

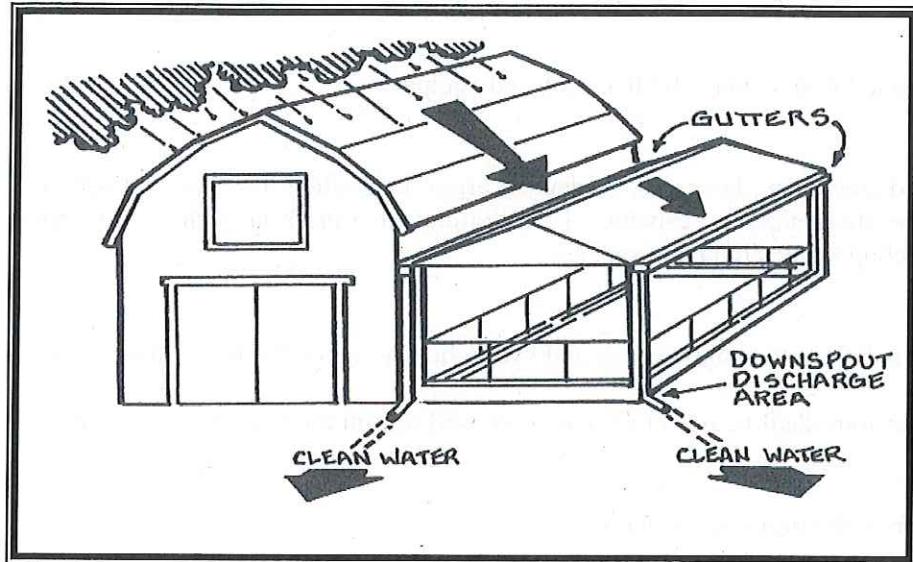


# BEST MANAGEMENT PRACTICE

## *Roof Runoff Structure*

(Also referred to as "Gutters, Downspouts, Outlet Piping")

Adapted from Natural Resource Conservation Service (NRCS) conservation practice standards.



### **Definition:**

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

### **Purpose:**

- Improve water quality
- Reduce soil erosion
- Increase infiltration
- Protect structures
- Increase water quantity

### **Condition Where This Practice Applies:**

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.

**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.

**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:**

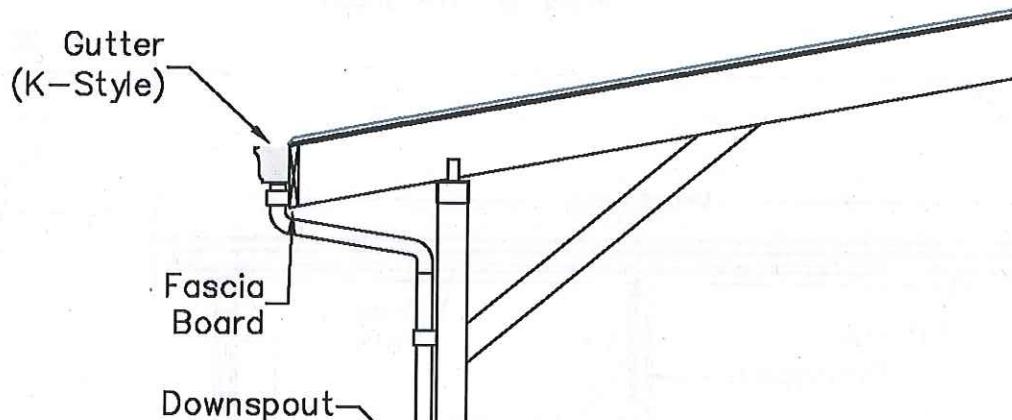
Avoid discharging outlets near wells or into structures that discharge directly into surface waters.

**Operations and Maintenance:**

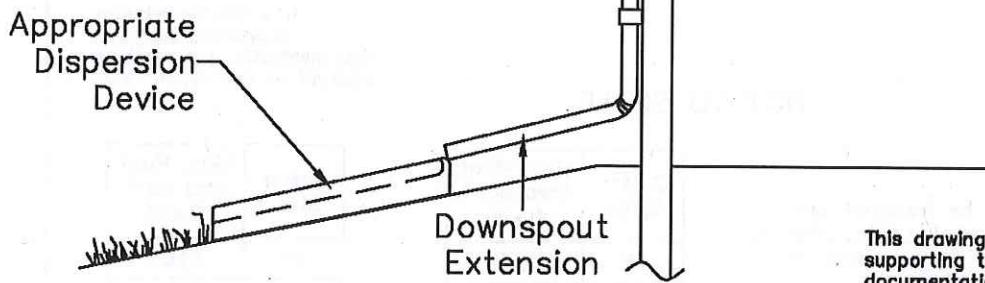
- Keep roof runoff structures clean and free of obstructions that reduce flow.
- Make regular inspections and perform repair maintenance as needed to ensure proper functioning of the roof runoff structures.

# Roof Runoff Structure

## Gutter & Downspout



Note: Concentrated Water shall be managed in accordance with the latest addition of the King County Surface Water Design Manual



This drawing requires supporting technical documentation and must be adapted to the specific site.

NOT TO SCALE

1. In accordance with county dispersion requirements, runoff may empty into surface or underground outlets, or onto the ground surface.
2. Gutters and downspouts shall be installed in accordance with manufacturers recommendations.
3. Downspouts shall be spaced and gutters sloped such that water is directed equally into all downspouts.
26. All gutters shall be free draining, without dips or bows that retain water. Gutters shall be sloped towards downspouts at a minimum of  $\frac{1}{8}$  inch drop in 1 foot.
17. Gutters shall only be installed against boards that are sound and free from rotten wood.
16. Gutters shall be supported at a maximum spacing of 48 inches for galvanized steel or 32 inches for aluminum.
17. Downspouts shall be secured at the top and bottom with intermediate supports that are a maximum of 10 feet apart.
18. Aluminum gutters shall have a minimum nominal thickness of 0.027 inches.
19. Aluminum downspouts shall have a minimum nominal thickness of 0.020 inches.
20. Galvanized steel gutters and downspouts shall be at least 28 gage.
21. Polyvinyl chloride (PVC) downspouts shall be schedule 40 and shall meet the requirements of ASTM-D-1785.
22. Dissimilar metals shall not be in contact with each other.
23. PVC pipe shall be painted if exposed to direct sunlight.



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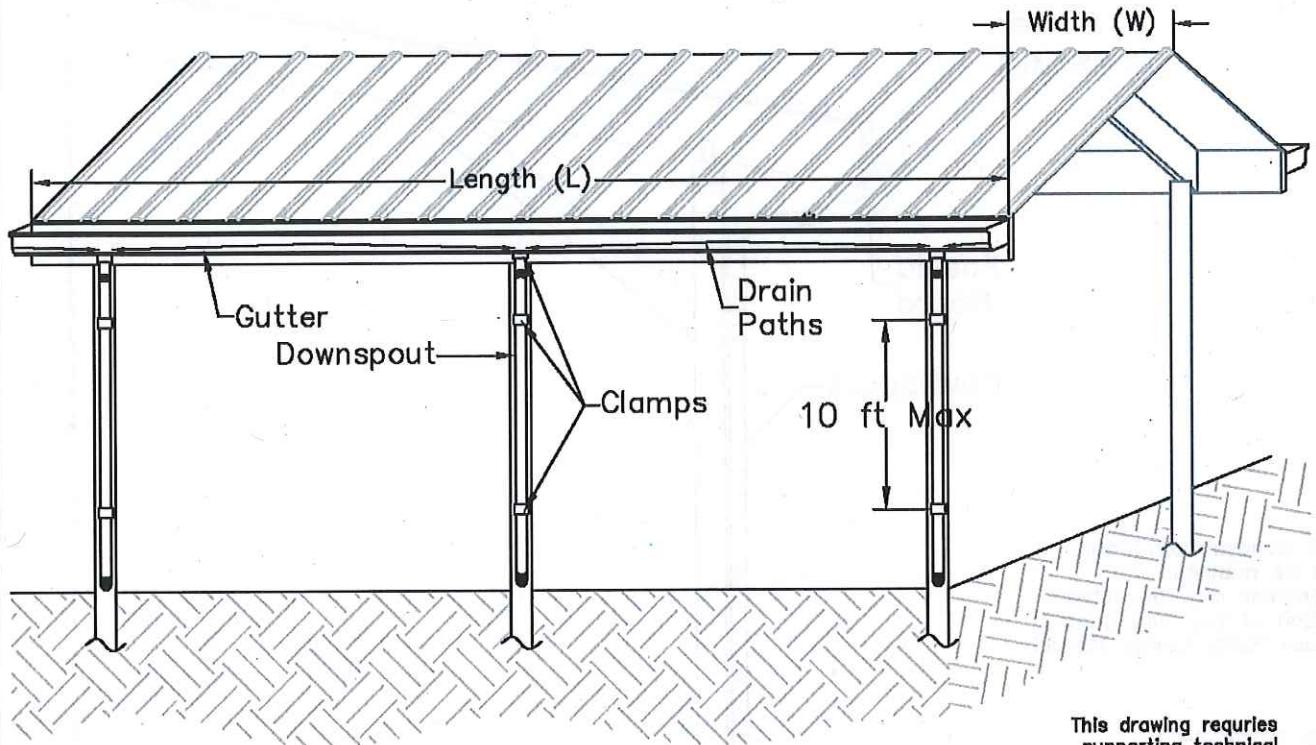
### ROOF RUNOFF GUTTER AND DOWNSPOUT

End View

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Sheet 1 of 2

## Roof Runoff Structure Gutter & Downspout



This drawing requires supporting technical documentation and must be adapted to the specific site.

**NOT TO SCALE**

24. At least one downspout shall be installed per gutter. Additional downspouts shall be installed in accordance with the minimum requirements of this plan and in accordance with county dispersion and/or infiltration requirements.
25. Gutters and downspouts shall meet the minimum sizing requirements as listed.
26. Downspouts shall not be wider than the bottom gutter dimension.

**Downspout Sizes**

Gutter Sizes	2"x3"	3"x4"	2" PVC	3" PVC	4" PVC
8K	—	3	—	5	3
7K	4	2	—	3	2
6K	3	2	—	2	—
5K	2	—	3	—	—
4K	1	—	2	—	—

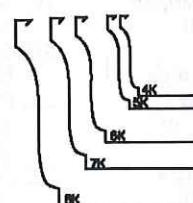
**Downspout Quantity:** The numbers indicated by the combination of a gutter and downspout size represents the minimum number of downspouts required per gutter. More may be necessary due to roof geometry or water management requirements.

Gutter Sizes	Max. Roof Area sq.ft. (LxW)
8K	12100
7K	6900
6K	4200
5K	1900
4K	1280

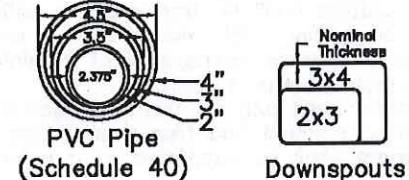
Smallest gutter size allowable per roof area, not on a manure management site.

Gutter Sizes	Max. Roof Area sq.ft. (LxW)
8K	9500
7K	5400
6K	3250
5K	1450
4K	1000

Smallest gutter size allowable per roof area, for use on a manure management site.



**K-Style Gutters**



**Downspouts**



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**ROOF RUNOFF  
GUTTER AND DOWNSPOUT**

**Notes**

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Sheet 2 of 2