ANSI/SPRI RD-1 2009
Performance Standard for Retrofit Drains

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Disclaimer

This standard is for use by architects, engineers, roofing contractors and owners of low slope roofing systems. SPRI, its members and employees do not warrant that this standard is proper and applicable under all conditions.

1.0 INTRODUCTION

This standard is a reference for those that design, specify or install retrofit roof drains which are designed for installation in existing drain plumbing on existing roofs. This standard does not include consideration of all roof storm water drainage code requirements for specific building sites. Design is dictated by local code as referenced in 3.2. It shall be used in conjunction with the installation specifications of the manufacturer of the specific retrofit roof drain.

2.0 DEFINITIONS

For the purposes of this Document, the following definitions apply:

2.1 Retrofit Drain

A factory fabricated drain, installed within an existing roof drain on an existing roof. Retrofit roof drains are installed from the roof surface and provided with a horizontal flashing flange for adhering membrane flashing materials, and rubber coupling to provide a mechanical backflow compression seal to the existing plumbing. A **retrofit drain** is designed so that it may be installed without removing the existing roof **drain body** and plumbing.

2.2 Drain Body

The basic drain, consisting of the **Drain Flange** and interconnected **Drain Stem**. There may be a sump between the flange and the stem.

2.3 Effective Drain Diameter

The least cross-sectional flow area between the **Drain Body** and the outlet of the **Drain Stem** expressed as a diameter.

2.4 Drain Flange

The part of the **Drain Body** that extends horizontally, in the plane of the roof. It is used for attachment of the drain to the roof deck and for clamping and sealing the roof membrane flashing plies to the drain.

2.5 Drain Stem

A part of the drain that is inserted through the existing roof drain bowl for connection to the existing roof drain plumbing. The **Backflow Seal** is integral to the stem.

2.6 Seal

The watertight bond between the **Retrofit Drain** and the existing roofing system as well as the existing plumbing system.

2.6.1 Clamping Ring

A component of the **Retrofit Drain** that creates a mechanical compression seal with the membrane flashing plies by clamping the membrane flashing plies between the **Clamping Ring** and the **Drain Flange**.

2.6.2 Heat Welding

A method for creating a watertight **Seal** between the electric heat-welded membrane flashing plies and the **Drain Flange**.

2.6.3 Backflow Seal

The part of the **Retrofit Drain** that creates a watertight mechanical compression seal between the **Drain Stem** and the existing plumbing

2.7 Strainer Dome

A component of the drain, which minimizes the amount of debris that enters the drain. The **Strainer Dome** shall have sufficient open area to facilitate normal flow of water. [Refer to Section 6]

2.8 Available Inlet Area

The combined area of all of the openings in the strainer.

3.0 GENERAL DESIGN CONSIDERATIONS

3.1 The drain manufacturer's installation instructions shall reference the information required for proper installation of the roof **Drain Body**, **Backflow Seal**, and **Strainer Dome** and shall include at least the following:

3.1.1 A requirement that all drain installations shall meet the requirements of this standard and the requirements of the local authorities having jurisdiction. Where local codes conflict with this standard, local codes shall have priority.

3.1.2 A description of the retrofit roof **Drain Body**, **Backflow Seal** and **Strainer Dome** and the equipment needed for proper assembly and installation.

3.1.3 Information regarding proper storage and handling of the retrofit roof drain materials prior to and during installation.

3.1.4 Description of all limitations, special installation instructions and design criteria associated with the performance of the **Retrofit Roof Drain.**

3.2 The **Retrofit Roof Drain** size shall be the proper size available for the application providing adequate performance based on: the flow requirements as noted in Section 8 and in the Commentary of this Standard, or the flow requirements of the governing building code, whichever is more stringent.

3.3 Roofing Watertight Seal

The bond between the roof membrane and the **Drain Flange** shall provide a watertight **Seal** using a manufacturer's approved water block adhesive and **clamping ring**, with bolts evenly cinched to membrane or by **heat welding** to the roofing membrane.

3.4 **Drain Seal** shall extend below the top of the existing drain and be long enough to create a watertight **backflow seal** with the properly prepared and cleaned interconnecting portion of the existing drain system.

4.0 MATERIALS

Retrofit roof drains are to be constructed of polymeric or metal materials or any combination of metals and polymeric materials that have been judged to perform satisfactorily in the rooftop environment. Manufacturers are to be contacted to determine membrane system compatibility.

5.0 TESTING

Retrofit roof drain manufacturers shall test samples that are representative of standard production per the tests specified in this section.

5.1. Prior to installation and testing the **Retrofit Drain**, the drain manufacturer's installation instructions shall be thoroughly understood and followed.

5.2. Leakage

Drain Bodies with **Backflow Seals** shall withstand a continuous test pressure under the equivalent of 10 foot head of water or 4.33 lbf/in^2 (30 kPa) above the elevation of the **Backflow Seal** without any visible leakage after 24 hours. Laboratory test method RF-1 shall be used to test the **Backflow Seal**.

Test RF-1:

Setup

Insert a representative **Retrofit Drain** into a vertical plumbing pipe large enough to receive the **retrofit drain stem** and the **Backflow Seal**. **Seal** the existing plumbing pipe below the **Drain Stem**-to-plumbing pipe juncture. Affix a vertical pipe at least 10 foot long (3.05 m), but of any convenient diameter that can be sealed to the **Drain Body** so that water can flow through the pipe and into the **seal** between the plumbing and the backflow gasket.

Method

Fill the pipe with water to a height of 10 foot (3.05 m) above the **Backflow Seal**. The test shall be conducted for a minimum of 24 hours -0/+1 hour during which the 10 foot (3.05 m) head of water shall be maintained.

Test Results

The drain shall be acceptable if there is no visible leakage at the **Backflow Seal.**

6.0 Strainers

Strainer Domes shall extend not less than 4 inches (100 mm) above the surface of the roof immediately adjacent to the roof drain. **Strainer Domes** shall have an **Available Inlet Area**, above roof level, of not less than one and one-half times the inside cross-sectional area of the Drain Diameter.

7.0 Installation

The drains shall be installed in compliance with the drain and roof cover manufacturer's instructions.

8.0 Flow Requirements

Flow capacity calculations shall be based on the **effective drain diameter**. There shall be a sufficient drainage to accommodate a one-hour rainfall rate base on a 100-year return period or the local code, whichever number is greater. Consult the map of Figure 1 or local weather stations for local statistics. Where separate roof sections are drained independently, flow calculations shall be performed on each section. Each section shall have at least one drain. Drain capacities shall be determined from the following chart. Values may be interpolated. Pipe diameter shall be the inside diameter of the retrofitted **drain stem**, not the original drain diameter.

In reference to the drainage areas in Table 1, that vertical façades (walls), which can shed wind-driven rain onto roof sections, should be accounted for when determining effective roof areas. Tributary vertical façade areas are generally considered to be 50% effective—that is, the tributary wall area is reduced by 50% to determine the equivalent effective tributary roof area which is then added to the roof section drainage area to determine the total effective roof drainage area.

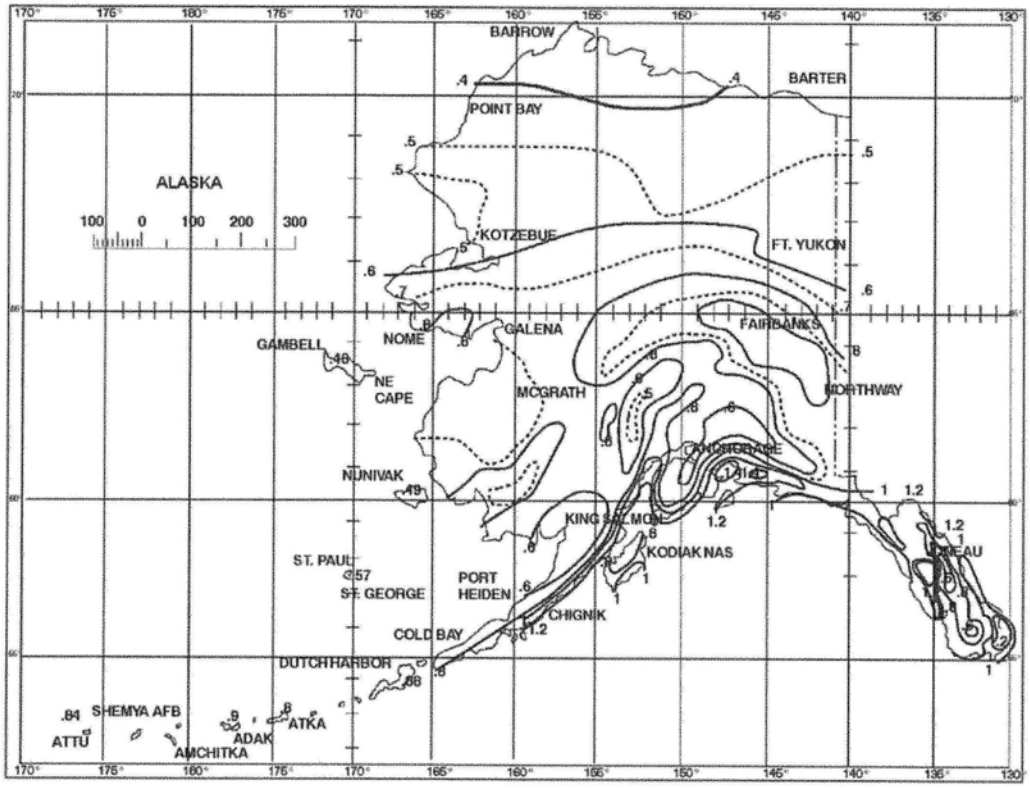
Table 1 may be interpolated for intermediate effective pipe diameters and rainfall rates. Drainage areas assume roof conditions will allow sufficient water flow to the drain.

Table 1

Roof Area (sq. ft.) Drained vs. Drain Diameter and Rainfall Rates

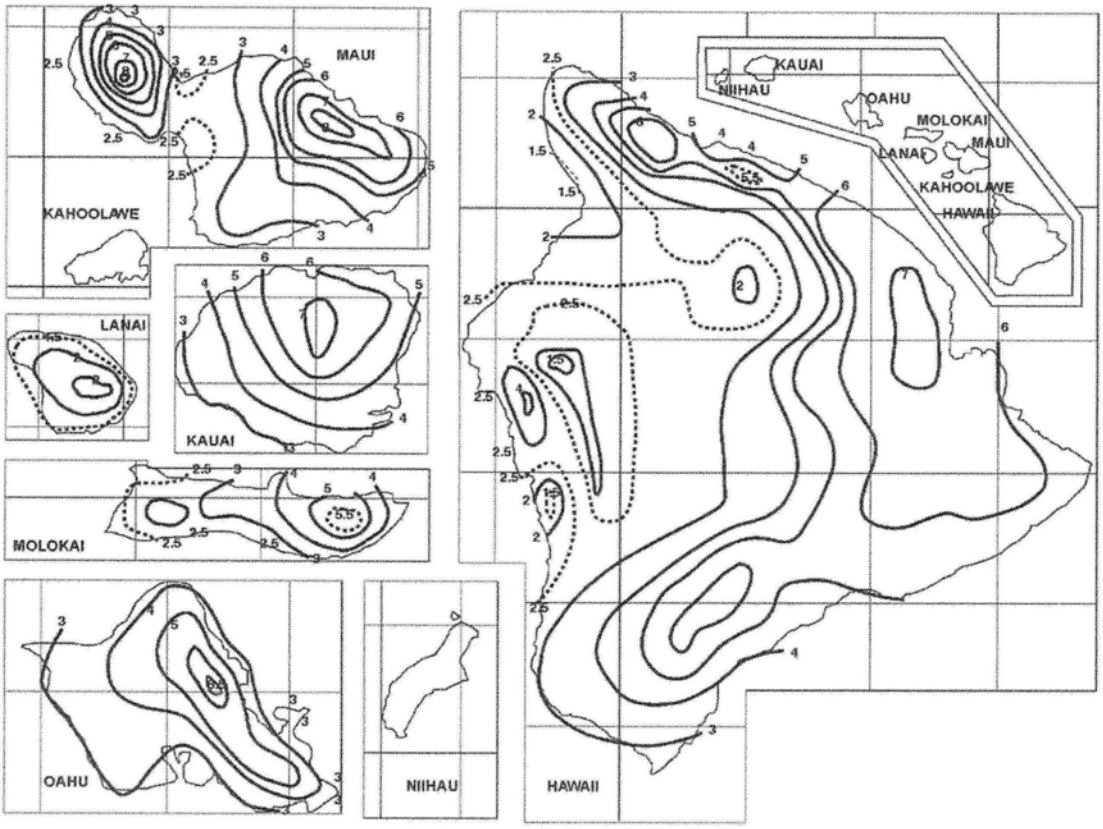
Rainfall in./hr.	Drain Diameter, in.					
	2	**3**	**4**	**5**	**6**	**8**
0.8	3,670	10,780	23,170	41,950	68,130	146,440
1.0	2,930	8,620	18,540	33,560	54,500	117,150
1.2	2,440	7,190	15,450	27,960	45,420	97,620
1.4	2,090	6,160	13,240	23,970	38,930	83,680
1.6	1,830	5,390	11,580	20,970	34,060	73,220
1.8	1,630	4,790	10,300	18,640	30,280	65,080
2.0	1,470	4,310	9,270	16,780	27,250	58,570
2.5	1,170	3,450	7,410	13,420	21,800	46,860
3.0	980	2,870	6,180	11,190	18,170	39,050
3.5	840	2,460	5,300	9,590	15,570	33,470
4.0	730	2,160	4,630	8,390	13,630	29,290
4.5	650	1,920	4,120	7,460	12,110	26,030
5.0	590	1,720	3,710	6,710	10,900	23,430

Figure 1A
One-Hour 100-year Return Rainfall Rates
Alaska



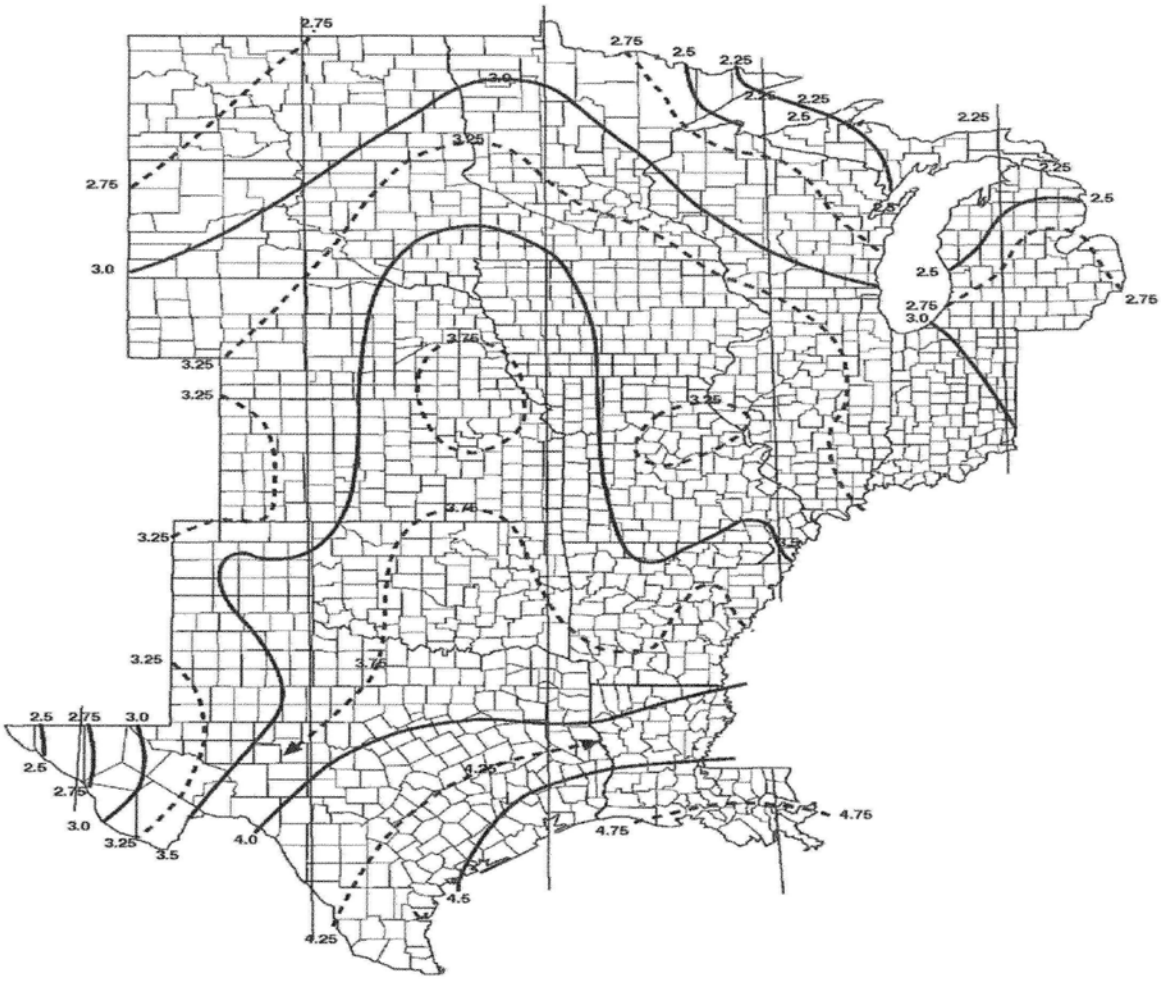
Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, D.C.

Figure 1B
One-Hour 100-year Return Rainfall Rates
Hawaii



Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, D.C.

Figure 1C
One-Hour 100-year Return Rainfall Rates
Central US



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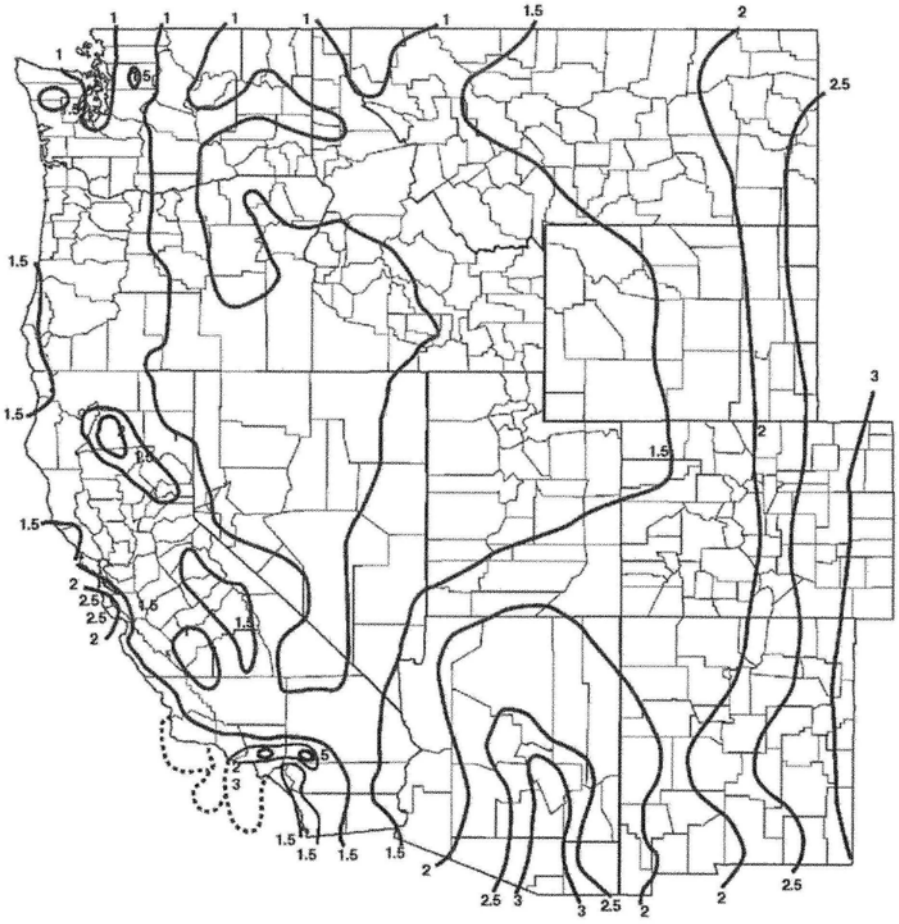
Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, D.C.

Figure 1D
One-Hour 100-year Return Rainfall Rates
Eastern US

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, D.C.

Figure 1E
One-Hour 100-year Return Rainfall Rates
Western US



Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, D.C.

COMMENTARY

ANSI/SPRI RD-1

Performance Standard for Retrofit Drains

This Commentary consists of explanatory and supplementary material designed to help designers, roofing contractors and local building authorities in applying the requirements of the preceding Standard. It is intended to create an understanding of the requirements through brief explanations of the reasoning employed in arriving at these requirements.

This Standard addresses the design of retrofit primary drains. Note that local codes may also require a secondary or overflow drain and this secondary drain may be required to have greater flow capacity than the primary drain.

Flow requirements

Flow capabilities are addressed in the Standard. There should be sufficient total cross-section area of drains to drain the entire roof area. Drain rates on Table 1 can be approximated using the following formula:

$A = 464 \times D^{2.66} \div r$

in which:

A=area drained in square feet,

D=Drain Diameter in inches and

r=rainfall rate in inches/hour

The International Plumbing Code formula, ICC/IPC (Q = 0.0104 x A x i) will produce slightly different values .

Existing drain capacities frequently exceed requirements. When more drain capacity is needed, consult with a design professional for a compatible solution.

Alternative Drain Specification Method

Table 2 may be used to check to see if sufficient drains exist on the retrofit roof. Pipe diameter is that of the retrofitted drain, not the original drain diameter.

Table 2

Minimum Number of Drains

per Thousand Squares (100000 sq. ft.)

Rainfall in./hr.	Drain Diameter, in.					
	2	**3**	**4**	**5**	**6**	**8**
0.8	28	10	5	3	2	1
1.0	35	12	6	3	2	1
1.2	41	14	7	4	3	2
1.4	48	17	8	5	3	2
1.6	55	19	9	5	3	2
1.8	62	21	10	6	4	2
2.0	69	24	11	6	4	2
2.5	86	29	14	8	5	3
3.0	103	35	17	9	6	3
3.5	120	41	19	11	7	3
4.0	137	47	22	12	8	4
4.5	154	53	25	14	9	4
5.0	171	58	27	15	10	5

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Drain sizing tables should be used with care. Roof design may not be capable of conducting rain