



# City of San Clemente Engineering Division

## GUIDELINES FOR PROTECTING HILLSIDE HOMES

October 06, 2008

Many homes in the City of San Clemente are constructed on hillsides and coastal bluffs. The geology of these hillsides causes many to be susceptible to various forms of earth movement, including landslides, erosion, lateral fill extension and slope creep. Slope movement can cause serious damage to homes and, in the most extreme cases, even threaten the safety of residents.

Water causes most slope stability problems. When water saturates the soil, it makes the soil heavier and reduces the hillside's ability to withstand the force of gravity. Therefore, as the winter rains approach, it is particularly important that all homeowners consider what steps they can take to protect their property from slope movement. Some homeowners may fear that if they cannot afford to hire a geologist or engineer they are helpless to protect their property. This is not the case.

The attached guidelines contain many simple and inexpensive steps homeowners can take to minimize the risk of slope movement. The City recommends that the guidelines be reviewed carefully and take the appropriate steps for protecting your property.

These guidelines are general suggestions for hillside homeowners; however, a more site specific approach is highly recommended. Consulting with a Geologist, Geotechnical Engineer, and/or Civil Engineer is the best approach before engaging in extensive repair, maintenance or remodel work that impacts drainage and grading for the property. These professionals are experts in matters relating to slopes and design work and best to recommend the correct approach to undertake.

- **Pad and Slope Drainage**

- 1) Care should be taken that slopes, terraces, berms (ridges at the top of slopes) and drainage swales are not disturbed. Surface drainage should be conveyed from roof gutters/downspouts and the rear yard, through the side-yard, to the street. All water should drain away from slopes and house foundations.
- 2) Inspect your property after a rainstorm or irrigating exterior landscaping to identify any locations where water ponds. Install area drains in such locations that will carry water to the street. Water that is allowed to pond will seep into the soil and contribute to saturation.
- 3) Regularly inspect area drains, drainage pipes, and their outlet points to make sure they are free of debris. Consider hiring a plumber to snake out blocked drains or to inspect drainage pipes for cracks using a remote camera.
- 4) Inspect patio slabs and other flatwork to ensure that they are graded to drain away from the slopes. Flatwork should drain towards the street, or drain toward inlets that carry water to the street. Often, flatwork near a failing slope is slanted toward the slope and directs drainage water onto the slope. This can cause erosion and saturation, further destabilizing the slope. You may need to construct a concrete basin or other device to catch water draining from slanted flatwork and direct it away from the slope.

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- 5) Periodically check the exterior flatwork for major cracks. Major cracks should be patched so that flatwork continues to direct drainage water to the street, area drains, or other collection devices.
- 6) Inspect wooden decks which may also be slanted towards and drain water onto slopes or lawns. You may need to install drainage collection devices in or under the decks.
- 7) If the slope adjacent to your home was constructed with terrace drains, inspect them periodically to remove debris and repair cracks. If not, consider installing terrace drains if recommended by the Geologist or Geotechnical Engineer.
- 8) Developers often construct slopes with subdrains. Subdrains are typically perforated pipes that extend deep into the slope and outlet on the slope face. Water saturating the slope will enter the pipe and flow to the outlet point, following the path of least resistance through the pipe rather than the soil. If your slope has subdrains, keep the outlet points unobstructed and make sure water is discharged appropriately and conveyed away from the slope.
- 9) During the winter storm season, keep shovels, sandbags, and sheets of plastic on hand at all times for emergency slope and runoff protection. Prompt action during storms can keep problems from getting out of control.
- 10) Eliminate animal burrows and the animals that make them, as they can cause diversion of surface runoff, promote accelerated erosion and even bring about shallow slope failures. Contact a professional pest exterminator if you think you have a problem.
- 11) Do not toss loose soil on slopes. Loose soil soaks up water more readily than natural soil or compacted fill. It has a greater tendency to slide and may carry along the soil beneath it. It may also clog terrace drains.
- 12) Do not alter the grading of the pad without advice from an engineer or other professional. Most pads were originally graded to drain to the street. Many have ditches or berms which are critical components of their drainage design.
- 13) Avoid piecemeal or homemade approaches to slope instability repair, as improperly engineered solutions can result in the aggravation of instability problems.
- 14) Common causes of slope erosion and shallow slope failures are:
  - a. Inadequate care and/or maintenance of slopes and drainage devices.
    - Inspect slopes and drains often, especially during the winter.
    - Correct small problems before they become big ones.
  - b. Inadequate and/or improper planting.
    - Drought-tolerant landscaping is very effective in providing slope erosion control.
    - Replant bare spots as soon as possible.
    - Plants selected for slope planting should develop deep root structures, require little water and be fire retardant.
    - A list of plant materials that fulfill the above requirements is available in the City as a separate handout.

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### c. Too much irrigation or diversion of runoff over the slope.

- Over-irrigation is one of the worst things that can be done to the slope. Keep plants watered, but do not overwater and choose plant materials that are drought-tolerant.

#### • **Roof Drainage**

- 1) Install roof gutters and downspouts if structures do not have them. Downspouts should be connected to drain pipes that convey drainage water directly to the street or an approved storm drain system and not to landscape areas or slopes.
- 2) Regularly inspect gutters and downspouts to make sure they are free of debris and are still sloped to properly drain in the appropriate direction.

#### • **Irrigation/Landscaping**

- 1) **Do not leave outdoor faucets running unattended.** Common causes of superficial slope failures are hoses left running overnight with water running down slopes. The slopes can erode or fail when saturated with water.
- 2) Do not over-irrigate. Consider consulting a landscape architect or gardening professional for advice concerning appropriate watering schedules. Watch for irrigation runoff. It may indicate that the ground is already saturated.
- 3) No irrigation should occur on or near slopes known to be moving. If stopping irrigation causes the existing vegetation to die, replant the slope with drought-resistant vegetation that can survive on rainfall alone. A nursery professional or landscape architect can make specific recommendations.
- 4) Irrigation is the most critical factor in landscaping slopes. In order to promote deep root systems, water should be applied slowly several times during the day for short durations. This will increase percolation and reduce runoff. The soil should be allowed to dry completely before the irrigation cycle is begun again. This will also discourage shallow rooting. Take care not to over irrigate.
- 5) Once the landscaping has been established, irrigation may become less frequent. Some of the more drought tolerant plants may need no supplemental irrigation depending on the availability of moisture in the ground.
- 6) Irrigation systems should be designed to provide different amounts of water at the top and the bottom of slopes. More water should be applied at the top of the slope because it will dry out faster as water percolates downhill. Conversely, less water is needed at the bottom of the slope as it may become oversaturated. As previously stated, do not over-irrigate.
- 7) The surface of the slope should be roughened just prior to planting in order to create small pockets where moisture and nutrients can collect. It is especially important to roughen the surface on cut slopes where little topsoil may exist to improve growing conditions. Terracing is recommended on steeper slopes.

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- 8) Because some plants do better than others in different situations, due to variations in soils, exposure, climate or other such factors, a wide variety of materials should be planted. Diversity in planting will ensure better coverage.
  - 9) Avoid planting ice plant on slopes. Ice plant is heavy ground cover and, when saturated, can cause surface sloughing, removing layers of soil and contributing to erosion and superficial slope failure.
  - 10) On flat pad areas adjacent to slopes, consider alternative landscaping choices, such as patios with planter boxes, cactus, rocks, and decorative flatwork. It may be unrealistic to maintain a lush green lawn adjacent to an unstable slope.
  - 11) If the irrigation system uses an automatic timer, consider turning it off except during the driest months.
  - 12) Do not use soaker hoses or deep root watering devices near slopes.
  - 13) Regularly inspect and test the irrigation system for leaks. Consider turning off the water feeding pressurized irrigation pipes during the rainy season so that a pipe break will not cause a leak.
  - 14) Consider year-round water conservation measures as stated in San Clemente Municipal Code Chapter 13.12:
    - A. Prohibited Acts- It shall be unlawful for any person at any time, to do any of the following:
      1. Conducting landscape or other irrigation in such a manner as to cause water to flow into the gutter or off the property being irrigated due to broken sprinklers or excess watering.
      2. Using water in any manner which results in water flowing into the drainage system for no utilitarian purpose.
    - B. The following year-round restrictions are hereby imposed upon water users within the City:
      1. Describes odd day/even day watering.
      2. Prohibits watering between 9:00 a.m. and 5:00 p.m.
      3. Automatic sprinkler systems shall be set to water every other day or less.
- **Utilities on Private Property**
    - 1) Watch for water back up in drains and toilets. This may indicate a break or offset in a sewer pipe. Consider hiring a plumber who can inspect the sewer lateral for cracks, sags and leaks with a remote camera.
    - 2) Monitor the water usage by reviewing your water bill. A sudden spike may indicate a leak. Leaks can also be checked by turning off the water and watching to see if the water meter is still registering usage.

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- 3) Land movement can pull apart water lines, including the one running from the water meter to the house. Learn how to turn off the water to your home in case of an emergency.
  - 4) If you suspect your home is being damaged by slope movement, turn off the water and gas before going on vacation or leaving the property for an extended length of time.
  - 5) Consider keeping notes of your observations so you can report what you have seen more accurately.
- **Swimming Pools and Similar Water-Bearing Improvements**
    - 1) Conduct regular leak detection of pools, spas and associated plumbing. A pool service may be able to tell you what rate of water loss is normally attributable to evaporation, so that you can better monitor unusual water loss. Make repairs promptly.
    - 2) Inspect regularly anything that, if defective, might contribute to soil saturation, including fountains, fish ponds, water gardens, hose bibs, sump pumps, and solar heating water tubing.
  - **Monitor Movement**
    - 1) Be observant of damage potentially caused by slope movement, such as widening cracks in flatwork or walls, or doors and windows that stick. Consider measuring or marking cracks to determine if they are growing over time.
    - 2) A civil, geotechnical or structural engineer may be able to evaluate your property and determine if any damages observed are attributable to a slope movement.
    - 3) Contact your insurance agent to determine what coverage you may have for damages caused by slope movement.
    - 4) Consider making notes or photographs of your observations so that you can provide more accurate information to any expert you may hire, or as part of an insurance claim.
  - **Work Together**
    - 1) Get to know your neighbors. Determine if you are observing similar damages at your respective properties. Your neighbors may know about prior instances of slope failure in the vicinity and prior repair efforts. Such information can be helpful to any expert you may hire.
    - 2) Be observant of potential problems on neighboring properties. If your neighbors are over-irrigating, tell them. If you see water draining from their property onto the slope, tell them.
    - 3) Consider cost sharing. Neighbors may save money if they can collectively hire landscapers, geotechnical engineers, plumbers, etc.

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- 4) Reach an agreement on the location of property lines so that all neighbors know who is responsible for maintaining each area of property.
- 5) If a homeowners' association is responsible for slope maintenance, promptly report any blocked drains, broken sprinklers, or areas of erosion.
- 6) If you rent out your San Clemente property, share this information with your tenants and make sure that they are mindful of slope movement hazards.

When people buy a home, they expect that they will have to invest time and money to maintain the roof, paint, plumbing and other fixtures. Slope maintenance should be considered one more responsibility of home ownership for hillside properties. Maintenance steps are typically far less expensive than repair after neglect.

Protection of hillsides properties may require some grading work to address possible slope problems. The grading work not only requires engineering design, but also may require permits from the City. The best approach is to present the proposed work plan to City staff for permit determination before proceeding. This could avoid undertaking any unpermitted work that might impact the integrity of the property or result in issuance of a code violation.

Please contact the City's Engineering Division at (949) 361-6135 for further information.

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