ASME A112.6.4-2003

ROOF DECK, AND BALCONY DRAINS

AN AMERICAN NATIONAL STANDARD

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The American Society of Mechanical Engineers



A N Μ ERIC A N NATIONAL STANDARD Α ROOF, DECK, AND BALCO IRAI

ASME A112.6.4-2003

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FOREWORD

The American National Standards Committee A112 was established on July 27, 1955 to standardize plumbing materials and equipment. Its first organizational meeting was held on July 22, 1958. Panel No. 21 was created on May 1, 1964, to establish standards for roof drains, floor drains, backwater valves, and other drainage specialties. Its scope was the recommendation of suitable existing standards in cooperation with interested sponsors, or the development of adequate new standards as needed for roof drains, floor drains, and other drains as used or installed in plumbing systems. The committee has since been reorganized as an ASME Standards Committee.

The ASME A112 Committee was restructured during 1998 in accordance with the ASME Redesign Process and Panel 21 Working Group 1 became Project Team 6.4. The project team met twice to update this Standard and incorporated criteria from the International Association of Plumbing and Mechanical Official's Product Standards PS 41 and PS 47.

This Standard was preceded by ANSI A112.21.2M-1983, which was withdrawn in 1995.

Suggestions for the improvement of this Standard are welcome. They should be sent to the American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-0509.

This Standard was approved as an American National Standard on August 14, 2003.

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(The following is the roster of the Committee at the time of approval of this Standard.)

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> Secretary, A112 Standards Committee The American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the edition, the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation. When appropriate, proposals should be submitted using the A112 Project Initiation Request Form.

Interpretations. Upon request, the A112 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the A112 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation
	is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or infor- mation.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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Attending Committee Meetings. The A112 Standards Committee schedules meetings as needed, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the A112 Standards Committee. The A112 home page contains information on future meeting dates and locations.

ROOF, DECK, AND BALCONY DRAINS

1 GENERAL

1.1 Scope

This Standard establishes minimum design requirements for roof drains, including general purpose, gutter and cornice, parapet and promenade, balcony, or deck types, which convey rainwater from the roof area of building structures. It includes definitions, nomenclature, outlet types and connections, dome or grate-free area, top loading classifications, materials and finishes, and accessories.

1.2 Units of Measurement

Values are stated in U.S. Customary units and the International System of Units (SI). The U.S. Customary units shall be considered as the standard.

1.3 Illustrations

The illustrations (figures) included in this Standard are intended only to describe and portray typical roof drain types and are not intended to restrict design or to be used for specification purposes.

1.4 Reference Standards

The following documents form a part of this Standard to the extent specified herein. The latest issue shall apply.

- ASTM A 48, Grey Iron Castings
- ASTM A 74, Cast Iron Soil Pipe and Fittings
- ASTM A 307, Carbon Steel Externally Threaded Fasteners
- ASTM A 525, Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- ASTM A 527, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
- ASTM A 536, Ductile Iron Castings
- ASTM A 563, Carbon and Alloy Steel Threaded Nuts
- ASTM A 888, Hubless Cast Iron Sanitary Drainage Systems
- ASTM B 16, Free Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
- ASTM B 152, Specification for Copper Sheet, Strip, Plate and Rolled Bar
- ASTM B 370, Specification for Copper Sheet and Strip for Building Construction
- ASTM C 564, Rubber Gaskets for Cast Iron Soil Pipe and Fittings

- ASTM C 584, Copper Alloy Sand Castings for General Applications
- ASTM C 1440, Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste, and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems
- ASTM D 1248, Polyethylene Plastics Molding and Extrusion Materials
- ASTM D 1784, Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- ASTM D 2661, Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste and Vent Pipe and Fittings
- ASTM D 2665, Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings
- ASTM D 3965, Rigid Acrylonitrile-Butadiene-Styrene (ABS) Compounds for Pipe and Fittings
- ASTM D 4066, Nylon Injection and Extrusion Materials
- ASTM D 4101, Propylene Plastic Injection and Extrusion Materials
- ASTM D 4329, Practice for Operating Light- and Water-Exposure (Fluorescent UV-Condensation Type) for Exposure of Plastic
- ASTM F 628, Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste and Vent Pipe with a Cellular Core
- ASTM G 23, Practice for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Non-Metallic Materials
- Publisher: American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

ASME B1.20.1, Pipe Threads, General Purpose (Inch)

- Publisher: The American Society of Mechanical Engineers (ASME International), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300
- CSA B602, Mechanical Couplings for Drain, Waste, and Vent Pipe and Sewer Pipe
- Publisher: The Canadian Standards Association (CSA), 5060 Spectrum Way, Mississauga, ON L4W 5N6, Canada

1.5 Definitions

1.5.1 General

blow hole: a hole in casting due to air or gas in the metal or mold.

1

building storm drain: a building drain used for conveying rainwater, surface water, ground water, or other similar discharge to a storm sewer or a combined sewer, extending to a point not less than 3 to 5 ft outside of the building wall.

building storm sewer: that part of the horizontal piping of a building storm drainage system that extends from the end of the building storm drain to the public storm sewer or other appropriate disposal system. The building storm sewer is the pipe that begins at least 3 to 5 ft outside the inner face of the building wall and extends to the public storm sewer or other appropriate disposal system.

cold shut: casting defects formed when two streams of metal become so cold that they do not fuse upon meeting, creating an incomplete casting.

fin: projection on castings due to imperfect joints.

overflow drain: a secondary or emergency rainwater receptor designed to receive and convey rainwater from roof areas. The overflow drain is installed in the roof at a height to prevent excessive ponding of the rainwater on the roof. Overflow drains may be scuppers installed in a parapet wall or roof drains designed for the overflow (emergency) drainage function.

overflow conductor: a secondary or emergency rainwater piping system connected to the overflow drain(s) and discharged to an approved point of disposal.

roof drain: a manufactured receptor designed to receive and convey rainwater from roof areas to the drainage system. Roof drains are available in various designs, shapes, sump depths, and outlet locations. The area to be drained, location of the drain in the building structure, local rainfall intensity, and the drainage system are factors in determining the type of drain to be used.

scupper: a drain installed in the side of a wall, vessel, or gutter to convey rainwater away from the roof, deck, or vessel.

1.5.2 Types

1.5.2.1 General Purpose Roof Drain. A roof drain is a plumbing fitting that is designed for installation in any roof area excluding the parapet of the roof structure. It is comprised of a drain body (sump), dome strainer, and gravel guard/membrane clamp. Optional components shall include under-deck clamp-standard, under-deck clamp-plywood substrate, expansion joint, and sump basket. (See Fig. 1.)

1.5.2.1.1 Roof Drain With Overflow and Flashing Flange. The combination roof drain, overflow sump, and flashing flange with a dome strainer and gravel guard in one integral watertight unit is designed for flat roof construction and where independent overflow drainage is required. An optional feature includes a side outlet for special use in shallow joist areas.

1.5.2.2 Gutter or Cornice Roof Drain. A roof drain for installation in gutters, cornices, balconies, and other overhanging construction to prevent overflow to areas below. (See Fig. 2.)

1.5.2.3 Parapet Roof Drain. A roof drain for installation in parapets for conveying rainwater from a roof area through the parapet. (See Fig. 3.)

1.5.2.3.1 Roof Parapet Drain With Flashing Flange. A roof drain with flashing flange for use in mansard or parapet roofs.

1.5.2.3.2 Roof Drain With Overflow. A roof drain with integral flashing flange and overflow combination for use with mansard or parapet roofs where independent overflow drainage is required. (See Fig. 4.)

1.5.2.4 Promenade or Deck Roof Drain. A deck drain is a manufactured receptor for installation in roof decks subject to pedestrian or vehicular traffic and that is fitted with a flat grate. (See Fig. 5.)

1.5.3 Dome or Grate-Free Area. Total area of drainage openings in the dome or grate.

1.5.4 Conductor. A pipe inside the building that conveys storm water from the roof to a storm or combined building drain.

1.5.5 Leader. An exterior drainage pipe for conveying storm water from roof or gutter drains.

2 OUTLET TYPES AND OUTLET CONNECTIONS

2.1 Outlet Types

2.1.1 Bottom Outlet. Threaded, inside caulk, spigot, solvent weld, or soldered with centerline of outlet vertical. (See Fig. 6.)

2.1.2 Side Outlet. Threaded, hub (outside caulk), spigot, solvent weld, or soldered with centerline of outlet horizontal. (See Fig. 7.)

2.1.3 45 Deg Side Outlet. Threaded, solvent weld, or soldered with centerline of outlet at a 45 deg angle. (See Fig. 8.)

2.2 Outlet Connections

2.2.1 Threaded. All threaded outlet connections shall be American Standard Taper pipe threads for general use and shall conform to the minimum dimensions shown in Table 1.

2.2.2 Hub (Inside Caulk or Gasket). All inside caulk outlet connections shall conform to the minimum dimensions shown in Table 2. No obstructions shall be permitted in the caulking areas.



Fig. 1 General Purpose Roof Drain



Fig. 2 Gutter or Cornice Roof Drain



Fig. 3 Parapet Roof Drain

3



Fig. 4 Roof Drain With Overflow and Flashing Flange



Fig. 5 Promenade or Deck Roof Drain

2.2.3 Hub (Outside Caulk-Push On). All hub outlet connections shall conform to the minimum dimensions shown in Table 3.

2.2.4 Spigot. All spigot outlet connections shall conform to the beadless dimensions shown in ASTM A 74 or ASTM A 888. Hubless connections shall be made using ASTM mechanical couplings or adapter fittings.

2.2.5 Solvent Cement. All solvent cemented outlet connections shall be made using appropriate solvent cement and methods of joining. ABS solvent cement joints shall be in accordance with ASTM D 2661 and PVC solvent cement joints shall be in accordance with ASTM D 2665.

2.2.6 O-Ring or Gasketed Joints. O-ring or gasketed joints shall comply with ASTM C 564, C 1440, or CSA B602.

2.3 Tolerances

All dimensions given in Tables 1, 2, and 3 and the associated figures shall be subject to standard commercial tolerances of $\pm \frac{1}{16}$ in. (± 1.6 mm).

3 DIMENSIONAL CRITERIA

3.1 Top Size

Dome or grate-free area of roof, balcony, and deck drains covered by this Standard shall comply with the minimum requirements in Tables 4 through 7.

3.2 Overflow Size

The overflow shall not be less than the size of the required roof drain outlet and conductor or leader size.

4

Not for Resale



Fig. 6 Bottom Outlet



Fig. 7 Side Outlet



Fig. 8 45 Deg Side Outlet



Table 1Minimum Dimensions for Threaded
Outlet Connections

Nominal Pipe	A NPT.	Ŀ	3	L	,
Size, in.	in.	in.	mm	in.	mm
$1^{1}/_{2}$	$1^{1}/_{2}$	$2^{5}/_{16}$	59	7/16	11
2	2	$2^{7}/8$	73	7/16	11
$2^{1}/_{2}$	$2^{1}/_{2}$	$3^{3}/_{8}$	86	5/8	16
3	3	$4^{1}/_{8}$	105	3/4	19
4	4	$5^{1}/_{8}$	130	13/16	21
5	5	$6^{1}/_{4}$	159	7/8	22
6	6	$7^{1}/_{4}$	184	1	25



Table 2 Minimum Dimensions for Inside Caulk (Gasket) Outlet Connections

Nominal Pine		4		В
Size, in.	in.	mm	in.	mm
2	$2^{1}/_{2}$	64	3	76
3	35/8	92	$4^{1}/_{8}$	105
4	4 ⁵ /8	117	$5^{1}/_{8}$	130
5	5 ⁵ /8	143	$6^{1}/_{8}$	156
6	6 ⁵ /8	168	$7^{1}/_{8}$	181

4 TOP LOADING: CLASSIFICATION

4.1 Loading Classifications

Grates and top rims shall be designed to meet the following loading classifications:

4.1.1 Light Duty. All grates having safe live load, as calculated in para. 4.2.5, under 2,000 lb (900 kg) shall be considered light duty.

4.1.2 Medium Duty. All grates having safe live load, as calculated in para. 4.2.5, between 2,000 lb (900 kg) and 4,999 lb (2 250 kg) shall be considered medium duty.

4.1.3 Heavy Duty. All grates having safe live load, as calculated in para. 4.2.5, between 5,000 lb (2 250 kg) and



Table 3 Minimum Dimensions for Hubbed
(Push-On) Outlet Connections

Nominal Pipe		A		В
Size, in.	in.	mm	in.	mm
2	2	51	3	76
3	3	76	$4^{1}/_{8}$	105
4	4	102	5 ¹ /8	130
5	5	127	6 ¹ / ₈	156
6	6	152	7 ¹ / ₈	181

Table 4General Purpose Roof Drain

Outlet S	Nominal Size	Flange Diameter		Dome Free Area	
in.	mm	in.	mm	in. ²	cm ²
2	51	8	203	18	116
3	76	12	305	25	161
4	102	15	381	36	232
5	127	15	381	50	323
6	152	15	381	70	452

 Table 5
 Gutter or Cornice Roof Drain

Outlet Nominal Size		Flange Diameter		Dome Free Area	
in.	mm	in.	mm	in. ²	cm ²
2	51	6	152	11	71
3	76	6	152	11	71

Table 6	Parapet	Roof Drain
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Οι Nor S	ıtlet ninal ize	Top Size			Grate Free Area	
in.	mm	in.	mm	in. ²	cm ²	
2	51	$4^{1}/_{2} \times 4^{1}/_{2} \times 11$	114 × 114 × 279	20	129	
3	76	$4^{1}/_{2} \times 4^{1}/_{2} \times 11$	114 × 114 × 279	20	129	
4	102	$4^{1}/_{2} \times 4^{1}/_{2} \times 11$	114 × 114 × 279	20	129	

Outlet Nominal Size		Top Size		Dome Free Area	
in.	mm	in.	mm	in. ²	cm ²
2	51	8 × 8	203 × 203	9	58
3 4	76 102	11 × 11 13 × 13	279 × 279 330 × 330	21 32	135 206

7,499 lb (3 375 kg) shall be considered heavy duty.

4.1.4 Extra Heavy Duty. All grates having safe live load, as calculated in para. 4.2.5, between 7,500 lb (3 375 kg) and 10,000 lb (4 500 kg) shall be considered extra heavy duty.

4.1.5 Special Duty. All grates having safe live load, as calculated in para. 4.2.5, over 10,000 lb (4 500 kg) shall be considered special duty.

4.2 Test Procedure for Grate Loading

Live load requirements listed in para. 4.1 shall be determined as follows:

4.2.1 Load Classifications. Load classifications as stated in para. 4.1 shall be determined by laboratory tests.

4.2.2 Platen Size. A 3.5 in. (89 mm) diameter platen shall be applied to the center of the grate specimen.

4.2.3 Loading. Loading shall be applied slowly so that point of failure can be observed.

4.2.4 Point of Failure

(a) Brittle Materials (Cast Iron). The load (in pounds or kilograms) at which the first fracture on any part of the specimen appears.

(*b*) *Ductile Materials.* The load at which the permanent set (at the point of loading) is greater than 2% of the longest transverse dimension of the specimen.

4.2.5 Safe Live Load. The maximum safe live load shall be computed by dividing the load failure by two.

5 MATERIALS AND FINISHES

5.1 Materials

The items in this Standard are to be of the material specified; suitable for production, installation, and service in the place specified; and shall meet all applicable requirements and standards given herein. The castings for these drains shall be sound; free of blow holes, cold shuts, and other imperfections; and shall be of uniform wall thickness and true to pattern. They shall also be clean and free of fins. Clean rework plastic generated from the manufacturer's own production and conforming to the cell classifications, groups, or classes specified

herein, shall be permitted to be used provided that the components produced meet all the requirements of this Standard. It is not the intent of this Standard to limit acceptable materials to those included in this Section. It is anticipated that the use of other materials meeting all the requirements of this Standard and having a comparable performance shall be permitted.

5.1.1 Cast Iron. Castings shall conform to ASTM A 48, Class 25. The minimum thickness for the casting shall be $\frac{7}{32}$ in. (5.6 mm).

5.1.2 Copper Alloy. Castings shall conform to the chemical and mechanical requirements of ASTM B 584 for Copper Alloy Nos. C83600, C83800, and C84400. The minimum thickness for the casting shall be $\frac{5}{32}$ in. (4 mm).

5.1.3 Leaded Nickel Bronze (Nickel Silver). Castings shall conform to the chemical and mechanical requirements of ASTM B 584 for Copper Alloy Nos. C97300, C97600, and C99700. The minimum thickness for the casting shall be $\frac{5}{32}$ in. (4 mm).

5.1.4 ABS. Roof drain components manufactured from acrylonitrile-butadiene-styrene (ABS) shall conform to physical property requirements contained in ASTM D 3965. The cell classification shall be 3-2-2-2-2. The minimum thickness for the mold shall be $\frac{5}{32}$ in. (4 mm). Inserts for fasteners in plastic drains shall be molded into the plastic material.

5.1.5 PVC. Roof drain components manufactured from polyvinyl chloride (PVC) shall conform to physical property requirements contained in ASTM D 1784. The cell classification shall be 12454-B, 12454-C, or 14333-C. The minimum thickness for the mold shall be $\frac{5}{32}$ in. (4 mm). Inserts for fasteners in plastic drains shall be molded into the plastic material.

5.1.6 Polypropylene. Roof drain components manufactured from polypropylene (PP) shall be Group 1 or 2 general purpose or better complying with ASTM D 4101.

5.1.7 Polyethylene. Roof drain components manufactured from polyethylene (PE) shall be of Type I, II, or III complying with ASTM D 1248.

5.1.8 Nylon. Roof drain components manufactured from nylon shall be Types I through IV complying with ASTM D 4066.

5.1.9 Copper Sheet Metal Roof/Deck Drain Bodies. Copper sheet metal stampings shall be Alloy UNS No. C11000 conforming to ASTM B 152. Copper shall be a minimum of 16 oz (454 g) and shall conform to the mechanical and physical properties as specified in ASTM B 370.

5.1.10 Sheet Steel in Bonderized Drains. Sheet steel used in bonderized drain bodies shall be a minimum of 26 gauge and shall conform to the mechanical, physical,

and chemical requirements specified in ASTM A 525 and ASTM A 527.

5.2 Fastener Materials

5.2.1 Steel. The materials for studs, nuts, cap screws, and other steel fasteners shall at least equal the requirements of ASTM Specifications A 307, Carbon Steel Externally Threaded Fasteners, Grade A, and A 563, Carbon and Alloy Steel Nuts, Grade A. Threads shall be Classes 2A and 2B, and shall be plated.

5.2.2 Stainless Steel. Stainless steel fasteners shall be of a 300 series stainless steel alloy.

5.2.3 Copper Alloy. Copper alloy fasteners shall comply with ASTM B 152.

5.3 Finishes

5.3.1 Cleaning. In all cases where parts are to be coated or plated, they shall be cleaned to provide suitable surface for proper bonding of the finish.

5.3.2 Paint Coatings. Iron castings shall be cleaned and coated with a suitable paint, lacquer, or synthetic coating of quality to provide protection against rusting of ferrous surfaces during normal handling and warehousing prior to installation.

5.3.3 Cadmium Plate. After pre-plating cleaning, parts shall be given a Commercial Grade Cadmium Plate.

5.3.4 Chrome Plate Decorative. Parts shall be polished prior to plating and then given a Commercial Grade Copper-Nickel Chromium Plate.

5.3.5 Bronze Chromate. Parts shall first be given a Commercial Grade Cadmium Plate and then a Commercial Grade Bronze Chromate treatment.

5.3.6 Zinc Plate. After pre-plating cleaning, parts shall be given a Commercial Grade Zinc Plate.

6 ACCESSORIES

The optional features listed here identify the variations available for different applications. (See Fig. 9.)

6.1 Extension Collar

An accessory particularly suitable for use with roof drains installed in a structural deck where an additional thickness of insulation is to be added in order to raise the top flange to the roof line.

6.2 Under-Deck Clamp

An accessory to secure the roof drain to the roof deck by compressing the under-deck clamp against the underside of the deck.



Fig. 9 Accessories for Drains

6.3 Expansion Joint

An accessory to compensate for the expansion or movement of the conductor or roof.

6.4 Drain Body or Sump Receiver Plate

A device that receives and uniformly supports the roof drain, distributing the weight of the drain over a large area of the roof.

7 TESTING

Plastic roof drains and related components shall be tested for weathering in accordance with the methodology contained in ASTM G 23, or accelerated weathering tests in accordance with ASTM D 4329 test cycle B. The test shall be conducted for a minimum of 2,000 hr. After the test, tensile strength shall be not less than a minimum of 90% of its original value, and the hardness shall not be less than $\pm 20\%$ of its original value. Test samples shall be cut from the finished product or molded from the material used to manufacture the finished product.

8 MARKINGS

The dome, grates, and bodies shall be marked with the manufacturer's name or trademark.

ASME STANDARDS RELATED TO PLUMBING

Air Gaps in Plumbing Systems
Air Gap Fittings for Use With Plumbing Fixtures, Appliances, and
Appurtenances
Performance Standard and Installation Procedures for Stainless Steel
Drainage Systems for Sanitary, Storm, and Chemical Applications,
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Six-life water closets equipped with a Dual russing Device
Datitudy Wini pool Datitudy Switch Plessure Sealed Dools
Comparial Suimming Deal, Eps. Hat Tub and Wading
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