SMITH®
CUSTOMER DRIVEN

# ROOF DRAIN TECHNICAL DATA SECTION

## DEFINITION - ORIGIN - USAGE

The modern roof drain is designed to drain off rain water in the most effective manner possible while maintaining an aesthetic appeal because in many instances it is placed in full view of the public.

Through the years, Smith has attempted to satisfy both the artistic eye of the architect and the calculating mind of the engineer, concluding the properly designed roof drain must have the following features:

- Pleasing dome shape with a low profile and adequate free drainage area
- Corrosion-resisting dome material
- Effective debris protection
- Overflow drainage to allow drainage during debris build-up
- Gravel stop
- Positive Flashing Clamp
- Seepage control channels
- Sump designed to minimize air entrapment
- Flexibility to meet all construction requirements

Smith roof drains include all of these features.

## TYPICAL SMITH ROOF DRAINS

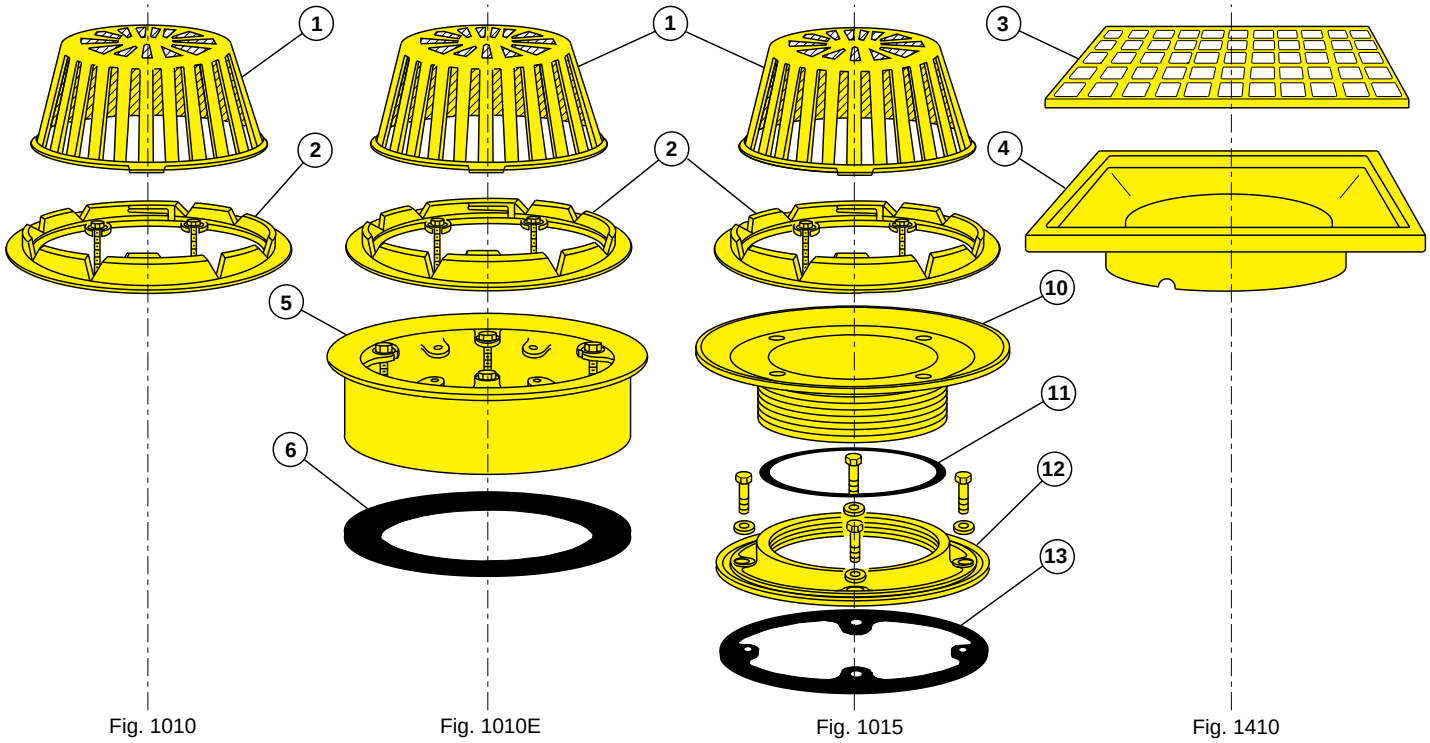
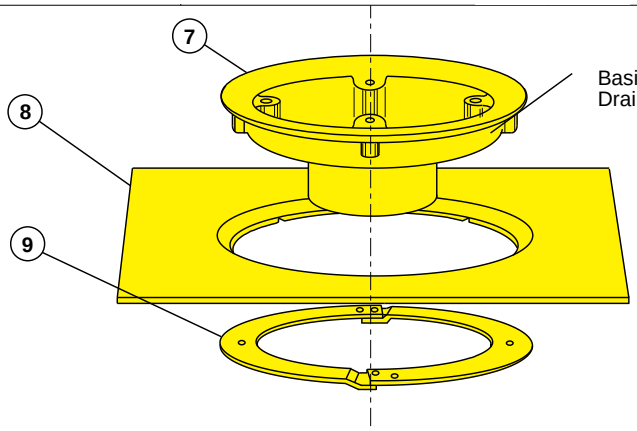



Fig. 1010 Fig. 1010E Fig. 1015 Fig. 1410




## ROOF DRAIN PARTS LIST

| NO. | DESCRIPTION | NO. | DESCRIPTION |
|---|---|---|---|
| 1 | High Density Polyethylene Dome | 7 | Drain Body |
| 2 | Combined Cast Iron Flashing Clamp and Gravel Stop | 8 | Sump Receiver |
| 3 | Secured Square Hole Grate | 9 | Underdeck Clamp |
| 4 | Flashing Clamp for Square Grate | 10 | Adjustable Extension Sleeve |
| 5 | Fixed Extension | 11 | O-Ring Gasket |
| 6 | Fixed Extension Gasket | 12 | Reversible Collar |
| | | 13 | Neoprene Gasket |

## HOW TO SELECT A ROOF DRAIN

To select the proper roof drain, the following information must be determined by the specifier.

- Type of roof construction
- Roof pitch
- Volume of expected rainfall
- Desired rate of drainage
- Roof load and safety overflow requirements
- Location of drains
- Size
- Vandal-proofing
- Local Code Requirements

## SELECTION OF ROOF DRAIN BODY

| Heavy rainfall region | Light rainfall region |
|---|---|
| use 16" diameter type for large or small roof areas | use 12" diameter type for small roof areas |

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# STEPS FOR SELECTING PROPER ROOF DRAIN LEADER SIZES AND NUMBER REQUIRED FOR A GIVEN ROOF

1. Calculate the total roof area.
2. Determine the maximum hourly rainfall in inches. (The figure can be acquired from your local weather bureau and/or local code authority.)
3. Select leader size.
4. From Table 1, determine the number of square feet that can be drained by one roof leader at the local maximum rainfall rate.
5. Divide the total roof area by the area that one leader will handle. The above result is the number of roof drains required for the building. If the result is a fraction less, use the next higher number.

**Example:**

1. Total roof area - 500' by 270' equals 135,000 sq. ft.
2. Determine rate of rainfall - for this example use 4".
3. After studying building plan and physical arrangement, assume that 6" leaders are required for this job.
4. From Table 1 - one 6" leader at 4" rate of rainfall will take care of 13,500 sq. ft. of roof area.
5. Number of roof leaders required is 10 (135,000 sq. ft. divided by 13,500 sq. ft.), thus 10 roof drains would be required.

**NOTE:** It can readily be seen that if 4" leaders were used, the number of roof drains required would increase to 30 drains. (29.348 rounded off to next highest number.) If a smaller number of roof drains are required, then larger leaders would have to be chosen. Several small drains and leaders rather than one or two large drains will insure even safer yet adequate roof drainage. Drains should be spaced for uniform drainage.

# ROOF DRAIN VERTICAL LEADER REQUIREMENTS FOR HORIZONTAL ROOF AREAS AT VARIOUS RAINFALL RATES

| Leaders Pipe Size Inches | Size Open Area Sq. In. | Hourly Rainfall in Inches | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 1 1/2 | 2 | 2 1/2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 02 | 3.14 | 2,880 | 1,920 | 1,440 | 1,150 | 960 | 720 | 575 | 480 | 410 | 360 |
| 03 | 7.06 | 8,880 | 5,860 | 4,400 | 3,520 | 2,930 | 2,200 | 1,760 | 1,470 | 1,260 | 1,100 |
| 04 | 12.56 | 18,400 | 12,700 | 9,200 | 7,360 | 6,130 | 4,600 | 3,680 | 3,070 | 2,630 | 2,300 |
| 05 | 19.60 | 34,600 | 23,050 | 17,300 | 13,840 | 11,530 | 8,650 | 6,920 | 5,765 | 4,945 | 4,325 |
| 06 | 28.30 | 54,000 | 36,000 | 27,000 | 21,600 | 18,000 | 13,500 | 10,800 | 9,000 | 7,715 | 6,750 |
| 08 | 50.25 | 116,000 | 77,400 | 58,000 | 46,400 | 38,680 | 29,000 | 23,200 | 19,315 | 16,570 | 14,500 |

**NOTE:** Above table is for leader sizes. Select drains with adequate open free area in proportion to the leader size and consistent with code requirements.

**TABLE 1**

**BASED ON NATIONAL PLUMBING CODE**
**(Always consult your local code for these roof areas)**

## STEPS FOR CALCULATING DRAINAGE REQUIREMENTS FOR ABOVE EXAMPLE USING G.P.M.

1. Use the following formula to determine G.P.M.
   G.P.M. = .0104 x R x A
   G.P.M. = Gallons per minute
   R = Rainfall intensity - inches/hour
   A = Roof area - square feet
   .0104 = Conversion factor - G.P.M./sq. ft. for one (1) inch/hr. rainfall

2. Example:
   A. 4" rainfall in./hr.
   B. 135,000 sq. ft. roof area
   C. G.P.M. = .0104 x 4" x 135,000 sq. ft. = 5616 G.P.M. (Use 5620)

3. Refer to table 2: a 4" leader will handle 192 G.P.M. 5616 ÷ 192 = 29.25 or (30) 4" vertical leaders required.

   A 6" leader will handle 566 G.P.M. 5616 ÷ 566 = 9.9 or (10) 6" leaders required.

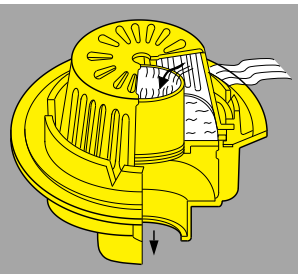
## ALLOWABLE FLOW FOR VERTICAL LEADERS AND HORIZONTAL STORM DRAINS

| ALLOWABLE FLOW IN G.P.M. | | | | |
|---|---|---|---|---|
| PIPE SIZE | VERTICAL LEADER | HORIZONTAL STORM DRAIN SLOPE PER FOOT | | |
| | | 1/8" | 1/4" | 1/2" |
| 02 | 30 | 12 | 17 | 24 |
| 03 | 90 | 36 | 51 | 72 |
| 04 | 192 | 78 | 111 | 157 |
| 05 | 348 | 142 | 201 | 284 |
| 06 | 566 | 231 | 327 | 462 |
| 08 | 1220 | 498 | 705 | 996 |
| 10 | 2200 | 902 | 1275 | 1804 |
| 12 | – | 1467 | 2076 | 2934 |
| 15 | – | 2666 | 3774 | 5332 |

**TABLE 2**

# SMITH® OVERFLOW DRAINS

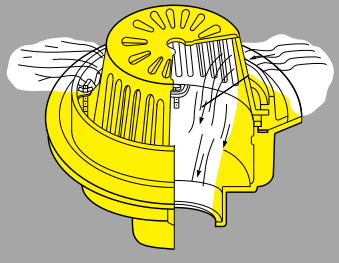
CUSTOMER DRIVEN



See Pg. 1-11

Fig. 1070-Standpipe Type Overflow Drain

Overflow drains should be specified to prevent the overloading of roofs where the building code calls for a specific maximum water build-up depth. This is where parapet scuppers are not used. Parapet scuppers have fallen into some disfavor because they create unsightly streaks on the building face. Certain codes call for the overflow system to remain independent of the primary leader system to the exterior of the building. In those systems the overflow drains remain inactive until the water level reaches the overflow level.



See Pg. 1-11

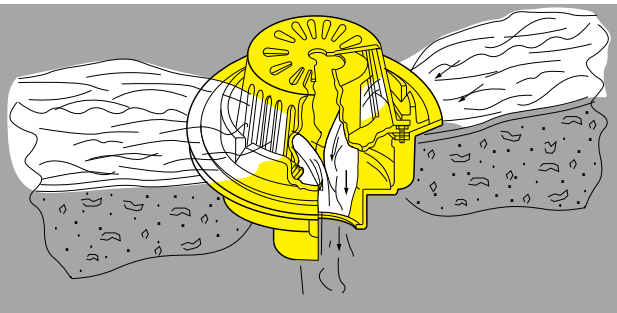
Fig. 1080-Water Dam Type Overflow Drain

The exterior water dam type overflow drain, Fig. 1080, is usually preferred to the interior standpipe overflow drain, Fig. 1070, because the dam keeps debris away from the dome and accommodates more overflow drainage with less head build-up than the standpipe.

**NOTE:** Fig. No. 1070 and 1080 drains are special purpose drains used in conjunction with the conventional roof drainage system. These drains should never be used unless special structural and architectural considerations have been provided.

# RAINTROL® ROOF DRAIN

Metered flow rate roof drains should be specified to control rainwater run-off from roofs where uncontrolled run-off would overburden storm drainage systems. Such control, with temporary retention of rainwater on the roof until the storm abates, provides relief for the drainage system. Roofs for which metered flow drainage is planned must be structurally designed to support and retain the rainwater load during the prolonged drainage period.



Series 1083-1089-Raintrol Roof Drain

Smith RAINTROL® metered flow rate roof drains are designed to provide this control. Sizing, quantity and location of RAINTROL® roof drains are separate and distinct procedures from those for regular roof drains. For selection, see pages 1-21 thru 1-34.

# VANDAL PROOFING

Fig. 1748
Vent Cap

See Pg. 1-18

All roof openings, whether they are at the roof drain or at the vent stack, should be protected from vandalism. It is recommended that all vent stacks be furnished with vandal proof vent caps. Vandal proof roof drain domes and vent caps protect the roof leaders and vent stacks from vandalism prohibiting foreign objects being either carelessly or maliciously placed in the pipes.

VANDAL PROOF VENT CAPS add to the finished look of any roof and are designed with a vent open area to pipe area ratio of 3 to 1.

# ROOF DECK INDIRECT WASTE RECEPTORS

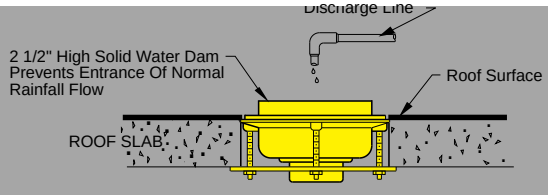



Fig. 3960 Pg. 3-22

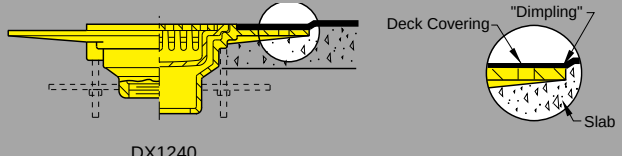
**ROOF-CEPTORS®** are indirect waste receptors designed specifically for roofs. These units are recommended for use in roof areas to receive waste water from air conditioning units, cooling towers and other mechanical equipment installed on the roof. The 2 1/2" high solid water dam prevents normal rain water from entering the waste line. The large vandal proof dome bottom strainer provides ample drainage and prevents entry of debris. All accessories necessary to install roof drains are available with these receptors.

## PREFIX DX

Designates a wide flange that can be added to certain Smith roof drains. This flange receives and serves as a bonding base for the membranes and coatings of waterproof roof deck covering systems. These coverings consist of thin elastomeric coatings which are applied in a series of trowel coats. The covering forms its own membrane, flashing and durable traffic surface. The DX flange is regularly furnished 4" in width. The usual covering is approximately 3/16" thick and may be applied over many subsurfaces such as concrete, gypsum or wood decks. Such coverings are particularly adaptable to flat roofs, used for recreational purposes, balconies, area ways, plazas, sun decks, floors and corridors.

When the DX flange is required on drains other than those shown in this section, the prefix DX must be used with the figure number. The regular flange will have a minimum 4" width with a 3/16" lip at drain body. If waterproof deck covering thickness is greater (or less) than 3/16", lip dimension must be specified. Roughing dimensions of the body must be adjusted accordingly. Drain body should be set low enough to permit "dimpling" of area surrounding drain.

Illustrated is a typical waterproof traffic bearing deck covering installation and an example of the "dimpling" effect.

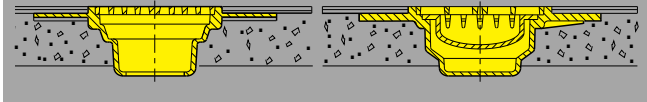



DX1240

## CONCRETE DECK INSTALLATIONS

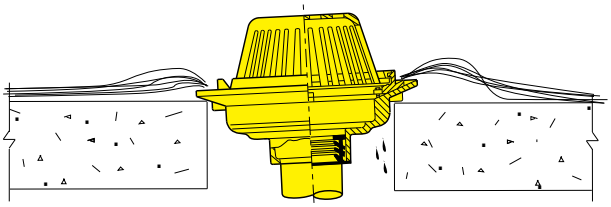
Typical Deck Drain with Nickel Bronze Flat Grate

Typical Deck Drain with Bucket and Nickel Bronze Flat Grate

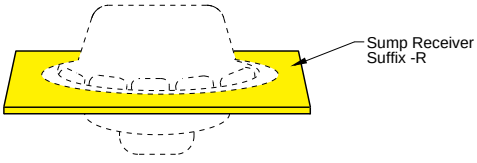


**NOTE:** For Wood Deck Installations, See pg. 1-05.

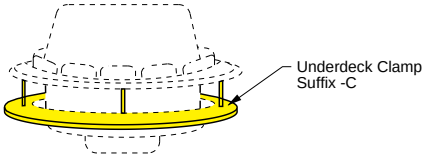
# OPTIONAL VARIATIONS



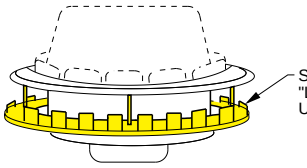
A poor installation occurs when a circular hole has been cut in the roof that ends up off center of the leader pipe. The result is usually a crooked or off-set leader. The Smith square sump receiver allows the hole to be cut oversize and square permitting the drain to be shifted and centered over the pipe. The illustration shows the probable result of not using a sump receiver. The drain body is improperly seated on the deck, causing roofing felts and other roofing materials to create a dam-like effect around the drain, resulting in a puddle in the vicinity of the drain. This problem can always be eliminated with a sump receiver.



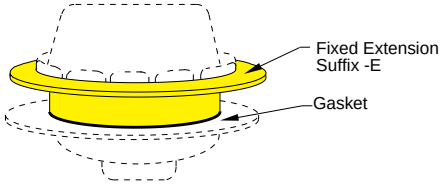

**SUFFIX -R** **SUMP RECEIVER** should be specified on all but poured-in-place roof drain installations. The sump receiver is a square metal plate with recessed center opening to accept the drain body flange. This eliminates the puddle of water surrounding many roof drain installations due to the flange resting on top of a circular hole cut in the roof.




**SUFFIX -C** **UNDERDECK CLAMP** should be specified on all but poured-in-place installations. Roof drains must be firmly secured to the roof with an underdeck clamp, otherwise, due to snow loads, rain loads and regular expansion and contraction, the drain will work in and out of the roofing, causing roofing membranes to flex and fail. Brittle tar will crack and leaks will occur.

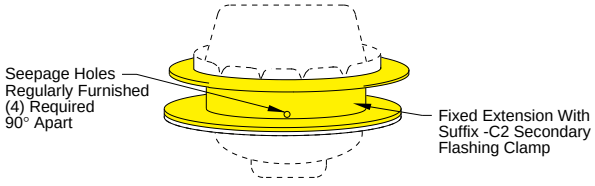



An "L" shaped underdeck clamp Suffix -CL is available for use when the regular underdeck clamp is not acceptable. Specify the "L" shaped underdeck clamp when the deck thickness is less than the minimum dimension shown for the regular underdeck clamp. This is particularly applicable for roof drain installations in metal roof decks.



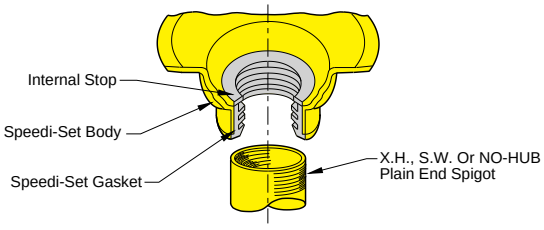

**EXTENSION HEIGHT SHOULD BE SPECIFIED 1/2" LESS THAN INSUMATION THICKNESS**

**SUFFIX -E** **FIXED EXTENSION** is specified when insulation is used, it is available in any height from 3/4" (minimum). During construction, prior to installation of insulation, the extension can be removed to eliminate water build-up. The extension is sealed by gasketing. Adjustable type extensions are available. (See Fig. 1015)




**SUFFIX -C2** **SECONDARY FLASHING CLAMP** is specified when an extension is required with a flashing clamp at the bottom of the extension to clamp the flashing at that location in lieu of the upper flashing clamp or it may be used to clamp a secondary flashing.

# SPEEDI-SET




**OUTLET TYPE L** **SPEEDI-SET** connection consists of a push on outlet with a factory inserted neoprene gasket. This connection can be used with all piping materials, including service weight, extra heavy, "NO-HUB", steel and plastic. **NOTE:** Piping material must be specified.

# EXPANSION JOINTS

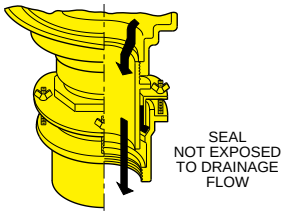
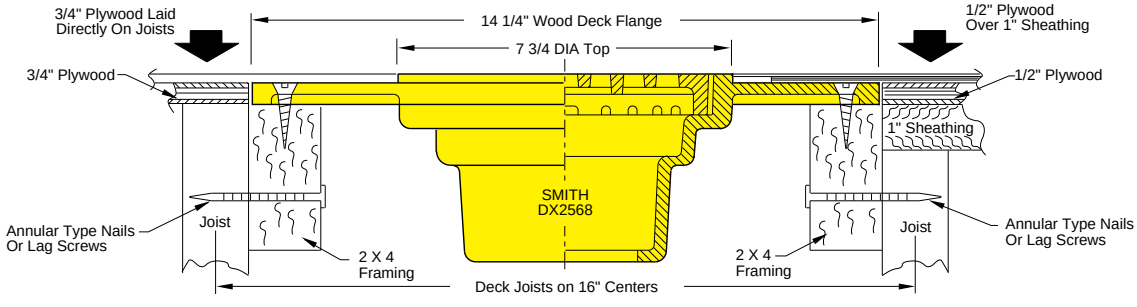



**FIG. 1710** **SEPARATE EXPANSION JOINT** with internal seal not exposed to the flow drainage passing; however, provisions must be made in installation for access to the outside packing gland adjustment nuts. These units should only be used in a vertical position and with a roof drain.

**NOTE:** Do not use with speedi-seal and plastic leaders.

# DX DRAIN IN WOOD DECK INSTALLATION




**NOTE:** For concrete deck installation see pg. 1-04.

# CONSTRUCTION VARIATIONS

## APPLICATIONS AND ACCESSORIES

Fig. 1010

Drain set in poured roof deck slab. Flashing is secured by a non-puncturing flashing clamp.

**POURED CONCRETE** **PRECAST DECK**

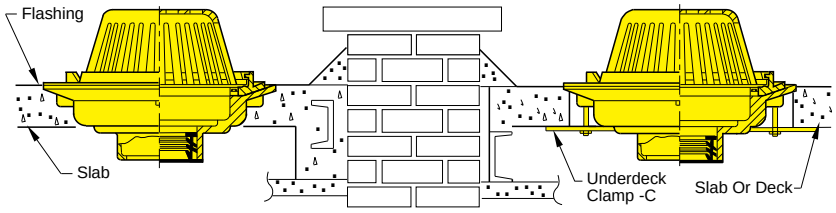



Fig. 1010 (-C)

Drain with underdeck clamp -C used where roof drain openings are presleeved in the slab. Underdeck clamp provides positive anchoring of the drain body. May be used in any slab or deck.

**NOTE:** Drain flange rests in a recessed portion of the deck, eliminating sump receiver.

Fig. 1015 (-R-C)

Drain with adjustable extension sleeve, sump receiver -R and underdeck clamp -C. Extension sleeve adjusts for any specified thickness of insulation required above the roof slab or deck. Removal of the extension sleeve permits roof drainage during construction.

**ANY INSULATED DECK** **PROMENADE FINISHED DECK**

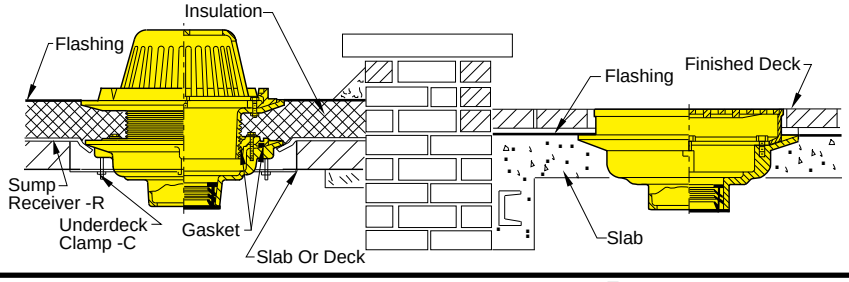
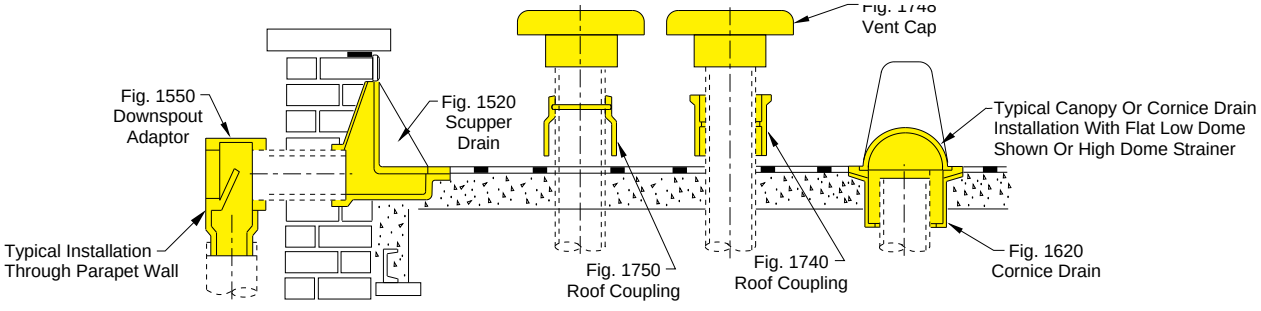



Fig. 1410

Promenade deck drain set in finished roof deck. The construction provides for waterproof flashing at the roof slab and topping of tile or any finished roof deck material.




TYPICAL ROOF COUPLING INSTALLATION WITH VANDAL PROOF VENT CAPS

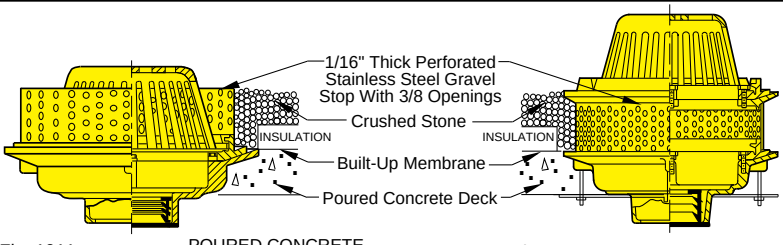



Fig. 1011 POURED CONCRETE OR GYPSUM DECK

Fig. 1017

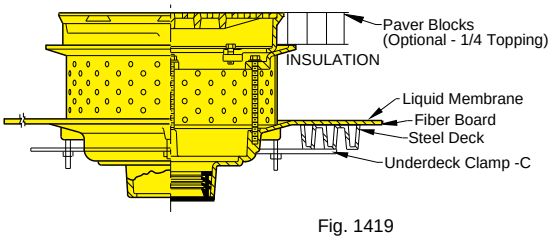



Fig. 1419

### IRMA SYSTEMS (INSULATED ROOF MEMBRANE ASSEMBLY)

The "Insulated Roof Membrane Assembly" design turns conventional roofing upside down.

Conventional Roofing has the waterproof membrane (built-up felts and asphalt) as the top layer, exposed to all outside weather conditions. Insulation, when used, is installed under the membrane (directly on deck or structural slab). Thus, the membrane is continuously exposed to extremes of weather which severely test its performance and durability.

"Insulated Roof Membrane Assembly" (sometimes called "Inverted Membrane") places the waterproofing membrane directly on the structural deck. Rigid foam type insulation from 1" to 3" thick is placed over the membrane layer. A layer of crushed stone or a finished traffic deck is then installed over the insulation. The insulation, placed in this manner, insulates the building roof and also protects the membrane layer from weather and temperature extremes. Proponents state that the insulated roof membrane assembly prolongs roof life practically eliminating membrane failures.

Some insulated membrane systems use a liquid membrane instead of the built-up felt and asphalt type membrane. Since either of these two membrane materials may be specified, Smith offers a separate body design for each type.

**Drain Figure Numbers and Application--**For insulated membrane systems:

**Built-Up Membrane Type**

Uses conventional hot asphalt and felt layers which are clamped to the drain body with our conventional roof drain flashing clamp.

Smith figure numbers are:

Roof Drain - Fig. 1011 - This is similar to the regular Fig. 1010 drain and is regularly furnished with a 4" high perforated stainless steel gravel stop. (see also Fig. 1017)

Deck Drain - Fig. 1409 - This is similar to Fig. 1410 (-E) except a secondary clamping device and extension perforated with seepage holes, are regularly furnished.

**Liquid Membrane Type**

A liquid membrane is a self-adhering liquid polymer which cures to a flexible rubber-like seamless blanket. This material is not clamped to the drain body, but is bonded to a wide flange drain body.

Smith figure numbers are:

Roof Drain - Fig. 1019 - Body has a 20" diameter integral bonding flange to bond the liquid membrane. Drain is regularly furnished with a 4" perforated stainless steel gravel stop. (see also Fig. 1018)

Deck Drain - Fig. 1419 - Body has a 20" diameter integral bonding flange and is regularly furnished with a perforated extension with rows of seepage holes.