

# Walls and Rim Joists

Insulate Wall Systems in Basements and Crawlspace



## SKILL SET

Be sure you have the experience needed for this job. If you are in doubt, hire a contractor.

## SAFETY

These tasks require working in tight clearances and under task lighting. Use a dust mask/respirator, gloves, safety glasses and kneepads.

## TOOLS

Utility knife, table or circular saw, caulk gun, measuring tape, lights, straight edge and markers

## MATERIALS

Foam/caulk/construction adhesive compatible with insulation product

Insulation – cavity batts, rigid insulation – foam board, etc., or two-part foam kit

Sheathing – code-approved foam board

Fasteners – screws with washers or button-capped nails, power actuated fasteners

## COST BENEFIT

Insulation, combined with air sealing in basements and crawlspaces reduces heating and cooling costs and improves comfort and indoor air quality.

### PRIORITY LEVEL

LOW MED HIGH

### SKILL LEVEL

DIY PRO

## Locating the Thermal Envelope - Insulate the walls

One approach to locating the thermal envelope is to air seal and insulate the foundation walls, then condition or indirectly condition the basement or crawlspace. See the recipe card on *Foundation Subfloor Insulation* for details on insulating under the floor.

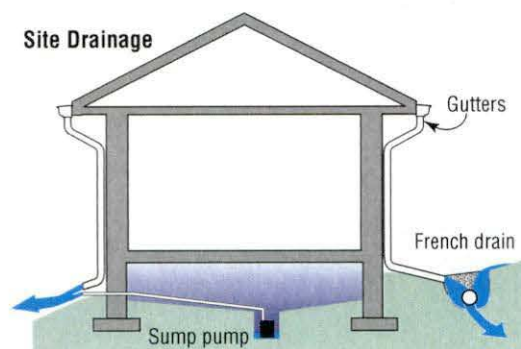
There are numerous advantages to air sealing and insulating the foundation walls and then directly or indirectly conditioning the basement/crawlspace.

Determining the thermal envelope at the walls of the foundation requires that proper exterior moisture details have been implemented, including:

- Site drainage and proper slope for downspouts away from the foundation walls
- Grading at the interior and possibly installing a low point sump pump to remove bulk water in the event of flooding
- 100% coverage of a 6-mil or better (fiber-reinforced is highly recommended) plastic vapor barrier that is overlapped and sealed at the seams and to the foundation walls

These items are needed for proper interior bulk moisture management. Basements usually have a concrete floor poured over the plastic.

Perform a visual inspection for obvious signs of pest (termites, rodents, snakes, etc.) or moisture damage



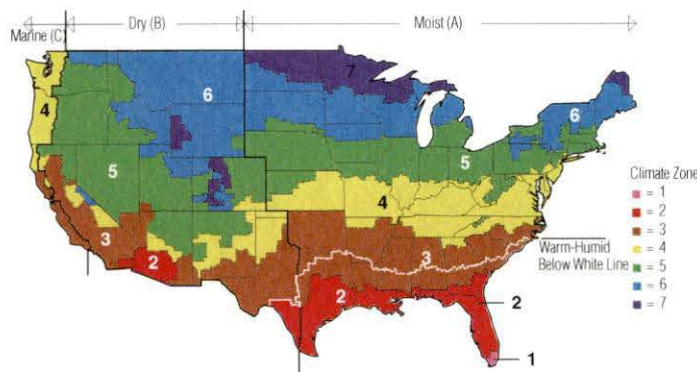
Drain water away from the foundation

and consult a professional if needed. Confirm that your current pest control company will be able to inspect the space or switch to another pest control contractor.

## Insulation Details for Foundation Walls and Rim Joists

Foundation wall materials are typically masonry brick filled-in between structural concrete piers, concrete masonry unit (CMU) blocks and solid poured concrete foundation assemblies. On newer homes, technologies such as insulated concrete forms (ICF) have been installed either for foundation walls alone or for all above grade walls as well. Occasionally an All Weather Wood (AWW) foundation wall may be encountered.

R-values of foundation walls should attempt to meet prescriptive code as outlined in IECC 2012 table below.

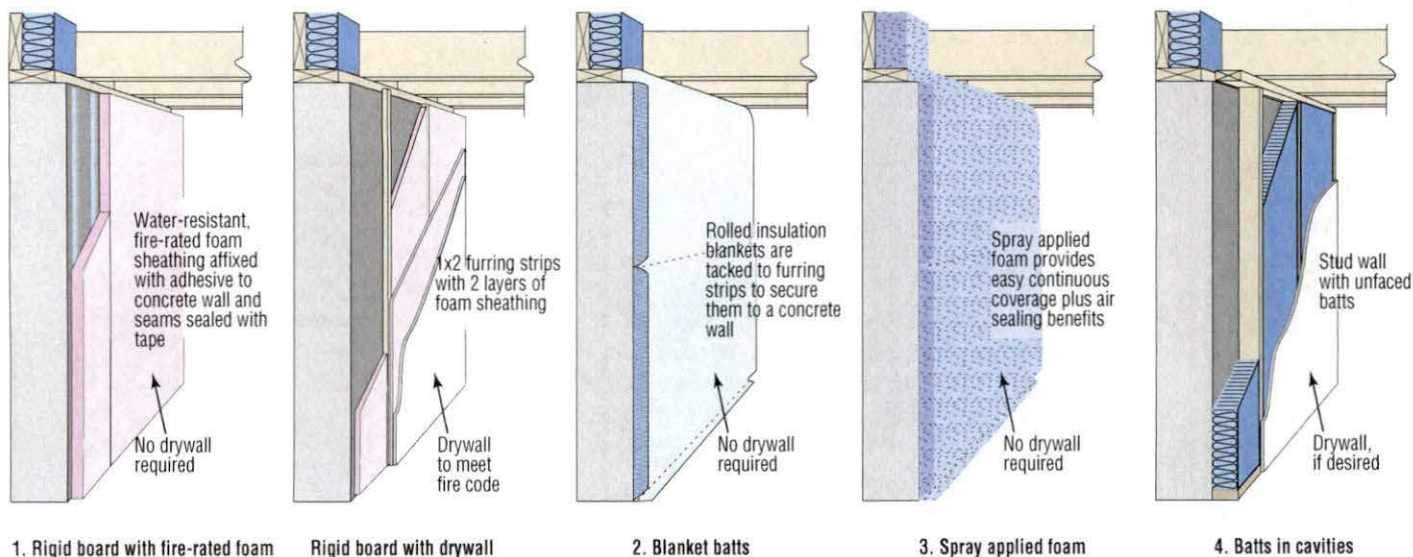


The codes permit the foundation walls to be insulated either with a continuous layer of insulation or for a framed assembly, with cavity R-values indicated.

Insulation R-values - 2012 International Energy Conservation Code

Energy Code Climate Zone	1-2	3	4*	5-8
Basement/Crawl Wall R-value - continuous	0	5	10	15
Basement/Crawl Wall R-value - cavity	0	13	13	19

\*Except Marine 4 (treat Marine 4 as Climate Zone-5)



1. Rigid board with fire-rated foam

Rigid board with drywall

2. Blanket batts

3. Spray applied foam

4. Batts in cavities

Basement and crawlspace wall systems all encounter issues with moisture intrusion. Your particular situation will guide your approach, e.g. an insulated crawlspace wall may require a termite inspection strip. Insulate to the R-values required for your climate. Consult a professional if needed.

## Insulate a Masonry Foundation Wall

### Four Common Methods

#### 1. Rigid Insulation Boards

Rigid insulation products are typically expanded polystyrene (EPS), extruded polystyrene (XPS), or poly-isocyanurate (poly-iso) boards of varying thickness and dimensions. Although less common, other non-foam rigid insulation products made from fiberglass or mineral wool do exist. Generally, rigid insulation products offer excellent durability in terms of moisture. Rigid insulation boards are commonly attached with an adhesive that is compatible with the material and/or mechanical fasteners. They can be installed on either the exterior or the interior of the foundation wall.

Interior insulation is generally easier and more common but some products cannot be left exposed due to fire issues and would need to be covered by drywall or equivalent. Certain products such as DOW Thermax (a foil-faced poly-iso board), rigid fiberglass or rockwool boards can be left exposed.

Exterior insulation performs better thermally because it is outside the mass of the foundation wall. It must be protected from UV exposure and damage from lawn equipment – a stucco coating, fiber cement or brick cladding is sometimes used. However this approach is less common in areas of high termite risk since the insulation board is not accessible for visual inspection – options include foam boards with pest resistant attributes such as borate treated EPS.

#### 2. Rolled/Blanket Insulation Batts

Rolled insulation blankets (sometimes referred to as a “batt in a bag”) are larger products that are ideal for insulating the inside of an unfinished basement that is to be (directly or indirectly) conditioned. Using a product similar to what is used in the metal building industry, a 4’ by 50’ blanket is cut and supported either vertically at the sill plate or installed horizontally using furring strips. The insulation coverage is considered continuous and the fiberglass is covered by a vapor permeable material - usually a perforated

foil or vinyl covering. The insulation is fairly inexpensive but not as durable as rigid board insulation from a bulk moisture standpoint. Other rolled products such as cotton and cellulose batts (that have been treated with borates as a fire retardant) can be easily glued to the walls with adhesive.

#### 3. Spray Applied Foam

Whether open or closed cell, spray applied foam insulation is arguably the most effective (albeit the most expensive) strategy for insulating foundation walls. A major advantage of the sprayed foam is that it both air seals and insulates in one application. It is also ideal for rim joist areas. Spray applied foam is generally not a DIY job – the equipment and training of a professional is recommended. However, in certain applications, a two-part foam “froth pack” may be purchased and used to seal and insulate the foundation walls.

#### 4. Interior Cavity Insulation (batts or spray applied)

Another insulation strategy for foundation walls (more commonly used in basements than crawlspaces) is to construct a stud wall and insulate the cavities much like in an above grade exterior wall application. Advantages of this fairly low-cost approach is that the walls are now framed and ready for drywall in case the basement will be finished. Insulation in the cavity includes standard batt and blown-in products including spray applied fiberglass, cellulose and foam.

One downside to this approach is that placing wooden studs against the concrete could lead to moisture and thermal conductivity issues. Often, installers will leave a gap between the wood and concrete and hang an unfaced (recommended) batt in the cavity and not cover it. Unfortunately, this approach results in a fiberglass batt without an air barrier. An improvement would be to install a rigid insulation thermal break between the studs and the concrete or create a thermal break using a thin layer of spray foam in a “flash and batt” application (thin layer of foam then batts). In addition, this technique can be used in rim joist areas; after spraying foam to air seal, batts may be cut to fit in this location.