ASME A112.3.1-1993

PERFORMANCE STANDARD AND INSTALLATION PROCEDURES FOR STAINLESS STEEL DRAINAGE SYSTEMS FOR SANITARY, STORM, AND CHEMICAL APPLICATIONS, ABOVE AND BELOW GROUND

AN AMERICAN NATIONAL STANDARD



The American Society of Mechanical Engineers

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FOREWORD

(This Foreword is not part of ASME A112.3.1-1993.)

In the Fall of 1990, the ASME Standards Committee A112, Standardization of Plumbing Materials and Equipment, initiated work on the development of a standard for stainless steel DWV pipe fittings and drains. This effort was in response to a request from Josam-Blucher. Much of the initial work was simplified, as existing standards from Europe were available as a starting point for the text. Additional modifications were made based upon solicited comments and the evaluation of test results.

Suggestions for improvement of this Standard will be welcomed. They should be sent to The American Society of Mechanical Engineers; Attn: Secretary, A112 Main Committee; 345 East 47th Street; New York, NY 10017.

This Standard was approved as an American National Standard on November 12, 1993.

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CONTENTS

Foreword iii
Standard Committee Roster v

1 Scope, Purpose, and Reference Standards 1
2 Applicable Definitions 1
3 General Requirements 2
4 Test Methods and Performance Requirements 4
5 Installation Practices 5
6 Pipe and Fitting Dimensions 7
7 Drain Dimensions 15

Figures
1 Stainless Steel Pipe 7
2 Stainless Steel Double Ring-Seal Socket 7
3 Stainless Steel Sliding Ring-Seal Socket 7
4 Stainless Steel Expansion Socket 7
5 Stainless Steel Bulkhead Penetration Pipe 7
6 Stainless Steel Pipe with Flange 8
7 Stainless Steel Bottle Trap 8
8 Stainless Steel P-Trap 8
9 Stainless Steel 87.5 deg. Bend 9
10 Stainless Steel 45 deg. Bend 9
11 Stainless Steel 30 deg. Bend 9
12 Stainless Steel 15 deg. Bend 9
13 Stainless Steel Long Radius Bend 9
14 Stainless Steel 87.5 deg. Bend With Cleanout 9
15 Stainless Steel Cleanout Tee 10
16 Stainless Steel Sanitary Combination 10
17 Stainless Steel Tee 10
18 Stainless Steel Cross 11
19 Stainless Steel Tee With Side Inlet 11
20 Stainless Steel Tee With Side Cleanout 11
21 Stainless Steel Tee With Rear Cleanout 12
22 Stainless Steel Double Wye 12
23 Stainless Steel Wye With Oblique Side Branch 12
24 Stainless Steel Wye 13
25 Stainless Steel Eccentric Reducer 13
26 Stainless Steel Eccentric Increaser 13
27 Stainless Steel Ground Continuity Clamp 14
28 Stainless Steel Socket Plug Clamp 14
29 Stainless Steel Socket Plug 14
30 Stainless Steel Floor Drain 15

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31 Stainless Steel Adjustable Floor Drain 15
32 Stainless Steel Adjustable Floor Drain With Membrane Flange 15
33 Stainless Steel Mini Floor Drain 15
34 Industrial Stainless Steel Floor Drain — Horizontal Outlet 15
35 Industrial Stainless Steel Floor Drain — Horizontal Outlet 16
36 Industrial Stainless Steel Floor Drain — Vertical Outlet 16
37 Industrial Stainless Steel Floor Drains — Vertical Outlet With Membrane Flange 17
38 Stainless Steel Trench Drain 17
39 Stainless Steel Trench Drain — Vertical Outlet 17
40 Stainless Steel Trench Drain — Sediment Container and Horizontal Outlet 18
41 Stainless Steel Trench Drain — Angle Piece 18
42 Stainless Steel Trench Drain — Tee Assembly 18
43 Stainless Steel Trench Drain — End Cap 18
44 Stainless Steel Floor Sinks 19
45 Stainless Steel Roof Drains 19
46 Stainless Steel Floor Access Cleanouts 20

Tables

1 Chemical Requirements of Stainless Steel Drainage System Components 2
2 Specifications for Stainless Steel Pipe, Fittings, and Drain Outlets 3
3 Open Area Requirements for Drains 4
4 Joint Pressure Tests 5

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1 SCOPE, PURPOSE, AND REFERENCE STANDARDS

1.1 Scope

This Standard covers performance and installation requirements for socket-type, seam-welded stainless-steel pipe, fittings, joints, and drains for use in plumbing sanitary and storm, drain, waste and vent (DWV), and chemical waste systems.

1.2 Purpose

This Standard includes minimum standards for material, workmanship, dimensions, weld strength, pressure testing, chemical resistance, corrosion resistance, and marking for stainless steel DWV pipe, fittings, and drains in such systems. The Standard shall serve as the basis for certification of such systems components.

1.3 Reference Standards

This Standard refers to other standards and publications. When revisions to these standards are prepared, the updated editions shall apply.

ASTM Standards[1]

B 117 Test Method of Salt Spray (Fog) Testing

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension

D 471 Test Methods for Rubber Property-Effect of Liquids

D 573 Test Method for Rubber-Deterioration in an Air Oven

D 624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer

D 1149 Test Method for Rubber Deterioration-Surface Ozone Cracking in a Chamber

D 2240 Test Method for Rubber Property-Durometer Hardness

D 2444 Test Method for Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)

G 15 Terminology Relating to Corrosion and Corrosion Testing

[1] ASTM, 1915 Race Street, Philadelphia, PA 19103.

2 APPLICABLE DEFINITIONS

The following definitions apply in this Standard:

adjustable floor drain — a floor drain designed for use in finished floor area, including showers, with a nonferrous adjustable strainer and a seepage flange on the body

area drain — a manufactured receptacle designed to receive and convey run-off water or other liquid from the areas immediately adjacent to the building structure to the drainage system

DWV — an acronym meaning drain, waste, and vent

floor drain — a floor drain designed for use in finished floor areas, including showers, and with a nonferrous adjustable strainer and a seepage flange on the body

grate free area — total area of the drainage opening in the grate

joint component — any gasket, collar, clamp, or other device used to connect pipe to pipe or pipe to fittings, in the form of a mechanical joint

open area — total area of the drainage openings in the grate

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TABLE 1 CHEMICAL REQUIREMENTS OF STAINLESS STEEL DRAINAGE SYSTEM COMPONENTS

Type	UNS Designation	Carbon, max.	Manganese, max.	Phosphorus, max.	Sulfur, max.	Silicon
304	S 30400	0.08	2.00	0.040	0.030	0.75
316L	S 31603	0.035B	2.00	0.040	0.030	0.75

Type	Nickel	Chromium	Molybdenum
304	8.00–11.0	18.0–20.0	—
316L	10.00–15.0	16.0–18.0	2.0–3.0

trench drain — a long narrow manufactured receptacle designed to receive and convey to the drainage system, run-off water, or other liquids, from a broad flat area inside of or immediately adjacent to the building structure

3 GENERAL REQUIREMENTS

3.1 Interchangeability

Components of similar dimensions shall be interchangeable.

3.2 Alloys

Pipe, fittings, and drains shall be certified to be made of a stainless steel core alloy of AISI 304 or 316L, the chemical composition of which is in accordance with Table 1. Type 304 shall be used for aboveground applications. Type 316L shall be used on belowground application.

3.3 Manufacture

Components shall be fabricated by welding. After welding, system components may be treated so that the annealing colors from welding are removed. Treatment may be made by heat annealing or grinding or by methods in para. 3.4.

3.4 Treatment

After fabrication, welded components shall be pickled and passivated.

3.5 Condition of System Components

3.5.1 Straightness of Pipe. Pipes shall be straight. The variation of a length of 3.0 ft (1 m) shall not be more than 0.06 in. (1.5 mm) in the middle.

3.5.2 Ends of Pipe and Fittings. The pipes and fittings shall be cut perpendicular to the pipe axis. Pipe ends shall be smooth and free of burrs.

3.5.3 Inner Surfaces of Components. The inner surface shall be smooth and free from functional damage and material impurities.

3.5.4 Outside Surfaces of Components. The outside surface shall be smooth and free from sharp unevenness that could damage the sealing ring when inserted. Annealing colors or material impurities shall not be present.

3.5.5 Welding Seam. Burrs, edges, and sediments in the welding seam area shall not exceed 0.04 in. (0.3 mm). The welding seam shall be watertight to withstand the weld integrity test in para. 2.8.

3.5.6 Socket Shapes. Pipe shall be plain end single socket or double socket. Fittings shall be single socket.

3.6 Diameter and Wall Thickness

The diameter of the stainless steel DWV pipe, fittings, and drain outlets shall be in accordance with Table 2. Other dimensions shall be per Section 6 and 7. Tolerances shall be ±0.004 in. (0.10 mm).

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TABLE 2 SPECIFICATIONS FOR STAINLESS STEEL PIPE, FITTINGS, AND DRAIN OUTLETS

Nominal Diameter, in.	Actual Outside Diameter		Wall Thickness	
	in.	(mm)	in.	(mm)
2	1.97	(50)	0.04	(1.00)
3	2.95	(75)	0.04	(1.00)
4	4.33	(110)	0.04	(1.00)
6	6.30	(160)	0.06	(1.50)

3.7 Fittings

Stainless steel fittings shall comply with the dimensional requirements cited in Section 6. Fitting ends shall be cut perpendicular to the pipe ends. No burrs shall be present.

3.8 Adapters

Joints between dissimilar piping materials shall be made using suitable approved mechanical joint couplings complying with CSA B602 or equivalent.

3.9 Drain Requirements

3.9.1 Dimensions. Stainless steel drain dimensions shall comply with the dimensional requirements of Section 7.

3.9.2 Outlet Types and Connections

3.9.2.1 Outlet Types. Outlets may be either bottom, side, or side with integral or removal trap.

3.9.2.2 Outlet Connections. Outlet connections shall be of the spigot type.

3.9.3 Drain Top Configuration. The configuration of the drain top shall be at the option of the manufacturer.

3.9.4 Grate Openings. The openings in the grate may be any geometric shape. Openings shall be sized to exclude debris and to accommodate the loading tests in para. 4.8. Open area shall be per Table 3. When drainage requirements dictate that openings would permit passage of debris, a sediment bucket or removable trap shall be installed in the sump body to intercept this debris.

3.9.5 Variations in Drains. The optional features listed are stated here to identify the variations available for different applications.

3.9.5.1 Extension. Used to raise grate to floor level where deeper slabs are encountered.

3.9.5.2 Anchor Flange. Flange extending from side to drain body which anchors it in the concrete slab.

3.9.5.3 Auxiliary Inlet. Connection in side of drain body sump which receives discharge from another fixture appliance, or drain.

3.9.5.4 Backwater Valve. Used to prevent backflow of waste or storm water into the building.

3.9.5.5 Clamping Device. For floors where waterproof membrane, metallic, or composition flashing is required. Clamping device shall be secured nonpuncturing type of ring.

3.9.5.6 Dome Grate. Convex grate which has available grate free area above floor level which permits drainage if debris collects around base of grate.

3.9.5.7 Floor Cleanout. Cleanout which permits access to drain line from finished floor level.

3.9.5.8 Hinged Grate. Used where access to drain is required without completely removing secured grate from body.

3.9.5.9 Secondary Strainer. Strainer, set in base of drain body sump, which intercepts debris which might pass through grate openings.

3.9.5.10 Sediment Bucket. Required where debris must be intercepted before it enters the drain lines.

3.9.5.11 Trap Primer Connection. Tapped boss on drain body used to receive discharge from trap primer valve.

3.9.5.12 Removable Trap. Trap assembly made of Type 316L only to facilitate drain cleaning.

3.10 Applicability

Components made of other materials shall be in accordance with the applicable plumbing standards, codes, or listing, where available, and the joint shall be in accordance with the performance requirements of this Standard.

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TABLE 3 OPEN AREA REQUIREMENT FOR DRAINS

Outlet Connection Size, in.	Traverse Area of Connecting Pipe in.² (cm²)	Grate Free Area Min. in.² (cm²)
	Floor Drains	
2	3.14 (20.3)	5.0 (32.3)
3	7.06 (45.5)	11.0 (71.0)
4	12.5 (80.6)	18.0 (116.1)
6	28.3 (182.5)	42.0 (270.9)
	Shower Drains	
2	3.14 (20.3)	5.0 (32.3)
3	7.06 (45.5)	11.0 (71.0)
4	12.5 (80.6)	18.0 (116.1)
	Area and Trench Drains (subject to rainfall)	
2	3.14 (20.3)	6.5 (41.9)
3	7.06 (45.5)	14.0 (90.3)
4	12.5 (80.6)	25.0 (161.3)
6	28.3 (182.5)	56.0 (361.2)

3.11 Marking

3.11.1 Pipe Markings. Pipe shall be permanently or indelibly marked with at least the following:

(*a*) manufacturer's name or trademark;
(*b*) nominal pipe size;
(*c*) ASME A112.3.1;
(*d*) date of manufacture.

3.11.2 Fittings and Drain Markings. Each fitting and drain shall have the manufacturer's name or recognized trademark and the nominal pipe size permanently marked on it.

4 TEST METHODS AND PERFORMANCE REQUIREMENTS

4.1 Test Laboratory Conditions

All tests shall be conducted at standard laboratory room temperature of 73 ± 4°F (23 ± 2°C) unless otherwise specified. Pipe samples shall be cut in accordance with tools required in para. 5.2.2.

4.2 Impact Resistance

4.2.1 Test Method. The impact resistance of the pipe shall be determined annually, or at the time of any dimensional or material design change in accordance with ASTM D2444 for reverse impact, with the following modification:

(*a*) A 6 pound, Tup A shall be used.
(*b*) Using the stair-step method, test in increment to determine the point of deformation.

4.2.2 Performance Requirement. The pipe shall not crack at the point of wall deformation.

4.3 External Corrosion Resistance

4.3.1 Test Method. Three test specimens of stainless steel pipe, fittings, or drains shall be randomly selected and tested for each pipe size. The pipe specimens shall be approximately 6 in. (150 mm) long with the ends cut cleanly. Test specimens shall be subject to a corrosion test in accordance with ASTM B117, for 500 + 1 hr. Immediately after the test cabinet is opened, each sample shall be washed with running water [not over 100°F (38°C)] and dried. The sample shall not be rubbed during washing and drying or before being examined.

4.3.2 Performance Requirement. Pipe samples of alloys conforming to this Standard may show only slight etching and superficial pitting. Pitting deeper than 0.010 in. (0.25 mm) shall be cause for rejection.

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TABLE 4 JOINT PRESSURE TESTS

Nominal Size	Deflection degrees	Test Pressure psi (bar)	Deflection degrees	Test Pressure psi (bar)
2	5	15 (1.0)	0	50 (3.5)
3	5	15 (1.0)	0	50 (3.5)
4	5	15 (1.0)	0	50 (3.5)
6	3	15 (1.0)	0	35 (2.4)

Pipe samples of unsuitable alloys not conforming to this Standard will show deep pitting attack.

4.4 Joints

4.4.1 General. The joints shall be of a homogeneous structure. Surfaces shall not have any defects and irregularities which could affect the functioning.

4.4.2 Watertightness. All assembled pipes and fittings including pipe connections shall be tight from 0 to 15 psi (1.0 bar).

4.4.3 Internal Sealing Ring (O-Ring)

4.4.3.1 Test Methods and Performance Requirements. Elastomeric sealing rings shall comply with the following:

(*a*) elongation shall be a minimum of 250% when tested in accordance with ASTM D412;

(*b*) tear resistance shall be a minimum of 150 lb/in. when tested in accordance ASTM D624 using Die C;

(*c*) resistance to heat aging shall be determined as follows when conditioned in accordance with ASTM D573 at 70±2°C for 96±0.5 H;

(*1*) Maximum increase in hardness of 10 points when tested in accordance with ASTM D2240 (Shore A durometer);

(*2*) Maximum loss in tensile strength of 15% when tested in accordance with ASTM D412; and

(*3*) Maximum loss in elongation of 20% when tested in accordance with ASTM D412.

(*d*) water absorption as measured by the change in mass of the specimen shall not exceed 20% when tested in accordance with ASTM D471 at 70±2°C for 116±1.5 H using distilled water as a standard test liquid.

(*e*) the elastomer shall exhibit no cracking at 2X magnification when tested in accordance with ASTM D1149 (Specimen A) at 40±1°C for 100±1 H in an ozone concentration of 0.5 ppm (volume ± ratio).

(*f*) the volume increase of the specimen due to immersion in ASTM oil No. 3 shall be not more than 80% when tested in accordance with ASTM D471 at 40±2°C for 70±0.5 hr.

4.5 Weld Integrity Test

4.5.1 Test Method. Three samples of seam-welded stainless steel pipe shall be sealed at each end and subjected to an internal hydrostatic pressure of 150 psi (10.5 bar) for 1 min and inspected for leakage or other signs of failure.

4.5.2 Performance Requirement. The stainless steel pipe shall not leak or show other signs of failure.

4.6 Pressure Test

4.6.1 Test Method. Sample joints made using stainless steel and pipe fittings shall be tested annually and at the time of any dimensional or material design change for 1 ± 0.25 hr in sizes and at the hydrostatic pressures given in Table 4 under the following conditions:

(*a*) with no axial restraint, but deflected; and

(*b*) with axial restraint and no deflection.

4.6.2 Performance Requirements. The assembly shall not leak or show other signs of failure.

5 INSTALLATION PRACTICES

5.1 General

The installation of stainless steel drain, waste, and vent (DWV) pipe, fittings, and drain systems for both sanitary and chemical use shall be installed as per these requirements.

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5.2 Shipping, Storage, and Handling

5.2.1 Shipping and Storage. Pipe shall be shipped and stored on a flat, clean surface. Pipe shall not be stacked more than 10 pieces high, unless strapped in bundles as received from the supplier.

5.2.2 Mechanical Handling. Unless suitably crated, mechanical handling of pipe and accessories shall not be performed. Manual handling shall be used on all sizes of pipe.

5.2.3 Safe Handling. Strict attention shall be paid to all safety regulations for handling and storage of pipe, fittings, and accessories.

5.3 Inspection of Shipment

5.3.1 General. An overall inspection of the load shall be made.

5.3.2 Intact Loads. If the load is intact, ordinary inspection while unloading shall be adequate to ensure that pipe, fittings, and accessories have arrived in good condition. The markings of the pipe shall be verified to be in accordance with para. 3.11 of this Standard.

5.3.3 Signs of Damage. If the load has shifted or shows signs of rough treatment, each pipe shall be carefully inspected for damage.

5.4 Installation

5.4.1 Visual Inspection. Before starting the installation, all pipe, fittings, and joint components shall be examined. Any materials that are bent, crushed, severely dented, or otherwise damaged shall not be used.

5.4.1.1 Preparation. The installer shall check that all pipe, joint components, fittings, hangers, and tools are on hand to permit an orderly completion of the system.

5.4.1.2 Local Code Provisions. Stainless steel DWV systems shall be installed in accordance with local code requirements.

5.4.2 Cutting and Deburring. Pipe shall be cut with a combination cutting and bevelling tool that results in a cut that is square, clean, and free of burrs. Mineral oil lubricant shall be used during the cutting and bevelling process.

5.4.3 Opening Through Walls, Partitions, and Floors

5.4.3.1 Open Clearance. Openings through walls, partitions, and floors shall be sufficient in size to allow free passage of pipe, fitting, and joint components. Openings shall be smooth and free of harmful surfaces and projections.

5.4.3.2 Sealed. If openings through walls, partitions, and floors require sealing, they may be sealed with mortar, concrete, or other sealants compatible with stainless steel. Care shall be taken to ensure that the pipe is not in contact with reinforcing steel embedded in concrete.

5.4.3.3 Service Penetration Firestops. Service penetration firestop assemblies shall be in accordance with local fire or building codes.

5.4.4 Joints

5.4.4.1 Assembled. Joints shall be made in accordance with the manufacturer's instructions.

5.4.4.2 Transition to Other Piping. Adapter fitting shall be available for joining stainless steel DWV pipe to other types of pipe. Only adapter fittings approved for the specific transition shall be used.

5.4.5 Supports

5.4.5.1 Hangers. Where a hanger or support for stainless steel DWV pipe is of a metal other than stainless and where chlorides or other electrolytes are present or likely to be present, the hanger shall be suitably separated and electrically isolated from pipe. Supports and hangers shall have a broad support base and shall be free of burrs and rough edges to prevent abrasion of the pipe.

5.4.5.2 Spacing. Horizontal pipe shall be supported at intervals not greater than 10 ft at all joints, at all branch ends, and at all points where there is a change in direction. Trap arms shall be supported as close to the trap as possible.

5.4.6 Special Environmental Conditions. In serving a stainless steel DWV system to protect trap and fixtures from freezing, a glycol-water solution

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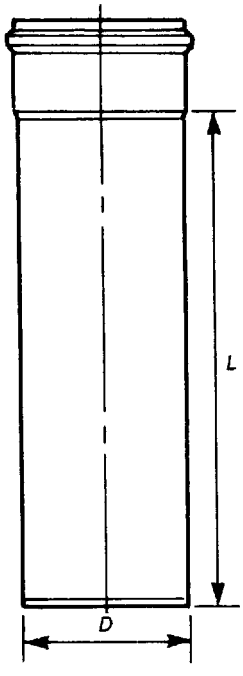
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made up 60% by mass of glycol mixed in water shall be used. Alcohol antifreeze shall not be used, as the alcohol will evaporate and lose its effectiveness.

6 PIPE AND FITTING DIMENSIONS

Stainles steel pipe, fittings, and adaptors shall be produced in the sizes and dimensions as detailed in Figs. 1 through 29.

D, in.	ft	*D*, in.	ft
6	16.4	3	16.4
6	9.8	3	9.8
6	6.6	3	6.6
6	4.9	3	4.9
6	3.3	3	3.3
6	1.6	3	1.6
6	0.8	3	0.8
4	16.4	2	16.4
4	9.8	2	9.8
4	6.6	2	6.6
4	4.9	2	4.9
4	3.3	2	3.3
4	1.6	2	1.6
4	0.8	2	0.8
4	0.5	2	0.5



D = Outside diameter
L = Net length

GENERAL NOTE: Pipe shall be available socketless, with a single socket or double socket.

FIG. 1 STAINLESS STEEL PIPE

D, in.	*x*, in.
6	1.4
4	0.9
3	0.9
2	0.7

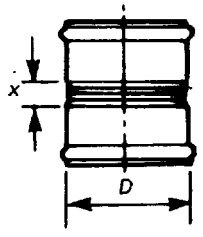


FIG. 2 STAINLESS STEEL DOUBLE RING-SEAL SOCKET

D, in.	*x*, in.
6	3.4
4	2.8
3	2.4
2	1.6

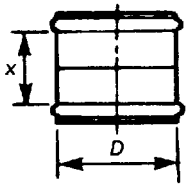


FIG. 3 STAINLESS STEEL SLIDING RING-SEAL SOCKET

D, in.	*x*1, in.	*x*2, in.
6	11.5	4.8
4	7.0	3.1
3	6.1	2.4
2	5.7	2.2

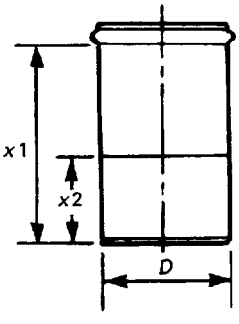


FIG. 4 STAINLESS STEEL EXPANSION SOCKET

D, in.	*T*, in.	*x*1, in.	*x*2, in.
4	10.8	5.5	2.8
3	10.2	5.5	2.4
2	9.6	5.5	2.2

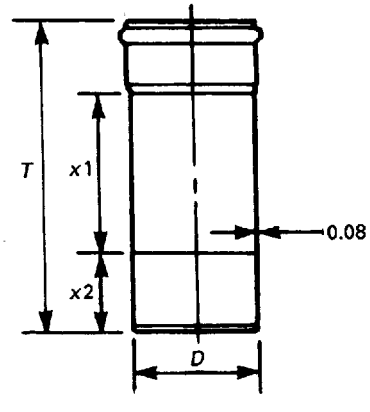


FIG. 5 STAINLESS STEEL BULKHEAD PENETRATION PIPE

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*D*1, in.	*D*2, in.	*x*1, in.	Number of Bolts	Flange Type
6	8.5	10.0	8	5″ ANSI B16.5
4	7.0	10.0	8	3½″ ANSI B16.5
3	5.5	10.0	4	2½″ ANSI B16.5
2	3.9	10.0	4	1½″ ANSI B16.5

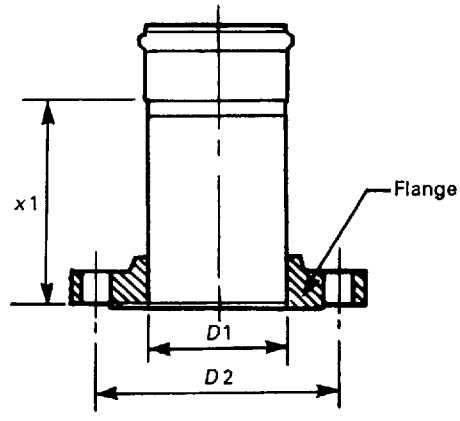


FIG. 6 STAINLESS STEEL PIPE WITH FLANGE

Inlet, in.	Outlet, in.
1¼	2
1½	2

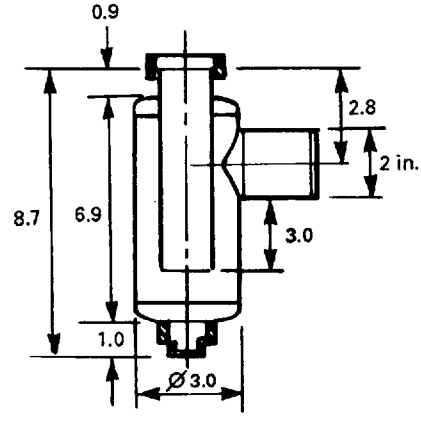


FIG. 7 STAINLESS STEEL BOTTLE TRAP

D, in.	*x*1, in.	*x*2, in.	*r*, in.	*a*, in.
6	13.1	10.2	3.4	14.7
4	9.4	7.2	2.8	10.7
3	7.4	5.2	2.0	8.1
2	5.6	4.1	1.5	6.3

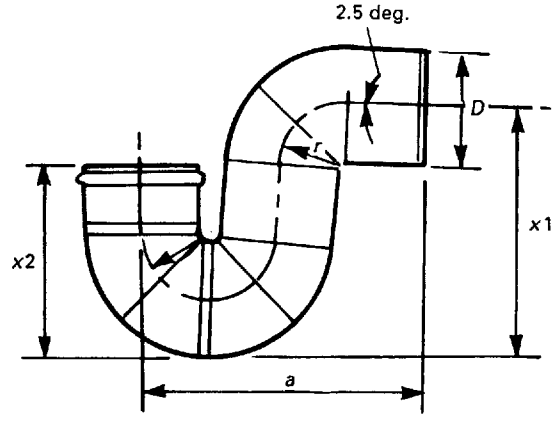


FIG. 8 STAINLESS STEEL P-TRAP

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D, in.	*x*1, in.	*x*2, in.	*r*, in.
6	6.9	4.2	3.4
4	5.3	2.8	2.7
3	4.2	2.4	2.0
2	3.4	1.7	1.5

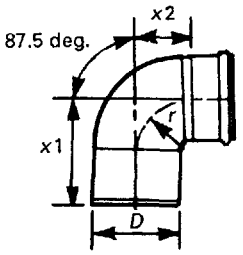


FIG. 9 STAINLESS STEEL 87.5 deg. BEND

D, in.	*x*1, in.	*x*2, in.
6	4.3	1.7
4	3.3	1.0
3	2.8	0.7
2	2.2	0.6

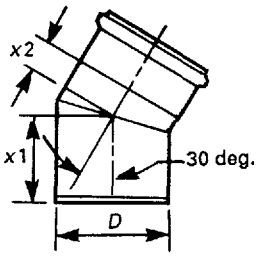


FIG. 11 STAINLESS STEEL 30 deg. BEND

D, in.	*x*1, in.	*x*2, in.	*r*, in.
6	5.2	2.3	3.4
4	3.9	1.3	2.7
3	3.2	1.0	2.0
2	2.5	0.9	1.5

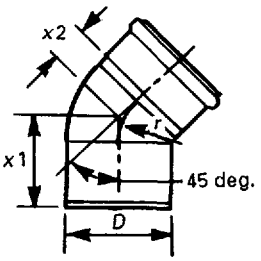


FIG. 10 STAINLESS STEEL 45 deg. BEND

D, in.	*x*1, in.	*x*2, in.
6	3.8	0.8
4	3.1	0.8
3	2.6	0.5
2	2.0	0.4

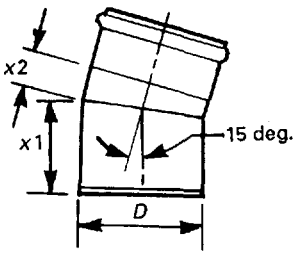


FIG. 12 STAINLESS STEEL 15 deg. BEND

D, in.	*a*, in.	*b*, in.	*c*, in.	*d*, in.	*r*, in.
6	13.6	4.5	10.9	2.0	6.7
4	12.0	3.4	10.0	1.3	4.6

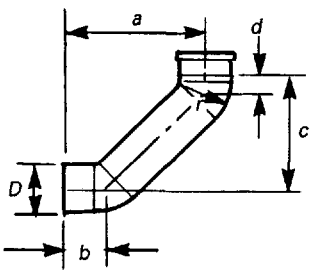


FIG. 13 STAINLESS STEEL LONG RADIUS BEND

D, in.	*x*1, in.	*x*2, in.
6	8.1	7.4
4	5.0	5.3

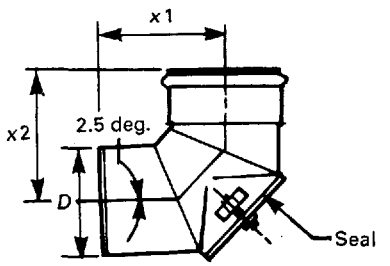


FIG. 14 STAINLESS STEEL 87.5 deg. BEND WITH CLEANOUT

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D, in.	*d*, in.	*x*1, in.	*x*2, in.	*a*, in.
6	6.7	11.4	7.2	0.9
6	4.6	9.3	6.1	0.9
4	4.6	4.6	4.6	0.9
3	3.3	5.4	3.5	0.9

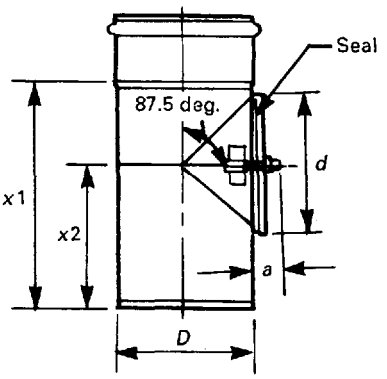


FIG. 15 STAINLESS STEEL CLEANOUT TEE

*D*1, in.	*D*2, in.	*x*1, in.	*x*2, in.	*x*3, in.	*x*4, in.
6	6	12.6	4.5	11.8	11.9
6	6	9.9	3.1	9.2	9.5
4	4	9.1	3.5	8.5	8.5
4	3	7.1	2.4	6.5	7.2
4	2	5.7	1.7	5.4	6.1
3	3	7.0	2.9	6.4	6.5
3	2	5.6	2.2	5.5	5.7
2	2	5.1	2.2	4.8	5.0

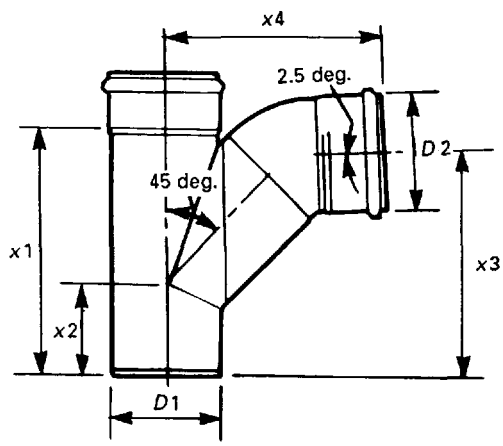


FIG. 16 STAINLESS STEEL SANITARY COMBINATION

*D*1, in.	*D*2, in.	*x*1, in.	*x*2, in.	*x*3, in.
6	6	11.4	7.2	4.4
6	4	9.3	6.1	3.0
4	4	7.2	4.6	2.6
4	3	6.0	4.0	2.6
4	2	5.1	3.5	2.7
3	3	5.4	3.5	2.0
3	2	5.4	4.0	2.0
2	2	4.5	2.8	1.4

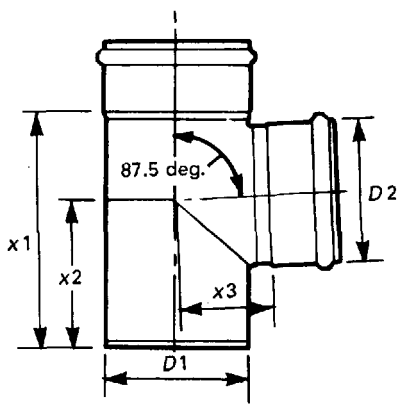


FIG. 17 STAINLESS STEEL TEE

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*D*1, in.	*D*2, in.	*x*1, in.	*x*2, in.	*x*3, in.
6	6	11.2	7.2	4.1
6	4	11.5	6.1	4.0
4	4	7.2	4.6	2.7
4	4	5.9	4.1	2.7
4	2	5.1	3.6	2.6
3	3	5.4	3.4	2.0
3	2	5.5	4.0	1.9
2	2	4.4	2.8	1.5

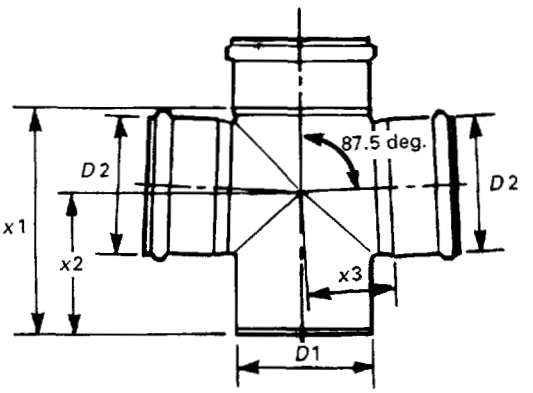


FIG. 18 STAINLESS STEEL CROSS

*D*1, in.	*D*2, in.	*x*1, in.	*x*2, in.	*x*3, in.
6	6	11.2	7.2	4.1
6	4	11.5	6.1	4.0
4	4	7.2	4.6	2.7
4	3	5.9	4.1	2.7
4	2	5.1	3.6	2.6
3	3	5.4	3.4	2.0
3	2	5.5	4.0	1.9
2	2	4.4	2.8	1.5

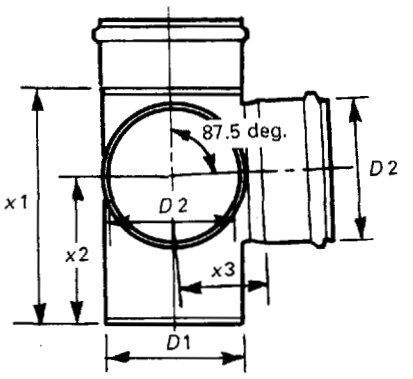


FIG. 19 STAINLESS STEEL TEE WITH SIDE INLET

*D*1, in.	*D*2, in.	*d*, in.	*x*1, in.	*x*2, in.	*x*3, in.
6	6	4.6	11.2	7.2	4.1
6	4	4.6	11.5	6.1	4.0
4	4	3.3	7.2	4.6	2.7
4	3	3.3	5.9	4.1	2.7
4	2	3.3	5.1	3.6	2.6

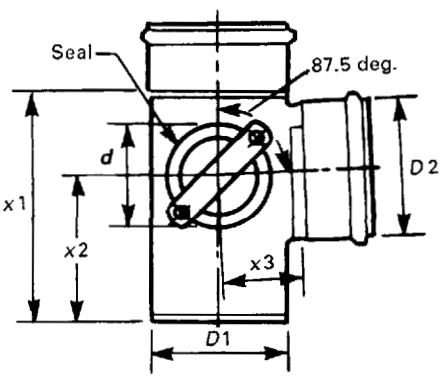


FIG. 20 STAINLESS STEEL TEE WITH SIDE CLEANOUT

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D1, in.	*D2*, in.	*d*, in.	*x1*, in.	*x2*, in.	*x3*, in.
6	6	6.7	11.2	7.2	4.1
6	4	6.7	11.5	6.1	4.0
4	4	4.6	7.2	4.6	2.7
4	3	4.6	5.8		
4	2	4.6	5.1	3.6	2.6
3	3	3.3	5.4	3.4	2.0
3	2	3.3	5.5	4.0	2.0

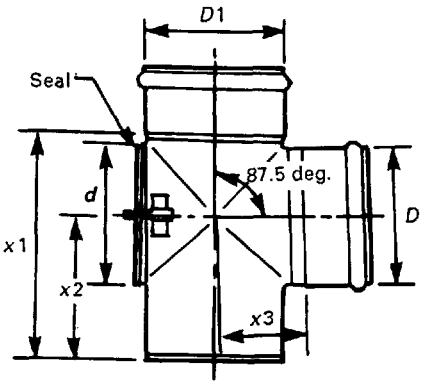


FIG. 21 STAINLESS STEEL TEE WITH REAR CLEANOUT

D1, in.	*D2*, in.	*x1*, in.	*x2*, in.	*x3*, in.
6	6	12.5	4.5	8.4
6	4	10.0	3.2	7.4
4	4	9.3	3.5	6.0
4	3	7.5	2.4	5.3
4	2	6.2	1.7	4.8
3	3	7.4	2.9	4.4
3	2	5.6	2.2	4.3
2	2	5.6	2.2	3.2

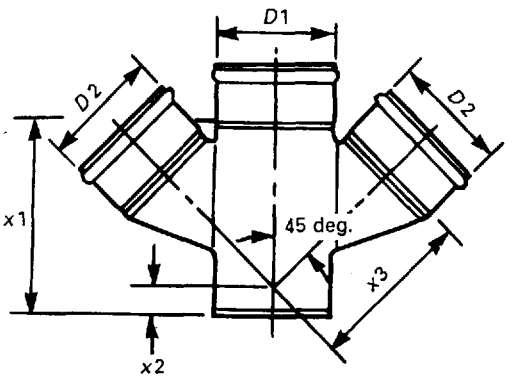


FIG. 22 STAINLESS STEEL DOUBLE WYE

D1, in.	*D2*, in.	*D3*, in.	*x1*, in.	*x2*, in.	*x3*, in.
6	6	6	12.5	4.5	8.4
6	4	4	10.0	3.2	7.4
4	4	4	9.3	3.5	6.0
4	3	3	7.5	2.4	5.3
4	2	2	6.2	1.7	4.8
3	3	3	7.4	2.9	4.4
3	2	2	5.6	2.2	4.3
2	2	2	5.6	2.2	3.2

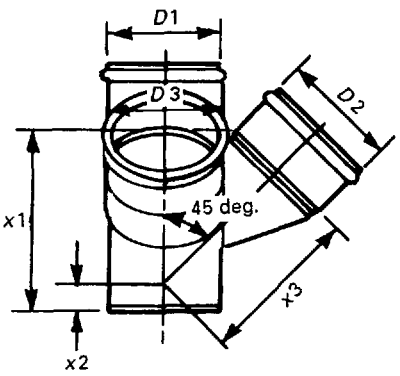
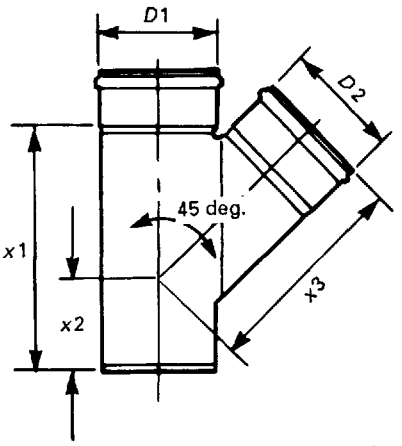


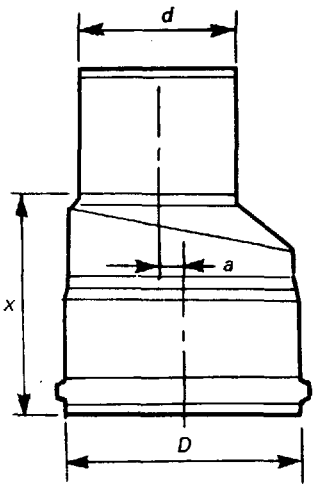
FIG. 23 STAINLESS STEEL WYE WITH OBLIQUE SIDE BRANCH

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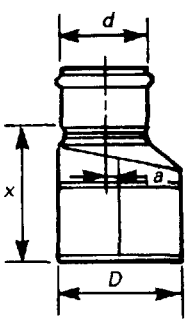
D1, in.	*d2*, in.	*x1*, in.	*x2*, in.	*x3*, in.
6	6	12.6	4.5	11.3
6	4	9.9	3.1	9.6
4	4	9.1	3.5	8.3
4	3	7.1	2.4	7.3
4	2	6.7	1.7	6.4
3	3	7.0	2.9	6.4
3	2	5.6	2.2	5.8
2	2	5.1	2.2	4.7

FIG. 24 STAINLESS STEEL WYE



D, in.	*d*, in.	*x*, in.	*a*, in.
3	4.3	4.3	0.6
2	3.0	2.8	0.3

FIG. 25 STAINLESS STEEL ECCENTRIC REDUCER



D, in.	*d*, in.	*x*, in.	*a*, in.
110	75	110	15
110	50	109	25
75	110	92	15
75	50	85	7

FIG. 26 STAINLESS STEEL ECCENTRIC INCREASER

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D, in.	*x*1, in.	*x*2, in.	*x*3, in.
6	6.4	8.3	6.3
4	4.1	6.5	3.9
3	2.9	4.5	2.8
2	2.1	3.4	1.9

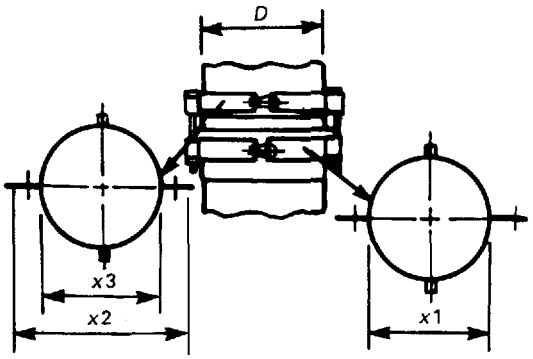


FIG. 27 STAINLESS STEEL GROUND CONTINUITY CLAMP

D, in.	*d*, in.	*B*, in.	*h*, in.
6	6.7	8.3	2.0
4	4.7	6.3	2.0
3	3.4	4.9	2.0
2	2.4	3.9	2.0

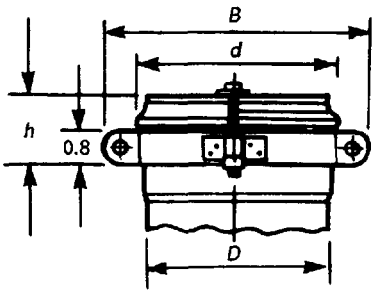


FIG. 28 STAINLESS STEEL SOCKET PLUG CLAMP

D, in.	*d*, in.	*x*, in.
110	120	40
75	85	40
50	60	43

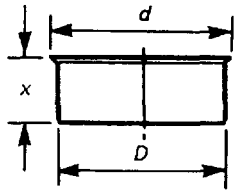


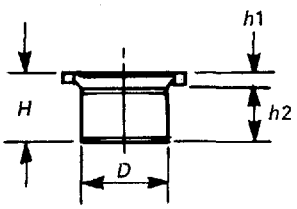
FIG. 29 STAINLESS STEEL SOCKET PLUG

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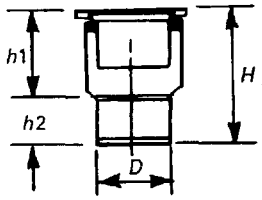
7 DRAIN DIMENSIONS

Drain dimensions shall be as shown in Figs. 30 through 46.



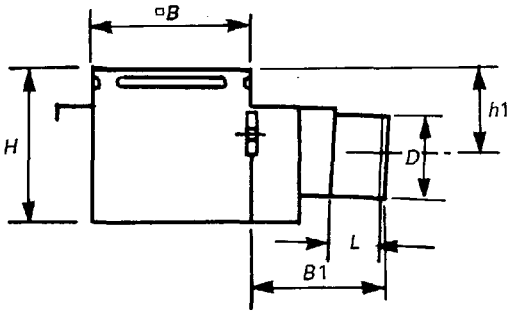
D		h1		h2		H	
in.	mm	in.	mm	in.	mm	in.	mm
2.95	75	1.1	28	2.4	60	3.5	89
1.97	50	1.3	33	2.2	55	3.5	89

FIG. 30 STAINLESS STEEL FLOOR DRAIN

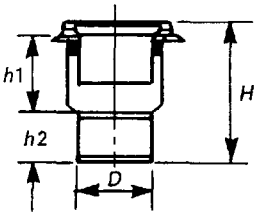


D		h1		h2		H	
in.	mm	in.	mm	in.	mm	in.	mm
2.95	75	5.3–7.1	135–180	2.4	60	7.7–9.5	195–240
1.97	50	5.5–7.3	140–185	2.2	55	7.7–9.5	195–240

FIG. 31 STAINLESS STEEL ADJUSTABLE FLOOR DRAIN

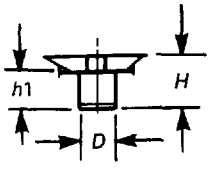


D		B		B1		L		h1		H	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
4.33	110	8.5	215	6.8	175	2.8	70	4.6	118	8.0	203



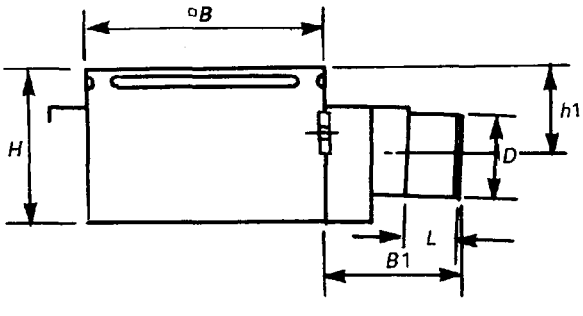
D		h1		h2		H	
in.	mm	in.	mm	in.	mm	in.	mm
2.95	75	5.1–6.3	129–159	2.4	60	8.3–11.3	211–286
1.97	50	5.3–6.5	134–164	2.2	55	8.3–11.3	211–286

FIG. 32 STAINLESS STEEL ADJUSTABLE FLOOR DRAIN WITH MEMBRANE FLANGE



D		h1		h2		
in.	mm	in.	mm	in.	mm	Connection
1.77	45	0.8	21	1.6	41	1¼ BSP
1.57	40	2.1	52	2.8	72	Spigot end
1.97	50	1.9	48	2.7	68	Spigot end
2.95	75	2.1	54	2.9	74	Spigot end

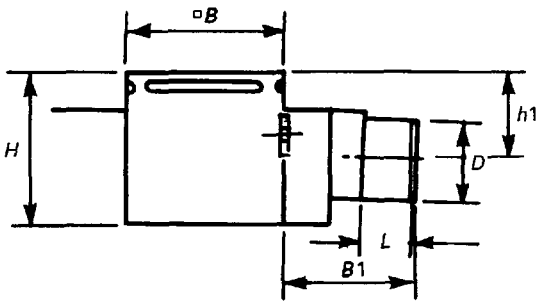
FIG. 33 STAINLESS STEEL MINI FLOOR DRAIN



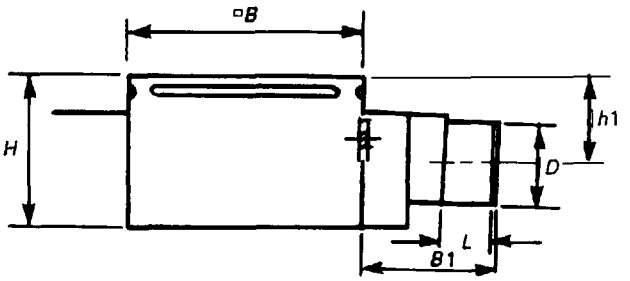
D		B		B1		L		h1		H	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
6.30	160	12.4	315	8.7	220	3.5	90	5.8	148	9.2	233
4.33	110	12.4	315	6.8	175	2.8	70	4.6	118	8.0	203

FIG. 34 INDUSTRIAL STAINLESS STEEL FLOOR DRAIN — HORIZONTAL OUTLET

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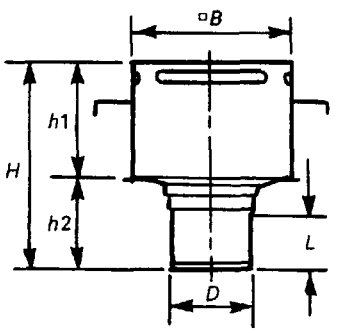


D in.	D mm	B in.	B mm	B1 in.	B1 mm	L in.	L mm	h1 in.	h1 mm	H in.	H mm
4.33	110	8.5	215	6.8	175	2.8	70	4.6	118	8.0	203

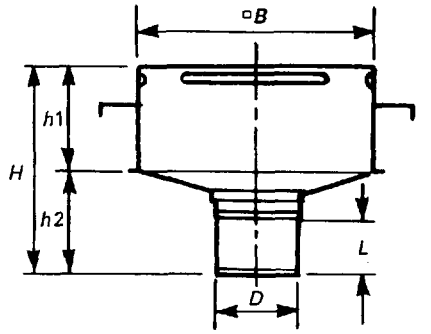


D in.	D mm	B in.	B mm	B1 in.	B1 mm	L in.	L mm	h1 in.	h1 mm	H in.	H mm
6.30	160	12.4	315	8.7	220	3.5	90	5.8	148	9.2	233
4.33	110	12.4	315	6.8	175	2.8	70	4.6	118	8.0	203

FIG. 35 INDUSTRIAL STAINLESS STEEL FLOOR DRAIN — HORIZONTAL OUTLET



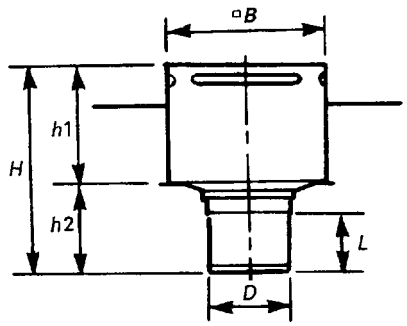
D in.	D mm	B in.	B mm	L in.	L mm	h1 in.	h1 mm	h2 in.	h2 mm	H in.	H mm
4.33	110	8.5	215	2.8	70	6.1	155	4.8	122	10.9	277
2.95	75	8.5	215	2.2	55	6.1	155	5.1	129	11.2	284

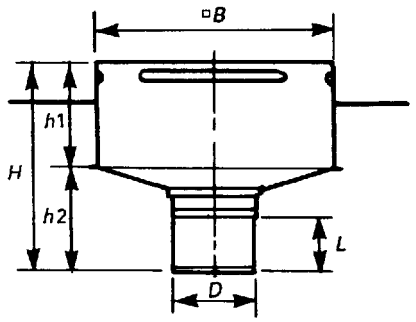


D in.	D mm	B in.	B mm	L in.	L mm	h1 in.	h1 mm	h2 in.	h2 mm	H in.	H mm
6.30	160	12.4	315	3.5	90	7.2	182	6.2	158	13.4	340
4.33	110	12.4	315	2.8	70	5.5	140	5.4	137	10.9	277
2.95	75	11.4	315	2.2	55	5.5	140	5.7	144	11.2	284

FIG. 36 INDUSTRIAL STAINLESS STEEL FLOOR DRAIN — VERTICAL OUTLET

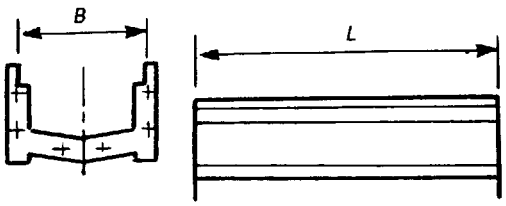
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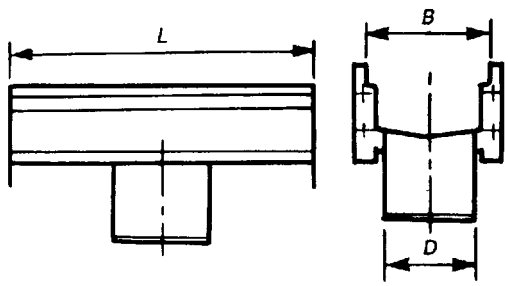
D in.	D mm	B in.	B mm	L in.	L mm	h1 in.	h1 mm	h2 in.	h2 mm	H in.	H mm
6.30	160	12.4	315	3.5	90	7.2	182	6.2	158	13.4	340
4.33	110	12.4	315	2.8	70	5.5	140	5.4	137	10.9	277
2.95	75	11.4	315	2.2	55	5.5	140	5.7	144	11.2	284

FIG. 37 INDUSTRIAL STAINLESS STEEL FLOOR DRAINS — VERTICAL OUTLET WITH MEMBRANE FLANGE



B in.	B mm	L in.	L mm
5.8	147	12	305
5.8	147	24	610
5.8	147	36	915
5.8	147	48	1220
5.8	147	60	1525
5.8	147	72	1830
11.7	297	12	305
11.7	297	24	610
11.7	297	36	915
11.7	297	48	1220
11.7	297	60	1525
11.7	297	72	1830

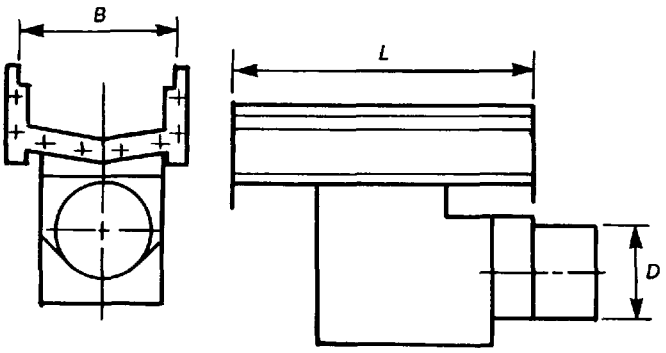
FIG. 38 STAINLESS STEEL TRENCH DRAIN



D in.	D mm	B in.	B mm	L in.	L mm
4.33	110	5.8	147	12	305
4.33	110	11.7	297	12	305

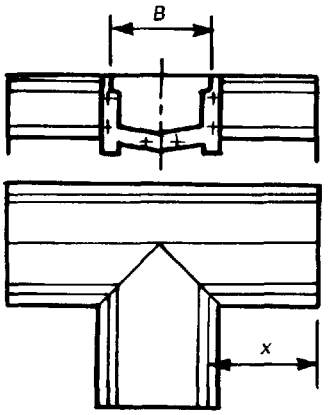
FIG. 39 STAINLESS STEEL TRENCH DRAIN — VERTICAL OUTLET

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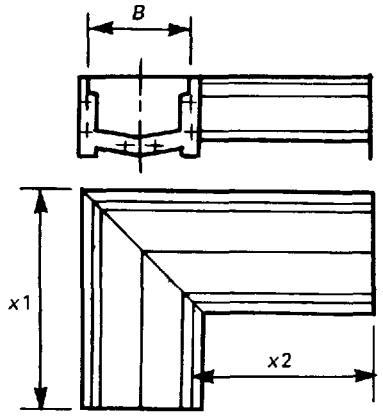
D		B		L	
in.	mm	in.	mm	in.	mm
4.33	110	5.8	147	12	305
4.33	110	11.7	297	12	305

FIG. 40 STAINLESS STEEL TRENCH DRAIN — SEDIMENT CONTAINER AND HORIZONTAL OUTLET



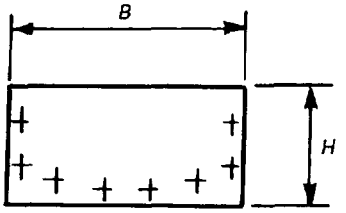
B		x	
in.	mm	in.	mm
5.8	147	6.9	175
11.7	297	3.9	100

FIG. 42 STAINLESS STEEL TRENCH DRAIN — TEE ASSEMBLY



B		x1		x2	
in.	mm	in.	mm	in.	mm
5.8	147	15.7	400	13.8	350
11.9	297	21.7	550	7.9	200

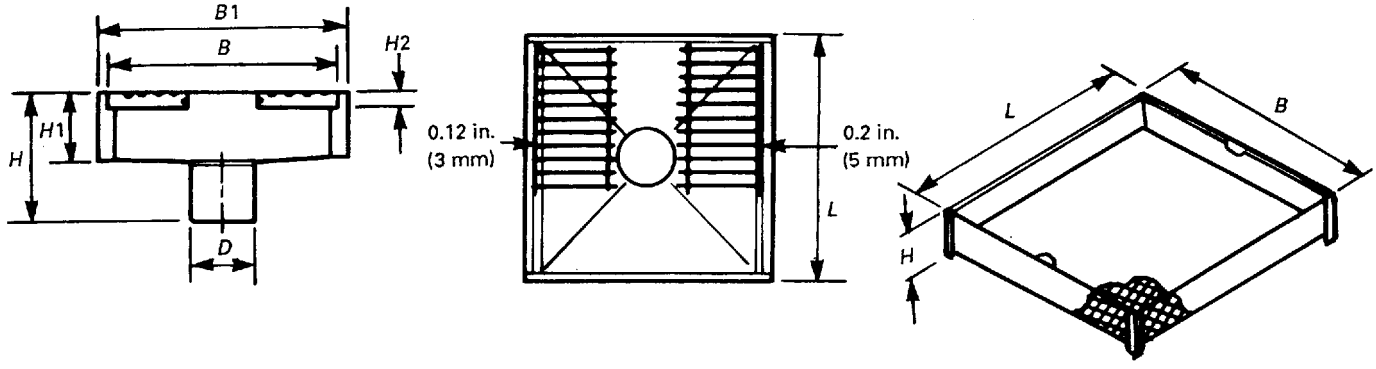
FIG. 41 STAINLESS STEEL TRENCH DRAIN — ANGLE PIECE



B		x	
in.	mm	in.	mm
7.0	178	4.6	116
12.9	328	4.6	116

FIG. 43 STAINLESS STEEL TRENCH DRAIN — END CAP

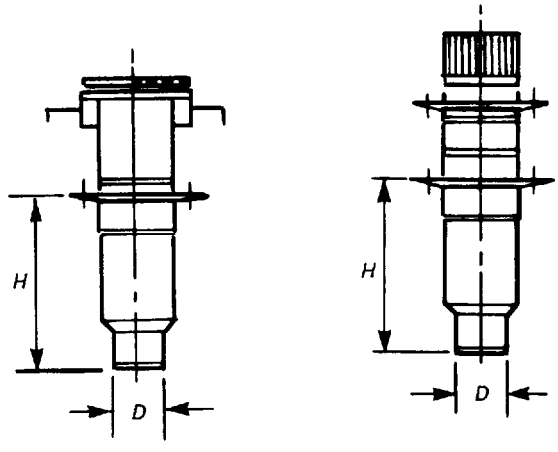
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D in.	D mm	B in.	B mm	B1 in.	B1 mm	L in.	L mm	H1 in.	H1 mm	H2 in.	H2 mm	H in.	H mm	Grates in.	Grates mm
4.33	110	15.7	400	16.9	429	16.8	426	1.0	25	4.7	120	8.5	215	0.12	3
4.33	110	23.6	600	16.9	429	24.6	626	1.0	25	4.7	120	8.5	215	0.12	3
4.33	110	31.5	800	16.9	429	32.5	826	1.0	25	4.7	120	8.5	215	0.12	3
4.33	110	15.7	400	16.9	429	16.8	426	1.0	25	4.7	120	8.5	215	0.20	5
4.33	110	23.6	600	16.9	429	24.6	626	1.0	25	4.7	120	8.5	215	0.20	5
4.33	110	31.5	800	16.9	429	32.5	826	1.0	25	4.7	120	8.5	215	0.20	5

B in.	B mm	L in.	L mm	H in.	H mm
14.6	370	15.6	396	3.1	80
14.6	370	23.4	596	3.1	80

FIG. 44 STAINLESS STEEL FLOOR SINKS

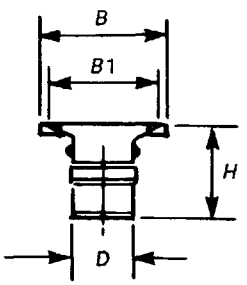


D in.	D mm	H in.	H mm
4.33	110	6.0	151
2.95	75	9.9	251

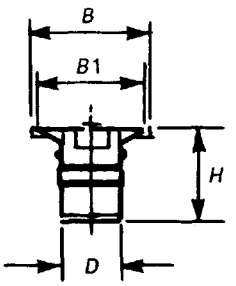
D in.	D mm	H in.	H mm
4.33	110	6.0	151
2.95	75	9.9	251
1.97	50	9.9	251

FIG. 45 STAINLESS STEEL ROOF DRAINS

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D		B		B1		H	
in.	mm	in.	mm	in.	mm	in.	mm
6.30	160	7.9	200	7.2	183	3.5	89
4.33	110	6.1	156	5.5	140	4.7	120
2.95	75	6.1	156	5.5	140	4.5	115



D		B		B1		H	
in.	mm	in.	mm	in.	mm	in.	mm
6.30	160	7.9	200	7.2	183	3.5	89
4.33	110	6.1	156	5.5	140	4.7	120
2.95	75	6.1	156	5.5	140	4.5	115

FIG. 46 STAINLESS STEEL FLOOR ACCESS CLEANOUTS

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