

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

ROOF RUNOFF STRUCTURE

(Number)

CODE 558

DEFINITION

A structure that will collect, control and convey precipitation runoff from a roof.

PURPOSE

This practice is applied to achieve one or more of the following purposes:

- Protect surface water quality by excluding roof runoff from contaminated areas
- Protect a structure foundation from water damage or soil erosion from excess water runoff
- Increase infiltration of runoff water
- Capture water for other uses

CONDITIONS WHERE PRACTICE APPLIES

Where roof runoff from precipitation needs to be:

- diverted away from the foundation of a structure or contaminated areas;
- collected and conveyed to a stable outlet or infiltration area; or
- collected and captured for other uses such as evaporative cooling systems, livestock water and irrigation.

CRITERIA

General Criteria Applicable to All Purposes

Use of this standard requires compliance with all applicable federal, state, and local laws and regulations.

Gutter Design Capacity. When a roof runoff structure is used to protect roof runoff from contamination by manure, design the roof runoff structure to convey the flow rate generated from a 25-year frequency, 5-minute precipitation event of 0.6 inches (Refer to Agricultural Waste

Management Field Handbook, NEH Part 651 Chapter 10 Appendix 10B).

For other applications, design the roof runoff structure to convey the flow rate generated from a 10-year frequency, 5 minute precipitation event.

When gutters are used, the capacity of the downspout(s) must equal or exceed the gutter flow rate.

Runoff may empty into surface or underground outlets, or onto the ground surface. Surface and underground outlets will be sized to ensure adequate design capacity and will provide for clean-out as appropriate. When runoff from roofs empties onto the ground surface, a stable outlet will be provided. Indiana (IN) Field Office Technical Guide (FOTG) Standard (620) Underground Outlet will apply to the portion of outlets that are under ground. When runoff is conveyed through a gutter and downspout system, an elbow and energy dissipation device will 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.

In regions where snow and ice will accumulate on roofs, guards and sufficient supports to withstand the anticipated design load will be included.

Roof runoff structures will be made of durable materials with a minimum design life that meets the conservation practice lifespan. Roof gutters and downspouts may be made of aluminum,

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service State Office, or download it from the Field Office Technical Guide for your State.

galvanized steel, or plastic. Aluminum gutters and downspouts will have a minimum nominal thickness of 0.027 inches and 0.020 inches, respectively. Galvanized steel gutters and downspouts will be a minimum 28 gauge. Plastics will contain ultraviolet stabilizers. Dissimilar metals will not be in contact with each other. Gutter supports will have a sufficient strength to withstand anticipated water, snow, and ice loads. They will have a maximum spacing of 24 inches. Downspouts will be securely fastened at the top and bottom with intermediate supports that are a maximum of 5 feet apart.

Rock-filled trenches and pads will 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 will not be used for backfill material unless it has been washed. Subsurface drains or outlets will meet the material requirements of the applicable NRCS conservation practice standard.

Concrete appurtenances used will meet the requirements of NRCS NEH Part 642, Chapter 2, Construction Specification 32 Structure Concrete.

Roof runoff structures will 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 roof line to further reduce gutter damage from snow and ice.

Additional Criteria to Increase Infiltration

Runoff will be routed onto pervious landscaped areas (e.g., lawns, mass planting areas, infiltration trenches, rain gardens or natural areas) to increase infiltration of runoff. These areas will be capable of infiltrating the runoff in such a way that replenishes soil moisture without adversely affecting the desired plant species and without creating a soil erosion problem.

Additional Criteria to Protect the Foundation of a Structure

For a design which outlets the roof runoff on the ground, slope the runoff discharge area away from the structure foundation. Use a minimum

downspout extension of ten (10) feet to discharge runoff away from the foundation of a structure built on expansive soils or a building foundation placed on bedrock.

Additional Criteria to Increase Water Quantity or Capture Water for Other Uses

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

Design a water storage tank of adequate size, strength and durability to hold water for the intended purpose. Install the tank on a firm, unyielding foundation. Anchor above-ground water storage tanks to prevent damage from wind loads.

Prohibit access to water storage tanks by children and animals to prevent drowning. Protect the area around the tank from erosion caused by overflow from the tank.

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

CONSIDERATIONS

The considerations section contains information that is optional to the planner.

Avoid discharging outlets near wells and sinkholes.

Some designs may provide secondary benefits, e.g. rock pads may also reduce rodent problems around livestock and poultry barns.

Carefully clean dust and particulate matter from the roof and gutters, especially above fans, prior to precipitation events. Collect and add the dust and particulate matter to the waste storage facility.

PLANS AND SPECIFICATIONS

The plans and specifications will 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 outlet, will be included.

OPERATION AND MAINTENANCE

An operation and maintenance plan will be developed that is consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design. The plan will 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 maintenance as needed to ensure proper functioning of the roof runoff structures.
- Carefully clean dust and particulate matter from the roof and gutters, especially above

fans, prior to precipitation events. Collect and add the dust and particulate matter to the waste storage facility.

REFERENCES

NRCS, 2009, National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook, Chapter 10, Agricultural Waste Management System Component Design

NRCS, National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 2, Estimating Runoff

NRCS National Engineering Manual, Part 536.20, Design Criteria for Reinforced Concrete

NRCS National Engineering Handbook, Part 642, Construction Specification 32, Structural Concrete