SLOPE DESIGN AND TREATMENT

1. General

   This Directive outlines Fund requirements for the design and treatment of slopes. It is desirable to achieve easy gradients throughout a project but when program requirements, topography restrictions, or legitimate designs demand grading solutions with slopes of 1 foot vertical on 4 feet horizontal (25 percent) and steeper, criteria for their establishment and care is necessary.

2. Standards

   Slope Classification: The following standards are based on customary campus landscape techniques and maintenance. Slope classifications rank from easy to severe.

   a. Easy Slope (Slopes -Less than 1-foot vertical to 4 feet horizontal (25%): This class of slopes requires no special landscape treatment. Circulation solutions should strive for simplicity without steps or walls unless absolutely necessary. Riding and gang mowers may be used safely and efficiently.

   b. Moderate Slope (Slopes -From 1-foot vertical to 4 feet horizontal (25%) to 1 foot vertical on 3 feet horizontal (33%): These gradients create banks where only hand mowers are manageable.

      (1) Treatment Objectives: Riding units tend to slide and are troublesome to maneuver. North facing slopes, because of lingering dew or subsurface seepage, can upset mowing schedules. Single specimens of trees and shrubs on these grades should be avoided in grass due to the problems of mowing around them. Use only in groups or bed plantings. Show bed line or mowing limits.

      (2) Landscape Alternatives: Grass where accessible. Utilize a conservative grass seed mix or acceptable ground cover recommended by a Botanist or Landscape Architect. Hydroseeding is a positive method of establishing a stable slope. Stabilization fabrics are useful in helping knit seed mixture into the slope. Ground covers (with landscape fabric) over limit areas or where access is difficult.
c. Steep Slopes (Slopes -From 1 foot vertical to 3 feet horizontal (33%) to 1 foot vertical on 2 feet horizontal (50%)). These gradients create banks where only hand movers are not easily manageable.

(1) Treatment Objectives: A maximum slope for landscape treatment. Too steep for safe and efficient grass mowing, including push mowers.

(2) Landscape Alternative: Use a meadow grass seeding as it requires no mowing. Use in remote areas demanding little or no maintenance. Native plants will eventually succeed. Ground covers (those low, woody plants which form a mass of roots) and crowns are generally used for holding slopes. Trees and shrubs with meadow grass and ground covers.

(3) Meadow grass and ground cover require erosion controls (Jute netting) straw or hay mulch to hold the soil until plant roots are established. For long sustained slopes this class should be avoided in favor of a combination of Class II and IV gradients where using the steepest slope for a short duration allows a longer slope (I or II) where more normal construction and maintenance can follow.

d. Severe Slopes (Slopes -1 foot vertical to 2 feet horizontal (50%) and steeper). Plants, including grass and groundcovers, are difficult to establish and demand frequent and skilled maintenance to prevent erosion and unsightliness. Turf mowing is unsafe and difficult except for lateral distances of 3 feet or less (push mowers only).

(1) Treatment Objectives: This class of slope is best treated architecturally (hard) rather than by landscaping (soft). Pedestrian circulation solutions will require the use of steps, ramps, walls, drainage systems and extra lighting, all of which have undesirable implications of cost, maintenance, and needs of the handicapped. Where this slope is proposed in any significant amount of area, thought should be given to alternate solutions.

(2) Structural Alternatives: Cast-in-place retaining walls (for vertical retainment), rip-rap –(for slanted retainment). Pre-manufactured or block landscape walls offer vertical and/or tiered retainment but manufacturers often set limitations on height. Refer to Directive 2-9.
3. Design Criteria (All Class Slopes)

The designer must be aware of the many problems connected with slope construction. Some of the more common but troublesome oversights are these:

a. The top and bottom of turfed slopes should have an ample radius to avoid either "scalping" the grass or leaving it uneven.

b. Grades should always slope away from buildings.

c. Walks should be oriented parallel with contours. Sheet flow across sidewalks should be minimized as freezing of snow creates icy condition.

d. Whenever possible, utility manholes and vaults should be placed at either the top or bottom of slopes to simplify access and slope treatment. When they must occur on slopes, they should be installed with covers pitched to match the gradient (to a maximum of a 1 on 3 pitch) with the low edge coincident with the ladder rungs. Use larger size cover and ring if necessary.

e. A natural shape is easier to construct and maintain than a geometric layout with sharp corners.

f. Contractor shall be required to provide appropriate means of stabilizing and maintaining slopes throughout the duration of construction and through the warrantee period. Appropriate means shall include but not be limited to mulching blankets, silt fence, temporary seeding, hay bales etc. Failures resulting from not properly treating slopes will not be the basis of additional payment.

g. Contract documents shall include, through use of technical specifications and details, appropriate means with which to require the contractor to address sedimentation and erosion control.

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