



INNOVATIONS FOR LIVING™

Insulating Techniques Exterior Walls

Construction Details

to serious building damage, building designers need to properly protect their buildings from excessive moisture build-up.

Building codes and climate conditions may require the use of a vapor retarder on the exterior wall. In most climates it is recommended that the vapor retarder be placed toward the interior of the home, next to the interior finish. Kraft-faced building insulation meets most of these requirements with a perm rating of 1.0. In some applications it may be necessary to use a stronger vapor retarder. In this case, a 4 or 6-mil polyethylene can be applied over unfaced insulation. For hot humid climates polyethylene is not recommended and in locations along the Gulf Coast and Florida the local building code may call for the vapor retarder to be placed toward the outside or not used at all.

Further Reading

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

- Handbook of Fundamentals, 2005: American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE)
- Model Energy Code, 1995: Council of American Building Officials (CABO)
- International Residential Code (IRC)

Warning: Kraft facing will burn. Do not leave exposed. Facing must be installed in substantial contact with an approved ceiling, floor or wall material. Keep open flame and other heat sources away from facing. Do not place insulation within 3 inches of light fixtures or similar electrical devices unless device is labeled for contact with insulation. Use only unfaced insulation between wood framing and masonry chimneys. Do not use insulation in spaces around metal chimneys, fireplaces, or flues. Unfaced insulation is considered non-combustible by model building codes. Flame Spread 25 products are flame spread rated and can be left exposed where codes allow. See package for warnings fire hazard and installation instructions, or call 1-800-GET-PINK.

Caution: FOAMULAR is combustible. Although it does contain a flame-retardant additive to inhibit ignition from small fire sources, if exposed to fire of sufficient heat and intensity, FOAMULAR insulation will ignite. Do not expose the product to open flame during shipping, storage, installation or use. In most applications, a code compliant thermal barrier must be used to separate FOAMULAR insulation from the building interior. See "conditions for use" section of ICC ES Report 96-24

for application covering recommendations.

Fiber Glass and Mold:

As manufactured, fiber glass insulation is resistant to mold growth. However, mold growth can occur on building materials, including insulation, when it becomes contaminated with organic material and when water is present. To avoid mold growth on fiber glass insulation, remove any water that has accumulated and correct or repair the source of that water as soon as possible. Insulation that has become wet should be inspected for evidence of residual moisture and contamination, and any insulation that is contaminated should be promptly removed and replaced.

May cause temporary irritation to the skin, eyes and respiratory tract. Avoid contact with eyes and skin. Wear long-sleeved, loose-fitting clothing, gloves and eye protection when handling and applying material. Wash with soap and warm water after handling. Wash work clothes separately and wipe out washer.



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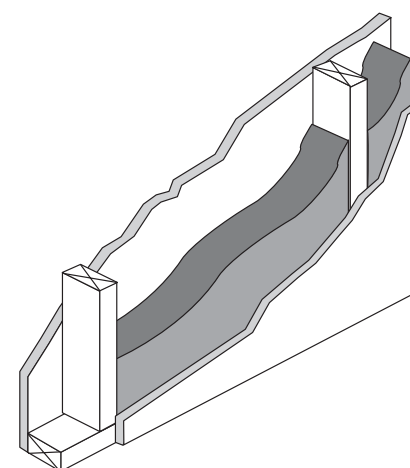
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All homes have exterior walls, which need to be insulated. When insulating an exterior wall, care needs to be taken to ensure proper thermal, moisture and air infiltration control.

The US Department of Energy lists R-value recommendations for walls based on local heating and cooling costs and climate conditions in different areas of the nation.

Building Code Requirements

Individual states and localities may have their own building code requirements, so check with your local building department for the requirements in your area. The Council of American Building Officials (CABO) publishes the One & Two Family Dwelling Code, which sets requirements for residential structures, where it has been adopted. These requirements are a good guide for most residential construction. For more information see "Applying Insulation to Meet Building Codes" Pub No. 5-BL-16095.

Energy Requirements

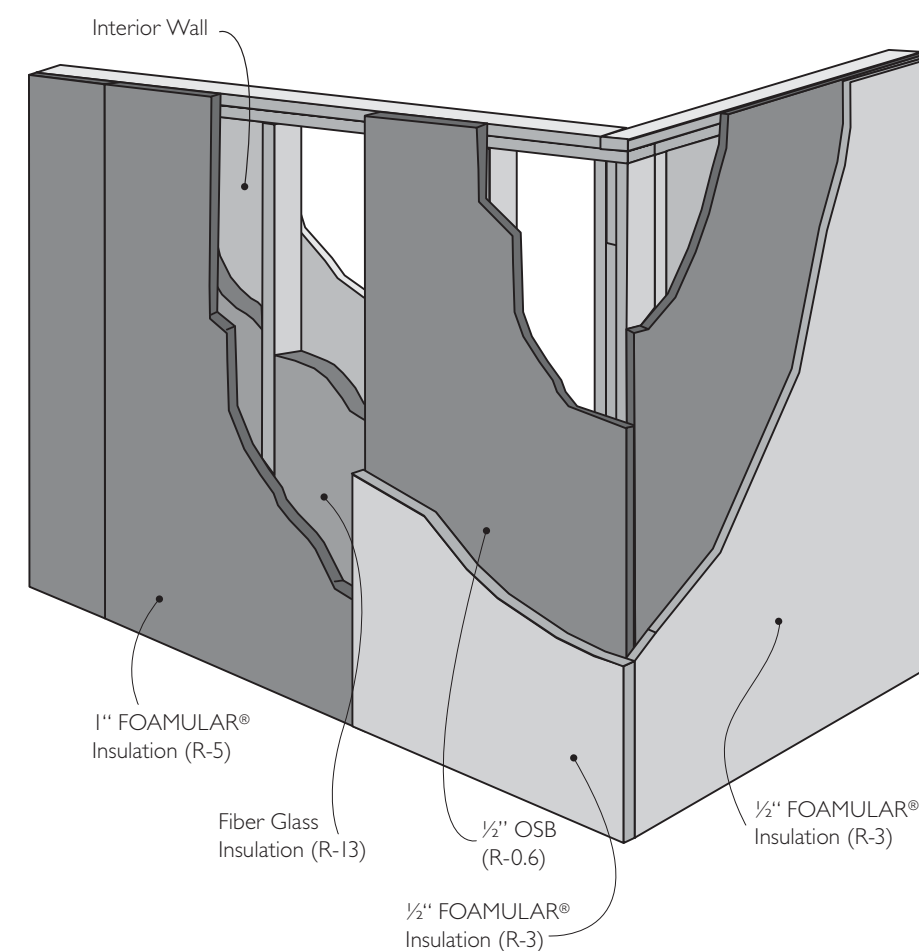
Most energy codes require that exterior walls are included in the total insulation treatment of the structure to reduce energy use. The CABO Model Energy Code includes minimum requirements for thermal protection of exterior walls. The walls can be insulated with cavity insulation alone or in combination with an exterior insulating sheathing. The requirements for exterior walls can be met for most of the country by providing a total insulation value of R-19.

Wood framing batts are typically 15" wide, approximately 1/2" wider than the actual cavity width. Metal framing batts are cut at 16 1/8" wide to completely fill the cavity. In all types of framing there may be a need for more insulation to meet local energy requirements.

Structural Considerations

Most residential walls are framed with 2x4 or 2x6 wood studs or 3 5/8" or 6" metal studs. The insulation used needs to properly fit the type of framing both in depth and width. When energy

Figure 1



Construction Details

performance is critical, insulating foam sheathing may be necessary over the entire wall structure, including the corners. For these applications, consideration needs to be given to lateral support. There are a number of alternative solutions for providing lateral bracing, that can provide the required resistance to imposed forces, and also allow full coverage of the wall with non-structural insulated sheathing. When the walls of homes are being framed, the assembly must be built to handle the lateral loads that can be imposed on the walls from wind, earthquakes and other factors. For some builders, the solution can be to use Oriented Strand Board (OSB) on the corners of the structure. If the wood sheathing is being replaced with insulating sheathing, like FOAMULAR® insulation, alternative structural bracing needs to be utilized. There are several types of bracing that can be used— some better than others. Let-in bracing, kerfed-in metal bracing, corner bracing and metal strapping are all types of bracing that can be used. (Figure 1) For details on structural bracing see “Construction Details” Pub. No. 15-BL-24957 for structural bracing.

Thermal Control

In most homes the exterior walls make up the largest surface area of the home. This means that a major amount to the home's energy is lost or gained through the wall. Properly insulating this area is critical to saving valuable energy used to heat and cool the home. Insulating the wall cavities

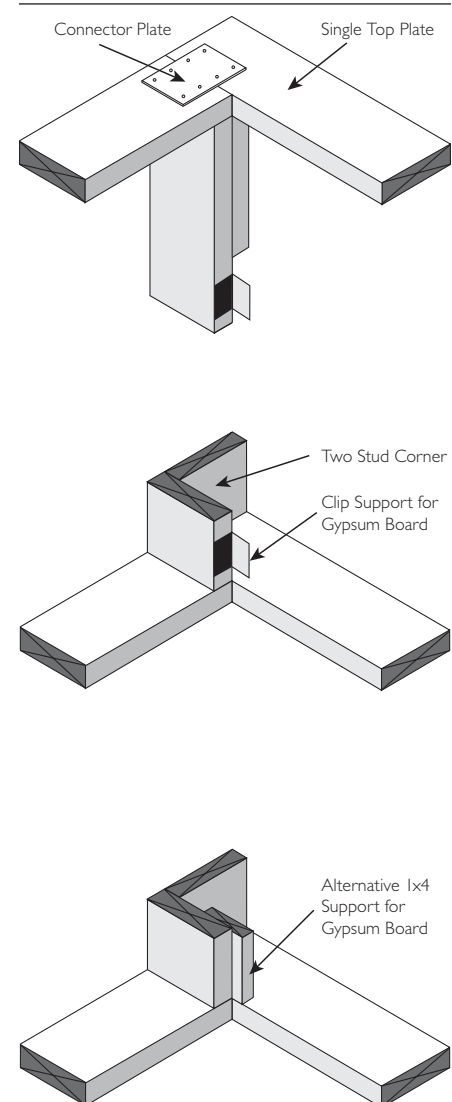
and/or applying rigid insulation over the framing is not the only means to control heat loss. Using energy efficient framing methods will also reduce heat loss (Figure 2). With this type of corner framing, insulation can be tucked in behind the framing.

Air Infiltration

Air infiltration is air that penetrates the building envelope either naturally, through framing joints and penetrations, or mechanically through the heating and cooling equipment. Air infiltration through joints and penetrations can account for 95% of the air leakage in a home. Uncontrolled air infiltration can raise the heating and cooling costs for the building. Proper attention should be given to this detail to increase the thermal efficiency of the structure. Before the actual insulation is installed all penetrations in the wall should be sealed to prevent outside air from entering the home.

All framing joints should be caulked and sealed and all electrical boxes should be sealed. The construction process itself causes holes to be made in the building envelope. Steps should be taken to help seal the building to prevent air from infiltrating into the structure (Figure 3). Housewrap and taped exterior sheathing can be used to reduce air infiltration. Caulking at the bottom and top plates of exterior walls should also be utilized to reduce unwanted air from entering the structure.

Figure 2

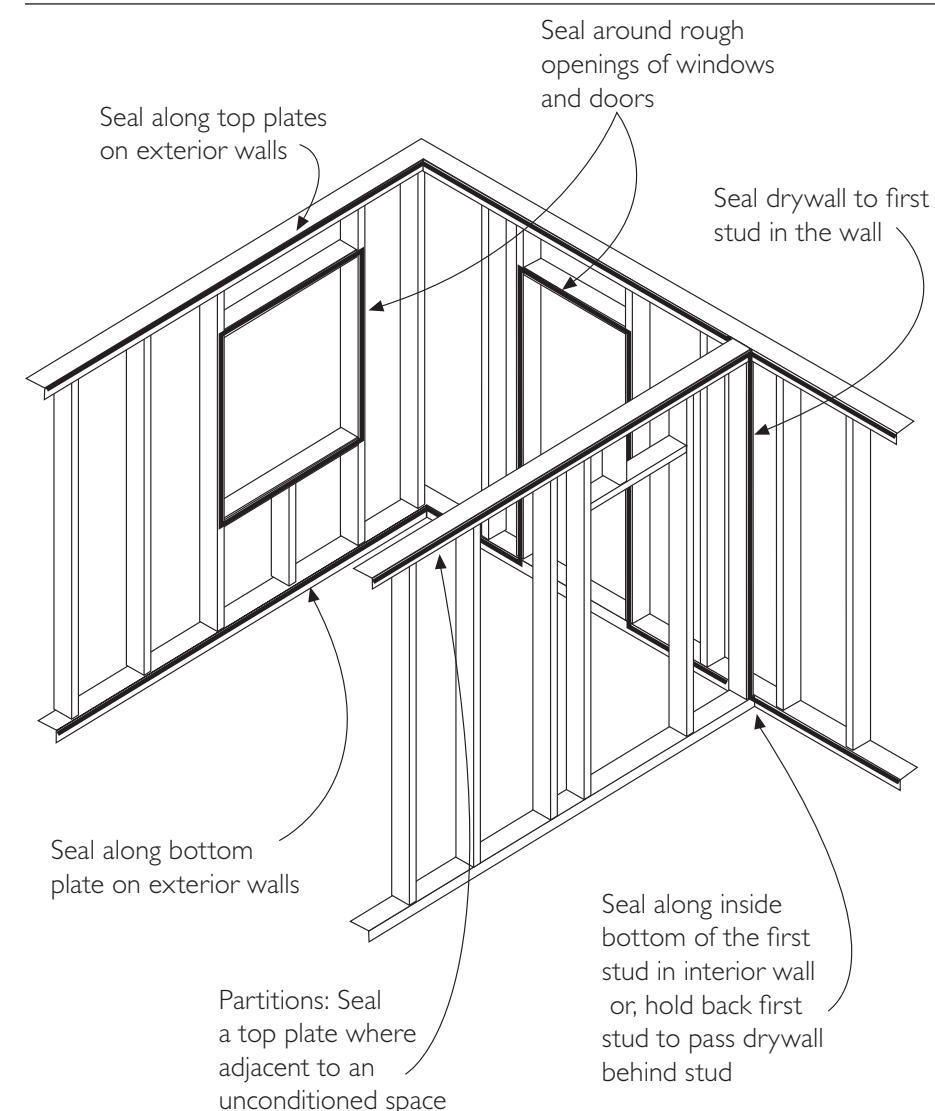


How to Insulate Exterior Walls

Once the wall is sealed against air infiltration install fiber glass batts between the studs. For irregular cavities, the batts should be cut to fit. It is recommended to cut the batts about 1/2" to 1" bigger than the cavity to ensure a tight fit. This will also help hold the insulation in place.

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Figure 3



When installing kraft-faced building insulation with flanges, staple the paper to the inside or face of the stud. If the interior finish is going to be glued, it is necessary to staple the flanges to the inside of the studs. With R-11, the facing should be pulled tight with the staples placed about 8 to 10" apart. With higher density products such as R-13 and R-15, or flangeless batts such as PROPINK FastBatt®, it is not necessary to staple the product in

place— provided the batt fills the cavity. If unfaced insulation is installed, apply a 4 or 6 mil thick polyethylene vapor retarder over the insulation. Overlap the seams by one stud spacing to minimize the number of staples used to attach it to the studs. Vapor retarder recommendations and requirements vary, see the section on moisture control for these recommendations.

If the cavity has electrical wires, be sure the wiring is insulated wire without any nicks. If there is any bare wire showing, it should be repaired before installing the insulation. If you are unsure about the condition of the wiring, contact a local electrician to inspect the wiring. The insulation should be installed in a manner that minimizes the compression of the batt. Split the insulation in half—putting half of the batt behind the wiring and half of the batt in front of the wiring. Cut the insulation to fit around any electrical boxes. Any scrap insulation can be stuffed behind the box.

Use of Exterior Insulating Sheathing

In many homes the framing can account for 10-15 percent of the wall area. The framing members allow for “thermal short-circuiting” through the wall. To help prevent thermal short-circuiting, insulating sheathing like Foamular can be applied to the exterior side of the exterior wall. Apply Foamular Insulating Sheathing vertically, parallel to studs, and close all joints tightly to reduce air infiltration. Attach to wood studs using nails with 1" diameter head, or plastic cap, spacing 8" on center and of sufficient length to penetrate the framing a minimum of 1". Joints may be sealed with a construction-grade tape.

Moisture Control

Because excess moisture can cause a large number of problems, ranging from extreme discomfort in hot, humid weather