



## Beat Basement Heat Loss

*Proven methods and materials make insulating foundation walls easy and cost effective.*

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**F**oundation walls are big heat losers. The R-value of an 8-inch concrete wall plus air films is 1.49, less than for double glazing. And the upper part of the foundation wall acts like a wick, drawing basement heat to the cold outdoors. In a well-insulated two-story home, basement heat loss will account for 15 to 30 percent of the annual heat load. In a single-story structure, the percentage may be higher. R-10 perimeter insulation from siding to footing (with one foot of exposed foundation) will cut basement heat loss in a heated basement by about 70 percent. Payback periods for perimeter insulation are relatively short, typically ranging from two to six years in a 5000 degree-day climate.

### Materials

You should select a material that withstands the below-grade environment—the wetting and vapor drive, and the freeze/thaw cycles. If you plan to leave the material directly exposed to the soil, extruded polystyrene (such as Dow's Styrofoam™ or U.S. Gypsum's Foamular™) holds up best and retains most of its original R-value. Other insulating materials can be used, but they should be protected from direct contact with wet soil by plastic or other barriers. In Canada, some builders have reported success with burying fiberglass insulation in a pressure-treated plywood box.

### Where and how much

Several arguments favor exterior versus interior insulation of masonry and concrete basements. First, an exterior job is usually cheaper, since the insulation can be left uncovered (except for above grade). On the interior a good fire retarder, such as 5/8-inch drywall, is required over the insulation. Second, if a decent job is done tying the insulation into the siding, the major air leak at the sill will be controlled. Third, the thermal mass of the foundation walls remains available to the house for both heating and cooling benefits. And fourth, exterior insulation protects the foundation from additional stresses caused by insulating. Deprived of your home's heat, the soil around the foundation will be more prone to frost heaves, which can be particularly damaging to block and stone foundations that cannot resist lateral forces. Cracks may result.

*Steve Bliss is an associate editor at Solar Age.*

Foam insulation on the exterior can absorb some of this movement. Backfilling with materials not prone to frost heaves, such as clean, granular fill also helps. Freeze/thaw cycles can also lead to the spalling of the exterior surface of a concrete wall insulated on the interior.

In new construction in cold climates it makes sense to insulate from siding to footing. You will get the most out of the material by using a greater thickness on the upper half of the wall than on the lower. In a retrofit, stick to the upper half or third of the foundation wall—whatever your budget or arms will tolerate. Insulating half way down an 8-foot wall to R-10 will achieve almost the same results as insulating the whole wall to R-5 (see chart below,) with the same amount of material and a lot less digging. In climates where cooling loads compete with heating, it is best to leave the lower portion uninsulated to maintain earth coupling.

### Percent Reduction In Heat Loss

R-value	Half Wall	Full Wall
R-5 interior	42.1	62.4
R-5 exterior	46.6	57.5
R-10 interior	49.4	76.0
R-10 exterior	54.2	69.8

Computer modeling done by Paul H. Shipp, senior engineer at Owens-Corning Technical Center, shows that insulating the upper half of a foundation wall to R-10 will produce close to the same savings as insulating the full wall to R-5 compared with an uninsulated foundation wall. The simulation was done for a 1193-square-foot single-story house in Columbus, Ohio (5660 annual heating degree days).

### Installation

Before you excavate and have to work over a trench, you should prepare the joint where the bottom of the siding meets the insulation. Unless the siding will project a good 1/2-inch beyond the finished insulation, you will need to install a metal flashing or wooden drip cap over the top edge of the insulation board. Aluminum drip edge (sold for door and window head casings) or J-channel will work here