundation walls are frequently wet, interior insulation could result in frost damage to the foundation walls, as the walls will be significantly colder after the insulation job. The third dilemma when insulating from the interior is dealing with obstructions such as electrical panels, plumbing, oil tanks, etc.

Air/Vapor and Moisture Barriers

If, however, interior insulation is the approach taken, one should provide a wood stud wall on the inside of the foundation wall and fill the cavities with batt-type insulation. A moisture barrier should be provided against the foundation wall (before constructing the stud wall) and an air/vapor barrier should be installed on the warm side of the insulation. Under some circumstances, combustible plastic insulation can be glued to existing foundation walls; however, it must be covered with drywall or some other non-combustible material. No moisture barrier or air/vapor barrier is required.

New Construction

In new houses, insulation on basement walls in some northern climates need to be applied from the subfloor down to a maximum of 8 inches above the basement floor to comply with Current Standards, if less than 50 percent of the foundation wall is above grade. Many areas however, require no insulation on basement walls.

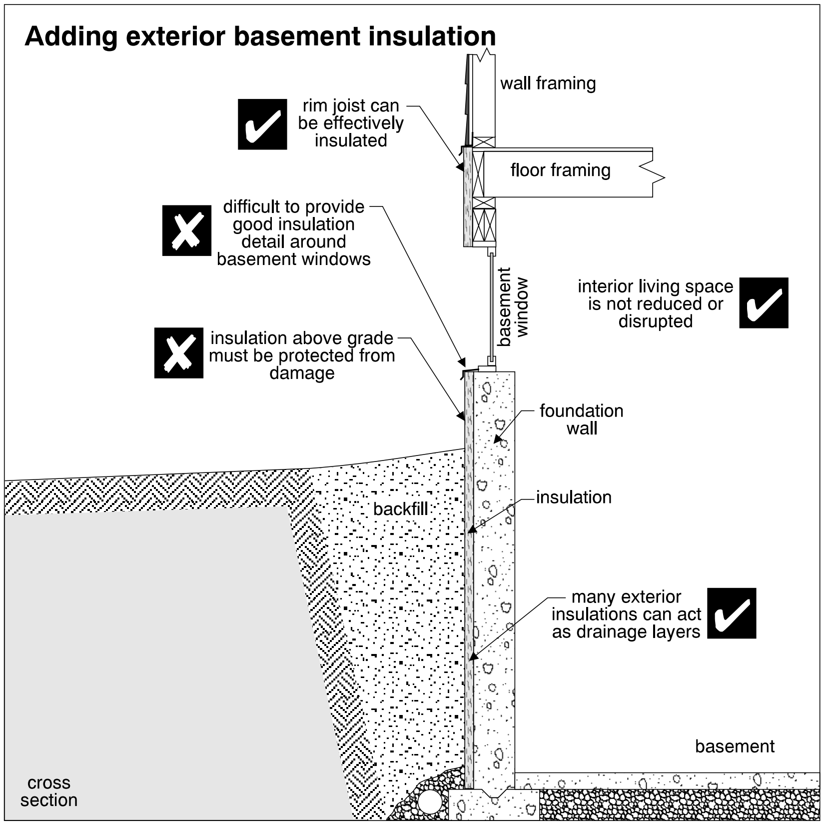


Joist Cavities

Regardless of the type of wall insulation, batt-type insulation should be added in joist spaces at the top of the wall. Depending upon the direction the joists run, this space may be a series of small spaces roughly fourteen inches wide (between the joist) or one long space parallel to the joists. Again, ideally, an air/vapor barrier is added on the warm side of the insulation (although it is difficult to install because of the nature of the space); however, no moisture barrier is needed on the cold side of the insulation. Caulking the foundation/sill, header/sill, and headed/subfloor connections will help reduce heat loss due to air leakage.

► J. BASEMENT WALLS-EXTERIOR

Exterior wall insulation only makes sense if exterior digging is to be done for another reason, such as dampproofing the basement walls. Rigid or semi-rigid insulation which comes in boards is the best material. The insulation is fastened to the exterior of the foundation wall and the upper portion of the insulation (above ground level) should be covered within a protective material. A flashing should be installed at the top of the insulation to prevent water penetration in this location. Some insulations drain water very well. These can be used to reduce basement problems if the insulation carries water down to a functional perimeter drainage tile system.



► K. CRAWL SPACES

When dealing with crawl spaces, there are two options. The perimeter walls of the crawl space can be insulated so that the crawl space becomes a heated area, or the crawl space can be left cold and the floor above the crawl space can be insulated. If the crawl space walls are to be insulated, the same options are available as insulating basement walls.

If the crawl space is to remain unheated, refer to the following sections:

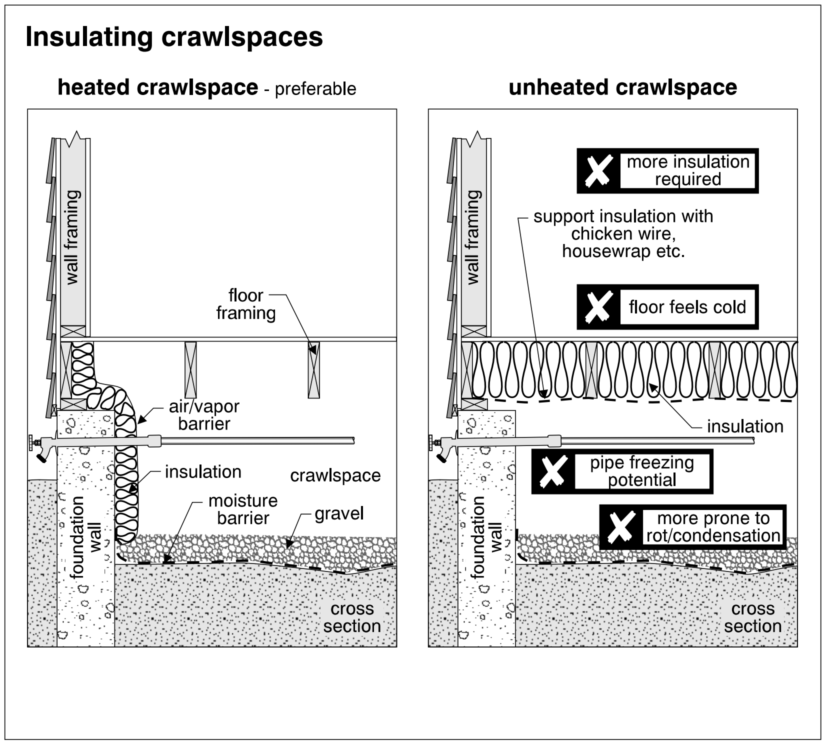
L) Floors Above Unheated Areas
M) Pipes in Unheated Areas
N) Ductwork in Unheated Areas
O) Exhaust Ducts in Unheated Areas
14) Add Moisture Barrier
15) Add Ventilation

As a rule, perimeter wall insulation, resulting in a heated space, is the preferred method; however, it is not practical in some instances. Crawl spaces under buildings constructed on piers, for example, do not lend themselves to perimeter insulation even if skirting has been provided between the piers. Crawl spaces which are chronically damp are best kept unheated and well ventilated.

► L. FLOORS ABOVE UNHEATED AREAS

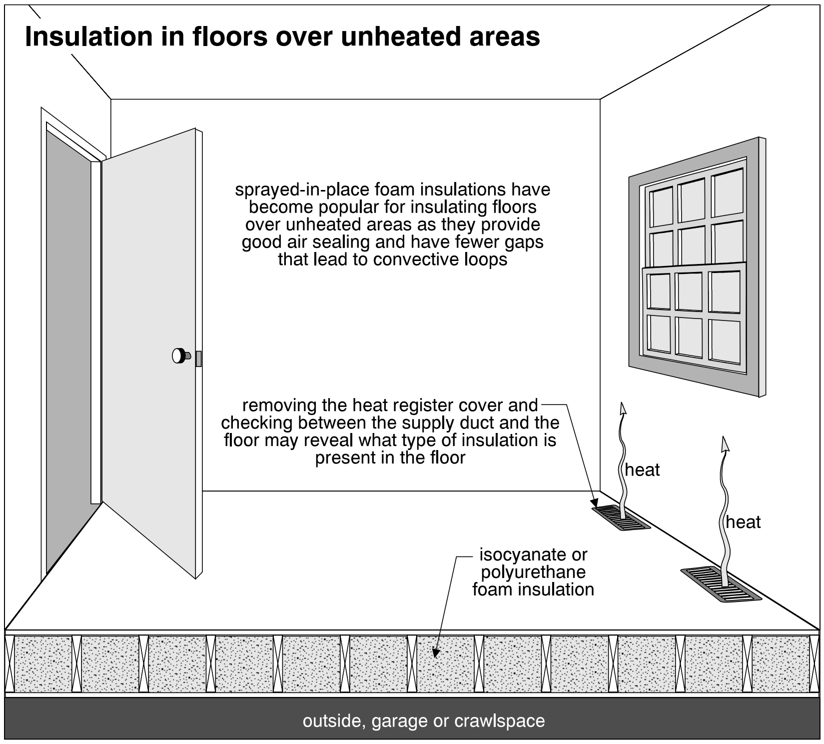
Floors over unheated spaces (crawl spaces, garages, porches, cantilevers, etc) are usually insulated by installing batt-type insulation between the floor joists and securing it in place with a material such as chicken wire. The use of a plastic air/vapor barrier below the insulation to hold it in place is incorrect, and may cause rot. Again, this barrier should be on the warm side of the insulation.

In some cases, rigid plastic insulation can be used in lieu of batts; however, it must be covered by a non-combustible surface such as drywall. Rigid glass fiber insulation need not be protected.



If the unheated space is an attached garage, the areas which abut the house must prevent automobile exhaust fumes entering the house itself. In some areas, a fire separation is also required between house and garage.

Even when properly insulated, the space above an unheated area is usually cooler than the rest of the house; however, the following illustration showing a dropped ceiling is one approach if ceiling heights permit. This method only works well if a) the insulation does not obstruct air flow. b) the supply and return air ducts are balanced so that the space is not pressurized or depressurized. c) proper air barriers are installed to prevent the warm moist air from escaping into the wall cavities. A better method may be to insulate the floor with expanding isocyanurate or polyurethane foam insulation.



► M. PIPES IN UNHEATED AREAS

Plumbing pipes (supply and waste) and heating pipes which pass through unheated areas should be insulated to a minimum of R-4, but higher if possible. It is important to remember, however, that even a well insulated pipe will eventually freeze if the water in the pipe is not flowing. Insulation slows the rate of heat loss, but does not stop it. Depending upon the configuration, it is often better to relocate the pipes to a heated area or provide heating cables on the pipes under the insulation.

► N. DUCTWORK IN UNHEATED AREAS

Ductwork for cooling and/or heating which is located in unheated areas should be insulated (minimum R-7) to prevent heat gain or heat loss. Some ductwork comes pre-insulated. In some instances, the insulation is on the interior of the ductwork and is not visible.

► O. EXHAUST DUCTS IN UNHEATED AREAS

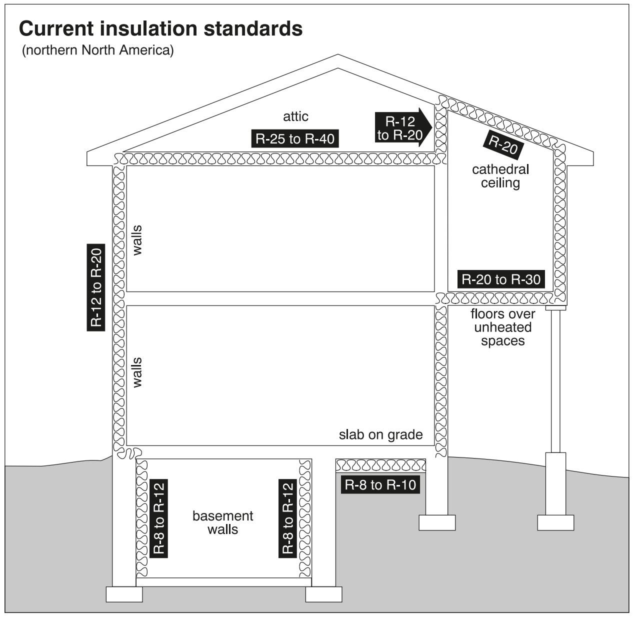
Exhaust ducts in unheated spaces should be insulated to prevent condensation from forming within the ducts. Often, bathroom exhaust fans are connected to uninsulated ducts which pass through an attic. The warm moist air being exhausted from the bathroom condenses on the inside of the ductwork. It runs back down the duct and drips out of the exhaust fan. This is hazardous as the water is dripping past the electric motor of the fan.

► 1.0 CURRENT STANDARDS

The numbers shown below are the current standards required by many northern codes. While these standards apply to new buildings only, they give an indication of the values one might insulate to if one were to upgrade. The numbers in this column are known as R-values. An R-value is simply a numerical representation of thermal resistance. The higher the number, the greater the resistance to heat transfer. RSI values are simply the metric equivalent of R-values. To obtain an RSI value, divide the R-value by 5.6.

R-Value

RSI-Value



Different types of insulation have different R-values per inch of thickness. Even the same type of insulation can have a different R-value, depending on its form. Glass fiber insulation, for example, has a higher R-value in batt form than in loose fill form.

► 2.0 EXISTING AMOUNT

This column represents the existing amount of insulation expressed as an R-value. It can be directly compared to the Current Standards outlined above to determine how the existing insulation stacks up against the minimum amounts called for in new construction.

► 3.0 GLASS FIBER INSULATION (R-Value 2.9-4.2 per inch)

Glass fiber insulation is one of the most common types of insulation available and is made from threads of glass glued together with phenolic resins. It is available in batt form, rigid board and loose fill. It is resistant to moisture, mildew, fungus and vermin, and some types are non-combustible. It is, however, a skin and eye irritant and inhaling small threads of glass fiber is not good for the respiratory system. It should be understood that these irritations are only common during installation, and once the material is in place it is not considered to be a problem.

► 4.0 MINERAL WOOL (ROCK WOOL) (R-Value 3.0-3.2 per inch)

Mineral wool is similar to glass fiber except that mineral waste is used to form the wool-like material. It, too, is available in batt form or as loose fill. Its insulating value is comparable to glass fiber and it has very good resistance to fire and rot. Further, it is slightly less irritating to work with than glass fiber.

► 5.0 CELLULOSE FIBER (R-Value 3.4-3.6 per inch)

Cellulose fiber is essentially paper, finely shredded and treated with chemicals to make it somewhat resistant to moisture, fire, rot and vermin. It is usually blown in but can also be poured. It is prone to settling. Due to its relatively low cost, this material is very popular. Usually gray in color, it has a similar texture to lint. Cellulose fiber will absorb water which will lead to deterioration.

► 6.0 VERMICULITE (R-Value 2.3 per inch)

Vermiculite is a mineral substance made from mica. This insulation is available as loose fill and can be identified by the small rectangular shape of the individual pieces. Vermiculite is relatively expensive. It is, however, non-combustible.

Zonolite

It has been determined that one brand of vermiculite insulation, Zonolite, came from ore contaminated with asbestos. Identification of Zonolite or asbestos cannot be done visually and is outside the scope of a home inspection. For more information on asbestos, please refer to the Supplementary section.

► 7.0 WOOD SHAVINGS (R-Value 2.4 per inch)

Wood shavings used as insulation today are treated with fire retardant chemicals and can be made moisture resistant. This was not the case many years ago.

► 8.0 PLASTIC BOARD (R-Value 3.7-6.0 per inch)

Most plastic board type insulations are made of polystyrene or polyurethane. Both pose fire hazards if left exposed. If applied on interior walls or ceilings, they should be covered with at least 1/2 inch drywall or plaster. While these materials have a very good R-value per inch of thickness, they are more expensive than most other types.

9.0 OTHER TYPES OF INSULATION

There are many different types of insulation materials available on the market today.

INSULATION TYPES

Material	**R-Value/Inch**	**Common Form**
Glass Fiber	2.9-4.2	batt, loose fill, rigid board
Mineral Wool	3.0-3.2	batt, loose fill
Cellulose Fiber	3.4-3.6	loose fill
Vermiculite	2.3	loose fill
Wood Shavings	2.4	loose fill
Plastic Board	3.7-6.0	rigid board

10.0 NO ACCESS

In some areas of some homes, it is not possible to inspect the insulation as there is no access (e.g., attics without access hatches or crawl spaces with no means of safe entry).

11.0 ACCESS NOT GAINED

In some circumstances, access hatches have been provided to allow for an inspection of the insulation; however, for some reason, access could not be gained. Circumstances such as this might include an access hatch which has been nailed shut and would be damaged if the nails were removed. Access cannot be gained when shelving has been built into a closet space below the attic access hatch. Although the hatch is still there, it is impossible to reach. Sometimes loose insulation has been blown over the access hatch, in which case it will not be opened. This situation should be rectified after taking possession of the house.

12.0 SPOT CHECKED ONLY

Certain areas such as wall insulation can be spot checked only. Wall insulation can be checked by removing the electrical cover plates on exterior walls to probe into the wall cavity. During this process, furniture is not moved, nor are cover plates removed which have been painted in place. Many inspectors do not do this since it is not conclusive.

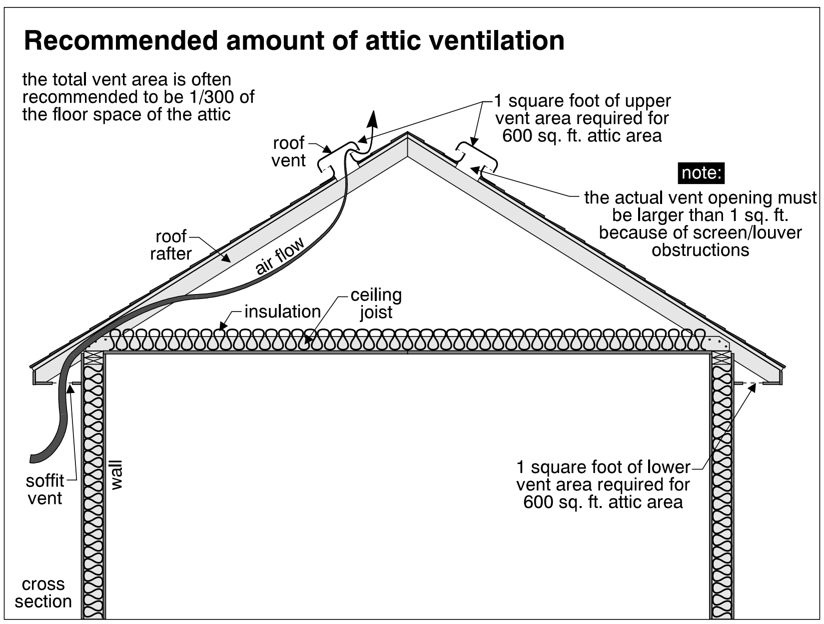
13.0 ADD AIR/VAPOR BARRIER

An air/vapor barrier is a continuous layer of material (usually plastic sheeting) that is impervious to the passage of water vapor and air. Air/vapor barriers should always be installed on the warm side of the insulation. They are used to prevent warm moist air, contained within the building, from migrating into insulated spaces. Air which gets into insulated spaces cools and forms condensation. The condensation can cause rot and reduce the effectiveness of the insulation. Barriers installed toward the cold side of the insulation may result in condensation damage as they trap the moisture. These barriers should be slashed or removed.

On a retrofit basis, there are many areas where an air/vapor barrier would be desirable; however, it is not practical to install one. Therefore, all areas which should ideally have an air/vapor barrier are not recorded in this section. Only areas that show signs of condensation problems or allow for the installation of an air/vapor barrier with relative ease, are mentioned. Vapor barrier paints, or vinyl or foil wallpaper are alternatives.

► 14.0 ADD MOISTURE BARRIER

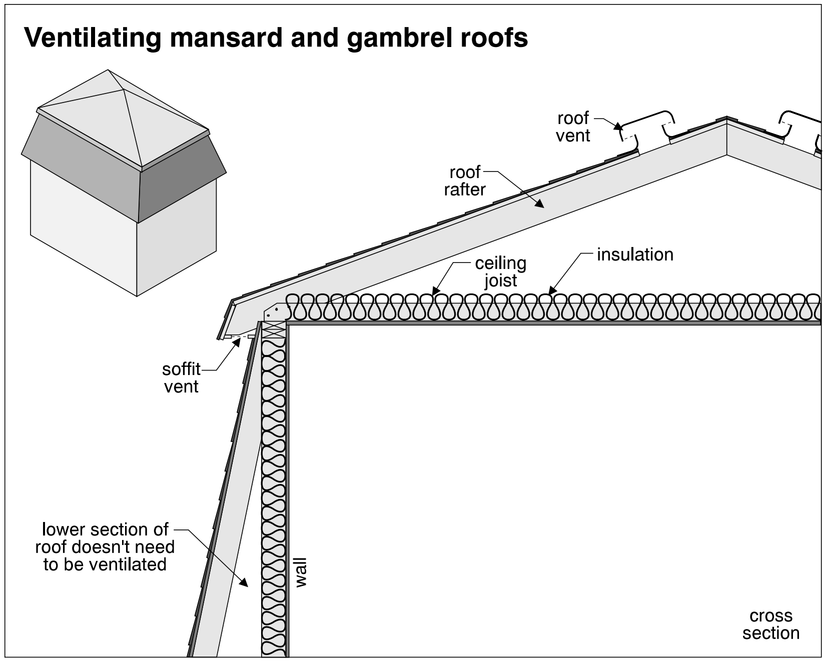
While air/vapor barriers are designed to keep the moisture within a building, moisture barriers are designed to keep it out. A typical area for the application of a moisture barrier (plastic sheet) would be an earth floor in a crawl space. Damp earth floors can allow a significant amount of moisture absorption into the air in a house. One study revealed that the daily evaporation in a heated crawl space dropped from over sixteen gallons to less than a 1/4 of a gallon with the installation of a moisture barrier!



► 15.0 ADD VENTILATION

Ideally, all of the moisture laden air within a house could be prevented from migrating through the insulation to cold areas by the presence of an air/vapor barrier. However, this is never practical. Therefore, it is wise to ventilate cold areas wherever possible.

Ventilation also removes warm air from the attic which keeps the house cooler in the summer and helps to prevent ice dams (see Roofing 1.14) in the winter. Cooler summer attic temperatures also help prolong the life of many roofing materials.



Attic Ventilation Rate

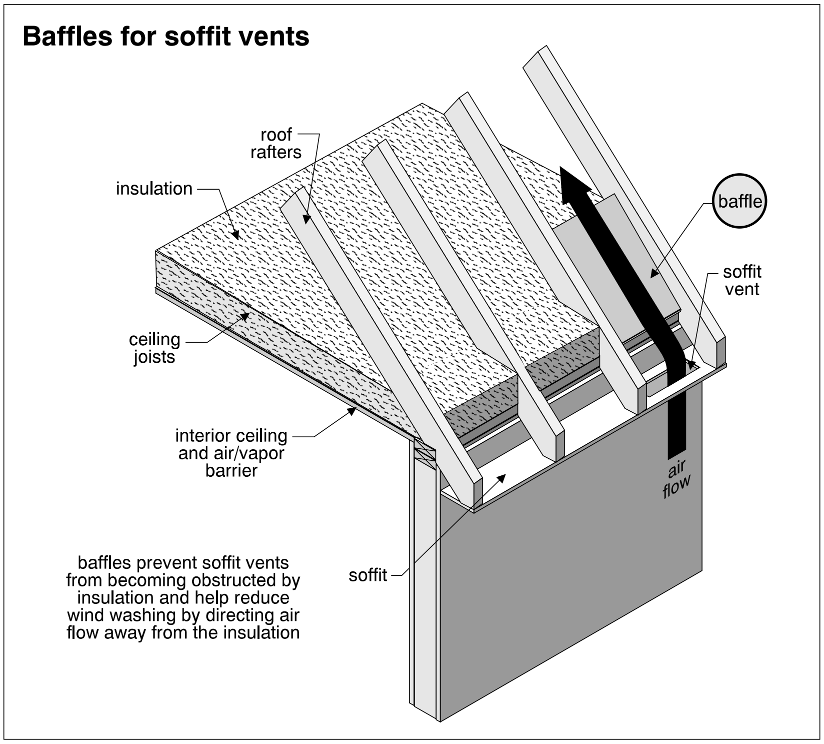
Attics are the easiest areas to ventilate. The recommended ventilation rate is one square foot of ventilation for every three hundred square feet of attic space. Ideally, ventilation should be provided in such a way as to allow for good air flow from end to end of an attic space and from bottom to top. The best way to accomplish this would be to have continuous soffit vents (under the eaves) and a continuous ridge vent (at the top of the roof). On a retrofit basis, this is usually not practical.

Vent Location

Blocked Soffit Vents

Roof-top vents (the round or square metal vents seen on most roofs) and/or gable vents should account for approximately fifty percent of the total venting. They should have screens to keep insects and birds out of the attic. Where possible, they should be located high on the downwind side of the house to help create a draft up through the eaves. The remaining fifty percent of the ventilation should be provided under the eaves. These screened vents should be protected on the interior of the attic to prevent insulation from plugging them. Baffles are available which keep soffit vents clear. On some houses, soffit venting is not possible. Vents can be provided on the lower portion of the roof; however, they may allow leakage into the attic as snow and ice accumulates on the roof.

Turbine type vents (air powered vents) are not suggested as they only work on windy days, when they are not really necessary. On still days, when more ventilation is required, they do no more good than a regular roof-top vent. They are also very noisy if not well balanced and lubricated.



Power Ventilators

Power ventilators are not suggested for winter use because they put the attic under negative pressure, which draws more warm moist air up from the house into the attic. Also, motors in attics tend to be neglected and eventually malfunction. (These fans are sometimes installed for summer use only. Removing hot attic air in the summer helps keep the house cooler.)

Crawl Spaces

Conventional wisdom has held that unheated crawl spaces should be ventilated to remove moisture. A common recommendation is one square foot of vent area for every 500 square feet of crawlspace area. This practice has recently been challenged in warm, humid climates, where moist air may be drawn into the cool crawlspace. In these areas, vents are usually no longer installed. There still may be a benefit to ventilation in drier climates. Most agree that heated crawlspaces require no ventilation.

► 16.0 VENT EXHAUST FAN OUTSIDE

In many cases, exhaust fans from areas such as bathrooms, discharge into the attic space. This is not a good arrangement becuase the air in an attic should be dry. Air being exhausted from bathrooms is typically moisture laden. Therefore, all exhaust fans should discharge directly to the building exterior. The exhaust ductwork should be insulated. See paragraph “O” earlier in this section.

► 17.0 COVER PLASTIC INSULATION

Polystyrene and polyurethane insulations create a severe fire hazard when left exposed. When ignited, they burn rapidly and give off toxic fumes. Both types of insulation are considered safe when covered. Inside a house or garage, they should be covered with 1/2 inch drywall.

► 18.0 REMOVE INSULATION FROM RECESSED LIGHTS

Recessed lights which are covered with insulation can generate excessive heat and start a fire. Special barriers should be provided over recessed lights to allow for insulation and yet allow for sufficient ventilation of the recessed lights. Alternatively, special lights designed for this application can be used. Some “pot” lights have different bulb wattage ratings, depending on whether they are in an insulated environment.

► 19.0 INCREASE INSULATION

Increasing insulation levels in a home should be considered an improvement rather than a repair. The optimum amount of insulation depends on local climate, fuel costs, the cost involved in adding insulation, the length of time one is planning to stay in the house, the level of comfort the homeowner expects, and a number of other factors. The decision to upgrade and the extent to which it’s done, will be different for every homeowner.

In some cases, increasing insulation is economically viable. Where possible, the additional insulation should be of the same type as the original insulation. If a different type of insulation is used, it should be a type which will not compress the original insulation. Cellulose and glass fiber insulations are most commonly used on a retrofit basis.

NOTES