U.S. Department of Energy - Energy Efficiency and Renewable Energy

Energy Savers

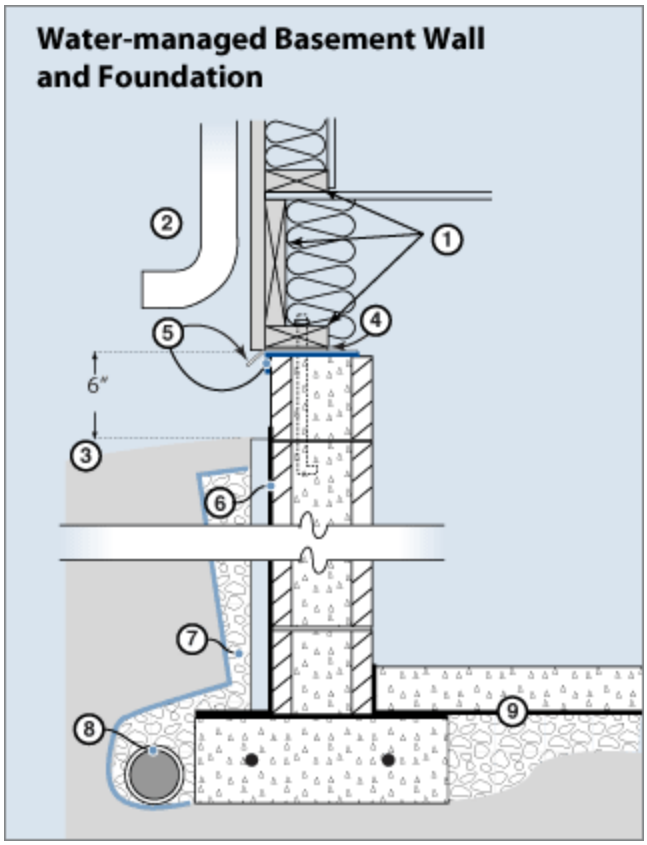
Moisture Control in Basements

To effectively insulate your basement for energy efficiency and to create a comfortable space, you need to properly control moisture in your basement.

Most basement water leakage results from either *bulk moisture* leaks or *capillary action*. Bulk moisture is the flow of water through holes, cracks, and other discontinuities into the home's basement walls. Capillary action occurs when water wicks into the cracks and pores of porous building materials, such as masonry blocks, concrete, or wood. These tiny cracks and pores can absorb water in any direction—even upward.

The best approaches for preventing these problems will depend on your local climate, type of insulation, and style of construction. However, the following general rules apply to most basement designs for creating a water-managed foundation system (see corresponding illustration):

1. Keep all untreated wood materials away from earth contact.
2. Provide drainage, such as gutters, to conduct rainwater away from the house.
3. Slope the earth away from all sides of the house for at least 5 feet at a minimum 5% grade (3 inches in 5 feet). Establish drainage swales to direct rainwater around.
4. Add a sill gasket to provide air sealing.
5. Install a protective membrane, such as caulked metal flashing or EPDM-type membrane, to serve as a capillary break that reduces wicking of water up from the masonry foundation wall. This membrane can also serve as a termite shield on top of foam board insulation.
6. Damp-proof all below-grade portions of the foundation wall and footing to prevent the wall from absorbing ground moisture by capillary action.
7. Place a continuous drainage plane over the damp-proofing or exterior insulation to channel water to the foundation drain and relieve hydrostatic pressure. Drainage plane materials include special drainage mats, high-density fiberglass insulation products, and washed gravel. All drainage planes should be protected with a filter fabric to prevent dirt from clogging the intentional gaps in the drainage material.
8. Install a foundation drain directly below the drainage plane and beside the footing, not on top of the footing. This prevents water from flowing against the seam between the footing and the foundation wall. Surround a perforated 4-inch plastic drainpipe with gravel and wrap both with filter fabric.
9. Underneath the basement's slab floor, install a capillary break and vapor diffusion retarder, consisting of a layer of 6- to 10-mil polyethylene over at least 4 inches of gravel.



Consult a qualified builder, basement designer, and/or insulation contractor in your area for specific basement moisture control measures concerning your climate, type of insulation, and construction style.

Learn More

Financing & Incentives

- Find Federal Tax Credits for Energy Efficiency
  ENERGY STAR®

Federal Government Resources

- Indoor Air Quality and Basement Conversions/Remodels
  U.S. Environmental Protection Agency

Reading List

- *Weather-Resistive Barriers* (PDF 223 KB). (October 2000). DOE/GO-102000-0769. U.S. Department of Energy.
- Ponessa, J. (October/November 1995). "Moisture in a Walk-Out Basement." *Fine Homebuilding*. (No. 98) pp. 14, 16, 18.
- Nisson, J. (June 1995). "Breathing Basement Walls," *Energy Design Update*. (15:5) pp. 6-7.
- "Keeping Basements Free of Mold." (February 2002). *Energy Design Update*. Ed. (22:2) pp. 9-12.
- Frane, D. (September 2002). "Waterproofing Basement Walls," *Journal of Light Construction* (20:12) pp. 89-94.
- Jackson, D. (August 2000). "Practical Foundation Waterproofing," *Journal of Light Construction*. (18:11) pp. 65-69.
- "Don't Forget about the Basement," (PDF 104 KB). (April 2002). *Quality Home*, Integrated Building and Construction Solutions. April 2002.