Construction Site Stormwater Runoff Control

An Online Continuing Education Course for Engineers

Course Number: C-6013

Credit: 6 Hours / 6 PDH / 6 CPD

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Regulatory Text

- You must develop, implement, and enforce a program to reduce pollutants in any storm water runoff to your small MS4 from construction activities that result in a land disturbance of greater than or equal to one acre. Reduction of storm water discharges from construction activity disturbing less than one acre must be included in your program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more. If the NPDES permitting authority waives requirements for storm water discharges associated with small construction activity in accordance with Sec. 122.26(b)(15)(i), you are not required to develop, implement, and/or enforce a program to reduce pollutant discharges from such sites.

- Your program must include the development and implementation of, at a minimum:

(A) An ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under State, Tribal, or local law;

(B) Requirements for construction site operators to implement appropriate erosion and sediment control (ESC) best management practices;

(C) Requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality;

(D) Procedures for site plan review which incorporate consideration of potential water quality impacts;

(E) Procedures for receipt and consideration of information submitted by the public, and

(F) Procedures for site inspection and enforcement of control measures.

Guidance

Examples of sanctions to ensure compliance include nonmonetary penalties, fines, bonding requirements, and/or permit denials for non-compliance. EPA recommends that procedures for

site plan review include the review of individual pre-construction site plans to ensure consistency with local (ESC) requirements. Procedures for site inspections and enforcement of control measures could include steps to identify priority sites for inspection and enforcement based on the nature of the construction activity, topography, and the characteristics of soils and receiving water quality. You are encouraged to provide appropriate educational and training measures for construction site operators. You may wish to require a storm water pollution prevention plan for construction sites within your jurisdiction that discharge into your system. See Sec. 122.44(s) (NPDES permitting authorities' option to incorporate qualifying State, Tribal and local erosion and sediment control programs into NPDES permits for storm water discharges from construction sites). Also see Sec. 122.35(b) (The NPDES permitting authority may recognize that another government entity, including the permitting authority, may be responsible for implementing one or more of the minimum measures on your behalf).

Runoff Control: Minimize clearing

Land Grading


Soils exposed from land grading activities are very vulnerable to erosion

Description

Land grading involves reshaping the ground surface to planned grades as determined by an engineering survey, evaluation, and layout. Land grading provides more suitable topography for buildings, facilities, and other land uses and helps to control surface runoff, soil erosion, and sedimentation during and after construction.

Applicability

Land grading is applicable to sites with uneven or steep topography or easily erodible soils, because it stabilizes slopes and decreases runoff velocity. Grading activities should maintain existing drainage patterns as much as possible.

Siting and Design Considerations

Before grading activities begin, decisions must be made regarding the steepness of cut-and-fill slopes and how the slopes will be

- Protected from runoff
- Stabilized
- Maintained.

A grading plan should be prepared that establishes which areas of the site will be graded, how drainage patterns will be directed, and how runoff velocities will affect receiving waters. The grading plan also includes information regarding when earthwork will start and stop, establishes the degree and length of finished slopes, and dictates where and how excess material will be disposed of (or where borrow materials will be obtained if needed). Berms, diversions, and other storm water practices that require excavation and filling also should be incorporated into the grading plan.

A low-impact development BMP that can be incorporated into a grading plan is *site fingerprinting*, which involves clearing and grading only those areas necessary for building activities and equipment traffic. Maintaining undisturbed temporary or permanent buffer zones in the grading operation provides a low-cost sediment control measure that will help reduce runoff and off-site sedimentation. The lowest elevation of the site should remain undisturbed to provide a protected storm water outlet before storm drains or other construction outlets are installed.

Limitations

Improper grading practices that disrupt natural storm water patterns might lead to poor drainage, high runoff velocities, and increased peak flows during storm events. Clearing and grading of the entire site without vegetated buffers promotes off-site transport of sediments and other pollutants. The grading plan must be designed with erosion and sediment control and storm water management goals in mind; grading crews must be carefully supervised to ensure that the plan is implemented as intended.

Maintenance Considerations

All graded areas and supporting erosion and sediment control practices should be periodically checked, especially after heavy rainfalls. All sediment should be removed from diversions or other storm water conveyances promptly. If washouts or breaks occur, they should be repaired immediately. Prompt maintenance of small-scale eroded areas is essential to prevent these areas from becoming significant gullies.

Effectiveness

Land grading is an effective means of reducing steep slopes and stabilizing highly erodible soils when properly implemented with storm water management and erosion and sediment control practices. Land grading is not effective when drainage patterns are altered or when vegetated areas on the perimeter of the site are destroyed.

Cost Considerations

Land grading is practiced at virtually all construction sites. Additional site planning to incorporate storm water and erosion and sediment controls in the grading plan can require several hours of planning by a certified engineer or landscape architect. Extra time might be required to excavate diversions and construct berms, and fill materials might be needed to build up low-lying areas or fill depressions.

References

State of Delaware. No date. *Delaware Erosion and Sediment Control Handbook for Development.* Department of Natural Resources and Environmental Control, Division of Water Conservation.

State of North Carolina. 1988. *Erosion and Sediment Control Planning and Design Manual.* North Carolina Sedimentation Control Commission and North Carolina Department of Natural Resources and Community Development, Raleigh, NC.

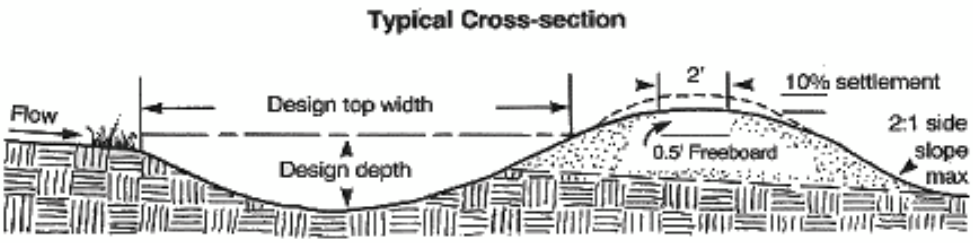
USEPA. 1992. *Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices*. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

USEPA. 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. EPA 840-B-92-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

Permanent Diversions

Description

Diversions can be constructed by creating channels across slopes with supporting earthen ridges on the bottom sides of the slopes. The ridges reduce slope length, collect storm water runoff, and deflect the runoff to acceptable outlets that convey it without erosion.



Site planners incorporate diversions into the overall grading plan to direct clean runoff away from exposed areas

Applicability

Diversions are used in areas where runoff from areas of higher elevation poses a threat of property damage or erosion. Diversions can also be used to promote the growth of vegetation in areas of lower elevations. Finally, diversions protect upland slopes that are being damaged by surface and/or shallow subsurface flow by reducing slope length, which minimizes soil loss.

Siting and Design Considerations

Ridge. A cross section of the earthen ridge must have side slopes no steeper than 2:1; a width at the design water elevation of at least 4 feet; a minimum freeboard of 0.3 feet; and a 10-percent settlement factor included in the design.

Outlet. Four acceptable outlets for the conveyance of runoff and their construction specifications include:

1. *Storm water conveyance channel*. A permanent designed waterway, containing appropriate vegetation, that is appropriately shaped and sized to carry storm water runoff away from developing areas without any damage from erosion. The following are general specifications that are required for channel construction:

- All obstructions and unsuitable material, such as trees, roots, brush, and stumps, and any excess soil should be removed from the channel area and disposed of properly.

- The channel must meet grade and cross-section specifications, and any fill that is used must be compacted to ensure equal settlement.

- Parabolic and triangular-shaped, grass-lined channels should not have a top width of more than 30 feet.

- Trapezoidal, grass-lined channels may not have a bottom width of more than 15 feet unless there are multiple or divided waterways, they have a riprap center, or other methods of controlling the meandering of low flows are provided.

- If grass-lined channels have a base flow, a stone center or subsurface drain or another method for managing the base flow m ovided.

- All char rosion.

2. *Level spreader*. infiltration by spreading storm v w instead of through channels. It usuall erses flow onto a flatter area across l vegetated areas. This reduces flow s fications for level spreaders include:

- Level sprea t on fill material or easily erodi

- There shoul flow can be evenly distri

- Heavy equipment and traffic should not be allowed on the level spreader, as they can cause compaction of soil and disturbance of the slope grade.

- The spreader should be regraded if ponding or erosion channels develop.

- Dense vegetation should be sustained and damaged areas reseeded when necessary.

3. *Outlet protection*. This involves placing structurally lined aprons or other appropriate energy-dissipating devices at the outlets of pipes to reduce the velocity of storm water flows and thereby prevent scouring at storm water outlets, protect the outlet structure, and minimize potential for erosion downstream. Construction specifications for outlet protection practices require the following: