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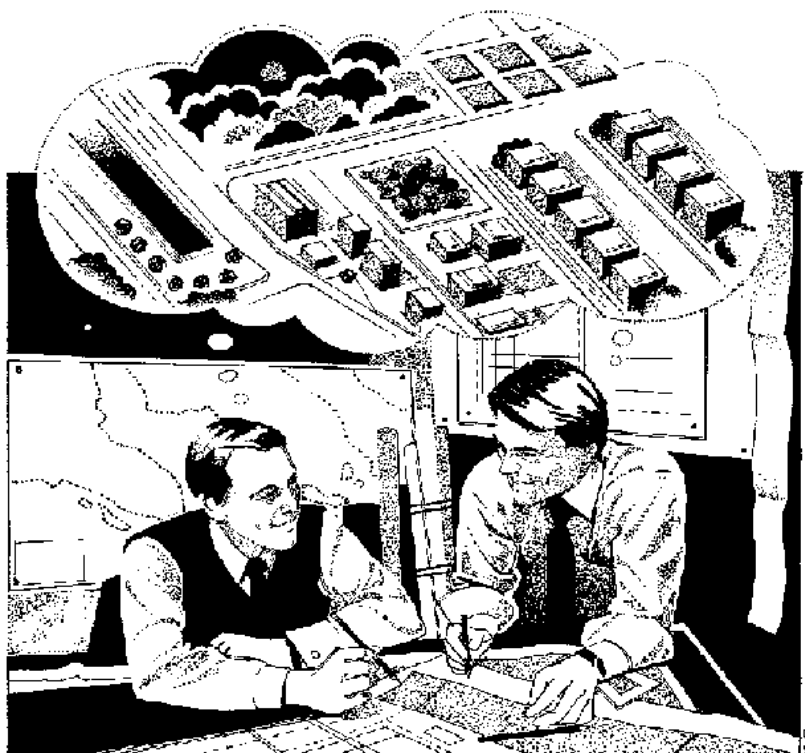
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Guide to Erosion and Sediment Control in Urban Areas

This guide is designed to help landowners or developers minimize erosion problems resulting from construction on small development sites. Since it is not always possible for trained soil conservation personnel to visit every planned development site, this guide provides a step-by-step approach for lay persons to use in evaluating a site's erosion potential and what erosion control practices should be implemented. Each control practice is described in detail with instructions on design, construction and maintenance. These guidelines are intended to supplement, not replace technical advice from local soil conservation personnel or private engineering consultants.



EROSION AND SEDIMENTATION IN THE URBAN SETTING

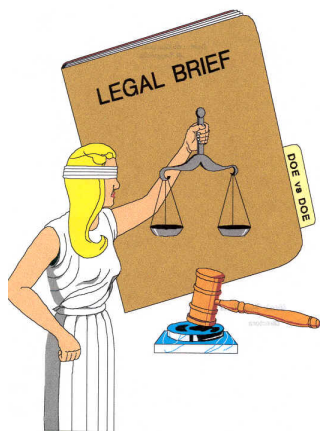


Soil erosion occurs when the soil surface is exposed to rain or runoff. Unprotected soil particles are first dislodged by the impact of raindrops or surface runoff. These loosened particles may then be moved by stormwater and deposited as sediment at some downstream location.

In urban areas this process is frequently started when a site is graded and protective vegetation is removed in preparation for construction.

The results can be:

- damage to the site by gullyng, loss of topsoil or flooding of structures
- damage to the property of others by sediment deposits in streets and stormdrains or through the siltation of a downstream water body
- runoff damage to slopes or structure due to improper drainage
- streambank erosion with resulting loss of trees
- slope failures in cuts or embankment



The cost of repairing this damage (i.e., regrading the site or repairing structures) or for securing legal defense against a damage suit by a downstream landowner could significantly hinder an otherwise successful development plan. To prevent these problems, landowners considering development should plan to use sound soil conservation practices throughout their projects.

On the surface it may appear the application of soil and water conservation measures is costly and time consuming. In fact, the practices included in this guide have been chosen to be compatible with typical urban construction activities. Further, when considered in the original plan, the costs of properly installed and maintained practices should be only a small portion of total project costs.



These costs become even less burdensome because of savings in erosion or flood damage repair costs and through prevention of litigation. **WHEN PROPERLY APPLIED, THESE MEASURES WILL SAVE TIME AND MONEY DURING MOST URBAN CONSTRUCTION ACTIVITIES.**

GENERAL GUIDELINES FOR URBAN EROSION PREVENTION DURING CONSTRUCTION

The best approach in preventing erosion is the use of common sense in planning and designing urban construction projects. Activities should be limited to those, which suit the soil conditions and topography of the chosen site. Construction activities should accommodate the natural drainage patterns and anticipated runoff volumes at the site. Finally, only the smallest possible amount of land should be disturbed to achieve the purpose of the project and any disturbed areas should be restabilized as soon as possible. This will minimize the loss of the sediment from the project site onto neighboring properties or into area streams.



These guidelines can best be attained through the use of appropriate soil and water conservation practices. Listed below are the types of practices most often needed during urban construction activities:



Managing Stormwater Runoff -The greatest driving force in the erosion and sedimentation process is rainfall and the resulting runoff. Nearly all practices in this guide are designed to reduce or eliminate the harmful effects of stormwater runoff on the project site and on downstream property. Particular attention is given to hydrological modifications (activities that may disturb or impair natural water courses) where the forces of runoff can cause severe damage.



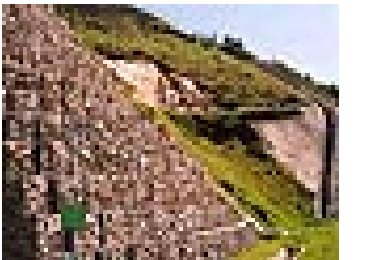
Establishment of Vegetative Cover -The most effective and direct means of controlling erosion during and after urban construction activities is to attain a good vegetative cover over all soil surfaces laid bare or disturbed by the project. Plants or grasses suitable for the site and locale are used for this purpose.



Stabilizing Disturbed Areas -Whenever soil will be laid bare for an extended period more than 2 weeks, steps should be taken to protect the soil from the erosive forces of rainfall and runoff. These practices normally involve temporary vegetation, natural or artificial mulches and other methods of covering any exposed soil surface.



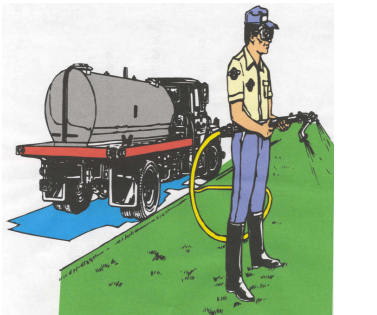
Trapping Sediment on Site -Because it is impossible to prevent rainfall on unstabilized, disturbed areas; practices to trap sediment carried by site runoff are also valuable. These practices provide both a backup mechanism should other practices not prove effective and protection against offsite damage to the property of others.



Managing Site Excavation Activities -The multitude of grading, trenching, excavation and fill activities that are encountered during construction give rise to the need for many erosion control practices. Whenever exposed soil will be left in a sloping configuration the erosive forces of stormwater will be at their greatest. Steps must be taken to minimize the time of exposure of these unprotected, sloping soil surfaces and to restabilize them as soon as possible.



Road Management -Soil disturbance during road construction can lead to serious erosion problems. Proper planning, design, construction and maintenance of roads is essential to minimize soil loss. If possible, locate the roads across the slope o grade instead of straight up the slope.



Maintenance- Nearly all erosion control practices require some short-term or even continual follow-up attention. Temporary measures, if not removed when their purpose is satisfied, may cause the damage they were designed to prevent. Other measures should be inspected frequently to detect and repair damage from the powerful natural forces that act upon them.

HOW AND WHEN TO USE THIS GUIDE

The practices suggested in this guide are appropriate for the following types of sites:

1. A small development where the only drainage area is 10 acres or less.
2. A larger development where there are several small (10 acres or less) drainage areas.

Drainage areas larger than 10 acres require different erosion control practices and professional assistance should be sought from the local conservation district or private engineering consultants. Sites with complex problems such as excessive slopes (greater than 5%), flowing streams, drainage or flooding problems or highly erosive or unstable soils also require professional help beyond the scope of the practices suggested in this guide. In addition, if changes in the drainage area could potentially threaten life or property downstream due to increased flooding, professional advice should definitely be sought.

ENGINEERS MANUAL

TO ASSIST THE ENGINEER, ARCHITECT OR OTHER PERSONS WITH A TECHNICAL BACKGROUND, WE HAVE ALSO DEVELOPED AN ENGINEER'S MANUAL. THIS MANUAL PROVIDES SPECIFICATIONS AND NOMOGRAPHS FOR DESIGNS FOR LARGER SITES OR MORE COMPLEX SITUATIONS THAN ARE COVERED BY THE STANDARD SMALL SITE DESIGNS IN THIS GUIDE.

STEP-BY-STEP APPROACH FOR EROSION CONTROL ON SMALL URBAN SITES

Even the smallest construction project begins with a plan and it is in this planning stage that the decisions about erosion control should be made. Before you draw your initial project layout we suggest you perform a site erosion evaluation.

STEP ONE - SITE EVALUATION

The most useful tool during this process will be good site maps. You may draw your own or have maps prepared by an architect or engineer. Some good sources for mapping information are the appropriate city planning and zoning departments, a regional planning agency or the U.S. Geological Survey (for topographic maps). You will also need information on the soil at your site. Your local conservation district has current soil maps and information on the erosiveness of the soil. In fact, we suggest you plan to visit the conservation district during this early planning stage. Call for an appointment, bring available information on your project and obtain guidance on the type of erosion control planning you will need. In many instances the best approach is to have an erosion control plan developed specifically for your site by the district with suggestions on which erosion control practices to employ.

STEP TWO - PROJECT LAYOUT

Once you have information on the topography, vegetative cover, and soils at your site you may layout your proposed project and evaluate its erosion potential. We suggest that this evaluation be done for three time frames; pre-project, during construction and post-project.

The following are a few pertinent questions to ask when evaluating each planning period.

PLANNING CONSIDERATIONS FOR PROJECT LAYOUT

Pre-Project

What type of vegetation does the site presently support?

Are there trees or other types of vegetation that should be saved for erosion control or to improve site aesthetics and landscaping?

Are there areas where extensive cutting or filling will be needed to attain the level areas needed for construction?

What are the natural drainageways on the site?

Are there adjacent properties that should be considered in project planning?

During Construction

Where will soil be disturbed during site grading, road building or project construction and for what length of time? (Evaluate each individually and then in combination)

Are measures needed to protect valuable trees or other resources?

Will flood protection be needed near streams and drainageways?

Will topsoil be stockpiled or will there be spoil piles from excavation?

Is slope protection needed to accomplish any part of the project?

What are the locations of planned roadways and will they cross drainageways or slopes where special protection will be needed?

Will downslope properties or streets need protection from sediment that might result from rainfall during construction?

Will drainageways be adequate to handle increased runoff after vegetation is removed or sites are paved?

Are downstream flooding, streambank erosion or siltation of streams or lakes likely to result from project activities?

Post-Project

Will soil in fill areas support needed vegetation?

Will slopes of fills, cuts or berms need permanent protection?

Will drainageways or stream channels need permanent erosion protection to safely carry design flows?

Are stormwater retention/detention ponds needed to hold expected site runoff and prevent flooding?

Assessment of downstream and downslope impacts warrants further consideration. One of the largest costs in both time and money to previous urban development projects has arisen from litigation over sediment damage to downstream water bodies. To prevent downstream damage and resulting claims against you or your project, extra time in project planning is clearly warranted. If your site will pave large areas, construct buildings with extensive roof area, drain into an otherwise unprotected stream or lake, make certain that you have adequately planned for downstream protection.

STEP THREE - PRACTICE SELECTION

The next step is to determine modifications to the site development ~ plan to accommodate needed erosion protection measures. Modifications might vary from simply rescheduling the sequence of operations to relocating planned structures in order to avoid erosion or flood prone areas. Once needed changes are incorporated into the site development plans, final erosion management practices may be selected.

Practice selection is the keystone of a sound management plan. This step will involve matching the practices recommended in this guide with the needs and conditions of your site.

To assist in this selection, practices are arranged in categories as follows:

Managing stormwater runoff and drainage.

Stabilizing disturbed areas and/or establishing vegetative cover.

Trapping sediment.

Managing excavation activities.

Road management.

You will find one or more practices recommended for use in each category. You should select the simplest most direct practice or practices that will serve your purposes. Once you have determined which practices you will be using, they may be incorporated into your overall project design and drawn into your final plans.

When planning and scheduling soil-disturbing activities remember to:

- 1) minimize the length of time soil will be exposed,

- 2) avoid leaving slopes in unstabilized condition,
- 3) avoid excavating within natural drainageways or streams,
- 4) minimize excavation work during the seasons when rain most often occurs
- 5) be prepared to take time during construction to install or maintain erosion control practices.

When these considerations are included in a construction plan, time and money lost in combating soil erosion will be reduced.

*******REMEMBER, THE DESIGNS FOR THE PRACTICES IN THIS GUIDE ARE INTENDED ONLY FOR SMALL SITES, WITH OBVIOUS AND STRAIGHTFORWARD EROSION CONTROL NEEDS. IF YOUR PROJECT DOESN'T FIT THESE CRITERIA, YOU MAY NEED ON-SITE ASSISTANCE FROM CONSERVATION DISTRICT PERSONNEL OR ENGINEER. SELF-HELP IS PREFERRED WHEN APPLICABLE BUT DIFFICULT SITES REQUIRE PROFESSIONAL EXPERTISE.*******

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