



Best Practices in Slope Stabilization

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Best Practices in Slope Stabilization

Engineers and construction professionals who wish to erect roads or buildings on slopes must use tried-and-true slope stabilization techniques in order to protect the safety of structures and the individuals who use them. Thankfully, the science of slope stabilization has made significant gains in the past decade. Green building techniques and materials have contributed to the increasing success of slope stabilization efforts.

Before beginning a construction project on a slope, it is necessary to gather comprehensive data about the land's soil makeup and previous slide history. If possible, land developers and engineers should choose to build on sites that are free of significant soil stability issues. Of course, choosing such sites is not always practical, especially for contractors who build roads.

Review the following tips and techniques to learn about the latest practices in slope stabilization. These best practices are designed to enhance the structural integrity of buildings and roads. They are also effective in protecting the inhabitants of homes that are built on at-risk slopes. Remember to thoroughly examine land surveys prior to designing a slope stabilization scheme.

The Purpose of Slope Stabilization

When a structure or road is built on a sloped surface, that slope is *disturbed*. If a disturbed slope is not properly reinforced, structures may slide away over time or may succumb to landslides during heavy rains. The slow shifting of slopes over time can cause a myriad of problems with underground utilities lines and can undermine the general stability of any structure.

Slope stabilization techniques are designed to help restore integrity to a disturbed slope. They are at the heart of structural integrity and protection. As green building practices have developed, slope stabilization techniques have been modified in order to offer promising results. Remember to have soil analysis conducted and to evaluate weather patterns in your area before choosing a slope stabilization technique.



Advantages and Disadvantages of Slope Stabilization

There are many advantages to slope stabilization. In addition to protecting structures, slope stabilization also:

- Absorbs rain.
- Reduces speed of surface water runoff.
- Prevents erosion.
- Offers overall soil stability.

A handful of individuals object to some slope stabilization processes, charging that they are either unattractive or not environmentally friendly. The major disadvantage of rock slope techniques is that such slopes are generally viewed as an eyesore. In some areas, the lack of readily available natural materials for use in slope stabilization may be viewed as a disadvantage. In general, alternative materials can be found in such circumstances.

Slope Stabilization Materials and Techniques

Slope stabilization can be achieved by employing a handful of techniques and materials. While the general techniques used for slope stabilization haven't changed substantially over the past century, they have been refined in order to offer the highest degree of stability possible.

When looking for green building options, pay close attention to the materials to be used in a slope stabilization project. Are materials renewable? Will non-renewable materials pose a significant advantage in terms of water filtration and erosion control? What materials are widely available in the geographic area of the project? If possible, buy rock and mulch that do not have to be shipped long-distance. This is both eco-friendly and cost-effective.

Rock Slopes

Rock slopes, also known as *rock riprap*, have been used nationwide as part of slope stabilization efforts. When using rock for slope stabilization, a loose layer of material can be spread over an unstable surface *or* rock can be built into a structure that looks like a retaining wall. In many areas, residents feel that rock slopes are unattractive and have been overused.

Before installing a rock slope, eliminate all other viable options. Rock slopes should generally be used only where vegetation growth is impossible. While rock slopes require little maintenance, they may be hazardous when installed in residential areas and areas prone to earthquakes or tremors. If a rock slope must be used in such an area, it should be installed *above* a retaining wall.

Use the following points as a guide when installing rock slopes as a stabilization feature.

- Rock slopes should not be used over long expanses of space.
- Choose rocks that are difficult to displace and cannot be moved by heavy rains.
- When possible, choose rocks that fit aesthetically with the surrounding environment.
- Do not use netting or mats underneath rock slopes unless absolutely necessary as these can compromise long-term stability.

Slope Terracing, Toughening and Rounding

Terracing, toughening and rounding are some of the oldest slope stabilization techniques in the worlds. Terraces or steps were used by pre-historic farmers to protect the stability of their land and to encourage the growth of vegetation. Today's slope terracing and toughening techniques are a modern take on these classic slope stabilization measures.

Terracing, toughening and rounding are most effective when combined with re-vegetation efforts. Developers should strive to cut terraces that fit into the natural landscape and that provide an excellent canvas for plantings. Remember to choose native plants with sturdy roots for the best results.

Use the following points as a guide when performing terracing, toughening and rounding for slope stabilization.

- Follow natural lines when possible to ensure that terraces do not become an eyesore.
- Remove all displaced soil from the area immediately to prevent slides.
- Leave the shelves of slopes somewhat uneven so that plants have better chances of growth.
- Avoid using such techniques in areas with granitic soils as they will fail to provide a sufficient level of stabilization.

Mulches

Mulches are generally used for erosion control in areas that receive heavy rains. Mulches are intended to filter rain so that it does not immediately erode or degrade the underlying soil. Green builders often prefer using mulches as they can be sourced locally and are often composed of recycled materials.

Many individuals in residential areas also favor mulches because they are attractive. However, mulches must be frequently tilled and replaced in order to be effective. They are not generally suited to long-term use, especially in the vicinity of highways. Mulches have been shown to be effective in re-vegetation efforts when combined with either erosion control blankets or gentle terracing.

Use the following points as a guide when using mulches as part of a slope stabilization effort.

- Choose mulches that are approved by an environmental agency in your area to ensure that you are not introducing non-native plants or diseases.
- Use composted materials such as pine needles when possible as they will encourage the growth of new vegetation.
- Avoid using green wood chips, which can inhibit re-vegetation.
- Do not use mulch for stabilization on steep slopes

Timber Walls

Timber walls and other retaining walls are constructed at the bottom of a slope and are designed to prevent mass movement of materials down a slope. They can also be used to stop rainwater runoff from moving into residential areas or onto a major roadway. Timber walls are only considered environmentally friendly if they can be built from repurposed wood or from woods that will be replenished quickly.

Timber walls are generally a good solution for sparsely inhabited residential areas and recreational areas such as parks and nature preserves. In order to be effective, they should be used in concert with other slope stabilization techniques.

The portion of the slope that is located above a timber wall should be properly stabilized with erosion mats, terracing, rock or mulch.

Use the following points as a guide when installing timber walls.

- In general, you must consult with engineers to ensure that a retaining or timber wall is designed properly.
- Use timber and other materials found in the local area.
- Perform regular inspections to ensure that timber walls have maintained their integrity.

Erosion Control Blankets and Mats

Erosion control blankets and mats have been used in slope stabilization efforts for several decades. These natural materials and geotextiles are generally used as a complement to other slope stabilization techniques but are not used as a stand-alone solution.

Such blankets can be used in concert with re-vegetation efforts. They are designed to lessen the negative effects of rainfall on disturbed slopes. Such materials are generally seen on slopes that have already been graded or terraced.

Use the following points as a guide when installing erosion control blankets and mats.

- Seed the area prior to installing blankets and mats.
 - Be sure to bury mat ends in trenches that are at least five inches deep and eight inches wide.
 - Roll mats and blankets out from the top of the slope downward.
 - The erosion control blanket should be extended beyond the end of the slope and should be secured in place with heavy-duty staples.
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A Final Note on Slope Stabilization

Slope stabilization can add value to any construction project. Though proper slope stabilization may be expensive, it can save structures from damage and improve the overall stability of soil in a construction area. Be sure to include comprehensive slope stabilization measures when undertaking any building project. If possible, use natural materials that are readily available in your area to ensure that your slope stabilization project is eco-friendly.

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