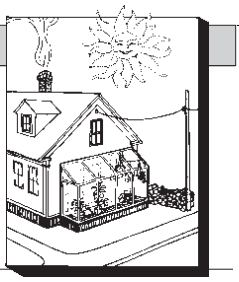
Insulating Existing Basements

by Alex Wilson

Foundation Insulation, Part 3



It is neither easy nor cheap to properly insulate existing foundations, but retrofit foundation insulation often makes sense for a number of reasons.

First, the vast majority of foundations have no insulation. While Americans have spent millions of dollars insulating their houses over the past dozen years, they've put little or nothing into the basement. As a result, today a disproportionate amount of heat is lost through many house foundations.

Second, many foundations leak—and improving the drainage away from foundation walls is a key element of any thorough foundation-insulation retrofit job. In fact, proper foundation drainage usually is just as important as insulation—if not more important. Whether you embark on a major foundation-retrofit project to reduce energy consumption or to fix a leaky basement, you'd be well advised to follow the proverbial "two birds with one stone" approach.

Listed below are several recommendations for foundation insulation and drainage retrofits. There are other approaches not covered here that are suitable for some situations, but in most cases these procedures make the most sense.

1. Insulate on the exterior if at all possible. I realize that this entails a lot of work (I've done it!), but in the Northeast, trenching usually is the only way to do it right if you want to ensure that your actions will not come back to haunt you. Particularly for drainage purposes, the trench and insulation should extend down to the basement-floor level.

If the soil around the house is extremely porous or the foundation has been properly backfilled with crushed stone, you might consider *interior* foundation insulation, but otherwise the risk of frost heaves is too great.

If you insulate on the inside of the wall, no heat from the basement can escape to prevent the ground outside the foundation wall from freezing. As a result, the soil against the foundation wall—and the wall itself—will freeze to the typical frost depth in your area. If the soil happens to be wet, freezing can cause the foundation to buckle

2. In trenching, avoid disturbing foundations that could be unstable. If the foundation is anything other than poured reinforced concrete in good condition, dig a trench several feet away from the foundation wall. This will disturb the foundation as little as possible. If you're using a backhoe, try to avoid setting the outrigger pads too close to the wall for the same reason.

Once the trench is dug, it can be sloped to the sill, or, for full-depth trenches, insulated vertically to several feet below grade, then sloped into the sill and insulated. This approach has the added benefit of preventing the soil next to the foundation from freezing, thereby eliminating any chance of frost heaves.

3. With stable, reinforced, poured-concrete foundations, trench down right against the wall. Even though a zone of buffered soil will not be created, the risk of frost heaves with one or more inches of exterior insulation is pretty slim. In addition, it is much easier to install insulation against a flat vertical wall than against soil.

4. Use extruded polystyrene insulation. Although expanded polystyrene insulation (EPS) frequently is used below grade—and although EPS manufacturers vehemently maintain that their products hold up well in such applications—I remain skeptical, having pulled soaking wet EPS out of the ground where it supposedly had been insulating a foundation.

Because there are so many manufacturers of EPS and the quality varies so widely, EPS is less of a given than extruded polystyrene (of which there are only four brands on the market). To be safe, stick with the extruded type. Polyisocyanurate and polyurethane rigid insulations are not recommended for below-grade applications.

As I mentioned last month, "Warm-N-Dri," manufactured by Owens-Corning, is another type of below-grade insulation that seems to be gaining popularity in foundation applications. It has the added benefit of aiding in drainage, but it is much less resistant to compression than extruded polystyrene.

5. Install a minimum of one inch of insulation running the full depth of the trench, with additional layers nearer the surface. "Tapering" the insulation in this manner is more cost-effective. You don't need as much insulation five feet underground as you do near the surface because the soil has an insulating value proportional to depth.

For a full-depth trench, here's the ideal arrangement: Install one-inch-thick 2x8 tongue-and-groove sheets vertically, then place a second layer of half sheets extending down four feet with joints offset. Follow this with a third layer of 2x8 sheets running horizontally at the top. (Because of the difficulty in dealing with added thickness at the top of the foundation, however, it usually makes sense to stick with just the two one-inch layers.)

6. Protect above-grade insulation from sunlight with a reinforced exterior stucco or waterproof board.

7. Install a layer of polyethylene against the insulation. This provides a slip surface, preventing soil in contact with the insulation from dragging the insulation down as it settles (which is particularly important when the insulation is sloping). The polyethylene also aids in drainage, keeping moisture away from the wall.

8. In areas of poor drainage, install a specialized drainage board or mat and drainage tile. If leakage has been a problem because of soil type, spring runoff, a high water table or underground springs, install a special drainage product against the outside of the insulation so that any water flowing toward the foundation will percolate down to the drainage tile.

Such products are manufactured by Enka, Geofab, Miradrain, GeoTech and Elgen.

The drainage tile should be located a little below floor level, resting on several inches of crushed stone. Cover the drain tile with a filter fabric to keep silt from clogging it.

If you can't get one of the special filter fabrics such as "Typar" or "Mirafi," fiberglass insulation will work all right if you peel off the backing. Do not use straw or other organic materials to filter out silt, because these will decompose over the course of a few years.

9. Backfill carefully with ¾" to 1½" of crushed stone against the insulation to aid in drainage and reduce the risk of frost heaves. With wide trenches, you can backfill alternately with crushed stone (toward the inside of the trench) and soil (toward the outside of the trench) for economy; just make sure there always is at least a thin layer of crushed stone against the insulation. It's very important to tamp the backfill as you add it to guard against later settling.

Fill the top foot or so of the trench with soil rather than crushed stone. This provides a fairly impervious barrier to keep surface water out.

10. Grade the surface away from the house to keep surface water away from the foundation walls. Even though grading may have been done properly at the time of construction, embankments may slump toward the house over time. This is a major problem that must be remedied, even if it means digging up the whole yard with a bulldozer and constructing retaining walls to stop further slumping.

11. Install gutters or wide splash stones beneath the roof drip line to keep rainwater away from the foundation. Downspouts from gutters should drain well away from the foundation. Splash stones provide an alternative to frequently replacing icicle-damaged gutters. To be effective, they must be used on properly sloping ground.

12. If there is absolutely no way to properly insulate a foundation (i.e., on the outside), you probably shouldn't insulate at all. Patios, walkways and plantings are common obstacles to proper trenching and foundation insulation, providing temptation to insulate on the inside. Unless you are certain that the foundation has excellent drainage and the soil moisture is low, however, interior foundation insulation may be too risky.

There is one exception: It should be safe to install interior insulation along the portion of the foundation wall that is above grade. The energy savings won't be as great, but you won't be causing possible structural problems down the road.

13. Remove trees and shrubs next to the house. Trees and shrubs close to the foundation wall can damage the foundation and clog drainage tile. And if plants are the only thing preventing you from trenching on the outside and doing a proper retrofit job, get them out of your way so you can do the job right.

14. Tighten, repair or replace basement windows. Whether you proceed with a major insulating job or not, take a look at the windows. Loose, leaky casement windows often are the main source of heat loss from a foundation. Make sure the windows have screens and can be opened in the summer for ventilation. ■

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Alex Wilson is a writer, energy consultant and part-time building contractor in southern Vermont.