

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**ROOF RUNOFF STRUCTURE**

(Each)

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 (Refer to Agricultural Waste Management Field Handbook, NEH Part 651, Appendix 10B). 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, 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.

<p>Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.</p>
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**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. [Roof gutter and downspouts should not be considered in areas where they will be within reach of livestock unless provisions are made to secure the structures or keep livestock away.](#)

**Trench Drains.** The pipe of a trench drain shall have the non-pressurized capacity to handle the design storm described above. The flow or storage of water in the gravel or stone shall not be considered in the design. The pipe shall be installed a minimum of two feet below ground. The pipe shall be perforated corrugated plastic tubing or PVC pipe. Heavy duty steel or PVC pipe shall be used in areas where heavy traffic is anticipated. The gravel or crushed stone shall be clean and have the follow gradation (ASTM C-33 Number 57) or coarser:

<u>Sieve Size</u>	<u>Percent Passing</u>
1-1/2 inch	100
1 inch	95 - 100
1/2 inch	25 - 60
No. 4	0 - 10
No. 8	0 - 5

The trench drain shall discharge to a suitable outlet that will not cause erosion or other downstream damage. Barriers, fencing, curbing, or other measures shall be installed to keep livestock and manure away. In areas where the ground water is high, additional capacity of the pipe may be required.

**Channels.** Channels, gutters or other practice installed may be installed on the ground to divert roof water. These practices shall be installed in accordance to the appropriate standard. These practices shall have the capacity described above and diverted to a suitable non-erosive outlet. Any channel or other practice installed on the ground to divert roof runoff shall be constructed of a non-erosive material. Barriers, fencing, curbing or other measures shall be installed to keep livestock and manure away. Curbing shall be designed in accordance to standard 561 – Heavy Use Area Protection. Due consideration shall be taken to the potential damage to building foundations and siding when these facilities are installed.

**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 and replacement as needed to ensure proper functioning of the roof runoff structures.

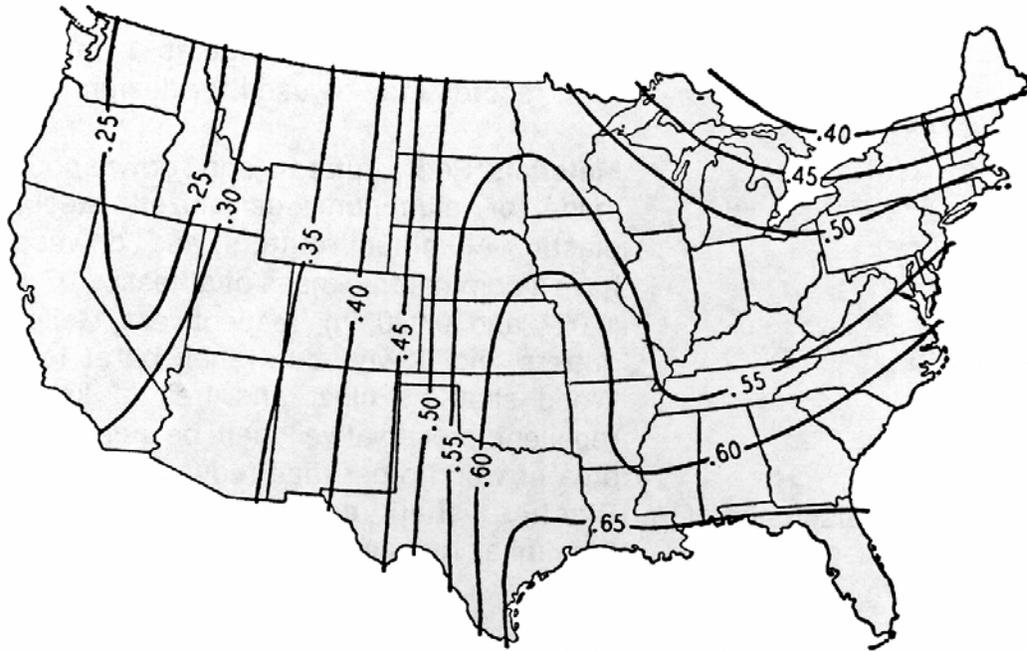


Figure 1.—Ten-year frequency, five-minute rainfall (inches).

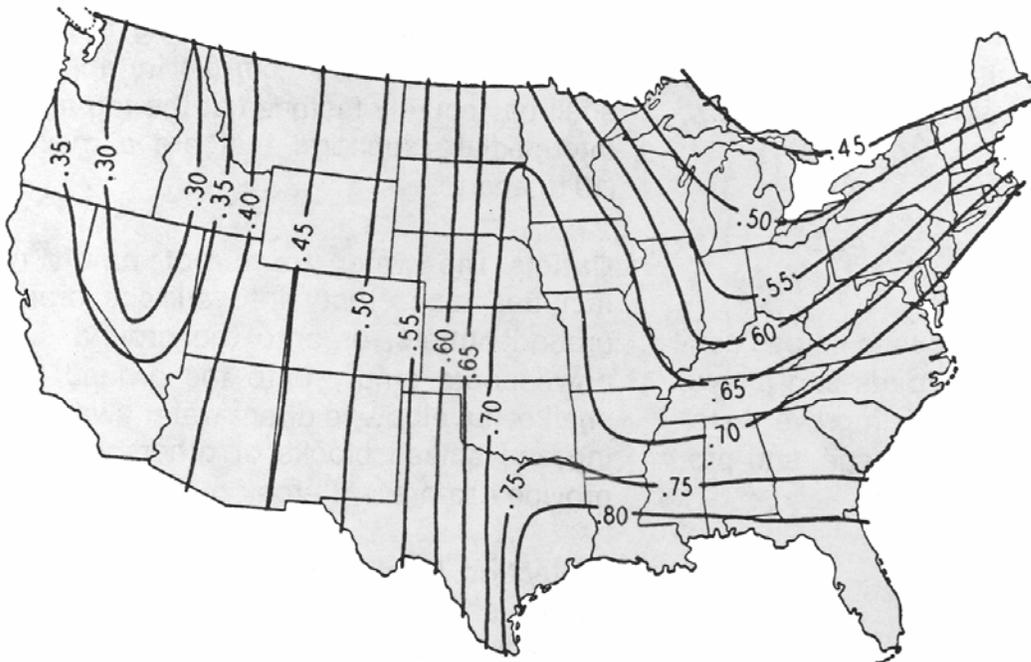


Figure 2.—Twenty-five-year frequency, five-minute rainfall (inches).