NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
RUNOFF MANAGEMENT SYSTEM
(No. and acre)
CODE 570

DEFINITION

A system for managing the quantity and quality of runoff from urban and rural watersheds for both existing and altered land use conditions.

PURPOSES

This practice applies to managing storm water runoff to achieve one or more of the following:

- Minimize destructive flooding impacts.
- Reduce erosion and sedimentation.
- Maintain or improve surface and ground water quantity and quality.

CONDITIONS WHERE PRACTICE APPLIES

The practice applies where there is a need to manage storm water runoff that can cause undesirable downstream flooding and/or degradation of surface and ground water quality. Runoff can originate from urban or rural watersheds for both altered and existing conditions.

CRITERIA

Overall

A runoff management system must be compatible and consistent with the flood plain management and storm water management programs of the local jurisdiction and consistent with CT/RI water quality standards. The system, a single component or a combination of components, must properly regulate storm discharges from a site to a safe, adequate outlet. Consideration shall be given to the duration of flow, peak discharge rates, and quality of the discharge. Adequate erosion-control measure and other water-quality practices must be provided. The components must be planned and designed to insure minimal impact on visual quality and human enjoyment of the landscape. Structures and materials must harmonize with surrounding areas.

Design Storms

If the primary purpose of the runoff management system is to minimize erosion and sedimentation and maintain or improve water quality, the peak discharge from the 2-year and 10-year frequency, 24-hour duration, type III duration storms shall be used for design. Smaller storms may need to be analyzed for water quality purposes such as suspended solids, nitrogen, or phosphorus removal.

If the primary purpose of the runoff management system is to minimize flooding, the peak discharge from the 2-year, 10-year, and 100-year frequency, 24-hour duration, type III storm distribution storms shall be used for design. Specific local and state criteria may require other storm frequencies or durations also be analyzed.

No increase in peak from these storms shall be allowed unless downstream increases are compatible with the overall flood plain management system. Some of the items to consider in determining if increased peak flows are compatible with the overall flood plain management system are:

1. the timing of peak flows from sub-watersheds;
2. the increased duration of high flow rates;
3. the stability of the downstream channels; and
4. the distance downstream that the peak discharges are increased.

If the primary purpose of the runoff management system is to improve water quality, the system shall

be designed to remove 80% of the average annual total suspended solids (TSS) entering the system. The system shall be configured to remove the TSS and provide storage for the removed TSS between cleanout periods. A minimum of six months of settled solid storage shall be provided with a recommended solid storage capacity of one year or greater. The system shall be designed to provide adequate access for cleaning out the settled TSS. The time interval between cleanings shall be no greater than the designed time to fill the storage capacity.

Components

Components include but are not limited to dams, excavated ponds, infiltration trenches, stormwater wetlands, stormwater treatment devices, parking lot storage, rooftop storage, and underground tanks.

Each component shall be designed according to sound engineering principles to insure that the system achieves its intended purpose. Design criteria for individual components shall be based on the following:

1. Dams shall meet the requirements, specified in part 520, subpart C of the National Engineering Manual.

2. Excavated ponds shall meet the requirements specified for Ponds (378) or Sediment Basin (350).

3. The design of infiltration trenches shall be based on such factors as soil permeability, soil depth, seepage, quality of water to be temporarily stored, foundations for adjacent buildings and structures, drainage conditions, and vegetation. Other considerations are

a. The soil characteristics shall be investigated and recorded to a depth at least 4 feet below the planned bottom elevation of the infiltration trench.

b. Only relatively clean water shall enter the trench to insure that oils, grease, and sediments do not seal trench walls and bottoms and thus reduce the effectiveness of the practice. At parking lots and at other areas having a similar contamination potential, filter areas; sediment traps; grease traps or filter traps, or both, shall be installed to remove objectionable materials from the water before it reaches the infiltration device. If grass is used as a filter area, it must be of close growing grasses at least 25 ft wide. The filter area must be properly placed and maintained to maximize the effectiveness of the trench. Water must move through the grass as sheet flow. If local site conditions warrant, a wider filter area may be used.

c. Trench bottom elevations shall be located at least one foot above the seasonal high water table.

d. The size of the trench shall depend on the volume of storage required and the void ratio of the stones in the excavation. The volume of water infiltrating the walls and bottom of the trench during a storm shall be assumed to be zero in calculating the required volume. The permeability rate of the soil is used in determining the dewatering time, which shall not exceed 5 days.

e. The soils in which an infiltration trench is installed must be well drained. If permeability of the surrounding soils is less than approximately 0.6 in./h, suitability of the site for an infiltration trench may not be practicable. Runoff management may be accomplished with infiltration trenches in soils with lower permeability by installing an underground outlet (Standard 620) in the infiltration trench.

f. An infiltration trench must not adversely affect nearby foundations for buildings, roads, and parking lots and must not impair the growth of significant woody vegetation.

g. Stone used in backfilling the excavated trench must be poorly graded and about 1 to 2 in. in size.

h. In areas where spring runoff from snowmelt is likely to occur before the trench thaws, provisions shall be made for removing the excess water.

i. Provisions shall be made to insure that salts or other soluble pollutants entering the trench do not contaminate local water supplies.

j. The trench bottom and the stone surface must be level to insure adequate storage capacity and uniform infiltration.

k. Trenches should be exposed to full sunlight.

4. Stormwater wetlands are designed to mitigate the negative impacts on stormwater quality and quantity that can occur due to land used changes. Mitigation is accomplished by temporarily storing stormwater runoff in shallow pools that create growing conditions suitable for emergent and riparian wetland plants. Stormwater wetlands usually fall into one of four basic designs as described below:

a. Shallow Marsh System: A design that has a large surface area, and requires a reliable source of baseflow or groundwater supply to maintain the desired water elevations to support emergent wetland plants. Components basically consist of a sediment forebay, a low and high marsh wetland area, and a small deep micropool.

b. Pond/Wetland System: A design that utilizes two separate cells for stormwater treatment. The first cell is a wet pond and the second cell is a shallow marsh. Adequate surface runoff is required to supply the water needed to support the shallow marsh wetland.

c. Extended Detention Wetland: A design that provides extra runoff storage by temporarily detaining runoff above a shallow marsh system. Adequate surface runoff is required to supply the water needed to support the shallow marsh wetland.

d. Pocket wetlands: A design that is used for drainage areas from one to ten acres. Due to small drainage areas, surface runoff and base flow are limited. Therefore, water levels are maintained by excavating down to the water table.

The following criteria shall be considered in the design of a stormwater wetland system in order to maximize pollutant removal:

a. Provide a treatment volume capable of capturing the runoff generated by 90% of the runoff-producing storms. To determine the runoff volume, either statistically analyze existing runoff records, or use the design method used in chapter 5 of "Design of Stormwater Wetland Systems, Guidelines for Creating Diverse And Effective Stormwater Wetland Systems In the Mid-Atlantic Region", 1992, authored by Thomas R. Schueler. In Connecticut and Rhode Island, treating the runoff from a 1.25 inch rainfall event should achieve treating 90% of the storm events. A minimum treatment volume of 0.25 watershed inches should be provided for all sites.

b. Provide a minimum stormwater wetland to watershed ratio of 1.0% to 2.0%.

c. Provide a depth /area allocation that maximizes the surface area to volume ratio. Shallower depths will provide a greater variety of vegetation for nutrient uptake and less treatment volume, whereas, deeper depths provide more treatment volume, however, provide a lesser variety of vegetation.

d. Allocate treatment volume of the stormwater wetland system to meet targets for the depth components of the system. Treatment volumes should be apportioned to the different treatment methods of a system to maximize removal efficiency.

e. Provide the longest possible flow path through the wetland system. The length to width ratio of the entire wetland design should be greater than or equal to 1. The dry weather flow path within the wetland should have a length to width ratio greater than or equal to 2:1.

f. Provide an adequate water supply to the wetland to maintain water elevations needed to support the type of designed wetland. Liners should be considered in areas of high infiltration rates or limited water supply for the more water dependent designs.

g. Provide for extended detention for smaller storms. In general the volume of the extended detention should be no more than 50% of the entire stormwater wet land system. The detention time should be 12 to 24 hours with a maximum water depth of three feet above the normal pool of the wetland.

h. Provide adequate wetland plant soil medium, proper planting techniques, adequate water level controls, and suitable wetland plant species. Use sections 5.4 , 5.5, and 5.6 of the reference noted in section 4a of this standard.

5. Stormwater treatment devices consists basically of oil grit separators and other contained devices that generally are retrofitted to an existing stormwater drainage system. The function of these devices is to improve the quality of stormwater runoff and provide little to no flood protection. Sediments are removed by settling or filtration. Oils are removed by the frequent cleanout of the temporary flotation provided by the treatment device. Some soluble nutrients are removed by either filtration, chemical, or biological treatment provided by a particular treatment device. The application of any of these devices should be as per the manufactures design criteria and recommendations. Incorporating any stormwater treatment device in a runoff management system shall not interfere with the intended function of any of the systems components.

6. Parking lot storage areas can be used to help control runoff from impervious paving. Most parking lot storage areas include small ponding areas that have an increased curb height and an outlet control structure. The following factors shall be considered in designing these areas:

a. The practice applies only to a maximum area of 3 acres in size.

b. The parking lot design and installed grades must insure positive flow to the storage area. The storage area must be nearly level, but the slope shall be steep enough to facilitate drainage.

c. Trash guards must be provided to prevent clogging of the outlet control device.

d. Generally, ponding on the parking lot must not exceed 6 in. in areas where cars and light trucks are to be parked or 10 in. where heavy trucks are to be parked.

e. Emergency overflow outlets must be provided.

f. Such auxiliary practices as porous pavement and vegetative filter areas may be used in or adjacent to parking lots to permit infiltration.

7. For rooftop storage, the following requirements are applicable:

a. The roof shall be structurally capable of holding detained storm water and of withstanding the effects of high winds and snow. Requirements for structural stability are outside the scope of this standard and shall be determined by the building designer.

b. An adequate number of roof drains shall be provided.

c. Emergency overflow measures shall be provided to prevent overloading if roof drains become plugged.

e. Storage time on the roof shall be 24 hours or less.

8. The design of underground tanks shall be based on the following criteria:

a. The tank must be structurally capable of handling the anticipated loadings and be suited to the soils. Requirements for structural stability are outside the scope of these standards and must be based on sound engineering principles.

b. The outlet from the tank shall not be less than 5 in. in diameter . Provisions shall be made to prevent debris from entering the tank. Debris collectors shall be placed so that the need for maintenance can be readily detected and cleaning operations easily performed.

c. The bottom of the tank shall be on a slight grade to insure complete drainage.

d. Access shall be provided to the tank to permit removal of sediment and other debris.

e. The maximum time of storage shall not exceed 5 days.

Sequence of installation

Components shall be designed and installed in a sequence that permits each to function as intended without causing a hazard. Single components shall not be installed until plans for the entire runoff management system are completed.

Safety

Appropriate safety features and devices shall be installed to protect humans and animals from such accidents as falling or drowning. Temporary fencing can be used until barrier plantings are established. Such protective measures as guard-rails and fences shall be used on spillways and impoundments as needed.

Visual resource. Landscape architectural practices must insure that all measures are visually compatible with the surrounding landscape.

Protection

A protective cover of vegetation shall be established on exposed surfaces and other disturbed areas. Vegetation types will be provided that give the best protection. Other protective measures, such as mulches, also can be used. Seedbed preparation, seeding, fertilizing, and mulching shall comply with recommendations in technical guides for the area.

OPERATION AND MAINTENANCE.

A plan of operation and maintenance shall be prepared for use by the owner or others responsible for the system to insure that each component functions properly. This plan shall provide requirements for inspection, operation, and maintenance of individual components, including outlets. It shall be prepared before the system is installed and shall specify who is responsible for maintenance. Adequate rights-of-way must be provided for maintenance access.

PLANS AND SPECIFICATIONS

Plans and specifications for runoff management systems shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.