United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

STORMWATER RUNOFF CONTROL

CODE 570

(ac)

DEFINITION

Measures or systems to control the quantity and quality of stormwater runoff.

PURPOSE

This practice is used to accomplish one or more of the following purposes in controlling stormwater runoff:

- Minimize erosion and sedimentation during and following construction activities.
- Reduce the quantity of stormwater leaving developing or developed sites.
- Improve the quality of stormwater leaving developing or developed sites.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to sites where stormwater runoff causes or may cause undesirable downstream conditions due to increased flows, sedimentation, channel degradation, and/or degradation of surface or ground water quality if left untreated. This practice may apply both to sites undergoing development as well as remedial work on developed sites.

CRITERIA

General Criteria Applicable to All Purposes

Plan, design, and construct stormwater runoff controls to comply with applicable Federal, State, and local laws and regulations including all necessary permits and utility locations.

Develop a plan to reduce the impacts of stormwater runoff from the site based on an assessment of the downstream area. As applicable include in the plan practices or management activities that will—

- Reduce onsite erosion.
- Reduce offsite impacts from sedimentation.
- Reduce the quantity of stormwater leaving the site to levels that will not adversely affect downstream receiving channels.
- Maintain or increase infiltration of precipitation to recharge ground water.
- Improve the quality of runoff leaving the site.
- Leave the site in a stable condition after construction.

All runoff control methods must include provisions to safely bypass runoff in excess of the design storm.

Stabilization measures

Where appropriate, stabilize all areas disturbed by construction as soon as possible after construction to reduce the potential for erosion. When vegetation is used, refer to NRCS Conservation Practice

Standards (CPSs) Critical Area Planting (Code 342) or Conservation Cover (Code 327). If vegetation is not appropriate for the site, use other measures such as NRCS CPS Mulching (Code 484) that protect the soil from erosion. Include pretreatment measures in the system as necessary to protect plantings from excessive sediment, trash, debris, or other pollutants.

Safety
Detention ponds and other areas where water is detained or flows swiftly can present hazards to the public. Where necessary, include appropriate safety features to warn of potential dangers or deter entry to hazardous areas such as fences, gates, and warning signs.

Additional Criteria for the Reduction of Water Quantity

Design stormwater control systems to control flow from the area of concern to rates and volumes that will not cause degradation of downstream areas due to erosion or sedimentation. Acceptable peak rates and volumes are dependent upon the capacity and stability of the receiving channel. Refer to local regulations that specify acceptable discharge rates and volumes for different storm frequencies. In the absence of local requirements, use the 2-year 24-hour predevelopment storm for the peak discharge rate and volume to receiving streams.

Control the peak rate of runoff by slowing the release of runoff from the site. This can be accomplished by onsite storage, increasing infiltration onsite, lengthening the flow path of runoff, or a combination of these methods. Use one or more of these methods to reduce peak rates of runoff.

All runoff control methods must include provisions to safely bypass runoff in excess of the design storm.

Additional Criteria for the Improvement of Water Quality

Runoff from developing areas can be contaminated with a variety of substances including sediment, oils, chemicals, and trash. Assess site conditions to determine the type of contaminants that must be controlled. Design practices that will capture or reduce these contaminants before they leave the site. These can include diversion of clean water, vegetated filtration areas, rain gardens and other biofilters, management actions to prevent spills of fuels or other contaminants, and trash guards and settling areas that are readily accessible for cleanout. Provide a minimum of 2 feet of soil depth from bedrock to the bottom of impoundments, vegetated filtration areas, rain gardens, and other biofilters.

Additional Criteria for Erosion and Sediment Control

Control erosion on the site by limiting the amount and length of time that bare soil is exposed to precipitation. This can be accomplished by staging construction and only removing vegetation from a portion of the site at a time, revegetating areas incrementally during construction or using temporary seeding and mulching to stabilize areas until permanent vegetation can be established.

Structural erosion control practices that reduce overland flow length and velocity such as CPSs Diversion (Code 362) and Terrace (Code 600), straw bale barriers, or silt fences can be used to reduce sheet and rill erosion. Refer to the current NRCS soil loss prediction methodology to determine the appropriate spacing for these practices.

When erosion cannot be stopped at the source, filter or detain sediment-laden runoff to allow sediment particles to settle out to acceptable levels before releasing runoff from the site. This can be accomplished by sediment traps, sediment basins, and other structures designed to detain or filter runoff. Refer to CPS Sediment Basin (Code 350) for design requirements for sediment basins.

CONSIDERATIONS

Research has shown that the first runoff from a site is often the most contaminated. After this initial flush, less pollutants are available for removal, and dilution lessens the impact. Consequently, treatment of this “first flush” of runoff is often sufficient to address the water quality concern. The exact amount of runoff to treat varies depending upon the surface and level of contamination. Determine the amount of runoff to treat based on appropriate research or experience.

For runoff that is known to be contaminated with substances that may be particularly harmful to the water supply or fish and wildlife, additional treatment methods may be necessary.

Stormwater control practices can affect downstream hydrology. While this is the point of most stormwater control systems, consider the effect (both positive and negative) of changing the peak rate and volume of runoff on downstream areas. Where there are multiple projects in a watershed, consider the effect of a single project in context with other projects in the watershed to determine the cumulative effect. For developed areas consider options for reducing the peak flow from the current developed condition.

Design stormwater control practices that will fit into the visual landscape as well as function for runoff control. Since stormwater control practices are generally installed in public spaces, consider the use of the space and the visual impact the practices will have.

Improving or maintaining infiltration can be an important component of a controlling stormwater runoff. Base the design of infiltration measures on the permeability rate of the most restrictive layer in the soil profile within the infiltration zone. Generally, soils should have a saturated hydraulic conductivity rate greater than 0.2 inches per hour. Design storage measures such as dry wells, stone trenches, and basins to empty within 72 hours.

If properly designed, stormwater control practices can be beneficial to wildlife. When possible use native vegetation to provide food and habitat for wildlife and pollinators.

To be most effective, stormwater control should include a system of practices working together. This might include detention along with infiltration areas and the maintenance of natural, undisturbed areas. However, it can also include managing the development of the site to limit the amount of disturbed area, ensuring that revegetation occurs in a timely manner and controlling where heavy equipment that will compact soils and destroy vegetation is allowed to travel on a site.

Large storms can quickly fill stormwater runoff practices with sediment. For the practices to function correctly the sediment must be removed and properly disposed of. Consequently, design these practices for easy access and maintenance.

Since stormwater control practices are often installed in urban and public spaces, vandalism may be a problem. Consider using practices that cannot be easily vandalized such as grouting rock in place and installing barriers and locks where appropriate.

Stormwater runoff control plans are often required by local regulations. As a result, the practices will often be part of a larger construction contract. To ensure that the plans will be properly implemented it is helpful to incorporate the requirements of the stormwater runoff control plan into the plans and specifications for the larger project.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for stormwater runoff control systems that describe the requirements for applying the practice according to this standard. As a minimum the plans and specifications shall include—

- A plan view showing the extent of the practice.
- Where appropriate, cross-sections and/or profiles showing elevations and distances.
- Where appropriate, plans for structural details.
- Where appropriate, seeding requirements.
- Construction specifications that describe in writing site-specific installation requirements for the stormwater runoff control systems.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance (O&M) plan for the operator. The minimum requirements to be addressed in the O&M plan are

- Periodic inspections, especially immediately following significant rainfall events.
- Prompt repair or replacement of damaged components, especially surfaces that are subjected to wear or erosion.
- Regular inspection of settling basins, trash guards, and other practices to collect and remove accumulated sediment and debris.
- Where vegetation is specified, periodic mowing, fertilization, and control of vegetation.

REFERENCES

Bannerman, R. and E. Considine. 2003. Rain Gardens: A How-to Manual for Homeowners. University of Wisconsin Extension Publication GWQ037 or Wisconsin Department of Natural Resources Publication PUB-WT-776 2003. Madison, WI.

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