



Stormwater Management

Drainage Issues Affecting Construction

July 2009

Residential Drainage

In most cases, the best solution for addressing excess surface water is to align stormwater flow along a common boundary or property line, whenever possible, in a manner so that it is centered on the property line.

Slope

In all cases, building floor levels must be carefully set so there is adequate slope away from the building in all directions, particularly when a floor opens to a lower grade.

Subdivision Drainage Plans

Many approved subdivisions have a stormwater drainage plan on file with the Larimer County Engineering Department. These drainage plans contain details as to the appropriate horizontal and vertical placement of structures, driveways, culvert sizes and overall site grading (where applicable).

Property Owner Responsibility

It is the responsibility of the property owner and builder to ensure that stormwater drainage on individual subdivision lots is consistent with the approved subdivision drainage plan.

Certification of drainage and grading by a licensed professional engineer may be required before a Certificate of Occupancy can be issued.

Certification of Elevation

Some subdivisions require an elevation certificate by a licensed professional engineer before a Certificate of Occupancy can be issued.

The Larimer County Building Department recommends you obtain the elevation certificate prior to requesting a framing inspection.

Larimer County Building Department
970-498-7700 web page: www.larimer.org/building

Colorado Common Law

Under Colorado common law, upstream property owners are prohibited from directing stormwater onto downstream neighboring properties in a quantity or manner as to cause harm.

Landowners are considered to be equal under common law, whether private citizens, companies, road authorities, municipalities, state or federal governments.

Directing water onto a neighboring property in a manner different from the historic may be determined by a court to be a trespass. It is recommended that landowners consult a qualified engineer before re-directing the flow of water.

Neighbor Disputes

In the event of a dispute over stormwater, neighbors are encouraged to reach some common ground without going to court. Colorado courts have the ultimate authority in stormwater drainage disputes; however, court rulings may not make either side happy.

Stormwater Construction Permit

Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division
web page: www.cdphe.state.co.us/wq/permitsunit

You must obtain permit coverage (or an R-Factor waiver) to discharge stormwater from any construction activity that disturbs at least 1 acre of land (or is part of a larger common plan of development that will disturb at least 1 acre).

The owner or operator must apply for coverage under the Stormwater Construction Permit at least 10 days prior to the start of construction activities. The application is available from the Colorado Department of Public Health web page. www.cdphe.state.co.us/wq/permitsunit

Drainage Tips – Excerpt from USDA *Natural Resources Conservation Fact Sheet*

Gutters and Downspouts to Direct Roof Runoff

Be sure that your roof is properly fitted with gutters and downspouts that will release water onto a surface such as a paved driveway. Or you can connect downspouts firmly to solid plastic pipe that will carry water down slope away from your structures to a place where it will be released safely such as a paved roadside or storm drain ditch. Because twigs, pine needles and leaves can clog gutters and downspouts, clear gutters regularly and inspect them to ensure your roof runoff system is working properly.

Curbs and Berms Protect Sensitive Slopes

An asphalt or compacted-earth berm (a sandbag berm may be used as a temporary measure) on the outside edge of a driveway or building pad can direct runoff away from sensitive slopes to an area where it can be released safely. Recommended height of the berm is a minimum 12-18 inches. A pipe drop may be used to carry runoff down slope to a place where it can be released safely, such as a paved roadside ditch.

Lined Ditches Handle Road & Driveway Runoff

Roads and driveways can be graded toward a lined ditch or street gutter designated to handle water sheet flowing from paved surfaces and uphill slopes. At specific intervals along the main road, water is transported under the road through a culvert and released safely onto a non-erodible surface. An energy dissipater, such as a rock-lined outlet, can serve this purpose where slope is minimal. Roads and driveways generally require a number of drainage measures.

Grading Your Property

Correct grading of your land helps prevent water from pooling around foundations, flooding basements and adding unwanted weight to slopes.

In general, grade surfaces around a home so runoff flows away from foundations at a minimum grade of six (6) inches within the first ten (10) feet. Where lot lines, walls, slopes and other physical barriers prohibit six (6) inches within ten (10) feet, drains and swales must be provided to ensure drainage away from the structure.



Drainage for Retaining Walls

Good drainage must be provided for retaining walls. Weep holes and perforated pipe with a gravel backfill behind the wall work well. Small openings between boards of redwood retaining walls are also used for this purpose.

Diversions Ditches

A diversion ditch may be needed to handle surface runoff flowing onto your property from upslope. For slopes steeper than 5%, where large amounts of water are expected, the ditch channel should be lined with erosion-resistant concrete or lined with filter fabric and hand-placed rock. Water should be directed to a safe, non-erodible outlet - never onto the slope itself. Always consult a qualified engineer to design water diversion measures.

Never direct water onto adjoining property without consulting the property owner.

Maintenance

Regular maintenance of drainage systems will keep your drainage problems to a minimum.

- One of the best measures you can take is to watch runoff patterns on your property during a rain.
- Check gutters, downspouts and pipes during and after storms and remove debris that might cause clogging.
- Regularly inspect, clean, and repair berms and ditches as necessary.
- Check for and repair any damage caused by burrowing animals.
- Seed and mulch or otherwise vegetate all bare areas, especially on slopes.
- Regular maintenance saves time and money.

Safety Measures, Utility Locate

Do not start any work until the location of both above-ground and underground utilities lines have been determined.

Information on the location of underground utility lines can be obtained by calling the Utility Notification Center of Colorado (UNCC) 1-800-922- 1987

Do not release runoff onto septic leach fields, slopes or at the base of foundations.

International Residential Building Code

R403.1.3 Drainage

Surface drainage shall be diverted to a storm sewer conveyance or other approved point of collection so as to not create a hazard. Lots shall be graded so as to drain surface water away from foundation walls. The grade away from foundation walls shall fall a minimum of 6 inches within the first 10 feet.

Exception: Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, drains or swales shall be provided to ensure drainage away from the structure.

R403.1.5 Slope

The top surface of footings shall be level. The bottom surface of footings shall not have a slope exceeding one unit vertical in 10 units horizontal (10-percent slope). Footings shall be stepped where it is necessary to change the elevation of the top surface of the footings or where the slope of the bottom surface of the footings will exceed one unit vertical in ten units horizontal (10-percent slope).

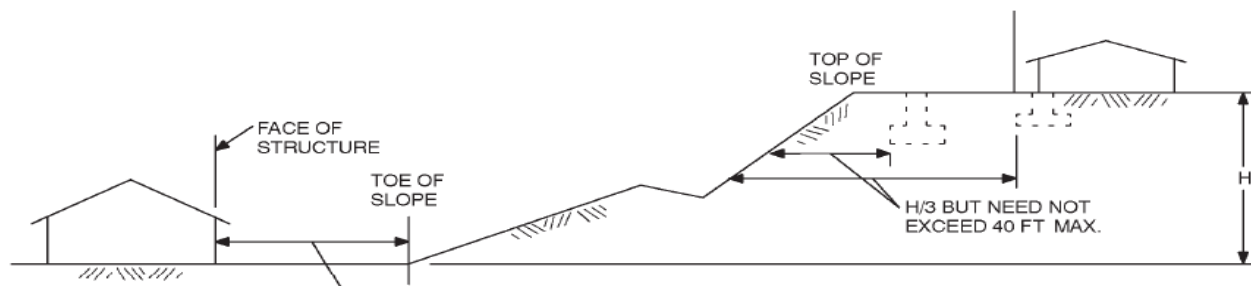
R403.1.7 Footings on or adjacent to Slopes

The placement of buildings and structures on or adjacent to slopes steeper than 1 unit vertical in 3 units horizontal (33.3-percent slope) shall conform to Sections R403.1.7.1 through R403.1.7.4.

R403.1.7.1

Building clearances from ascending slopes

In general, buildings below slopes shall be set a sufficient distance from the slope to provide protection from slope drainage, erosion and shallow failures. Except as provided in Section R403.1.7.4 and *Figure R403.1.7.1*, the following criteria will be assumed to provide this protection. Where the existing slope is steeper than one unit vertical in one unit horizontal (100-percent slope), the toe of the slope shall be assumed to be at the intersection of a horizontal plane drawn from the top of the foundation and a plane drawn tangent to the slope at an angle of 45 degrees (0.79 rad) to the horizontal. Where a retaining wall is constructed at the toe of the slope, the height of the slope shall be measured from the top of the wall to the top of the slope.



For SI: 1 foot = 304.8

Figure R403.1.7.1
Foundation Clearance From Slopes

R403.1.7.2

Footings Setback from descending slopes

Footings on or adjacent to slope surfaces shall be founded in material with an embedment and setback from the slope surface sufficient to provide vertical and lateral support for the footing without detrimental settlement.

Where the slope is steeper than one unit vertical in one unit horizontal (100-percent slope), the required setback shall be measured from an imaginary plane 45 degrees (0.79 rad) to the horizontal, projected upward from the toe of the slope.

R403.1.7.3 Foundation elevation

On graded sites, the top of any exterior foundation shall extend above the elevation of the street gutter at point of discharge or the inlet of an approved drainage device a minimum of 12 inches (305 mm) plus 2 percent. Alternate elevations are permitted subject to the approval of the building official, provided it can be demonstrated that required drainage to the point of discharge and away from the structure is provided at all locations on the site.

R403.1.7.4 Alternate setback and clearances

Alternate setbacks and clearances are permitted, subject to the approval of the building official. The building official is permitted to require an investigation and recommendation of a qualified engineer to demonstrate that the intent of this section has been satisfied. Such an investigation shall include consideration of material, height of slope, slope gradient, load intensity and erosion characteristics of slope material.