ROOF RUNOFF STRUCTURE

(No.)
Code 558

Natural Resources Conservation Service
Conservation Practice Standard

I. Definition

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

II. 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

III. Conditions Where Practice Applies

This practice applies where:

- Roof runoff structures are a component of an overall 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.

IV. Federal, State, and Local Laws

Users of this standard should be aware of potentially applicable federal, state and local laws, rules, regulations or permit requirements governing roof runoff structures. This standard does not contain the text of federal, state or local laws.

V. Criteria

A. General Criteria Applicable to All Purposes

1. 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 Figure 1 and 2 contain the precipitation data.

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

2. 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. Underground outlets shall be in accordance with NRCS Field Office Technical Guide (FOTG), Section IV, Standard 620, Underground Outlet.

   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.

   Chapter NR 812 of the Wisconsin Administrative Code requires a separation distance of 8 feet between a downspout and any well.

3. Supports

   The condition of existing roof structures must be evaluated prior to placement of gutters.

The existing structure must have sufficient strength to support the gutters.

Gutter supports shall have sufficient strength to withstand anticipated water, snow, and ice loads. They shall have a maximum spacing of 24 inches.

Gutters, which are not mounted on fascia boards, shall have lateral supports spaced not more than 12 feet apart.

Wood gutters shall be mounted on fascia boards using furring blocks that are a maximum of 24 inches apart.

Downspouts shall be securely fastened at the top and bottom with intermediate supports that are a maximum of 10 feet apart. Lateral downspouts shall have supports that are a maximum of 5 feet apart.

4. 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 sound and free of knots. Treated lumber used as fascia for aluminum gutters shall have a treatment retention of 0.25 pounds per cubic foot to minimize the potential reaction with the aluminum. A water-repellant shall be applied to the flow area of woods 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 FOTG Standard 620, Underground Outlet.

5. Protection

Roof runoff management facilities and outlets 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 should be installed below the projection of the roofline to further reduce gutter damage from snow and ice.

B. Specific 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.

C. Specific 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 5 feet from the structure.

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

VI. Considerations

Additional recommendations relating to design that may enhance the use of, or avoid problems with, this practice but are not required to ensure its basic conservation functions are as follows.

A. Consider the use of several downspouts to reduce gutter size.

B. Strainers should be considered at the head of the downspout when underground outlets are used.

C. Avoid discharging outlets directly into surface waters.

VII. 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.

VIII. 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:

A. Keep roof runoff structures clean and free of obstructions that reduce flow.

B. Make regular inspections and perform repair or maintenance as needed to ensure proper functioning of the roof runoff structures.

IX. References

USDA, NRCS, Wisconsin Field Office Technical Guide, Section IV, Conservation Practice Standards and specifications.

USDA, NRCS, National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook.

Figure 1: 10-Year, 5-Minute Rainfall (Inches)
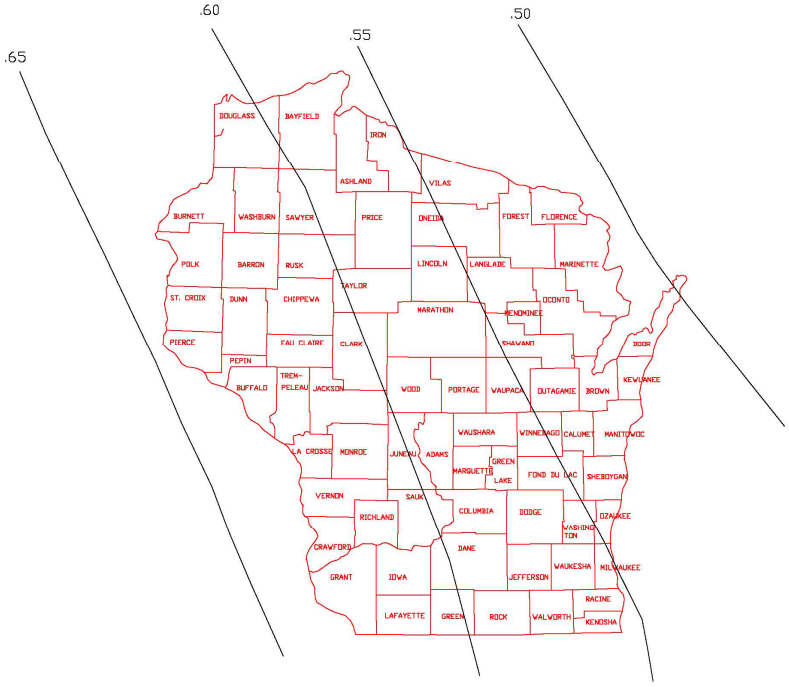
Figure 2: 25-Year, 5-Minute Rainfall (Inches)