

**NATURAL RESOURCES CONSERVATION SERVICE
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

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Roof runoff structures are a component of an overall resource 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. At minimum, a 10-year frequency, 5-minute rainfall precipitation event shall be used to design roof runoff structures, except where excluding roof runoff from manure management systems. In that case, a 25-year

frequency, 5-minute precipitation event shall be used to design roof runoff structures. Use Figures 10B-3 and 10B-4 in the Agricultural Waste Management Field Handbook, NEH Part 651, Appendix 10B for rainfall values or use the following;

10-year frequency, 5-minute rainfall.

The entire state of Maine use 0.40 inches

25-year frequency, 5 minute rainfall.

York and Cumberland Counties use 0.55 inches.

Kennebec, Penobscot, Waldo, Hancock, Franklin, Androscoggin, Sagadahoc, Washington, Somerset, Oxford, Knox, and Lincoln counties use 0.50 inches.

All of Aroostook, and Piscataquis counties use 0.45 inches.

The extent of roof area that can be served by a gutter system is controlled by either the flow capacity of the gutter (channel flow) or by the flow capacity of the header or downspout (orifice flow).

The size of roofs on livestock housing structures are usually large, the installation and maintenance of gutters and downspouts are expensive. Larger gutters may be more desirable because larger downspouts may be used and this reduces the number of downspouts needed and reduces the potential for frost damage and clogging. Considering these factors, it may be desirable to use no smaller than a 5-inch gutter. The availability of gutter sizes should also be considered.

Use Figure 5 in NENTC Agricultural Engineering Technical Note 1 to determine the gutter size when the system is controlled by the gutter (channel) capacity. It is based upon the

recommended gutter slope of 1/6 inch per foot or 0.00508 ft/ft.

Use Figure 4 NENTC Agricultural Engineering Technical Note No. 1 to determine the gutter size when the system is controlled by the downspout (orifice) capacity.

Figures 2 and 3 in NENTC Agricultural Engineering Technical Note 1 show dimensions of several typical gutters. Figure 1 shows dimensions of typical downspouts. Size the downspout based upon the bottom width of the gutter. For example, if the bottom width of the gutter is 3 inches, then the largest standard downspout that can be installed in the gutter is a 3-inch by 4-inch rectangular downspout.

Use the design procedures described in NENTC Agricultural Engineering Technical Note for gutter dimensions not provided in Figures 4 and 5.

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

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 and shall provide for clean-out as appropriate. 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 along building foundations below eaves, particularly where snow and ice are a significant load component on roofs.

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

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. Wood may be 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 meet the requirements of NRCS Construction Specification 32, Concrete for Minor Structures.

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.

Additional Criteria To Increase Infiltration

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 outlet, shall be included.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed that is consistent with the purposes of the practice, intended life, safety requirements, and the criteria for the design. 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.