Construction Site Erosion and Sediment Control Best Management Practices for Iowa

Definitions:

Erosion:
Erosion is a three-step process involving the detachment, transportation, and deposition of soil particles. There are many kinds of erosion, including sheet erosion, rill erosion, gully erosion, stream bank erosion, and wind erosion. Each of these types of erosion involves the detachment, transportation, and downstream/downwind deposition of sediment.

S **Sheet Erosion:** The uniform movement of a thin layer of soil across an expanse of land devoid of vegetative cover. Raindrops detach soil particles, which go into solution as runoff occurs and are transported downstream to a point of deposition. Deposition occurs when runoff slows to the point where soil particles can no longer remain in suspension. Tilled agricultural fields and construction sites are subject to sheet erosion.

S **Rill Erosion:** When sheet flows begin to concentrate on the land surface, rill erosion occurs. While sheet erosion is generally invisible, rill erosion leaves visible scouring on the landscape. This type of erosion occurs when the duration or intensity of rain increases and runoff volumes accelerate.

S **Gully Erosion:** Rill erosion evolves into gully erosion as duration or intensity of rain continues to increase and runoff volumes continue to accelerate. A gully is generally defined as a scoured out area that is not crossable with tillage or grading equipment.

S **Stream Bank Erosion:** This type of erosion is the scouring away of stream banks. Degrading or incising streambeds and/or repeated high flows of extended duration cause bank erosion. Bank erosion is significant contributor of sediment loads during high stream flows.

S **Wind Erosion:** Wind erosion is similar to sheet erosion in that detachment, transportation, and deposition of soil particles occurs, except that wind is the transportation mechanism rather than water. There are three types of wind erosion: siltation, suspension, and surface creep. The largest volume of erosion occurs via siltation. Sand size particles move in short hops close to the soil surface. Silt size particles move in longer hops within 12 inches of the soil surface and clay size particles are lifted into suspension and moved into the air.

S **Sediment:**
Sediment is the detached soil particles moving in the erosion process.

S **Erosion Control:**
Understanding the erosion process is essential to the development and implementation of effective erosion control plans. The key to erosion control is preventing the detachment of soil particles and reducing the volume of runoff. This is achieved through the use of practices such as minimizing land disturbing activities and maintaining vegetative covers or substituting for lack of growing vegetation by mulching or applying a compost blanket or erosion control mat.

S **Sediment Control:**
Sediment control is trapping detached soil particles that are being transported and ensuring they are deposited on site to prevent damage to other properties or receiving waters. This is achieved by such practices as silt fence installation, compost berms or filter socks, and sediment control basins.

Stormwater Pollution Prevention Plans (SWPPP)

SWPPP plans need to control erosion, be site specific, and be designed to effectively manage runoff and retain sediment on-site during construction. Plans should be developed in conjunction with early planning and design of any construction project as an integral part of new development. By incorporating SWPPPs into early planning and design, BMPs will be more effective at controlling erosion and sediment and protecting water quality. They will also be more cost effective to implement. Finally, a well-designed SWPPP will integrate BMPs that can become part of an effective post construction stormwater management system for the site.

A plan is required to address six phases that include the following:

Phase 1 Site Evaluation and Design Development

- Collect site information
- Develop site plan
- Prepare pollution prevention site map

Phase 2 Assessment

- Measure the site area
- Determine the drainage areas
- Calculate the runoff coefficient

Phase 3 Control Selection/Plan Design

- Select erosion and sediment controls
- Select other controls
- Select stormwater management controls
- Indicate the location of controls on site map
- Prepare an inspection and maintenance plan
- Coordinate controls with construction activity
- Prepare sequence of major activities
- Incorporate state or local requirements

Phase 4 Certification/Notification

- Certify the plan
- Submit Notice of Intent
- Plan location and public access

Phase 5 Construction/Implementation

- Implement controls
- Inspect and maintain controls
- Update/change the plan
- Report releases of reportable quantities

Phase 6 Final Stabilization/Termination

- Final stabilization
- Notice of termination

Construction Site Erosion Control

Erosion Control Practices

S **Vegetative Cover**
Maintaining vegetative cover during the construction process is the most effective erosion control practice. Mass grading exposes construction sites to erosion. Phasing of grading activities maintains strategic vegetative cover and minimizes the amount of disturbed land at any given time, which reduces erosion.

Another technique for maintaining vegetative cover is to design new development to fit into existing landscapes, minimizing the need for grading. Finally, utilizing a building envelope which confines traffic and land disturbing activities to the minimum area needed for construction will maintain vegetative cover.

There are two types of vegetative cover: temporary and permanent. Temporary cover is used when grading is not completed but will be suspended, or when grading is competed outside the specified planting dates for permanent cover. Typically, fast-establishing low-cost small grain species such as oats or rye are used for temporary cover.

Permanent cover is used after grading is compete and provides a permanent stand of vegetation, a protective layer to prevent soil erosion. Common turf grass species are typically used in seed and sod form. A more sustainable cover of native vegetation consists of a mixture of deep-rooted grasses and forbs. The strategic use of native landscaping on a minimum of 30% of any given site will contribute to on-site water management through improvement in soil quality that results in higher infiltration and percolation rates.

S Compost Utilization

Compost utilization is an emerging best management practice that controls erosion and reduces runoff. Compost is a soil amendment that consists of decomposed organic waste that has a consistency similar to high quality topsoil. While topsoil may typically contain 2-5% organic matter content, compost will usually have 30-60% organic matter content. The high organic matter content of compost absorbs the impact of raindrops, which prevents detachment of soil particles. Organic matter also retains water on site to reduce runoff and potential transportation of sediment or other pollutants. This practice should only be used in areas where sheet flow is occurring.

AASHTO describes compost as the product resulting from the controlled biological decomposition of organic material, occurring under aerobic conditions, that has been sanitized through the generation of heat and stabilized through the point that it is appropriate for its particular application. Active composting is typically characterized by a high-temperature phase that sanitizes the product and allows a high rate of decomposition, followed by a lower-temperature phase that allows the product to stabilize while still decomposing at a slower rate. When properly decomposed, compost possesses no objectionable odors or substances toxic to plants, and does not resemble the raw material from which it was derived. Compost contains plant nutrients, but is typically not characterized as a fertilizer. Compost is considered a soil amendment that controls erosion and enhances water absorption on-site.

Compost blankets consist of an application of a compost layer to protect soil from erosion. Compost can be applied using bulldozers, end loaders, manure spreaders or pneumatic blower trucks to a depth specified for site conditions. One example of how a compost blanket can be an effective BMP is where grading and seeding cannot be completed before freeze-up ends the construction season. A compost blanket can then be applied to stabilize the site throughout winter. Another way to utilize compost blankets is to apply blankets as each phase of grading is competed. Seeding is done after the compost blanket is applied. When pneumatic blower systems are used, seed can be incorporated with the compost as it is applied.

S Mulch

Mulching is the application of vegetative residue/organic matter to protect the soil surface from the impact of raindrops or the erosive force of wind until vegetative cover is established. It can be applied in lieu of temporary seeding but is typically applied in conjunction with a permanent seeding. Mulches typically consist of small grain straw or wood chips. If small grain straw is used as mulch, at least 4,000 lbs/acre should be applied and the mulch should be tacked down with a straight disk tool. If wood chips are used, apply at least 2,000 lbs/acre. Wood chips do not need to be tacked in. At least 50% of the soil surface should be covered by organic mulch, but a much higher percent of cover is recommended to enhance erosion control and vegetative establishment.

S Rolled Erosion Control Products (RECP)

Typically referred to as erosion control mats or blankets, these products are applied to provide protective cover until vegetative cover is established. There are a number of different materials that RECPs are made of, ranging from straw blankets to coconut fiber to

synthetic fiber blankets. The type of blanket should be specified for site conditions. Proper installation of the matting—including trenching in, overlaps, and staple placement—is critical to the successful utilization of these products. RECPs can be used to control erosion from sheet flows or concentrated flows of runoff. Seeding is done prior to installation of RECPs, or blankets with seed imbedded can be purchased to accomplish seeding and erosion control simultaneously. These products are especially effective at controlling erosion from concentrated flows and are a preferred practice where concentrated flows occur.

Construction Site Sediment Control

Sediment Control Practices

S Silt Fences

Primarily a sediment control practice, silt fences temporarily impound water, allowing sediment to settle out. Water seeps through the fabric, leaving sediment trapped and retained behind. This practice can be an effective sediment control measure if a comprehensive system is designed, installed properly, and maintained regularly.

Space silt fence no more than 100 feet apart and install on the contour to intercept sheet flows. The ends of each run should be pulled uphill so the base of the fence is at least several inches higher in elevation than the rest of the run.

When used to control concentrated flows, space silt fences so that elevation at the bottom of the top fence is equal to the elevation of the top of the lower fence to create a stair-step effect down the channel.

Inspect and clean out after every one-half inch rain. This is the most crucial and difficult aspect of an effective silt fence system.

S Straw Bales

Bales of straw are used primarily a sediment control practice in place of silt fence. However, this practice is not recommended for sediment control. Straw is used more effectively as a mulch to provide erosion control.

S Rock Check Dams

This practice is often used to prevent gully erosion from scour caused by concentrated flows and consists of rip rap grade stone placed perpendicular to concentrated flows in ditches or swales. Rock dams also serve as sediment trapping structures by slowing flows and allowing sediment to drop out of runoff.

Trapped sediment needs to be removed after every erosive rain to maintain the capacity of the structure until vegetation is established. Pores between rocks can become plugged reducing the filtering ability of the structure.

Dams are typically not removed after a site is stabilized, which could cause problems with surrounding land maintenance such as mowing.

S Compost Socks

These mesh tubes are filled with compost and often placed perpendicular to concentrated flows (similar to the positioning of silt fence, perforated silt dikes, or rock check dams) to slow flows and trap sediment. They are also placed at the top of slopes to intercept sheet flows and reduce erosion on slopes.

S Compost Filter Berms

Compost berms are constructed as small terrace-like structures perpendicular to sheet flows of runoff and function similar to silt fence, perforated silt dikes, or rock check dams to slow flows and trap sediment. Cross-sectional dimensions vary according to site conditions and rainfall intensity but typical cross-sections range from 1-foot high by 2-feet wide at the base to 2 feet high by 4-feet wide at the base. Filter berms should not be used to control concentrated flows (see compost socks).

S Inlet Protection Devices

Inlet protection is an important component of a comprehensive erosion and sediment control system. These devices provide one last opportunity to trap sediment. Silt fences, compost socks, and perforated silt dikes, as well as other products can be placed around inlets. Maintenance must be performed until the site is stabilized, at which time the device can be removed.

S Sediment Control Basins

Sediment control basins are typically earthen dams that temporarily impound sediment-laden runoff, allowing the sediment time to settle out. The clarified water is decanted through a perforated standpipe. There are other products and techniques that can be used to increase the sediment trap efficiency of sediment control basins, such as rapping the standpipe width with filter fabric or using polymers to flocculate and settle particulates.