SPRI RD-1
Performance Standard for Retrofit Drains

1. INTRODUCTION

This standard is a reference on retrofit roof drains which are designed for installation in existing drain plumbing on existing roofs. This standard does not address roof design criteria.

2. DEFINITIONS

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

2.1. **Retrofit Drain:** A factory fabricated drain, installed to replace a drain on an existing roof. Retrofit drains are installed from the roof surface and provide a watertight connection to the roofing and to the existing plumbing. A retrofit drain is designed so that it may be installed without removing the existing drain body and plumbing.

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

2.3. **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 or sealing the roofing to the drain.

2.5. **Drain Stem:** A part of the drain that is inserted through the roof deck for connection to the roof drain plumbing. The **Backflow Seal** is integral to the stem.

2.6. **Seal:** The watertight connections between the **Retrofit Drain** and the roofing system as well as the plumbing system.

2.6.1. **Clamping Ring:** A component of the **Drain** that creates a watertight seal with the roofing system by clamping the roofing between the **Clamping Ring** and the **Drain Flange**.

2.6.2. **Welding:** A method for creating a watertight **Seal** between the roofing membrane and the **Drain Flange.**

2.6.3. **Backflow Seal:** The part of the **Retrofit Drain** that creates a watertight connection between the **Drain Stem** and the existing plumbing

2.7. **Strainer Dome:** A component of the drain, which prevents debris from entering the drain. It shall have sufficient open area to facilitate normal flow of water.

2.8. **Available Inlet Area:** The combined area of all of the openings in the strainer.

3. GENERAL DESIGN CONSIDERATIONS

3.1. Prior to examining and testing the **Retrofit Drain**, the drain manufacturer's installation instructions shall be followed.

3.2. The 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:

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

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

3.2.3. Description of necessary requirements for inspection, testing and maintenance of the roof drain system installation.

3.2.4. Information regarding proper storage and handling of the roof drain materials prior to installation.

3.2.5. Description of all limitations and special installation and design criteria for the performance associated with the **Retrofit Drain**.

3.2.6. A watertight roofing seal to secure the roofing to the **Retrofit Drain**.

3.3. The **Retrofit Drain** size shall be the largest size, available from the manufacturer, which will fit inside the existing plumbing pipe.

3.4. **Roofing connection:** The connection between the roof membrane and the **Drain Flange** shall provide a watertight **Seal** using a **Clamping Ring** or by **Welding** to the roofing membrane.

3.5. **Drain Stem Seal** shall extend below the top of the existing drain and be long enough to create a watertight seal with the existing drain system.

4. MATERIALS

Retrofit roof drains may be constructed of polymeric or metal materials or any combination of metals and polymeric materials.

5. TESTING

Retrofit roof drain samples that are representative of standard production shall be subjected to the tests specified in this section.

5.1. **Leakage: Drain bodies** with **Backflow Seal**s 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. 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 plumbing pipe below the **Drain Stem**. Affix a vertical pipe at least 10 foot long, but of any convenient diameter that can be sealed to the **Drain Body** so that water can flow through the pipe and into the **Drain Stem**.

Method: Fill the pipe with water to a height of 10 foot above the **Backflow Seal.** Allow the water to stand for a test period of at least 24 hours during which the 10 foot head of water shall be maintained.

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

6. 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 calculated from the **Drain Diameter**.

7. INSTALLATION

7.1. Measure the inside diameter of the plumbing pipe into which the retrofit drain is to be inserted. Size the retrofit drain stem to be the largest size available from the specified maunfacturer that will fit inside the existing plumbing pipe.

7.2. Insert the **Retrofit Drain Stem** into the existing plumbing pipe. Confirm that the drain **Flange** is in solid contact with the roof surface.Activate the **Backflow Seal.**

7.3. Fasten the drain **Flange** to the roof deck

using means recommended by the **Retrofit Drain** manufacturer.

7.4. Seal the **Drain Body** to the roof membrane using means recommended by the Retrofit Drain and Membrane manufacturer.

7.5. Install the **Strainer Dome.**

8. FLOW REQUIREMENTS

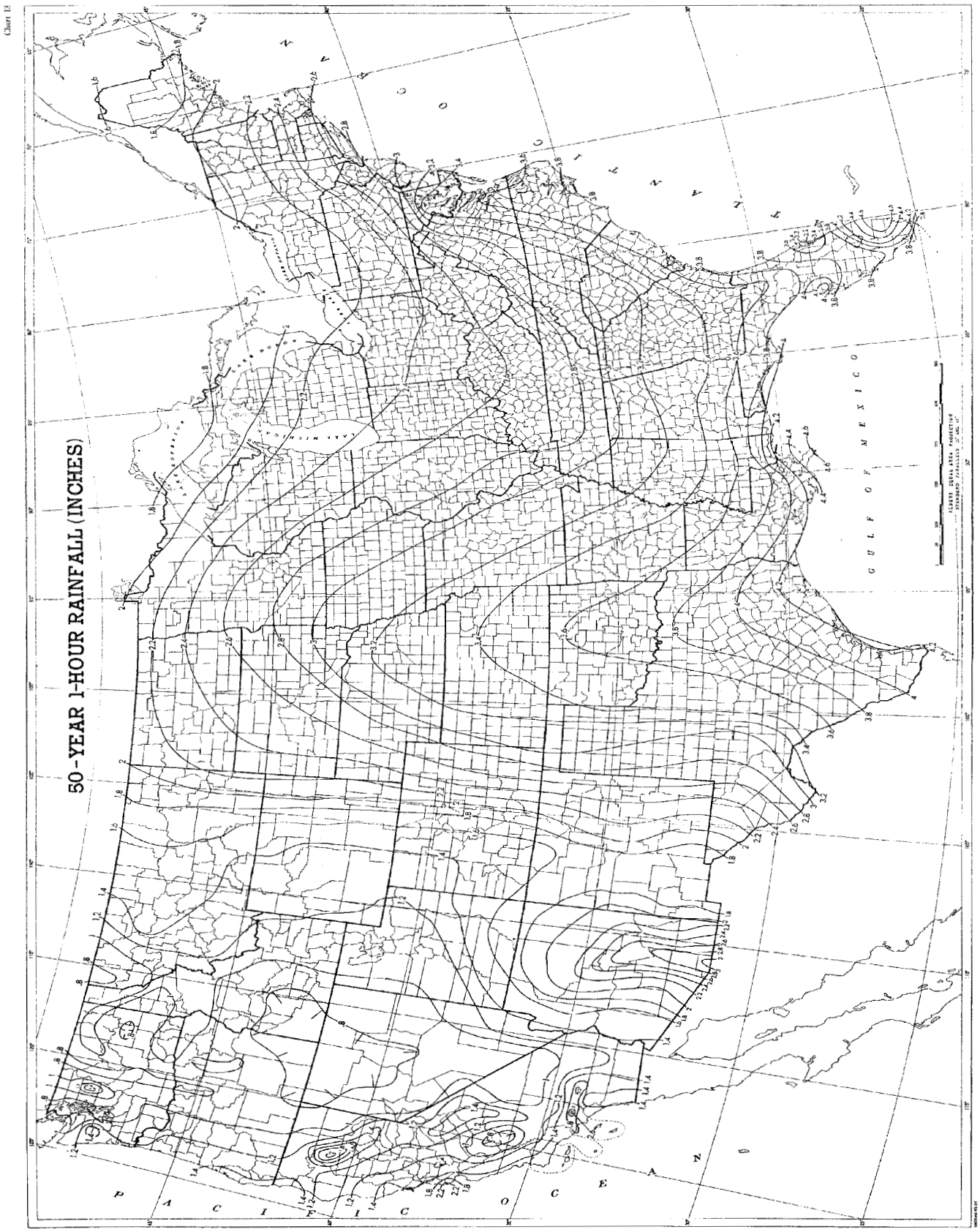
Flow capacity calculations shall be based on the cross-sectional area of the least cross-sectional flow area between the **Drain Body** and the outlet of the **Drain Stem**. There shall be a sufficient number of drains to accommodate a one-hour rainfall rate base on a 100-year return period or the local 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.

Table 1
Roof Areas (sq. ft.) Drained vs. Drain Diameter and Rainfall Rates

Rainfall in./hr.	Drain Diameter, inches					
	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

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.

Figure 1: One-Hour 100-year Return Rainfall Rates for the continental USA[1]



[2] U.S. Department of Commerce *Technical Paper N. 40: Rainfall Frequency Atlas of the United States for Durations of 30 Minutes to 24 Hours and Return Periods from 1 to 100 years*. Washington DC 1961

COMMENTARY to 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

Existing drain capacities frequently exceed requirements. When more drain capacity is needed, consult with the retrofit drain manufacturer 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 (100,000 sq. ft.)

Rainfall in./hr.	Drain Diameter, inches					
	2	**3**	**4**	**5**	**6**	**8**
0.8	27	9	4	2	1	1
1.0	34	12	5	3	2	1
1.2	41	14	6	4	2	1
1.4	48	16	8	4	3	1
1.6	55	19	9	5	3	1
1.8	61	21	10	5	3	2
2.0	68	23	11	6	4	2
2.5	85	29	13	7	5	2
3.0	102	35	16	9	6	3
3.5	119	41	19	10	6	3
4.0	137	46	22	12	7	3
4.5	154	52	24	13	8	4
5.0	169	58	27	15	9	4

Drain sizing tables should be used with care. Roof design may not be capable of conducting rain from a very large area, say, 40,000 square feet, to a single drain even if the drain could handle the water flow.

7.3 Fasten the **Drain Body** to the building. For steel decks, this is typically done by using self-penetrating fastener that will penetrate a minimum of .75 inch (20 mm) into the deck.

For concrete decks, the deck is predrilled and then screw or pound-in fasteners are used penetrating a minimum of one inch into the deck.

As always, check the **Drain Manufacturer's** specifications before proceeding.

7.4 Seal the **Drain Body** to the roof membrane. Clamping Ring Style Drain: Generally, a sealant is recommended by the membrane manufacturer to be used between the bottom clamping ring and the membrane. Once the sealant has been installed, the top clamping ring is placed over the membrane and tightened. Be sure to use a crossing pattern (similar to tightening a tire on a car) when tightening the clamp fasteners to assure uniform pressure is applied by the ring.

Weldable Flange Drains: Be sure the mating drain flange and membrane surfaces are clean. The membrane and drain manufacturer may require specific cleaners or primers to be used. Be sure to refer to their specifications. Once surfaces are prepared, heat or solvent weld the membrane to the flange developing a minimum of a 2 inch wide seam.