Getting Rid of Surface Water

by Gordon Tully

Once you have dealt with groundwater and water flowing onto a site from elsewhere (see *Building With Style*, 12/95), you must tend to water originating on-site: rainwater and piped-in water.

Why We Have a Problem

Drainage problems are created by the act of building. The major impact of building is reduced absorption — my shorthand for the combination of absorption and evaporation. Buildings, paving, and lawn absorb much less moisture than naturally vegetated land.

In addition, we often wish to correct the natural drainage to eliminate soggy places or to divert water from areas we want to use or build on. Step one is to deal with water coming off the roof.

To Gutter or Not to Gutter

Gutters are a positive way to prevent water from accumulating at the foundations of a building (see Figure 1). When they work, they work well. When they become clogged with leaves or ice, or when it rains so hard they are overshot, they don't work.

Gutters are never dead level. Hence, when leaders clog up (which they often do), water overflows at the low points of the gutter and runs off in concentrated streams, rotting sills and porch columns and causing foundations to crack and settle.

These considerations cause many, including myself, to avoid gutters. The no-gutters strategy has its downside, namely splashback. There is no foolproof way to prevent water from splashing back on the house wall when water runs off the eaves, although a trench at the drip line filled with round stones helps a lot. There's a thin metal gizmo available that's designed to break roof runoff into fine droplets, but it doesn't meet my standards of durability and appearance.

To protect the sidewalls of houses without gutters, I always extend the eaves. This is a serious design issue, since short overhangs are a key feature of many house styles. But when appropriate, the longer eaves offer functional advantages: They make it possible to leave casement windows open in the rain, and they help control direct sunlight.

Get Water Away from the House

Whether the design calls for gutters or not, step two is to direct the water away from the house. Bill Rose, of the Small Homes Council at the University of Illinois, is a well-informed gutter enthusiast who recommends the "ground roof" concept. This sterling idea utilizes an impervious underground clay "umbrella" that surrounds the house and directs the water away from the foundation (Figure 2, next page).

In dense clay soils, a basement hole acts like a swimming pool. Water flowing on the surface of the clay falls into the hole (which is usually backfilled with well-drained material), where its only escape is through the utility trenches. The problem is made much worse if rainwater leaders also empty into the basement hole.

I once owned a house with this condition, and during heavy rains fountains of water would spurt through the stone foundation, flooding the basement. I completely cured the problem by running the leaders to a drywell, sloping the surface grade away from the house, and adding a "ground roof" (made of plastic instead of clay) from the house to the outer edge of the basement excavation.

Backup Measures

By this time, if you have done everything right, you will have a dry basement simply because there is no way for water to get in. However, every system fails now and then, so it pays to protect the basement. Waterproofing on the sidewalls is gross overkill. Although it is more impervious than dampproofing, there is every reason to doubt whether you need dampproofing in the first place.

A better strategy is to install a drainage layer like gravel, sand, or one of the "drainage systems" like Enkadrain (Akzo Industrial Systems, P.O. Box 7249, Asheville, NC 28802; 704/665-5050) next to the foundation. The drainage layer breaks up the capillary force between soil particles and

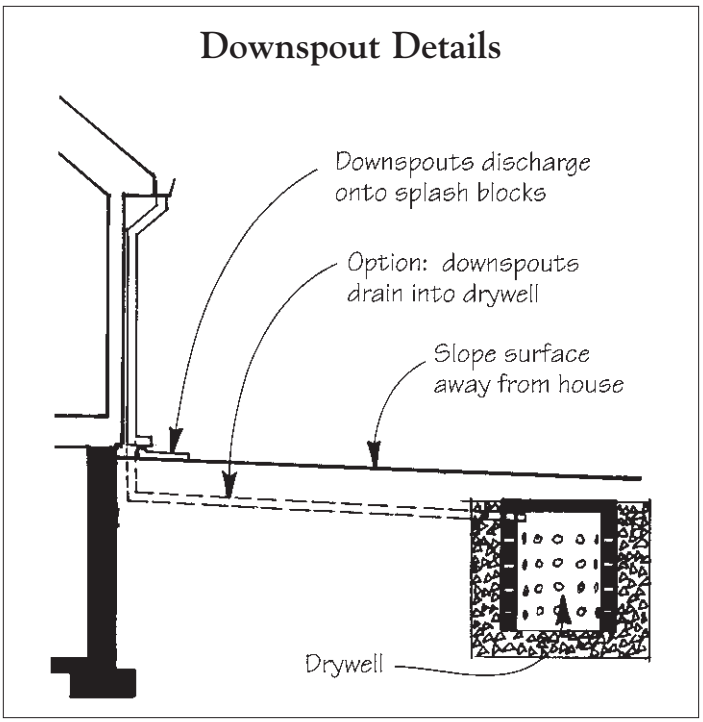

Figure 1. *Where gutters are used, be sure to include splash blocks below the downspouts, or tie the leaders to a dry well with underground piping. Never tie your gutters into the foundation drain system.*

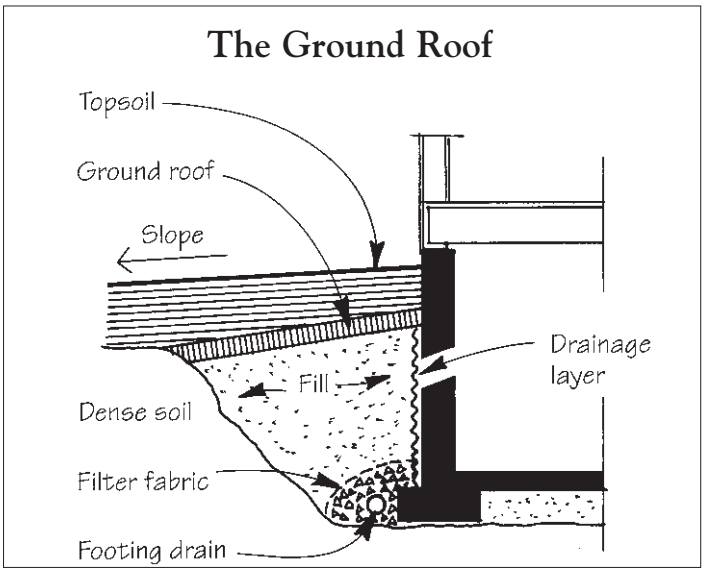

Figure 2. *A ground roof is a sloping "canopy" of impervious clay or plastic sheeting that covers the foundation excavation and drainage system — especially useful for heavy soils where otherwise water would pond against the foundation.*

allows any water in the soil to drop down to the base of the wall. It is prudent to install a perforated footing drain (accessible for cleaning) leading to a drywell or outfall; the flow will be very small.

Disposing of Excess Water

The key problem in coping with excess surface water is to figure out where to put it. In most cases, the goal is to get the water back into the ground, in effect restoring the status quo. If you can't get rid of some or all of the water, the excess must be piped off-site, spilled onto an adjacent site, or spilled into a public way — all of which may run into regulatory constraints. As the lot sizes shrink, on-site disposal becomes less and less possible, until in dense cities, where there is virtually no absorptive surface left, every building is connected directly to a storm sewer.

Putting the Water Back Into the Soil

Drywells, leaching fields, surface outfalls, and unused capacity elsewhere on the site can all be used to put water back into the ground.

Drywells and leaching fields are designed to increase the absorptive capacity of the site by increasing the contact area of the soil. These structures can be built almost anywhere and in any shape, as long as they aren't flooded by groundwater and don't themselves flood the building.

Usually on-site water can be dealt with by gravity, but occasionally you will need to pump water uphill to an absorptive structure.

Surface disposal is cheaper. It is much cheaper to dump the water onto the surface, so where possible, designers try to use the spare capacity of unbuilt surfaces to take the excess runoff. If the soil is highly absorptive, this can be straightforward: Just redirect the water away from the building in such a way as to minimize erosion.

Ponds. If spare absorptive capacity is inadequate, one can take advantage of the periodic nature of precipitation by storing water from downpours in ponds, allowing it to filter back into the soil slowly during intervening dry weather.

The Problem of Assigning Risk

In sizing disposal sites or detention ponds, we encounter the same problem that confounded us last month in our discussion of groundwater: Who decides how much risk to take (builder or owner), and what happens when the system fails? Whether the standard calculations used by civil engineers to size disposal sites are adequate depends on who is taking the risk.

At the very least, developers of marginal properties should inform buyers that the engineering calculations are designed to cope only with an assumed 25-, 50-, or 100-year storm, and that sooner or later the site will be overwhelmed by one bigger than that. Truth in advertising will keep you out of trouble. ■

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