651.1001 (a) Roof runoff management

Roof runoff management systems are generally used to collect clean rainfall off a building roof and route it away from areas contaminated with manure or other wastes. The roof runoff management system should consist of three parts, gutters, downspouts and a disposal system. Each of these parts of the system must be designed for the system to work properly.

Systems which collect rainfall which would otherwise runoff into a manure storage structure must be designed to control the 25 year 5 minute frequency rainfall. Other systems can be designed for a 10 year 5 minute frequency rainfall. Refer to Figure 10B-3 and 10B-4 in Appendix 10-B. There is little difference in the magnitude of these rainfall amounts for Indiana. Therefore, all gutters will be design to carry the P_{25}-5 min. rainfall of 0.60 inches unless a more site specific detailed analysis is warranted.

The components of a roof runoff management system are the gutters, downspouts and a means of disposing of the runoff. Gutters are available in a variety of sizes, styles and materials. The selection of the gutter material and size may depend upon what is readily available in your area. Downspout sizes are dependent upon the gutter size. The disposal system is generally a pipe or subsurface drain which is sized to carry the peak flow out of the downspouts and outlet it where it will not be contaminated with manure or other pollutants.

Design - A worksheet is enclosed as an aid to document the design. Gutters and downspouts are part of a manure management system and the roof runoff system should be designed for the P_{25}-5 minute frequency rainfall event of 0.60 inches. Compute the area of the roof. From Table 10D-3 select a maximum roof area that exceeds the actual roof area being guttered. Next determine the actual gutter capacity by multiplying the maximum gutter capacity by the ratio of the actual roof area to the maximum roof area that was selected. Select the number of downspouts to carry the gutter flow. The total flow of the downspouts must exceed the gutter flow.

Unless roofs are identical, a separate design must be completed for each roof to be guttered for the waste management system.

Next determine where and how all roof runoff can be disposed of. In most instances, a subsurface drain which can route the flow well away from buildings and livestock is the best alternative. This drain must be sized to carry the peak runoff from the roof. Refer to Chapter 14 of the Engineering Field Handbook to determine the required subsurface drain size.

Installation - The plans shall show type, size and slope of gutters to be installed. Gutters, downspouts, and associated hardware shall be of similar material. Gutters should be installed below a line formed by projecting the roof line down and out away from the building.

Hardware and accessories shall be of sufficient strength to secure the gutters and downspouts. Fasteners shall be securely anchored in a manner which will not prevent entry of water into the gutter.

Worksheet - Roof Gutters & Downspout Design

Use this worksheet for each roof to be guttered. Selection of type and size will depend on local availability of gutters and downspouts.

Owner/Operator _____ Building ID _____
Computed by _____ Date _____
Checked by _____ Date _____

1. Determine horizontal projected area of roof to be guttered.

L _____ ft. x W _____ ft. = _____ ft^2

2. Design storm P_{25} - 5 min = 0.60"

3. Determine Maximum Gutter Capacity.

From Table 10D-3, select maximum roof area that exceeds actual roof area.

Max. roof area _____ ft^2

Gutter slope _____ ft^2

Max. Gutter Capacity _____ cfs

4. Compute Actual Gutter Capacity.

Max. Gutter Capacity x (Actual roof area / Maximum roof area)

_____ cfs x _____ ft^2 / _____ ft^2 = _____ cfs

5. Determine size & number of downspouts.

From Table 10D-3, select compatible downspout. Compute the number of downspouts to provide a discharge equal to or greater than the actual gutter discharge.

Downspout type _____ Discharge _____ cfs

Actual gutter discharge / Downspout discharge = Number of downspouts

_____ cfs / _____ cfs = _____

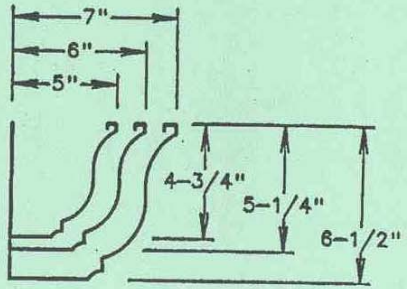
Number of downspouts (round up to next whole number) _____

TABLE 10D-3 - Roof Gutters & Downspouts Design Guide

Gutter Style	Gutter Size	Gutter Slope in/ft	Max. Roof Area [1] for P=0.60"	Max. Gutter Capacity [2] cfs	Compatible Downspouts - size / cfs [3]									
					Plain Round		Corrugated Round		Octagonal		Corrugated Square		Plain Rectangular	
Box Ogee Galv.	5"	1/16	1320	0.22	3"/ 0.15		3"/ 0.13		3"/ 0.17		3"/ 0.17		2"X4" 0.17	3"X4" 0.26
		1/8	1860	0.31										
		1/4	2640	0.44										
	6"	1/16	2040	0.34	3"/ 0.16	4"/ 0.29	3"/ 0.14	4"/ 0.25	3"/ 0.14	4"/ 0.26	3"/ 0.18	4"/ 0.27	3"X4" 0.27	4"X5" 0.46
		1/8	2880	0.48										
		1/4	4080	0.68										
	7"	1/16	3540	0.59	4"/ 0.32	5"/ 0.50	4"/ 0.28	5"/ 0.45	4"/ 0.28	5"/ 0.45	4"/ 0.30	5"/ 0.48	4"X5" 0.51	5"X6" 0.62
		1/8	4980	0.83										
		1/4	7020	1.17										
Box Ogee Alum.	5"	1/16	840	0.14	3"/ 0.13		3"/ 0.11		3"/ 0.13		3"/ 0.14		2"X4" 0.15	3"X4" 0.22
		1/8	1140	0.19										
		1/4	1620	0.27										
	6"	1/16	2040	0.34	3"/ 0.15	4"/ 0.28	3"/ 0.13	4"/ 0.24	3"/ 0.13	4"/ 0.23	3"/ 0.17	4"/ 0.26	2"X4" 0.17	3"X4" 0.26
		1/8	2820	0.47										
		1/4	4140	0.69										

1. Square feet (for maximum gutter capacity)
2. Includes 0.5 " freeboard. For roof areas less than maximum, actual gutter discharge is this value multiplied by (roof area / maximum roof area).
3. Sizes that fit gutter bottom width and their respective (orifice) discharges. Select size and number that provides a discharge equal to or greater than the gutter discharge; e.g. two 2x4" Plain Rectangular (2 x 0.17 = 0.34 cfs) are required for 5"Galv. Box on 1/8" slope (0.31 cfs).

Box Ogee
Galvanized



Box Ogee
Aluminum