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Cut Foundation Heat Loss

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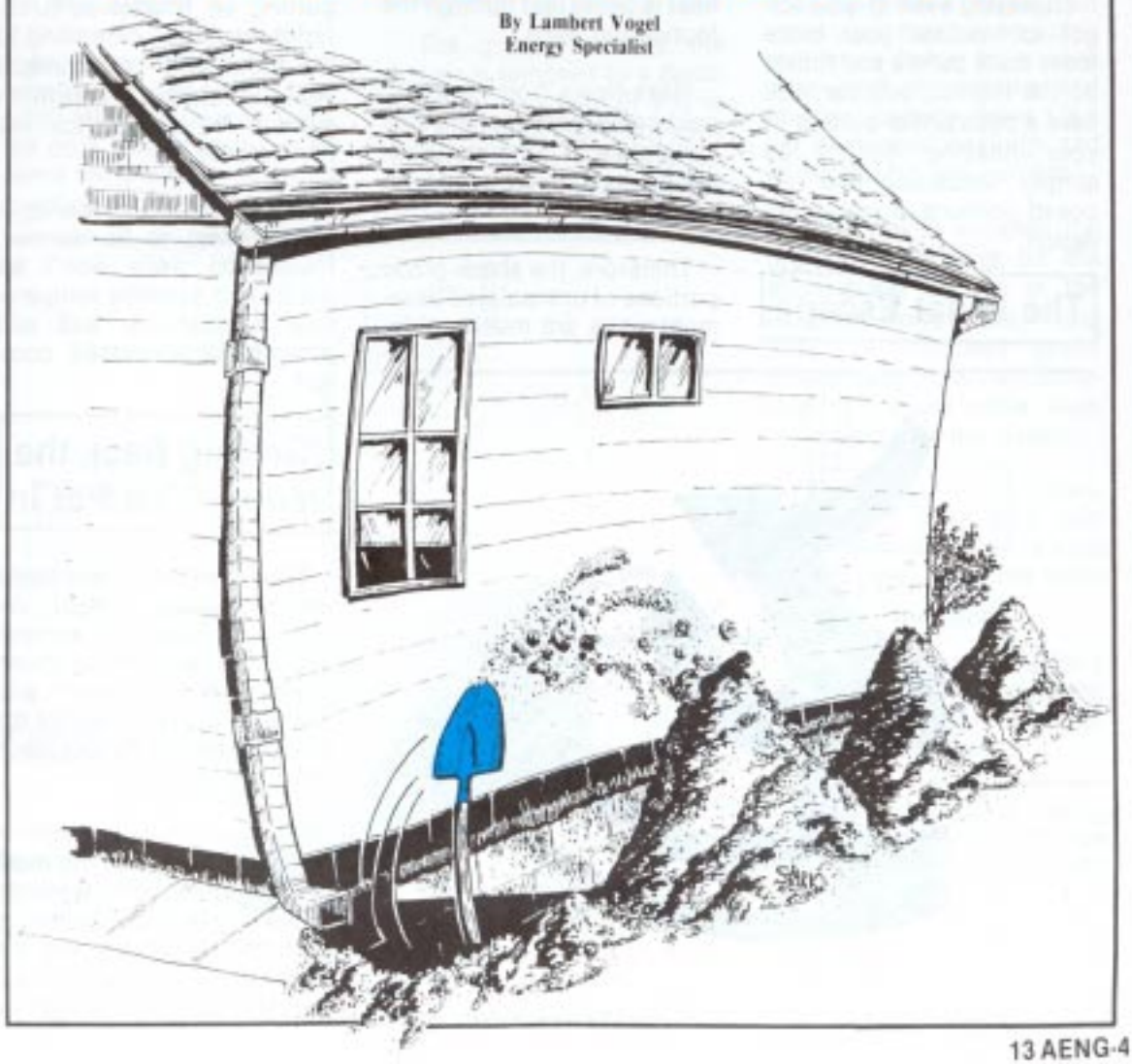

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Have you insulated the above-grade portions of your home while neglecting the foundation? If so, you've missed a chance to reduce your home's heat loss.

While your home's foundation may appear massive, sheer width can't prevent heat from escaping through basement walls. A concrete block (commonly used as a foundation material) has an R-value of about 1.11, while a cast-in-place concrete wall has an R-value of 0.90 — not much different than the 0.91 R-value of a single-glazed window.

However, even if you forgot to insulate your basement walls before you finished the interior, you can still save a substantial portion of your heating energy by simply insulating the exposed portions of your foundation.

The Great Escape

In the past, most of us have paid little attention to heat loss through basement walls. It's generally been assumed the mass of earth surrounding basement walls prevents heat from escaping.

However, while this assessment is partially true, most homeowners have noted the soil surrounding the house remains unfrozen within one or two feet of the structure. Melting snow and premature plant growth next to basement walls have also been noted.

These observations have led to the realization home heat is being lost through the foundation walls.

Heat flows from warm to cold areas, and cast-in-place concrete and concrete block walls are relatively good heat conductors.

Therefore, the above-grade portions of uninsulated basement walls are much colder than their insulated counterparts. Interior heat will flow up the walls to the colder wall sections, as well as flowing directly into the surrounding soil.

However, insulating basement wall exteriors to a depth of at least two feet below grade will keep them warmer, greatly reducing heat loss.

Figure 1. Heat loss from an uninsulated basement wall.

Blocking Basement Heat Loss

Many contractors are now putting up houses with exterior insulation extending to the footings — a technique which can save the maximum amount of energy for the homeowner.

Because this technique allows them to be warmer, foundation walls won't be subject to extreme temperature fluctuations, and will provide for increased comfort.

Getting Back the Money You Put In

The feasibility of any home weatherization project depends on cost. The general questions are "How much money will this cost?" and "How long will it take for my energy savings to pay back my investment?"

Insulating your basement walls can be one of the most cost-effective home weatherization projects. Considering current fuel prices and the North Dakota climate, the expected payback period for

adding two inches of extruded polystyrene to your basement walls will be from two to four years.

As an example, consider installing two inches of extruded R-10 polystyrene (to a depth of two feet below grade) to the exterior of a 30' x 40' house with one foot of exposed basement wall.

You can calculate the simple payback period for this installation.

This example home contains 140 lineal feet of basement wall. The heating load reduction will be 33,722,239 BTUs per year.*

Assuming the cost of the retrofit at $2 per square foot, 9,200 Heating Degree Days, the cost of electricity at 4.5 cents per kilowatt hour and a coefficient of performance of 1 for the electric heating system, the simple payback period will be approximately two years.

Blocking the Escape Routes

Now that you've some idea of how much heat escapes through your basement walls, the next step is blocking the escape routes.

While there are a number of ways to block heat loss, the most common construction technique for a retrofit application is shown in Figure 2.

The ground next to the house is removed to a depth of about two feet. (If you've excavated all the way to the footings to repair the foundation, two inches of extruded polystyrene should be placed on the entire basement wall before you backfill.)

A 2-inch thick sheet of extruded polystyrene is glued or nailed to the foundation wall and a protective covering is installed on the above-grade polystyrene. (**Do not** use expanded polystyrene [beadboard] or polyurethane insulation!)

If you glue the polystyrene sheets to the foundation walls, make sure the mastic you use is compatible with polystyrene.

Above-grade polystyrene areas must be covered with a protective finish to prevent ultra-violet degradation and physical damage. Table 1 is a list of generic coatings and coverings for this purpose.

Once you've installed the protective covering on the above-grade section of the extruded polystyrene, make sure the finished grade slopes away from the foundation to prevent water from collecting near the walls.

Check eave trough downspouts to make sure rain water from the roof is also carried away from the foundation.

Figures 3 and 4 illustrate two techniques for insulating foundation walls for slab-on-grade construction.

**Value computed using ASHRAE Handbook 1981 Fundamentals, Chapter 25, ppg. 25.6 and 25.7.*

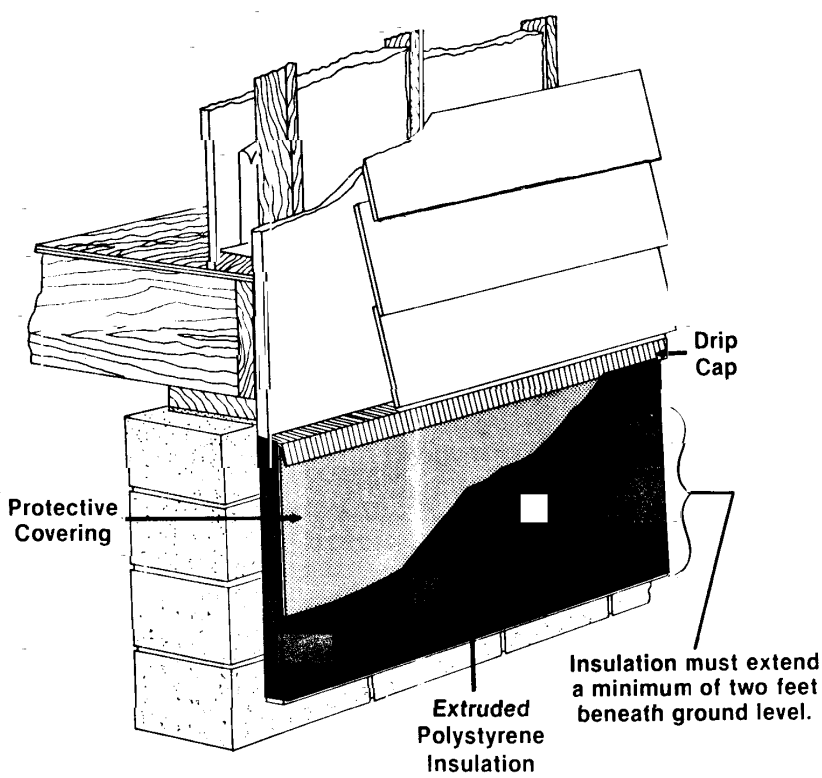

Figure 2. Insulation applied to an existing basement wall foundation.

Insulating Crawl Spaces

If your home has a crawl space, you can insulate it with a rigid board insulation material, rather than installing fibrous batt insulation under the floor. If the crawl space contains heating or plumbing pipes, this method will virtually eliminate the frozen pipe problem.

To ensure good thermal performance, close crawl space vents throughout the heating season. If the space has a dirt floor, you'll want to cover it with a 6-mil polyethelene sheet.

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TABLE 1

Protective/Decorative Coverings	Typical Sources
Latex-modified Cement Motar (Required latex additive can be purchased at local masonry supply.)	**—Masonry Supply —Lumberyard —Department Store**
Latex-modified Stucco (¼" thick with fiberglass mesh reinforcement.)	**—Masonry Supply —Plastering Contractor**
Pressure-treated Wood and Plywood	**—Lumberyard**
Cement-asbestos Board	**—Masonry Supply —Lumberyard**
Aluminum Coil Stock	**—Aluminum Siding Wholesaler —Siding Contractor**
Rigid Vinyl Sheet*	**—Vinyl Siding Wholesaler —Siding Contractor**

*Vertical siding installed horizontally, soffit material, etc.

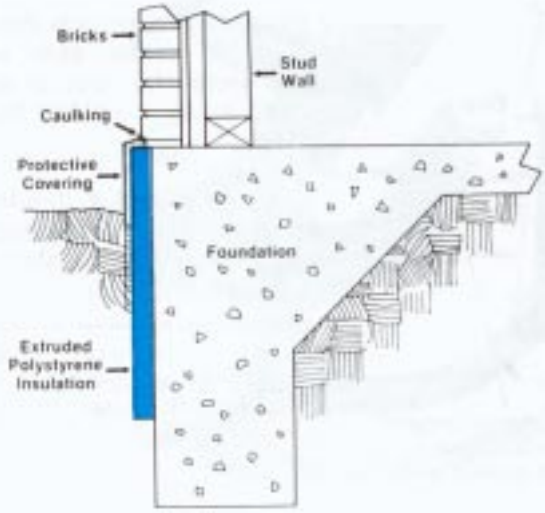

Figure 3. Insulation applied externally for slab-on-grade (thickened edge).

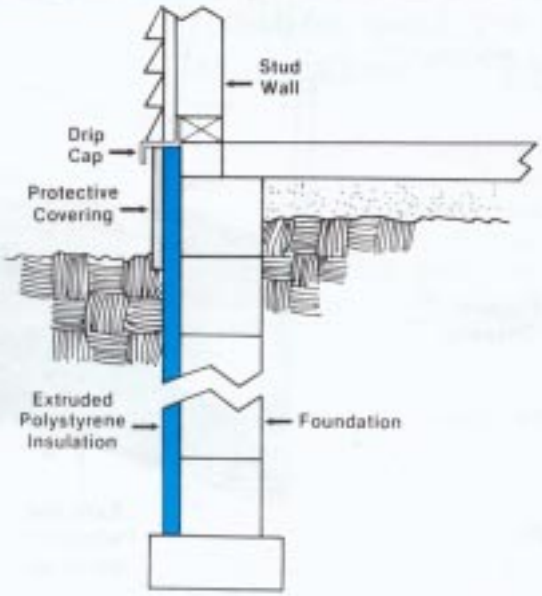

Figure 4. Insulation applied to a foundation wall.