NATURAL RESOURCES CONSERVATION SERVICE

VIRGINIA CONSERVATION PRACTICE STANDARD

ROOF RUNOFF STRUCTURE

(No.)

CODE 558

DEFINITION

Structures that collect, control, and transport precipitation from roofs.

PURPOSES

This practice may be applied as a part of a resource management system to support one or more of the following purposes:

- Improve water quality
- Reduce soil erosion
- Increase infiltration
- Protect structures
- Increase water quantity

Structure(s) may also be used to prevent roof runoff from flowing across concentrated waste areas, barnyards, roads and alleys, reduce pollution, prevent flooding, improve drainage, and/or protect the environment.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Roof runoff structures are a component of an overall resource management system and/or a waste management system.
- Roof runoff needs to be diverted away from structures or contaminated areas.
- There is a need to collect, control, and transport runoff from roofs to a stable outlet.
- Roof runoff is collected and used for other purposes.

CRITERIA

GENERAL CRITERIA APPLICABLE TO ALL PURPOSES

Design Capacity

Design of roof runoff structures shall be based on the runoff from a 10-year frequency, 5-minute rainfall except that a 25-year frequency, 5-minute rainfall shall be used to design roof runoff structures that exclude roof runoff from components of a waste management system (waste treatment lagoons, waste storage ponds, waste storage structures, or similar practices). Refer to Agricultural Waste Management Field Handbook, NEH Part 651, Appendix 10B for maps showing rainfall intensity data.

Gutters will be installed on a minimum slope of 0.5 percent (1/16 inch per foot). When gutters are used, the capacity of the downspout(s) must equal or exceed the gutter flow rate. The flow rates for downspouts shall be calculated by using the orifice discharge equation with a coefficient of discharge not greater than 0.65. Refer to Chapter 10 of the Agricultural Waste Management Field Handbook (NEH Part 651) for guidance in designing gutters and downspouts.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Materials

Roof runoff structures shall be made of durable materials with a minimum design life of ten years. Roof gutters and downspouts may be made of aluminum, galvanized steel, wood, or plastic. Aluminum gutters and downspouts shall have a nominal thickness of 0.027 inches and 0.020 inches, respectively. Galvanized steel gutters and downspouts shall be at least 28 gauge. Wood shall be clear and free of knots. A water repellant preservative shall be applied to the flow areas of wood other than redwood, cedar, or cypress. Plastics shall contain ultraviolet stabilizers. Dissimilar metals shall not be in contact with each other.

Rock-filled trenches and pads shall consist of poorly graded rock (all rock fragments approximately the same size) and be free of appreciable amounts of sand and/or soil particles. Crushed limestone shall not be used for backfill material unless it has been washed. Subsurface drains or outlets shall meet the material requirements of the applicable NRCS conservation practice standard.

Concrete appurtenances used shall be appropriate for the expected use and designed in accordance with sound engineering practices.

Supports

Gutter supports shall have sufficient strength to withstand anticipated water, snow, and ice loads. They shall have a maximum spacing of 48-in. (1.2 m) for galvanized steel and 32 in. (0.8 m) for aluminum or plastic. Wood gutters shall be mounted on fascia boards using furring blocks that are a maximum of 24-in. (0.6 m) apart. Downspouts shall be securely fastened at the top and bottom with intermediate supports that are a maximum of 10-ft. (3.0 m) apart.

Outlets

Runoff may empty into surface or underground outlets, or onto the ground surface. Surface and underground outlets shall be sized to ensure adequate design capacity. Clean out, when necessary, shall ensure proper function and capacity is maintained.

When runoff from roofs empties onto the ground surface, a stable outlet shall be provided. When runoff is conveyed through a gutter and downspout system, an elbow and energy dissipation device shall be placed at the end of the downspout to provide a stable outlet and direct water away from the building.

Surface or ground outlets such as rock pads, rock filled trenches with subsurface drains, concrete and other erosion-resistant pads, or preformed channels may be used, particularly where snow and ice are a significant load component on roofs.

Protection

Roof runoff structures shall be protected from damage by livestock and equipment. Where appropriate, snow and ice guards may be installed on roofs to protect gutters and reduce the hazard to humans and animals below. Gutters may be installed below the projection of the roofline to further reduce gutter damage from snow and ice. Ice guards should be considered on metal roofs to reduce the risk of ice damage.

ADDITIONAL CRITERIA TO INCREASE INFILTRATION

Where possible, runoff shall be routed onto pervious landscaped areas (e.g. lawns, mass planting areas, infiltration trenches and natural areas) to increase infiltration of runoff. These areas shall be capable of infiltrating the runoff in such a way that replenishes soil moisture without adversely affecting the desired plant species.

ADDITIONAL CRITERIA TO PROTECT STRUCTURES

Runoff shall be directed away from structure foundations to avoid wetness and hydraulic loading on the foundation. On expansive soils or bedrock, downspout extensions shall be used to discharge runoff a minimum of five (5) feet from the structure.

The discharge area for runoff must slope away from the protected structure.

ADDITIONAL CRITERIA TO INCREASE WATER QUANTITY

Structures needed to collect and store water from roofs for potable and non-potable purposes shall be designed and installed in accordance with

sound engineering principles. Storage structures for non-potable purposes such as irrigation water should be designed in accordance with NRCS conservation practice standards, as appropriate.

Potable water storage structures should be constructed of materials and in a manner that will not increase the contamination of the stored water. Roof runoff collected and stored for potable uses must be treated prior to consumption and should be tested periodically to assure that adequate quality is maintained for human consumption.

CONSIDERATIONS

Avoid discharging outlets near wells or into structures that discharge directly into surface waters.

PLANS AND SPECIFICATIONS

Plans and specifications for installing roof runoff structures shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. The plans and specifications shall show the location, spacing, size, and grade of all gutters and downspouts and type and quality of material to be used. Plans and specifications for other practices essential to the proper functioning of the roof runoff structure, such as underground outlets, shall be included.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed that is consistent with the purposes of the structure(s), intended life, safety requirements, and the criteria for the design. The plan shall provide requirements for inspection, operation, and maintenance of individual structures, including outlets. The plan shall contain, but not be limited to, the following provisions:

- Keep roof runoff structures clean and free of obstructions that reduce flow.
- Make regular inspections and perform repair maintenance as needed to ensure proper functioning of the roof runoff structures.
- Inspections should also be made after each storm event.

REFERENCES

1. NRCS Agricultural Waste Management Field Handbook, NEH Part 651, Chapter 10.

2. Agricultural Waste Management Systems (AWMS) Computer Based Training CD-ROM, Release 24 v11.32, January 2001.

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Approved Practice Narratives

(No.)

CODE 558

558 D1 Roof Runoff Structure: Establish and maintain roof runoff structure(s) in accordance with the Virginia Conservation Practice Standard *Roof Runoff Structure (Code 558)* and any specification(s) provided.

558 D2 Roof Runoff Structure: Maintain existing roof runoff structure(s) in accordance with the Virginia Conservation Practice Standard *Roof Runoff Structure (Code 558)* and any specification(s) provided.