

6.02



LAND GRADING

Definition Reshaping the ground surface to planned grades as determined by engineering survey evaluation and layout.

Purpose To provide more suitable topography for buildings, facilities, and other land uses, to control surface runoff, and to minimize soil erosion and sedimentation both during and after construction.

Conditions Where Practice Applies This practice is applicable where grading to a planned elevation is necessary and practical for the proposed development of a site, and for proper operation of sedimentation control practices.

Planning Considerations Fitting a proposed development to the natural configurations of an existing landscape reduces the erosion potential of the site and the cost of installing erosion and sedimentation control measures. It may also result in a more desirable and less costly development.

Before grading begins, decisions must be made on the steepness of cut-and-fill slopes, how they will be protected from runoff, how they will be stabilized, and how they will be maintained. The grading plan establishes drainage areas, directs drainage patterns, and affects runoff velocities.

The grading plan forms the basis of the erosion and sedimentation control plan. Key considerations that affect erosion and sedimentation include deciding which slopes are to be graded, when the work will start and stop, the degree and length of finished slopes, where and how excess material will be wasted, and where borrow is needed.

Leaving undisturbed temporary and permanent buffer zones in the grading operation may provide an effective and low-cost erosion control measure that will help reduce runoff velocity and volume and off-site sedimentation. In developing the grading plan, always consider how to take advantage of undisturbed water disposal outlets before storm drains or other constructed outlets are installed.

Design Criteria Base the grading plan and installation upon adequate surveys and soil investigations. In the plan, show disturbed areas, cuts, fills, and finished elevations of the surface to be graded. Include in the plan all practices necessary for controlling erosion on the graded site and minimizing sedimentation downstream. Such practices may include, but are not limited to, sediment basins, diversions, mulching, vegetation, vegetated and lined waterways, grade stabilization structures, and surface and subsurface drains. The practices may be temporary or permanent, depending upon the need after construction is completed.

In the grading plan consider the following as a minimum:

Make a provision to intercept and conduct all surface runoff to storm drains, protected outlets, or to stable watercourses to minimize erosion on newly graded slopes.

Use slope breaks, such as diversions or benches, as appropriate, to reduce the length of cut-and-fill slope to limit sheet and rill erosion and prevent gullying. A spacing guide is shown in Table 6.02a.

**Table 6.02a
Spacing Guide for Slope
Breaks**

	Slope	Spacing (ft)
Steep Slopes	2:1	20
	3:1	35
	4:1	45
Long Slopes	15-25%	50
	10-15%	80
	6-10%	125
	3-6%	200
	<3%	300

Stabilize all graded areas with vegetation, crushed stone, riprap, or other ground cover as soon as grading is completed, or when work is interrupted for 30 working days or more. Use mulch to stabilize areas temporarily where final grading must be delayed. The finished cut-and-fill slopes, which are to be vegetated with grass and legumes, should not be steeper than 2:1. Slopes to be maintained by tractor or other equipment should not be steeper than 3:1. Slopes in excess of 2:1 may warrant vines, special vegetation, or retaining walls. Roughen the surface of all slopes during the construction operation to retain water, increase filtration, and facilitate vegetation. (Practice 6.03, *Surface Roughening*.)

Do not place cuts or fill so close to property lines as to endanger adjoining property without adequately protecting such properties from erosion, sedimentation, slippage, subsidence, or other damages.

Provide subsurface drainage to intercept seepage in areas with high water tables that would affect slope stability, bearing strength, or create undesirable wetness.

Do not place fill adjacent to a channel bank where it can create bank failure or result in deposition of sediment downstream.

Show all borrow and disposal areas in the grading plan, and ensure they are adequately drained and stabilized.

Provide stable channels and floodways to convey all runoff from the developed area to an adequate outlet without causing increased erosion or off-site sedimentation.

Construction Specifications

1. Construct and maintain all erosion and sedimentation control practices and measures in accordance with the approved sedimentation control plan and construction schedule.
2. Remove good topsoil from areas to be graded and filled, and preserve it for use in finishing the grading of all critical areas.
3. Scarify areas to be topsoiled to a minimum depth of 2 inches before placing topsoil (Practice 6.04, *Topsoiling*).
4. Clear and grub areas to be filled by removing trees, vegetation, roots, or other objectionable material that would affect the planned stability of the fill.
5. Ensure that fill material is free of brush, rubbish, rocks, logs, stumps, building debris, and other materials inappropriate for constructing stable fills.
6. Place all fill in layers not to exceed 9 inches in thickness, and compact the layers as required to reduce erosion, slippage, settlement, or other related problems.
7. Do not incorporate frozen, soft, mucky, or highly compressible materials into fill slopes.
8. Do not place fill on a frozen foundation, due to possible subsidence and slippage.
9. Keep diversions and other water conveyance measures free of sediment during all phases of development.
10. Handle seeps or springs encountered during construction in accordance with approved methods (Practice 6.81, *Subsurface Drain*).
11. Permanently stabilize all graded areas immediately after final grading is completed on each area in the grading plan. Apply temporary stabilization measures on all graded areas when work is to be interrupted or delayed for 30 working days or longer.
12. Show topsoil stockpiles, borrow areas, and spoil areas on the plans, and make sure they are adequately protected from erosion. Include final stabilization of these areas in the plan.

Maintenance

Periodically, check all graded areas and the supporting erosion and sedimentation control practices, especially after heavy rainfalls. Promptly remove all sediment from diversions and other water-disposal practices. If washouts or breaks occur, repair them immediately. Prompt maintenance of small eroded areas before they become significant gullies is an essential part of an effective erosion and sedimentation control plan.

References

Chapter 3, Vegetative Considerations
Chapter 5, Overview of Erosion and Sedimentation Control Practices