Roof Runoff Structure (No.) 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 such as a comprehensive nutrient management plan or a waste management system plan.
- 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

Roof runoff structures shall be planned, designed, and installed to meet all federal, state, local, and tribal laws and regulations.

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. Rainfall from Figures 1 and 2 or reliable local records may be used for design. 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. Gutter supports shall have sufficient strength to withstand anticipated water, snow, and ice loads. They shall have a maximum spacing of 48 inches for galvanized steel and 32 inches for aluminum or plastic. 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.

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 underground outlets shall meet the material requirements of the applicable NRCS conservation practice standard.

Concrete appurtenances used shall be in accordance with NRCS Construction Specification MI-158, Reinforced Concrete, or MI-159, Plain Concrete, as appropriate.

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 roof line 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 5 feet from the structure.

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

Additional Criteria to Increase Water Quantity

Roof runoff water shall not be collected for potable purposes.

Structures needed to collect and store water from roofs for non-potable purposes shall be designed and installed in accordance with sound engineering principles. Storage structures for non-potable purposes such as irrigation water shall be designed in accordance with the applicable NRCS-Michigan conservation practice standards.

CONSIDERATIONS

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

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

Consider the potential effects of installation and operation of the roof runoff structures on cultural, archaeological, historic and economic resources.

PLANS AND SPECIFICATIONS

Plans and specifications for roof runoff structures shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Support data documentation requirements are as follows:

- Inventory and evaluation records
  - CONS-6 notes or special report
- Survey notes, where applicable
  - Design survey
  - Construction layout survey
  - Construction check survey
- Design records
  - Physical data, functional requirements, and site constraints, where applicable
  - Soils/subsurface investigation report, where applicable
- Design and quantity calculations
- Construction drawings/specifications with:
  - Location map
  - "Designed by" and "Checked by" names or initials

  - Approval signature
  - Job class designation
  - Initials from preconstruction conference
  - As-built notes
- Construction inspection records
  - CONS-6 notes or separate inspection records
  - Construction approval signature
- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable

OPERATION AND MAINTENANCE

An Operation and Maintenance (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.

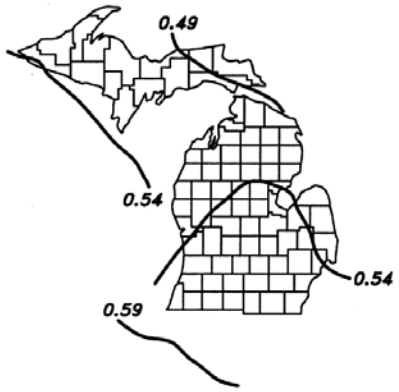

Figure 1 – Ten-year frequency, five-minute rainfall (inches)

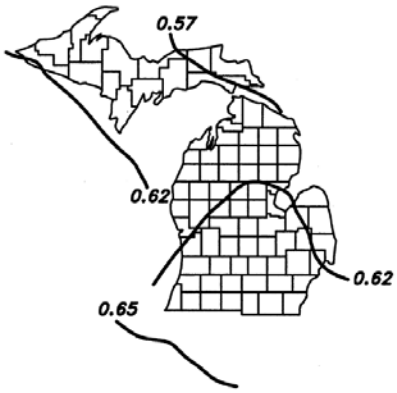

Figure 2 – Twenty-five-year frequency, five-minute rainfall (inches)

NOAA Technical Memorandum NWS HYDRO-35, Five- to Sixty-Minute Precipitation Frequency for the Eastern and Central United States, 1977.

Example: Roof Area = 50 ft x 100 ft = 5,000 ft^2 (Clinton County, Michigan)
10-year, 5-minute rainfall = 0.55 in
Total runoff = 0.55 in x 1 ft/12 in x 5,000 ft^2 = 229 ft^3
Duration of rainfall in seconds = 5 min x 60 sec/1 min = 300 sec
Design discharge for gutter = 229 ft^3/300 sec = 0.76 ft^3/sec