

Land Grading (LG)



Practice Description

Land grading is reshaping of the ground surface to provide 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. This practice applies to the following sites: where the existing topography must be modified to prepare for another land use and/or where adapting proposed development to the existing landscape can reduce the erosion potential of the site and the cost of installing erosion- and sediment-control measures. In some instances, other practices such as diversions can be used to reduce the length of continuous slopes and reduce erosion potential.

Planning Considerations

A detailed plan should be developed by a qualified design professional for all land-grading activities at the project site. The plan should show all areas to be disturbed, the areas of cut, areas of fill, and the finished elevation for all graded areas.

The grading plan should be designed to protect existing vegetation where possible, especially around natural drainageways. Grading activities should be scheduled to minimize the area disturbed at any one time during the construction process. The plan should include provisions for stabilizing disturbed areas immediately after final grading is completed. Provisions should also be made to protect existing underground utilities. Finally, topsoil should be removed and stockpiled for use in revegetating the site.

The grading plan should also include necessary practices for controlling sediment and erosion at the site. These practices could include stable outlets and slope breaks.

Design Criteria and Construction

Site Preparation



A detailed survey of the construction site should be performed by a qualified surveyor prior to grading-plan development. This survey should include existing topographic information at the site including existing elevations, existing drainage patterns, locations of existing overhead and underground utilities, and construction-limit boundaries.

The grading plan should require that the existing topsoil at sites to be graded be removed as the first step in the grading process. The plan should include a location on the construction site where topsoil will be stockpiled. Stockpiled topsoil should be protected by temporary vegetation (see *Temporary Seeding Practice*) until it is used to cover disturbed areas.

Practice) until it is used to cover disturbed areas.

The plan should include a schedule of disturbance activities that minimizes the area disturbed at any point in time. In areas where clearing of existing vegetation is planned, the area should be cleared and grubbed by removing trees, vegetation, roots, and other debris, such as trash. In areas to be filled, all loose or weak soil and oversized rocks should be removed from the area. The foundation of the area to be filled should consist of soil or rock material of adequate strength to support the proposed fill material and the structures to be built at the site. The exact depth of material to be removed should be determined by a qualified geotechnical professional according to accepted engineering standards.

Grading

A plan for placement of fill should be developed by a qualified geotechnical professional. The plan should specify the source of fill materials, which should be obtained on-site if possible. Materials used for fill, when placed according to the plans and specifications, should provide sufficient strength to support structures planned for construction at the location.

Loose fill material should be placed in layers not exceeding 9" in thickness. The materials should be compacted at a moisture content and to a dry density that will produce the design-bearing strength required for structures planned at the site. A qualified geotechnical engineer should provide fill placement specifications using standard, accepted engineering practices.

Slope lengths at the site should be minimized using diversions as slope breaks to reduce erosion potential (see *Diversion Practice*). The following table gives guidance on the horizontal spacing of slope breaks:

Table LG-1 Guidelines for Spacing Slope Breaks

Slope	Spacing (Ft)
33-50%	20
25-33%	40
15-25%	60
10-15%	80
6-10%	120
3-6%	200
<3%	300

In areas where seepage and ground water are present, subsurface drains should be installed to improve slope stability or soil-bearing capacity (see *Subsurface Drain Practice*).

Steep slopes should be avoided if possible. Slopes that are to be vegetated should be 2 horizontal to 1 vertical or flatter. If the slope is to be maintained by a tractor or other equipment, the slope should be 3 horizontal to 1 vertical or flatter. Slopes should be designed to blend with surrounding topography as much as possible.

Erosion Control

The grading plan should include provisions for stabilization of graded areas immediately after final grading is completed. On areas that will have no additional disturbance, permanent vegetation should be applied immediately to the site (see *Permanent Seeding Practice*). On areas where work is to be interrupted or delayed for 14 working days or longer, such as topsoil stockpiles, the area should be stabilized using mulch or temporary seeding (see *Mulching* or *Temporary Seeding Practices*). Other stabilization measures such as erosion-control blankets, should be used in extreme conditions, such as steep slopes and channels.

Where practical, runoff from undisturbed off-site areas should be diverted around the construction site to prevent erosion on the disturbed areas (see *Diversion Practice*).

Sediment Control

Any required sediment-control practices should be installed before the land-disturbance activities in the drainage area of the sediment-control practice. Until disturbed areas can be stabilized, appropriate sediment-control measures will be maintained to minimize sediment delivery off-site. Measures should include as a minimum:

Sediment Barriers – Placed along toes of slopes and drainageways (see *Sediment Barrier Practice*).

Sediment Basins – Divert sediment-laden runoff to basins as needed to minimize off-site sedimentation (see *Sediment Basin Practice*).

Inlet Protection – Where sediment-laden runoff is diverted to on-site stormwater-drain inlets, the inlets should be protected with an appropriate sediment-control practice.

Stabilized Outlets – All runoff from the site should be conveyed in stabilized channels (see *Grass Swale*, *Lined Swale*, or *Channel Stabilization Practices*).

Common Problems

Consult with a qualified design professional if any of the following occur:

Variations in topography on-site indicate grading plan will be ineffective or non-feasible.

Seepage is encountered during construction. It may be necessary to install drains.

Subgrade is soft or has high organic content and can hinder proper compaction of fill. It may be necessary to undercut and replace unsuitable subgrade soil.

Design specifications for sediment-control measures, seed variety, seeding dates, or other erosion-control measures or materials cannot be met. Substitutions may be required. Unapproved substitutions could result in erosion and lead to failure of sediment- and erosion-control measures.

Maintenance

Periodically check all graded areas and the related erosion and sediment-control practices for damage by equipment and especially after heavy rainfalls for damage by runoff.

Repair silt fences and other temporary, sediment-control measures.

Clean sediment out of adjacent diversions and other structures as needed.

Repair any failures that occur in surface stabilization measures, such as plantings.

References

BMPs from Volume 1

Chapter 4

Channel Stabilization (CS)	4-25
Erosion Control Blanket (ECB)	4-33
Mulching (MU)	4-48
Permanent Seeding (PS)	4-53
Temporary Seeding (TS)	4-103
Diversion (DV)	4-131
Grass Swale (GS)	4-162
Lined Swale (LS)	4-190
Subsurface Drain (SD)	4-218
Sediment Barrier (SB)	4-284
Sediment Basin (SBN)	4-298