

HOMEOWNER'S GUIDE TO MOISTURE MANAGEMENT

Moisture management in and around a residence is an important part of homeowner maintenance. In order to maintain the structural integrity of your home, reduce maintenance problems, enhance your home's durability and value, and reduce the potential for mold growth, you need to understand the moisture control systems of your home and your own important role in maintaining those systems.

Water that seeps into the soils around your foundation can cause the soils to swell or settle excessively, which can lead to foundation and concrete slab movements, drywall cracking and (in extreme instances) structural damage. Often these problems are very expensive to fix and can lead to a decrease in your home's value.



In addition, excessive moisture in your home may cause mold growth, which can cause adverse health effects, especially if the residents are allergic to mold.

Mold can grow on most surfaces within 48-72 hours if standing water or excessive humidity is present. Some everyday activities – such as showering, cooking and laundry – may increase humidity levels in the home if not vented properly.

By controlling the amount of water that can seep into the ground around your foundation, you can limit the risk of excessive soil movements and minimize the risk of water entering your home.

This can save you time and hundreds to thousands of dollars in cleanup, structural damage, and mold remediation costs.

The following tips can help you avoid excessive wetting of the soils around your foundation and help keep moisture from accumulating in your home:

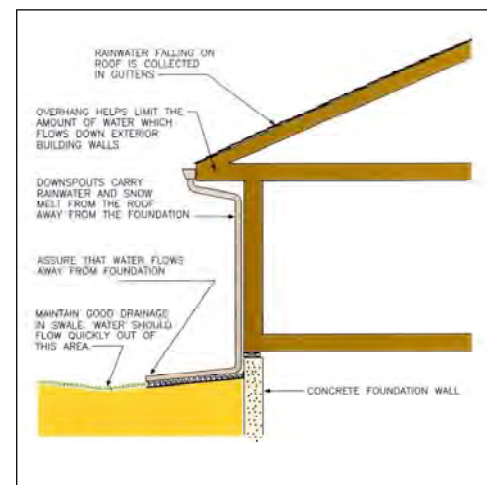
Irrigation

Landscape irrigation can be a major source of water around the foundation. Once a landscape is established, avoid excessive watering. Water running across the sidewalk and in swales (drainage pathways) is a sign of over-watering.

Rain gauges or moisture sensors can be connected to your irrigation system to help avoid excessive irrigation, and to limit water use.

Gutters and Downspouts

A tremendous amount of water comes off a roof during rainstorms and from snowmelt. Diverting this water away from a foundation is critical to the performance of the foundation.



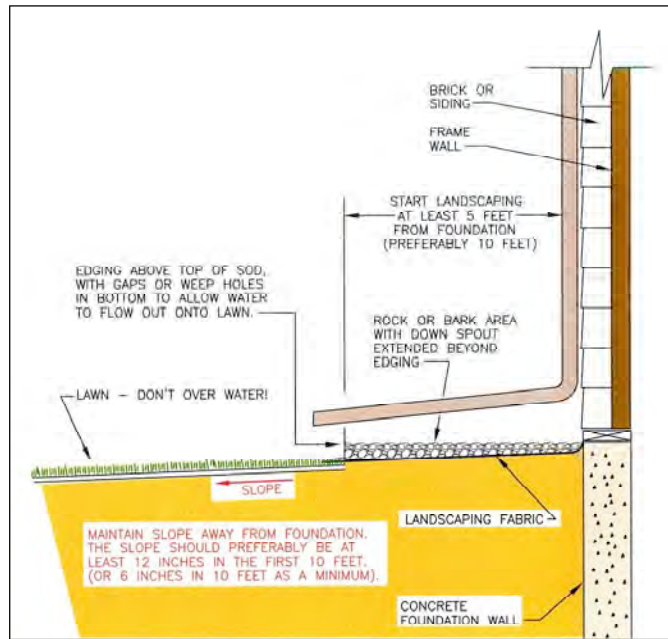
Gutters and downspouts should be kept free of leaves and other debris for optimal function. Gutter downspouts should discharge water at least five feet from the foundation and past any landscape edging. Do not remove these extensions since they provide a path for the roof water to flow away from the backfill soils and foundation.

Landscaping

It is important to maintain the grading established for drainage around your home, as illustrated. The ground around a home should preferably slope away from the house at least twelve inches in the first ten feet (or six inches in the first ten feet at a minimum), or as specified in a soil analysis report.

No landscaping that requires irrigation should be located within five feet of your foundation walls.

Trees, fencing, landscape edging, walls, sidewalks or other obstacles should not block swales, the drainage



pathways that move water away from the home.

Water should not pond within 10 feet of a home. When building a new home, it is best to install landscaping as soon as possible, so that drainage pathways and grading are not destroyed due to erosion.

The use of drought-tolerant landscaping is recommended both to reduce the introduction of water around your home's foundation as well as to conserve water.

A good source for appropriate plant selections can be found on the Internet at www.denverwater.org.

Basement Finishing

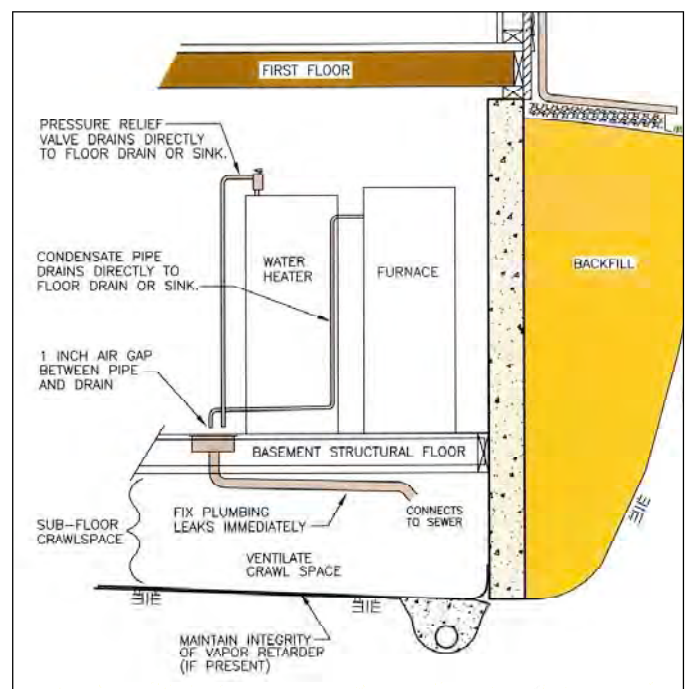
Many homeowners and builders elect to finish the basement space. It is not possible to eliminate the risk that problems associated with moisture and soils will develop, so, if you choose to finish your basement, you must accept these risks. It can take many years for moisture conditions in and around a home to stabilize. Waiting at least three years after your home is built before finishing your basement can reduce damage due to slab-on-grade concrete basement floor movement. However there is no guarantee that movement will not occur in the future.

If you have a slab-on-grade concrete floor, and the slab heaves due to moisture in the soil, damaged walls can be avoided if you allow a gap (slip joint) above the slab or at the ceiling line. Pipes that penetrate the floor should be isolated from the concrete

and provided with flexible bellows to allow for independent movement of the slab without hitting the pipes. If you have a structurally-supported wood floor, plumbing below the floor should be hung from the floor, with a clearance of at least four inches between the pipe(s) and the soil underneath, so that the pipe(s) do not get damaged if the soil heaves due to moisture.

Waterproof vapor barriers installed on vertical surfaces above the basement floor, such as exterior walls and concrete foundations, should be placed on the exterior of a structure in order to protect against outside moisture. To

alleviate trapped moisture problems, some portion of concrete walls needs to be uncovered to allow them to dry toward the inside of a home.



Perimeter Drains and Sump Pumps

If your house has a basement and was built in the last 20 years, a “perimeter drain” may have been installed around the periphery of your home, either on the inside or outside of the foundation walls.

This system helps collect water and move it away from your foundation. Sometimes the perimeter drain empties into a sump pit below the basement floor, where it must be pumped out. The discharge of the pump must terminate above ground at least five feet from the foundation.

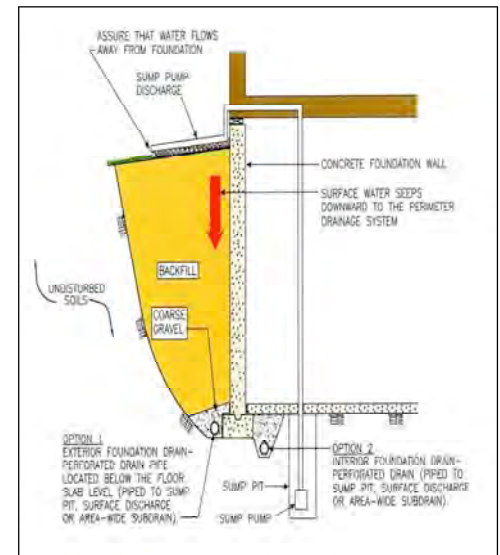
Sometimes the perimeter drain empties (by gravity) to a subdivision-wide collection pipe located below the street. In this case, the sump should be checked periodically to see if water is backing up and filling the sump. If this is the case, a pump must be installed.

The perimeter drain cannot overcome excess water problems due to poor roof drainage, irrigation too close to the foundation or poor landscape

grading. It can keep large amounts of water from collecting outside the foundation walls, and keep water out of the basement or basement crawl space.

If you have a basement crawl space below the basement floor, especially with a structural wood floor, you should routinely look under the floor through the access panel to check if water has collected under the floor area. If standing water exists under the floor, you should check to see that your sump pump is operating correctly and pump out any standing water. You should also identify the source of the water and correct the problem. You may need the help of a professional to do this.

If you have a sump pit and pump, it is very important to check them regularly. It is normal for some water to remain in the pit, but the water level should never be above the foundation drain inlet pipes of the sump pit. If water rises above inlet pipes and there is no pump present,



you should install one. Otherwise, it is possible the water in the pit will rise and flood your crawl space or basement. Remove debris or sediment at the bottom of the pit using a wet shop vacuum so that the inlet pipe does not become clogged. Periodically pour water into the sump pit to check the operation of the pump's float control. If the float control is broken, the pump will not turn on when the water level rises, which could lead to flooding of your basement or crawl space.

Heating, Cooling and Other Equipment

Proper maintenance of your furnace or boiler, water heater, evaporative cooler (swamp cooler), humidifiers and other equipment can help control moisture and mold in your home and save you money. Always use ventilation fans in the bathroom when bathing and in the kitchen when cooking. Check for leaks inside bathroom and kitchen cabinets that originate from sinks, pipes or hoses.

Clothes dryers should always vent outside, not into an attic or crawl

space. Maintain the air duct at a dryer vent. If it is a flexible duct, do not kink it, and always keep the dryer vent clean. Evaporative coolers and humidifiers add considerable moisture to the home's air and can cause hidden moisture damage. An evaporative cooler should only be operated with the windows open to allow excess moisture to escape as well as to reduce pressure imbalances in the home. Moisture build-up on the inside of double pane windows is not normal, and is a sign of over-

humidification. Humidifiers are not recommended, but if installed, they should never be set above 25% relative humidity.

Water heaters and air conditioners have relief pipes that must drain into a sink or floor drain. All gas-burning appliances generate moisture as a byproduct of the combustion process and should be professionally vented to the outside. Un-vented appliances (such as some fireplace inserts) should not be installed in a home.

Crawl Spaces

Standing water or excess humidity in a crawl space can be a major cause of moisture, promoting mold growth in your home. You should periodically inspect your crawl space for plumbing leaks, integrity of the vapor barrier (plastic sheeting on top of the soil), condensation, standing water, proper operation of mechanical equipment and “musty” odors. Seek professional assistance immediately if wet surfaces or mold are discovered.



A ground cover (10 mil plastic sheeting or equivalent puncture- and moisture-resistant material) can help control a moisture problem in your crawl space. It is best for the ground cover (also called “vapor retarder”) to be completely sealed to the

foundation wall and around pipes, etc. but, even if it is not sealed, the cover will help to limit evaporation of soil moisture into the crawl space.

Due to normal condensation of moisture in the soil, mold may grow below this plastic sheeting. If the integrity of the sheeting is not maintained, mold can be introduced into the occupied spaces of a home, because some of the air in the home is pulled from the lower levels of a home to the higher floors.

Consequently, it is very important to seal any holes in the plastic or re-attach the plastic to the walls if it becomes dislodged. Do not use the crawl space for storage, as this can damage the ground cover.

A sealed ground cover is recommended for new homes with moisture problems in the crawl space. However, if you do not have a moisture problem in the crawl space of an older home, the addition of a ground cover may not be needed.

It is very important to control humidity in the crawl spaces. Basement crawl spaces will usually be furnished with either ventilation fan(s) or passive air vents in the exterior foundation walls.



Some crawl spaces have humidity and temperature sensors that turn ventilation fans on and off. Do not set the humidity sensor above 40% relative humidity (RH) or the thermostat below 40°F.

Ventilation fans should be inspected periodically and replaced immediately if they fail. Never cover a vent or duct that is used to ventilate a crawl space.

For a better quality of life



HOME BUILDERS
ASSOCIATION
of
METRO DENVER



Tri-County
Health Department

Serving the Residents of Adams, Arapahoe and Douglas Counties
Main office: 303-220-9200 • www.tchd.org

Acknowledgements: Tri-County Health Department would like to thank the following individuals and entities for their participation on the Moisture Management Task Force, whose collaboration provided the information for this brochure: A. G. Wassenaar, Inc.; Bob Barrett, Consulting Engineer; Beazer Homes; Building Science Corporation; City of Boulder; City of Cherry Hills; CTL | Thompson, Inc.; Engle Homes; E-Star Colorado; Edward L. Fronapfel, M.S., P.E., Professional Investigative Engineers; Home Builders Association of Metro Denver; Justin Jones; Lennar Family of Builders, LLC; and Tom Thompson, CBO, City and County of Broomfield. We would also like to thank the Colorado Department of Public Health and the Environment's Community Based Clean Air Grants Program for providing the funding for this brochure, and CTL | Thompson, Inc. for the schematic drawings. ©2005 Tri-County Health Department Tri-County services are provided without regard to race, color, gender, sexual orientation, age, religion, national origin or disability. Brochure Number S-323. Printed on recycled paper.