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भारत सरकार - Government of India

रेल मंत्रालय - Ministry of Railways

सेनेटरी उपकरण और फिटिंग
Sanitary Appliances and Fittings

केमटेक/2024/सि/एसएएफ/1.0
CAMTECH/2024/C/SAF/1.0

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February – 2024

EXCELLENCE IN MAINTENANCE
Indian Railways
Centre for Advanced Maintenance Technology

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सेनेटरी उपकरण और फिटिंग

Sanitary Appliances and Fittings

Foreword

Maintenance of buildings used for domestic as well as public purpose requires intensive care and ability of field engineers of open line to keep them in a satisfactory and safe condition to meet the requirements of water supply, drainage and sanitation. In the buildings, various types of sanitary fittings or appliances are now considered necessary and provided to maintain health of inhabitants and cleanliness of premises.

The document prepared by CAMTECH on "Sanitary Appliances and Fittings" is informative and serves as a ready reference to field engineers of open line for maintaining the buildings.

I hope that this document will be quite helpful to field engineers of open line, who are engaged in the inspection and maintenance of buildings in Indian Railways.

CAMTECH/Gwalior ***(Jitendra Singh)***
29th February, 2024 ***Principal Executive Director***

Preface

Buildings whether they are used for residential purposes or business purposes or industrial purposes or public places including railway platforms, bus stations and terminals, seaports, airports and market yards should be built with an eye for general sanitation and, an effective and intelligently planned plumbing. Sanitary fittings or appliances considered necessary in Buildings provide comfort and convenience as well as maintains the health and cleanliness.

The present document deals with various codal requirements of sanitary appliances such as water closets, cisterns, wash basins, sinks, etc. These are generally made of vitreous china and should be free from wavy finish, warpage, discoloration, blisters or pinholes, bubbles etc. to the unaided eye of a trained observer at the time of purchase. The document is intended to serve as ready reference to SSE/JEs of open line on the subject covering the aspects related to Soil and Waste Appliances.

The document is limited only to cover the aspects related to specific requirements of only those vitreous china sanitary appliances which are mentioned in IRUSSOR-2010 & DSR-2023 and conforming to requirements of relevant Indian Standards.

The document is not statutory & its contents are only for the purpose of knowledge dissemination. Most of the data & information in some form or the other are based on literature available at the time of preparation of document. For more in-depth information/knowledge, the relevant detailed literature, BIS Codes, IRICEN/RDSO literature, etc. as available on the subject may be referred to.

I am grateful for the assistance given by Shri K.C. Shakya, SSE/Civil for his continuous study, hard work, sincere efforts & dedication to make this publication useful for open line maintenance personnel of Indian Railways.

We welcome valuable suggestions from our readers for further improvements to this document.

CAMTECH/Gwalior — ***(Deepak Mehra)***
23rd February, 2024 — ***Director/Civil***

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संशोधन पर्चियों का प्रकाशन

ISSUE OF CORRECTION SLIPS

इस हस्तपुस्तिका के लिए भविष्य में प्रकाशित होने वाली संशोधन पर्चियों को निम्नानुसार संख्यांकित किया जाएगा :

The correction slips to be issued in future for this handbook will be numbered as follows:

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जहाँ XX संबन्धित संशोधन पर्ची की क्रम संख्या है (01 से प्रारम्भ होकर आगे की ओर)

Where "XX" is the serial number of the concerned correction slip (starting from 01 onwards).

प्रकाशित संशोधन पर्चियाँ
CORRECTION SLIPS ISSUED

क्र.सं./ Sr. No.	**प्रकाशन दिनांक/ Date of issue**	**संशोधित पृष्ठ संख्या तथा मद संख्या/ Page No. and Item No. modified**	**टिप्पणी/ Remarks**

1.0 INTRODUCTION

Indian Railways own a vast infrastructure setup of Civil Engineering Assets comprising of tracks, buildings and bridges. Buildings whether they are used for residential purposes or business purposes or industrial purposes or public places including railway platforms, bus stations and terminals, seaports, airports and market yards should be built with an eye for general sanitation and, an effective and intelligently planned plumbing.

As according to the IS 1172:1993 *"Each family dwelling unit on premises abutting on a sewer or with a private sewage disposal system shall have, at least, one water closet and one kitchen sink. It is desirable that a bath room with a tap or shower should be installed to meet the basic requirements of sanitation and personal hygiene."* The basic requirements for water supply, drainage and sanitation are covered in this Indian Standard and may be referred to for more details.

In the buildings, various types of sanitary fittings or appliances are now considered necessary, not only for comfort and convenience, but also from considerations of health and cleanliness. These appliances are used for collection and discharge of soil or waste matter and may be grouped under soil appliances such as water closet, urinal etc. and waste water appliances such as drinking water fountains, wash basin, kitchen sink, bathtub etc. These appliances and their components should be durable, impervious, corrosion resistant and have smooth surface which may be easily cleaned. They should conform to relevant Indian Standard where they exist; otherwise they should be of the best quality and workmanship which should be approved by a competent authority.

The sanitary appliances are generally made of vitreous china. Vitreous sanitaryware is a strong high grade ceramicware made from a mixture of suitable clays and finely ground minerals, such as quartz and feldspar. It is important to note that after firing at a high temperature, the sanitaryware, even when unglazed, should not have an average value of water absorption greater than 0.5 percent of the dry weight of the ware. In some cases sink is made from marble stone or stainless steel. At the time of purchase, it should be checked that all exposed surface of sanitary ware is coated with an impervious non crazing, vitreous, glaze finish (generally white or of any colour with high gloss) which is thoroughly fused with body and should possess an impervious surface. The surface should not have wavy finish, warpage, discoloration, blisters or pinholes, bubbles etc. and these should not be visible to naked eye.

The general requirement for all vitreous china sanitary appliances are covered in IS: 2556-1. The specific requirements of only those sanitary appliances, which are mentioned in IRUSSOR-2010 & DSR-2023, are covered in this reference document. For details, the relevant Indian Standards may be referred to.

All types of sanitary fittings should be fixed against an external wall, so that the apartment in which they are placed can be provided with natural light and air, and also their wastes can be easily collected in drain. The floors of the rooms in which they are fixed should be of a non-absorbent material with curved angles at the junction with walls from sanitary point of view.

Sanitary appliances made of Glazed Earthenware are unhygienic and outdated, and those made of Glazed Fire-clay are no longer in use as the relevant Indian Standards (IS 771) have been withdrawn.

2.0 GENERAL REQUIREMENT OF VITREOUS CHINA SANITARY APPLIANCES

IS 2556-1 deals with the requirements generic with respect to material, manufacture, quality, dimensional tolerances and performance of vitreous china sanitary appliances. One should keep in mind the following points as selection criteria during visual examination of appliance.

- All exposed surfaces of an appliance should be uniformly glazed and free from craze and discolouration and should possess an impervious surface. The glaze should form a high gloss and be of such thickness and capacity to give uniform colour and finish. Surfaces coming into contact with walls and floors may be without glaze.
- Appliances may have unglazed portions but the unglazed surfaces should not be visible when the appliance is installed in the normal manner. The following exposed surfaces of various sanitary appliances may remain unglazed:
  - For water closets/squatting pans/urinals, the exposed unglazed surfaces are 1) the inside, back, and underside of the flushing cistern; 2) the underside of the cistern lid/cover; 3) the underside of the flushing rim; 4) section of the flushing surface not to exceed 6 mm below the flushing rim; 5) all surfaces of the trap not visible after installation; 6) the back and underside of the pedestal.
  - For washbasins/sinks, the exposed unglazed surfaces are 1) on wash basins set away from walls – i) the portions of the rear aprons used for supporting the appliances in kilns; ii) the backs of overflows; iii) the undersides of outlet bosses; 2) the undersides of drop-in washbasins/sinks; 3) the backs of wash basin/sink legs and pedestals.
  - In other fixtures, the surfaces where the fixture is supported in the kiln may remain unglazed, as long as such surfaces are not visible after installation.
- The thickness of the appliance/fixture at any location should not be less than 6 mm.
- The materials used for making glaze should be free from lead or a lead compound. In case of certain colouring oxides used for making coloured glaze, the lead content, if any, should not exceed 5 percent of the weight of the glaze when tested in accordance with the test preferably conducted at manufacture's works.
- The appliance should be visually examined for a) polishing mark, b) bubbles and specks, c) waves in finish, d) warpage, e) crazing, etc. from a distance of 60 cm and practically no such defects should be visible to naked eye. IS 2556-1 may be followed for more details.
- The dimensional tolerances on various parts of appliances except where otherwise specified in IS 2556-1 specifically, are as under:

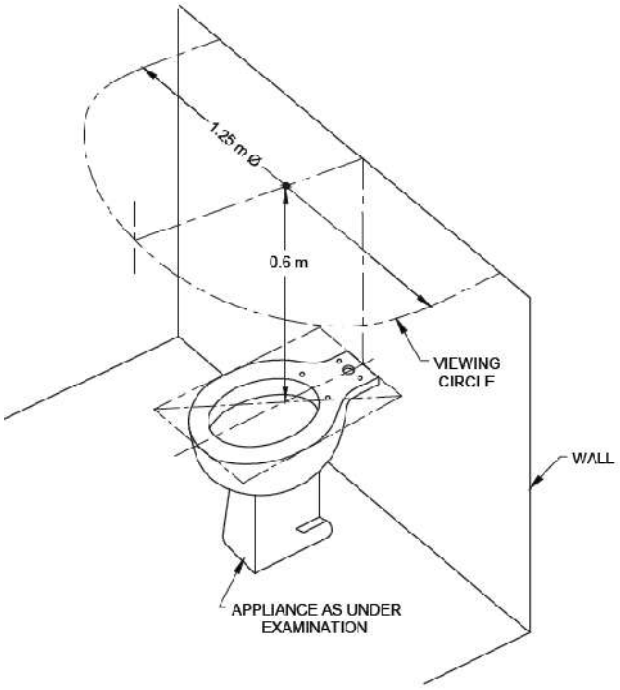
For dimensions 75 mm and more	± 2 percent of the specified dimension or ± 2 mm, whichever is more.
For dimensions less than 75 mm	± 5 percent of the specified dimension or ± 2 mm, whichever is more.
Height of the flush outlet of P-traps, or horizontal outlets	± 5 mm
All angles	± 3°

- The tests, which are conducted to check the performance of sanitary appliances, include tests for warpage, crazing, water absorption, modulus of rupture and chemical resistance as specified in relevant Para of IS 2556-1.
  - *Test for Warpage* is conducted to check deformation of shape and dimension of sanitary wares which cause them look nonconforming and poor appearance. The appliance should be considered to be within the warpage limits, if a feeler gauge of thickness equal to the maximum warpage specified does not slide under the appliances without application of force.
  - *Test for Crazing* is conducted to check the hair like cracking which occurs in fired glazes or other ceramic coatings due to critical tensile stresses known as crazing, and usually appears after firing but can appear years later. It is caused by a mismatch in the thermal expansions of glaze and body. Most ceramics expand slightly on heating and contract on cooling. When tested for crazing, none of the test piece should show crazing.
  - *Test for Water Absorption* is conducted to check the average value of water absorption. It should not exceed 0.5 percent when tested. No individual result should exceed 0.75 percent.
  - *Test for Modulus of Rupture* is conducted to check the resistance of a ceramic bar to breaking when supported on two points and subjected to an increasing force at its midpoint. The average modulus of rupture of ten samples when tested should not be less than 60 MPa. The values taken for determination of the average should not vary more than ± 20 percent of the average value. Values above or below 20 percent of the average may be discarded for the calculation of the average value.
    - If the fractured surface of test pieces shows lamination, crack or a cavity at the centre or any other defect, those test pieces shall be rejected but minimum ten test pieces shall be available for working out the average value.
  - *Test for Chemical Resistance* is conducted to check the resistance to the corrosive action of various chemical agents on ceramic glaze. The ceramic glaze is a mixture of specified raw materials, which, after being ground and applied onto a ceramic body, is transformed, either wholly or partially, into a vitrified coat during a firing process. For satisfactory performance requirement, none of the test pieces should appear to the unaided eye of a trained observer to have suffered any loss of reflectivity of the glaze when compared with the control sample.

- The glazed appliance should not have any adverse noticeable effect on treatment with chemicals as under *(Ref. Table 4 of IS 2556-1)*:

Name of Chemical	**Strength of Solution (%)**	**Time (Hrs)**	**Temperature (°C)**
Acetic acid	10	16	100
Citric acid	10	16	100
Detergent	(*)	48	60
Hydrochloric acid (HCl)	(**)	48	25-35
Sodium hydroxide (NaOH)	5	0.5	60
Sodium stearate	0.15	48	60
Sulphuric acid	3	16	100
NOTES **(*)** consists of an aqueous solution containing 0.04 percent (wt/vol) of a condensation product of Alcohol ethoxylates or nonylphenol with 8-10 molecules of ethylene oxide. **(**)** consists of equal volumes of water and of hydrochloric acid of specific gravity of 1.18.			

- When examined by an unaided eye of an experienced observer, from a distance of 60 cm from exposed surfaces, the appliance should be free from visible defects or blemishes. *(Ref. Fig.1 of IS 2556-1)*



- The maximum permitted limits of Blemishes and Defects in Water Closet (WC) Pans, Bidets, Squatting Pans, Urinals, Partition Plates, Pedestals, Short Pedestals and Accessories are listed as in table below *(Ref. Table 1 of IS 2556-1)*:

SN	Location	Blemish and Defect	Maximum Permitted
i)	General	Wavy finish	None on all visible surface
		Warpage: a) WC pan and bidets b) Squatting pans	Not more than 6 mm i) Not more than 6 mm, for long pattern of 580 mm size, ii) Not more than 10 mm, for long pattern of 630 mm size and Orissa patterns of 580 mm and 630 mm sizes
		Other appliances	Not more than 1 mm per 100 mm; total warpage not more than 6 mm
		Accessories	Not to exceed 3 mm on any plane
		Bit Discolouration	None on all visible surfaces None on all visible surfaces
ii)	Flushing surface and horizontal face of rims of WC pans, squatting pans, bidets and urinals	Spots, blisters and pinholes	A total of not over three; no grouping. For coloured appliances, blister and pinhole limited to one each
		Bubbles and specks	Not over two in one pottery square; a total of not over four. For coloured appliances, a total not over two

		Polishing marks	One only; none permitted for coloured appliances
iii)	Visible surfaces other than above	Spots, blisters and pinholes	A total of not over five; no grouping. For coloured appliances no blisters are permitted and pinholes are limited to a total of two
		Bubbles and specks	Not over three in one pottery square; a total of not over ten
		Polishing marks	Two only. One permitted for coloured appliances

- The maximum permitted limits of Blemishes and Defects in Wash Basins, Laboratory Sinks and Drinking Fountains are listed as in table below *(Ref. Table 2 of IS 2556-1)*:

SN	**Location**	**Blemish and Defect**	**Maximum Permitted**
i)	General	Wavy finish	None on all visible surface
		Warpage: a)Wash basins and drinking fountains b)Laboratory sinks	 Warpage of slab out of horizontal plane not to exceed 6 mm on all sizes (warpage of backs of wash basins which are attached to the wall not to exceed 3 mm) Warpage not to exceed ±3 percent on all planes
		Discolouration	None on all visible surfaces
ii)	Service space, top of slab, inside of bowl, front of fascia	Spots, blisters and pinholes	A total of not over two; no grouping. For coloured appliances no blisters are permitted and pinhole limited to one only
		Bubbles and specks	A total of not over four; no grouping. For coloured appliances, a total of not over two
		Polishing marks	One only, none permitted for coloured appliance
iii)	Face of internal, back and side	Spots, blisters and pinholes	One only on back or on either side; a total of not over three. For coloured appliances, no blisters are permitted and pinholes are limited to a total of two
		Bubbles and specks	A total of not over four; no grouping
		Polishing marks	Two only. One permitted for coloured appliances

- The maximum permitted limits of Blemishes and Defects in Flushing Cisterns and Covers Assembled Together are listed as in table below *(Ref. Table 3 of IS 2556-1)*:

SN	**Location**	**Blemish and Defect**	**Maximum Permitted**
i)	General	Warpage	Warpage of the flat back portion in case of cisterns not to exceed 5 mm and for bottom portion in case of coupled cistern not to exceed 3 mm
		Discolouration	None on visible surfaces

ii)	Visible Surface	Wavy finish	Not more than 2500 mm^2, on ends only; none on cover
		Spots, blisters and pinholes	A total of not over four; on grouping. However, a total of not over one on covers. For coloured appliances, blister and pinholes limited to one each, none on covers.
		Bubbles and specks	Not over two in one pottery square; total of not over six, including not over two on cover
		Polishing marks	One only; none on cover; none permitted for coloured appliance

3.0 SOIL APPLIANCES

The soil appliances include several kinds of water-closets, urinals, bidets, slop sinks, etc., which are installed in residential and other than residential spaces such as commercial, public spaces. The installation of these appliances is carried out in a space called toilet, which consists of minimum three fixtures such as stall/bath tub, wash basin and water closets. It is common practice to provide four fixtures, like tub and shower stall, wash basin/dressing counter and water closets. Luxurious type toilet consists of five fixtures name bath tub, shower stall, water closet, bidet and counter fitted with wash basin, with full length of mirror.

3.1 Water Closet

The word closet refers to the small room or enclosure in which early soiled water pans were located when they replaced the original dry latrine. The water closet (WC) is classified as ordinary or washdown type and the siphonic type, which is designed to receive human excreta directly from the user and is connected to the soil pipe by means of a trap. The design of a water closet is to provide a safe and convenient place for defaecation and the system of collection, conveying and disposal of the faeces made absolutely safe and hygienic without offending the people employed in this behalf. Water closet space should accommodate not only the pan but also a provision for water tap, tumbler, wall pegs, toilet paper holder, flushing valves, cistern high or low and storage for cleansing agents etc.

The minimum fittings and appliance in a water closet should consist of a squatting pan with its trap or alternatively a washdown (pedestal type) or a universal closet (pedestal type) provided with seat and cover, and flushing cistern or flush valve with flush pipe.

WC should be conveniently arranged with special attention to clearances, flushing system and floor trap. The outlet traps (P/S) is preferred at the central axis of the WC or at right angle in the plan. The location of water tap arrangement should permit more than one function. In case of western type, the position of WC and the toilet paper holder should be made within the convenient reach of users.

The following varieties of vitreous china water-closets are in common use.

- ***Squatting or Indian Type:*** a) Long Pattern; b) Orissa pattern; c) Rural pattern; d) Integrated Squatting Pan
- ***Western Type WC:*** a) Pedestal Washdown Water Closet with independent cistern b) Pedestal Washdown Water Closet (Close-Coupled & One-Piece) c) Wash Down Wall Mounted Water Closet
- ***Universal or Anglo-Indian Type***

3.1.1 Vitreous China Squatting or Indian Type

In India, traditionally people use the closet in a squatting posture and therefore, the seat arrangement is modified to have two foot rests on either side of the pan proper, the pan with the trap being placed flush with the floor of the closet apartment. The squatting pans and traps should be manufactured separately in two pieces except in the case of the integrated type where the squatting pan and trap are made integrally.

- The floor and the foot rests may be made with cement concrete.
- Separate squatting plates made of vitreous china may be fixed on the floor and finished with cement mortar.
- The pan and foot rests may be made integral in vitreous china as in the case of 'Orissa' pattern and in the case of 'universal' pattern of closet pans.
- The pan may have a flushing rim and connected to a flushing apparatus. Flushing system employed in Indian type pan is called 'wash out' system.
- In the case of the 'hand pour flushed' type, as in the case of the rural pattern, there is no flushing rim.

IS 2556-3 deals with specific requirements of squatting pans. The following requirements as part of selection process of appliances should be considered.

- The flushing rim and the inlet should be of the self-draining type and a weep-hole should be provided at the flushing inlet of the pan.
- The inside of the bottom of the pan should have sufficient slope from the front towards the inlet to enable easy and quick disposal while flushing. The minimum slope should be 15^0 to horizontal for all sizes except for the rural pattern for which the slope is fixed according to the dimensions given, namely 32^0.
- Each pan should be provided with a trap. The trap should have either P or S outlet with or without an inspection vent. The trap should be glazed inside.
- Inside surface of the squatting pan should be glazed uniform and smooth in order to ensure efficient flush.
- The flushing tests as required should be carried out by using the flushing cistern of the capacity with which the appliance is to be used.
- Each squatting pan should be clearly and indelibly marked at a suitable place indicating the name or trade-mark of the manufacturer and batch/lot number.

Long Pattern Squatting Pan: The arrangement is having two foot rests kept on either side of the pan. The pan is provided with integral flushing rim (*box or open type)* and is connected to flushing system. The centre of the flushing rim should be in line with the centre of the outlet. The inside of pan is glazed but the exterior needs to be rough and non-glazed. The foot rests are not integral to the WC pan but are provided separately. The squatting pan is made in two standard sizes viz. 580 mm and 630 mm long with length of opening as 480 mm and 530 mm respectively. Only the size 580 mm x 480 mm is included in IRUSSOR-2010 & DSR-2023.

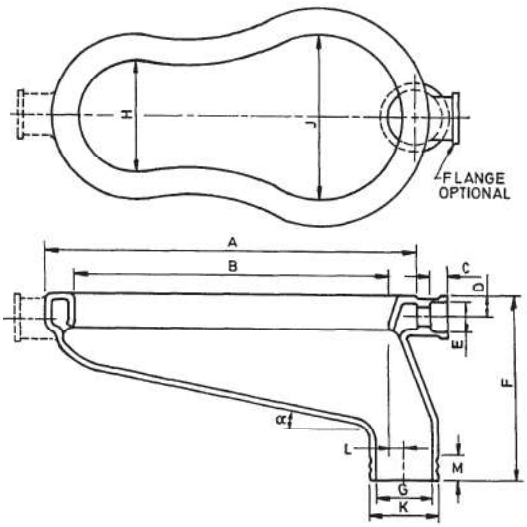


Fig. 1A Long Pattern Squatting Pan

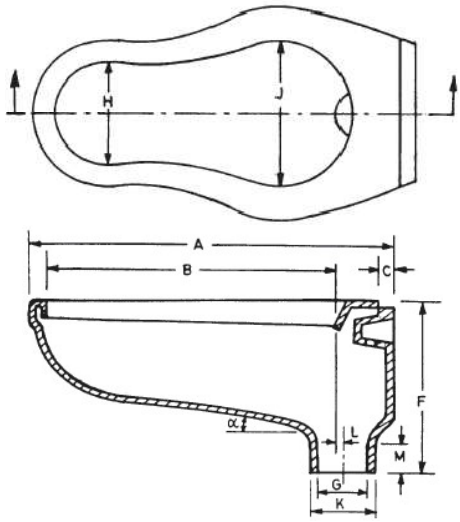


Fig. 1B Long Pattern Squatting Pan Type

Footrest for Squatting Pan: IS 2556-7 deals with the requirements of footrest for squatting pan. The face of the footrest should be made non-slippery by providing chequred or flute or any other design to permit easy flow of water towards the pan rim or bowl of the squatting pan. The size should be minimum of 250 mm x 125 mm x 15 mm. The surface coming in contact with water should be glazed uniform and smooth except for serration. The edges should be suitably rounded or chamfered.

Orissa Pattern Squatting Pan: It is similar to long pattern squatting pan except the footrests are integral part of pan. These are made in two sizes as given in table. This type of pan gives a more elegant appearance and is available in

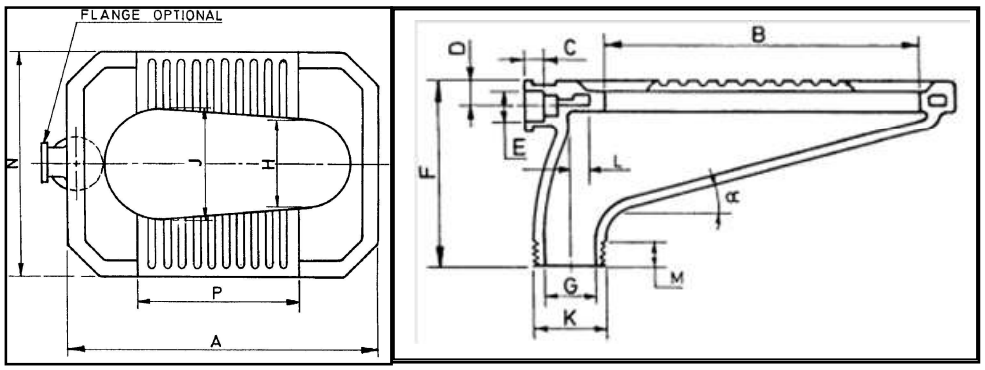


Fig. 2 Orissa Pattern Squatting Pan

NOTE: Footrest may be flushed or raised, clearance permissible between raised footrest and rim opening.

colours also. The pedestals may be raised above the pan or flush with the pan i.e. with the floor. The interior of the pan is glazed but exterior is to be rough and non-glazed.

The functional and connecting dimensions of Long pattern and Orissa pattern squatting pans are given in Table, read with figure as indicated above.

Functional Dimensions (in mm) (*Ref: Table 1 of IS 2556-3*)

S. No.	Description	Ref in Fig. 1A, 1B & 2	Long Pattern of Size	Orissa Pattern of Size
			580	**580 x 440**
1	Length	A	580	580
2	Length of Opening	B	480	470
3	Height	F	300±10	300±10
4	Width of Opening, small end	H	170±10	180±10
5	Width of Opening, wide end	J	260±10	210±10
6	Slope of bottom of pan (Deg)	α	15^0	15^0
7	Distance between the centre of outlet to the inside face of flushing rim at the back, max	L	70	70
8	Width	N	-	440
9	Length of footrest	P	-	300±10
Note: Tolerances where not specified shall conform to IS 2556-1.				

Connecting Dimensions (in mm) (*Ref: Table 2 of IS 2556-3*)

S. No.	Description	Ref in Fig. 1A, 1B & 2	Long Pattern of Size	Orissa Pattern of Size
			580	**580 x 440**
1	Depth of flush inlet socket, Min	C	25	25
2	Centre of inlet to top of inlet	D	34±3	34±3
3	Internal dia. of flush inlet socket	E(1)	50±3	50±3
4	Diameter of outlet, internal, Min	G(2)	80	80
5	Diameter of outlet, external	K	102±5	102±5
6	Length of serrated part of outlet, Min	M	40	40
(1) Ovality is permissible within the variation allowed for the dimension. (2) Ovality is permissible within the dimensions for inlet and outlet diameters.				

Rural Pattern Squatting Pan (*Ref: IS 2556-3*): In rural parts of India where there is no flushing system available, the rural pattern squatting pans are only used.

In rural pattern squatting pan sharp gradient of 32^0 is given to facilitate hand pour flushing. In this type no integral flushing rim is provided. These are made in vitreous china as available in market.

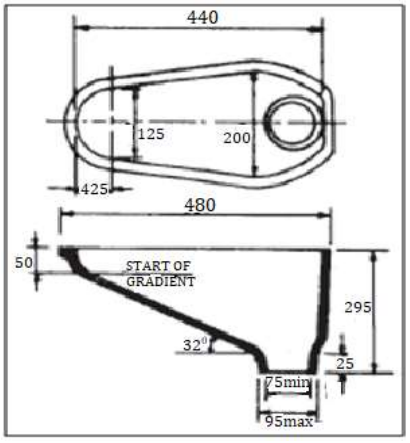


Fig. 3 Rural Pattern Squatting Pan

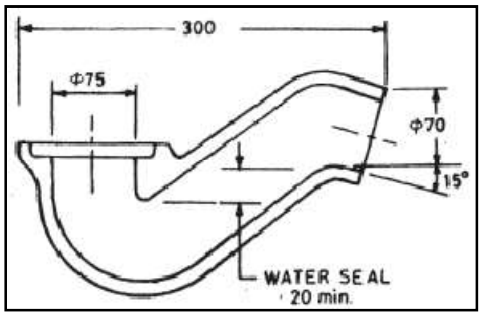


Fig. 3A Traps for Squatting Pan

The trap for rural pattern squatting pan should conform to the dimensions specified in Fig. 3B of IS 2556-7 and same is given here for reference. In the figures as shown above, all dimensions of rural pattern squatting pan are in millimeter.

Integrated Squatting Pan: The pattern of the integrated squatting pan is long pattern 500 (Fig. 4A-4B). The squatting pans may also be made in other patterns and sizes where so agreed to between the manufacturer and the purchaser. Depth of water seal should in no case be less than 50 mm.

IS 2556-14 deals with specific requirements of integrated squatting pans. The following requirements as part of selection process of appliances should be considered.

- Inside surface of the integrated pan should be glazed uniform and smooth in order to ensure efficient flush.
- The flushing tests as required should be carried out by using the flushing cistern of the capacity with which the appliance is to be used.
- Each squatting pan should be clearly and indelibly marked at a suitable place indicating the name or trade-mark of the manufacturer and batch/lot number.

The functional and connecting dimensions of integrated squatting pan are given in Table, read with the figure as indicated.

Functional Dimensions (in mm) ***(Ref: Table 1 of IS 2556-14)***

S. No.	Description	Ref in Fig. 4A	Long Pattern 500
1	Length	L	500
2	Overall length	L_1	730
3	Length of Opening	L_2	430
4	Width of Opening, small end	W_1	150
5	Width of Opening, wide end	W_2	230
6	Height	h_1	320±10
7	Slope of bottom of pan (Deg)	α	100 ± 3^0
8	Depth of water seal, min	T	50

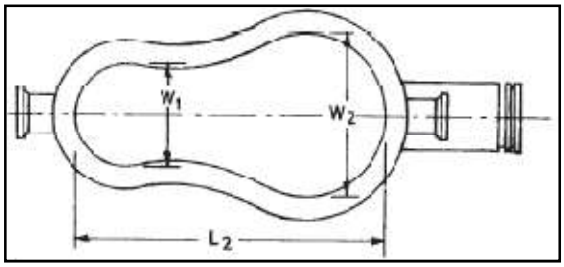


Fig. 4A Integrated Squatting Pan

Note: Tolerances where not specified shall conform to IS 2556-1.

Connecting Dimensions (in mm) ***(Ref: Table 2 of IS 2556-14)***

S. No.	Description	Ref in Fig. 4B	Long Pattern 500
1	Depth of flush inlet socket, Min	a	25
2	Distance from end of flush inlet socket to outside of outlet, Min	b	70
3	Diameter of outlet, internal[1)], Min	d_1	80
4	Diameter of outlet, external[1)]	d_2	102±5
5	Internal dia. of flush inlet socket[2)]	d_3	50±3
6	Length of serrated part of outlet, Min	m	40
7	Distance of the centre of outlet from the bottom of the pan	h_2	140
8	Angle of the outlet with the vertical plane passing through its centre	θ_1	104^0

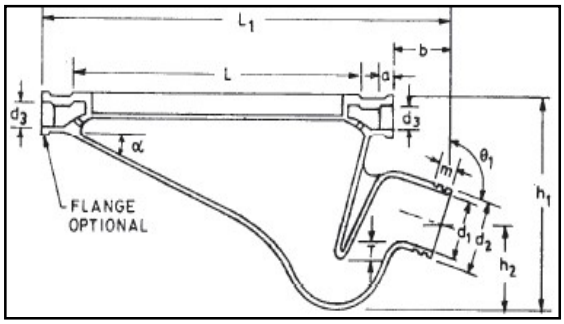


Fig. 4B Integrated Squatting Pan

(1) Ovality is permissible within the variation allowed for the dimension.
(2) Ovality is permissible within the dimensions for inlet and outlet diameters.

3.1.2 Vitreous China Washdown or Western Type

This is also called the European water closet and is used in a sitting posture over a plastic seat hinged to the closet structure. Another plastic cover is also hinged to close the pan from view. Where washdown water closets and universal water closets with seats and covers are provided, they should also be provided with 1) a floor trap; 2) a toilet paper holder and 3) an ablution tap, especially in public buildings.

Western type water closet includes the following:

a) Pedestal Washdown WC with independent cistern
b) Pedestal Washdown WC (Close-Coupled & One-Piece)
c) Washdown Wall Mounted WC

3.1.2.1 Pedestal Washdown WC with Independent Cistern

The closet is a floor mounted pedestal fitting with basin and trap in one piece. The pan consists of a short inverted cone, the back of which is almost vertical so that the excreta may fall directly on the water in the trap without fouling the sides. It is always provided with a flushing rim and attached to a flushing apparatus which is usually a low level flushing cistern.

IS 2556-2 deals with specific requirements of Pedestal Washdown WC with Independent Cistern. The following requirements as part of selection process of appliances should be considered.

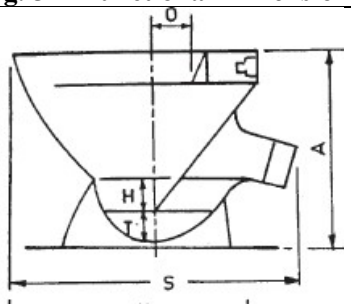
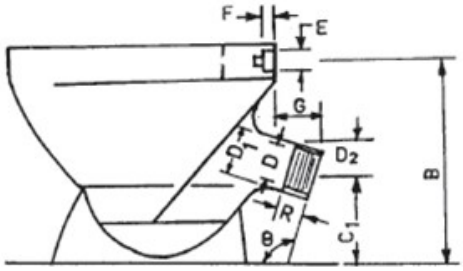
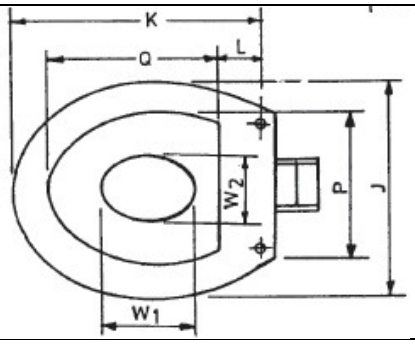
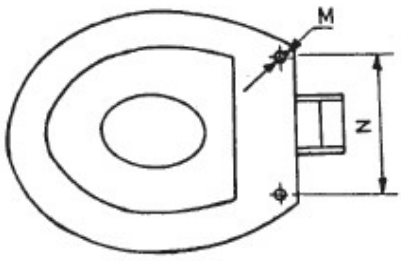
- Each closet should be provided with not less than two floor fixing holes having a minimum diameter of 6.5 mm and should have an integral flushing rim of suitable type.
- The flushing rim and the inlet should be of the self-draining type and a weep-hole should be provided at the flushing inlet of the water closet.
- Inside surface of the water closets and traps should be uniform and smooth in order to ensure efficient flush.
- The flushing tests as required should be carried out by using the flushing cistern of the capacity with which the appliance is to be used.
- Each closet should be clearly and indelibly marked at a suitable place indicating the name or trade-mark of the manufacturer and batch/lot number.

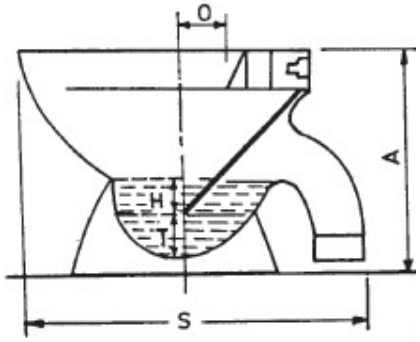
As per IS 2556-2, water-closets should be one of the following patterns:

a) Pedestal WC with independent cistern (Fig. 5) (Pattern 1 & Pattern 2)
b) Pedestal WC with independent cistern and horizontal outlet (Fig. 6) (Pattern 3)
c) Pedestal WC with independent cistern and concealed S-trap (Fig. 7) (Pattern 4)

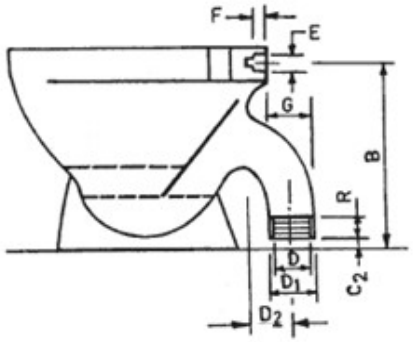
The functional dimensions and connecting dimensions of each pattern of water closet are given in Table, read with the figures as indicated below:

(A) Pedestal WC with Independent Cistern (Pattern 1 & Pattern 2)

Fig. 5A Functional Dimensions	**Fig. 5B Connecting Dimensions**
 P- TRAP	 P- TRAP
	



S- TRAP



S- TRAP

Fig. 5 Pedestal WC with Independent Cistern

(B) Pedestal WC with Independent Cistern and Horizontal Outlet (Pattern 3)

Fig. 6A Functional Dimensions

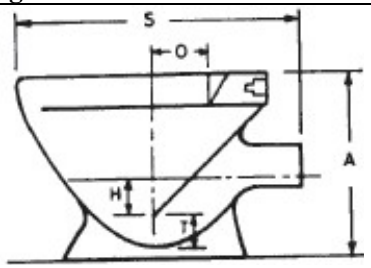
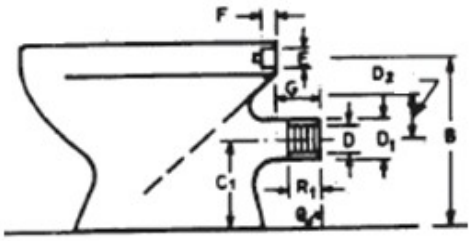
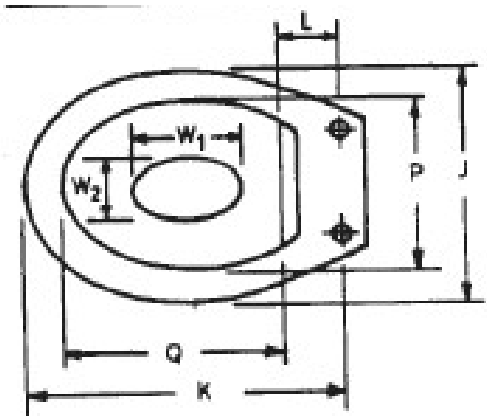
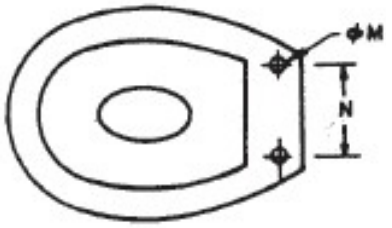


Fig. 6B Connecting Dimensions







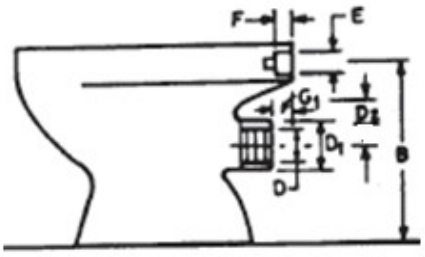


Fig. 6 Pedestal WC with Independent Cistern and Horizontal Outlet

(C) Pedestal WC with Independent Cistern and Concealed S-trap (Pattern 4)

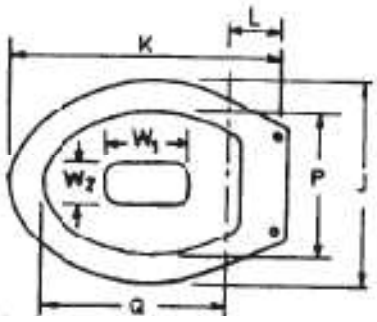
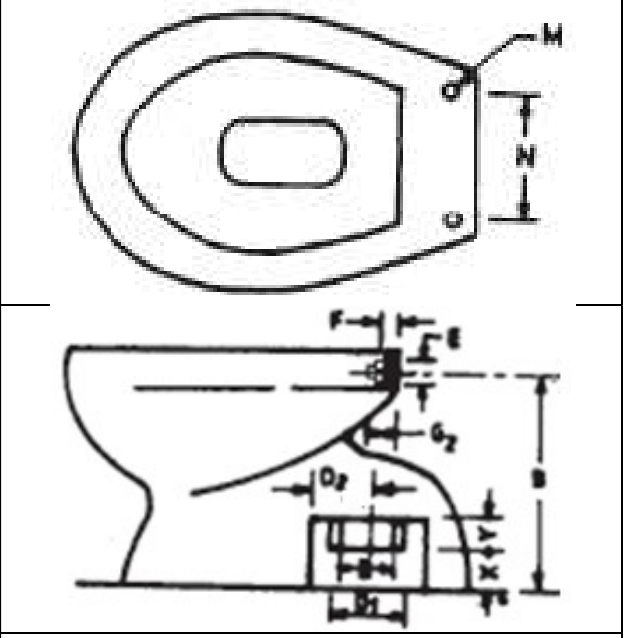
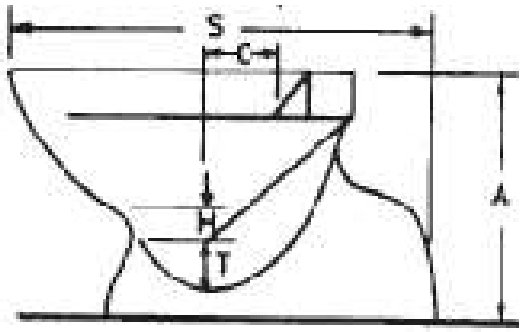
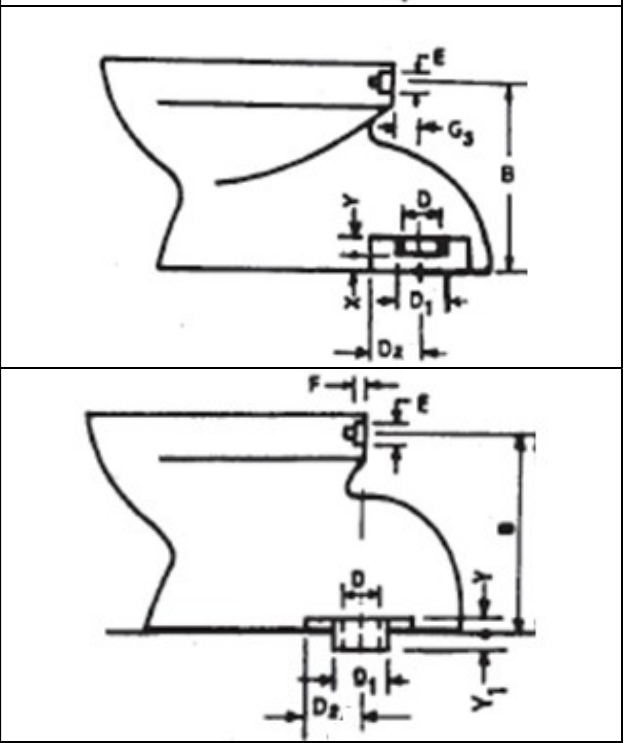
Fig. 7A Functional Dimensions	Fig. 7B Connecting Dimensions
	
	

Fig. 7 Pedestal WC with Independent Cistern and Concealed S-trap

Functional Dimensions (in mm) ***(Ref: Table 1 of IS 2556-2)***

S. No.	Description	Ref. in Fig.	Pattern 1 (Fig. 5A)	Pattern 2 (Fig. 5A)	Pattern 3 (Fig. 6A)	Pattern 4 (Fig. 7A)
i	Height	A	390±10	390±10	390±10	390±10
ii	Depth of water seal, *Min*	H	50	50	50	50
iii	Width of water closet	J	360±10	360±10	360±10	360±10
iv	Distance from centre of seat bolt hole to front of water closet	K	415 to 445	415 to 445	415 to 445	415 to 445
v	Distance from centre of seat bolt hole to inside face of flush rim at back, *Max*	L	80	80	80	80
vi	Distance between a vertical line from tip of back plate to inside face of flush rim at back, *Max*	O	70	70	70	70
vii	Width of opening, *Min*	P	240	240	240	240
viii	Length of opening, *Min*	Q	290	290	290	290
ix	Overall length	S	500-575	500-575	500 *Max*	600 *Max*
x	Trap inlet depth, *Min*	T	75	75	75	75
xi	Water surface back to front	W_1	150 *Min*	100 *Min*	150 *Min*	150 *Min*
	Side to side	W_2	110 *Min*	75 *Min*	100 *Min*	110 *Min*
NOTE — In case of centre vent in S trap, overall length should be taken as S + 75						

Connecting Dimensions (in mm) ***(Ref: Table 1 of IS 2556-2)***

S. No.	Description	Ref. in Fig.	Pattern 1 (Fig. 5B)	Pattern 2 (Fig. 5B)	Pattern 3 (Fig. 6B)	Pattern 4 (Fig. 7B)
i	Height of centre line of flush inlet floor level, (for P-trap only)	A	345 +15 -25	345 +15 -25	345 +15 -25	345 +15 -25
ii	Height of centre line of outlet from floor level (for P-trap only)	C_1	50 +15 -10	50 +15 -10	50 +15 -10	-
iii	Distance from end of trap to floor (S-trap only)	C_2	20±5	20±5	-	-
iv	Internal diameter of outlet, Min	D[1)]	80	80	80	80
v	External diameter of outlet	D_1[1)]	102±5	102±5	102±5	102±5
vi	Radius of free space (to be measured from the centre of the outlet at a point at a distance 40 mm above the end of the outlet), Min	D_2[1)]	75	75	75	75
vii	Internal diameter of inlet	E[2)]	50±3	50±3	55 +3 -1	55 +3 -1
viii	Depth of inlet F socket, Min	F	25	25	25	25
ix	Distance between end of flush inlet socket and outside of the outlet	G	45 Min	45 Min	20±20	-
		G_1	-	-	40±20	-

x	Distance between end of flush inlet socket and centre line of the outlet	G_2	-	-	-	20±20
		G_3	-	-	-	20±20
xi	Diameter of seat bolt hole	M	15±2	15±2	15±2	15±2
xii	Distance between centre of seat bolt holes	N	165 $^{+10}_{-5}$	165 $^{+10}_{-5}$	155±10	155±10
xiii	Length of grooved part of outlet, Min	R	40	40	-	-
xiv	Length of straight part of outlet glazed and without groove Angle of outlet (for P-trap only)	R_1	-	-	40 Min	-
xv	Angle of outlet (for P-trap only)	Θ	104^0	104^0	90^0	-
xvi	Distance between end of outlet and floor	X	-	-	-	10 Min
xvii	Length of outlet without grooves	Y	-	-	-	40 Min
xviii	Length of outlet extending to the floor	Y_1	-	-	-	32±5

NOTE — Tolerance where not specified shall conform to IS 2556-1.
[1] Ovality permissible within the dimensions for inlet and outlet diameters.
[2] Ovality permissible within the variation allowed for the dimension.

Antisyphonage Vent Horn: Each water closet should have antisyphonage vent horn on the outlet side of the trap with dimensions conforming to Fig. 8 and on either right or left hand as specified, set at an angle of 45^0 and invert of vent horn not below the central line of the outlet.

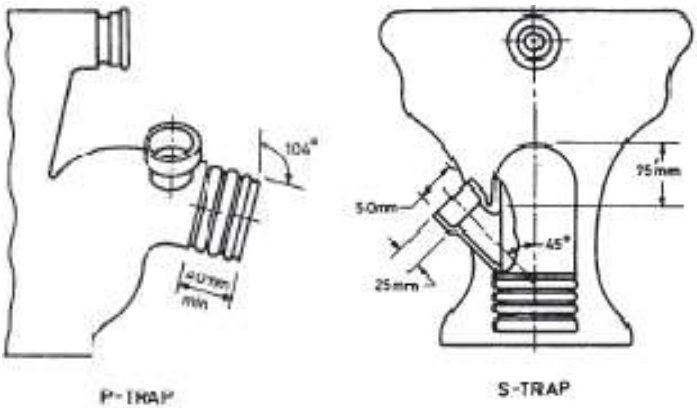


Fig. 8 Anti-syphonage Vent Hose Detail

Each WC should have an integral trap with either S or P outlet conforming to Fig. 5, Fig. 6 and Fig. 7. Special connectors, which are required to connect the horizontal outlet of water closet (Fig. 6) to the drainage system, should be supplied by the manufacturers of water closets. The anti-syphonage vent where required in a horizontal outlet water closet, should be provided in the special connector.

3.1.2.2 Pedestal Washdown WC (Close-Coupled & One-Piece)

Pedestal Washdown WC are close-coupled and one-piece pedestal water closets, both syphonic and washdown type and made of vitreous China. They are more attractive in appearance due to absence of flushing pipe. In syphonic type water closet pan, the excrement is removed by syphonage induced by the flushing water, and in washdown type water closet pan, the excrement falls directly into the trap before being removed by the flushing water.

Close-Coupled Pedestal Washdown WC: The close-coupled pedestal water closet is the combination of a water closet pan and flushing cistern directly coupled into a functional unit, which should be of one-piece construction. Suitable provision should be made for connecting a flushing cistern at the back of the closet and on top of the inlet using a suitable (resilient) gasket to make the system leak proof. Close coupled WCs are available in numerous styles and colours to suit any purse.

One-Piece Pedestal Washdown WC: The one-piece pedestal water closet pan is manufactured with an integral flushing cistern.

Syphonic Type Water Closet: Syphonic water closet pan is an excellent fitting in which excrement is removed by syphonage induced by the flushing water. The pressure of the atmosphere is utilized to assist the cleaning of sanitary fittings. Utilization of the pressure of the atmosphere permits the use of water seals of greater depth in syphonic closets than is practicable in fittings which depend entirely upon the flushing power of water delivered from an ordinary flushing cistern. The depth of seal for single trap and for each seal in the case of double trap should not be less than 50 mm.

Broadly, there are two types of syphonic water closet; *one type is directly dependent upon the actual flushing force of the discharge from the cistern for its syphonic action in the basin*, and *in the other the syphonic action is set up indirectly by means of an injector arranged in the upper portion of the flushing pipe.*

There are two patterns, namely, the single trap and the double trap patterns with S or P trap.

1) **In the single trap pattern with S trap**, the inlet from the trap is first enlarged and then somewhat suddenly contracted. The effect of this is to cause the discharge from the basin to mix with the air in the outlet and carry some of it away in its flow. Then, while the pressure of the atmosphere remains normal in the inlet, it is subnormal in the outlet and the atmosphere simply pushes the contents of the basin. Flushing is directly dependent upon the actual flushing force of the discharge from the cistern for its syphonic action in the pan.
2) **In the double trap pattern** with the first trap being an 'S' one and the second trap being a 'P' one, the space between the two traps is closed save for a small pipe which is connected to an injector in the flushing pipe immediately below the cistern. The action is simple and very effective. Immediately the flushing cistern is operated, water passing at a high rate of speed down the flushing pipe acting on the injector rarifies the air contained in the space between the two traps with the result that the full pressure of the atmosphere on the exposed water in the basin is not adequately resisted and movement is inevitable. The action is so efficient that the contents of the basin may actually begin to move out before the first flushing water reaches it.

IS 2556-8 deals with specific requirements of Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets. The following requirements as part of selection process of appliances should be considered.

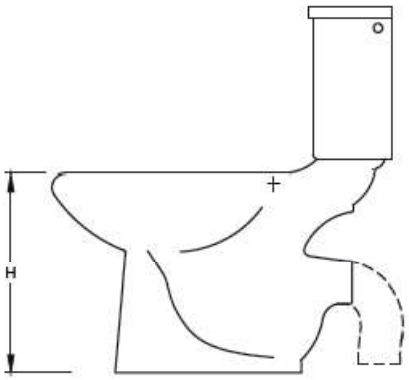
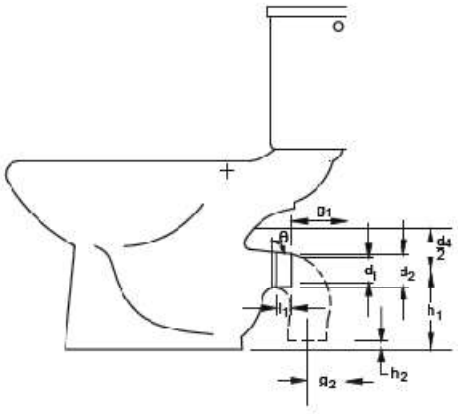
- Units of close-coupled water closets and one-piece water closets should be of one-piece construction.
- Each closet should be provided with not less than two floor fixing holes having a minimum diameter of 6.5 mm and should have an integral-flushing rim of suitable type.
- The flushing rim and the inlet should be of self-draining type and weep hole should be provided at the flushing inlet of the water closet.
- Each water closet should have an integral trap with either S-trap or P-trap or horizontal outlet P-trap or concealed S-trap.
- In case of a close coupled water closet, suitable provision should be made for connecting a flushing cistern at the back of the closet and on top of the inlet using a suitable (resilient) gasket to make the system leak proof.
- Inside surface of the water closets and traps should be glazed uniform and smooth in order to ensure efficient flush.
- The flushing tests as required should be carried out by using the flushing cistern of the capacity with which the appliance is to be used.
- Each closet should be clearly and indelibly marked at a suitable place indicating the name or trade-mark of the manufacturer and batch/lot number.

3.1.2.2.1 Close-Coupled Pedestal Washdown WC

The close-coupled pedestal water closets should be one of the following patterns:

a) Syphonic water closet with S-trap or P-trap (Fig. 9) (Pattern 1)
b) Washdown water closet with P-trap or S-trap (Fig. 10) (Pattern 2)
c) Washdown water closet with concealed S-trap (Fig. 11) (Pattern 3)
d) Washdown water closet with horizontal outlet P-trap (Fig. 12) (Pattern 4)
e) Washdown water closet for children (Fig. 13) (Pattern 5)

(A) Syphonic Pedestal Water Closet with S-Trap or P-Trap (Pattern 1)

Fig. 9A Functional Dimensions (in mm)	Fig. 9B Connecting Dimensions (in mm)
	

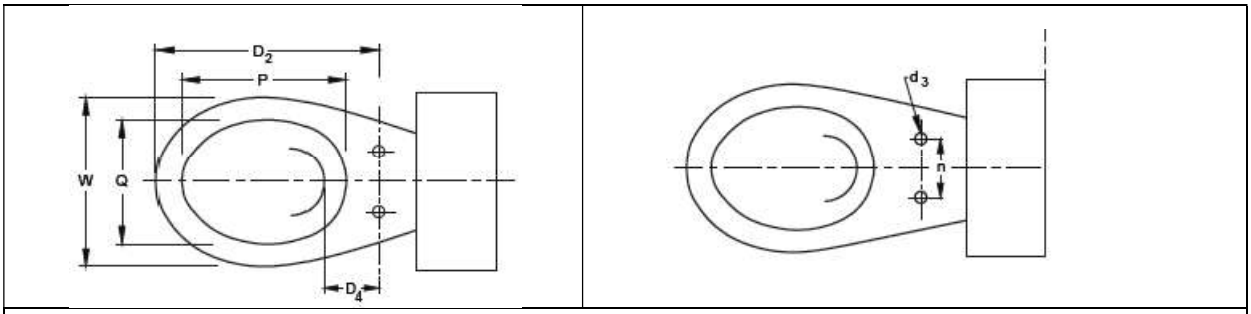


Fig. 9 Close-Coupled Syphonic Water Closet with S-Trap or P-Trap

Functional Dimensions (in mm) for Syphonic Pedestal Water Closet (P or S-Trap)
(Ref: Table 1 of IS 2556-8)

S. No.	Description	Ref in Fig. 9	Syphonic with P or S-Trap (Fig. 9A)
1	Pattern No.	-	1 and 2
2	Height	H	390, 470[1)]
3	Width	W	360
4	Depth of water seal	D_1	50 min
5	Distance from centre line of seat bolt holes to front of WC	D_2	415 to 445
6	Length of opening	P	290 min
7	Width of opening	Q	240 min
8	Distance between a vertical line from tip of back plate to inside face of flush rim at back	D_3	-
9	Distance from centre of seat bolt hole to inside face to flush rim at back	D_4	80 max
10	Trap inlet depth	T	65 min
[1)]Height for water closets for non-ambulant disabled persons.			

Connecting Dimensions (in mm) for Syphonic Pedestal Water Closet (P or S-Trap)
(Ref: Table 2 of IS 2556-8)

S. No.	Description	Ref in Fig. 9	Syphonic with P or S-Trap (Fig. 9B)
1	Internal diameter of outlet[1)]	d_1	55 Min
2	External diameter of outlet[1)]	d_2	90±5
3	Height of centre line of outlet from floor level, for P-trap only	h_1	180±10
4	Distance from end of trap to floor, for S-trap only	h_2	15±5
5	Length of outlet for P-trap only	l_1	40 Min
6	Distance between centre of seat bolt holes	n	160 to 175
7	Diameter of seat bolt holes	d_3	15±2
8	Distance between back of cistern and outside of outlet for P-trap	g_1	70 Min

9	Distance between back of cistern & centre line of outlet for S-trap	g_2	85 Min
10	Radius of free space (to be measured from the centre of the outlet, taken at a distance 40 mm from the end of the outlet)	$d_4/2$	75 Min
11	Angle of outlet	θ	104^0
12	Length of extended outlet into the floor	y_1	-
13	Length of extended outlet, for S-trap only	Y	40 Min
[1)] Ovality is permissible within the tolerance limits of internal diameter and external diameter			

(B) Washdown Pedestal Water Closet with P-Trap or S-Trap (Pattern 2)

Fig. 10A Functional Dimensions (in mm) | **Fig. 10B Connecting Dimensions (in mm)**

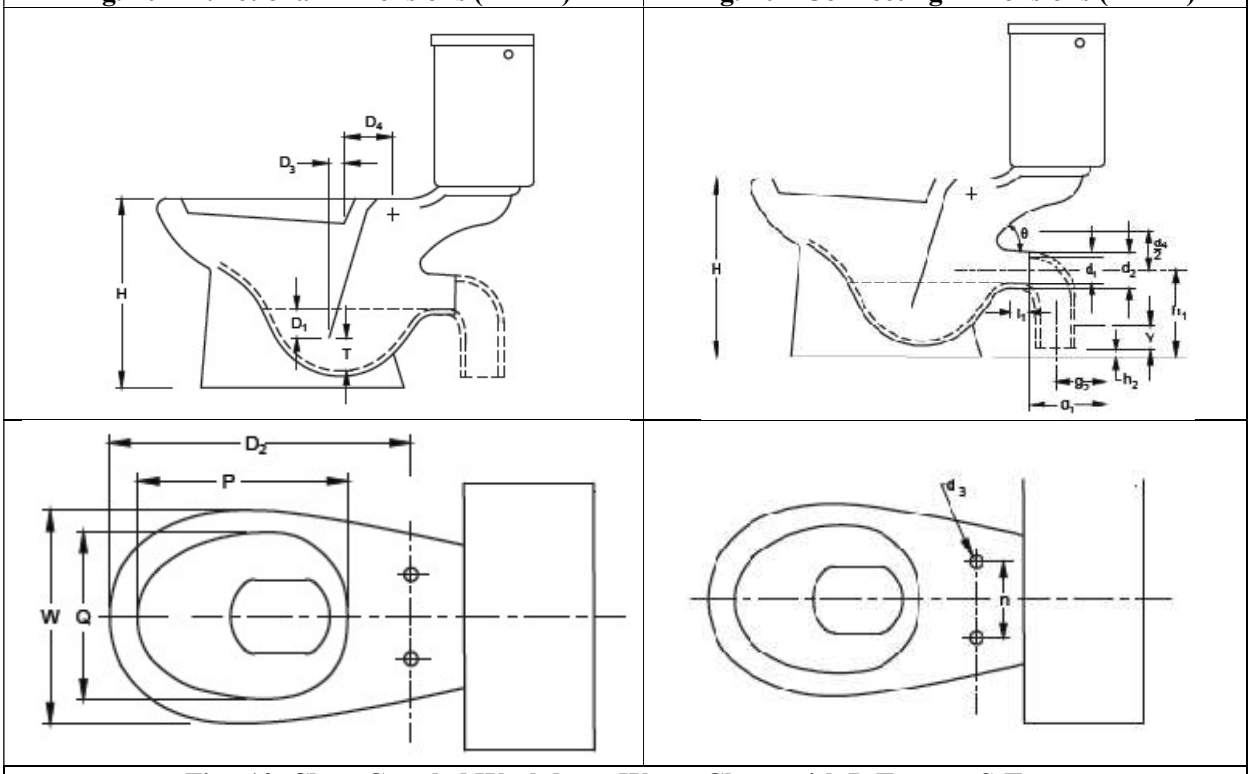


Fig. 10 Close-Coupled Washdown Water Closet with P-Trap or S-Trap

Functional Dimensions (in mm) for Washdown Pedestal Water Closet (P or S-Trap)
(Ref: Table 1 of IS 2556-8)

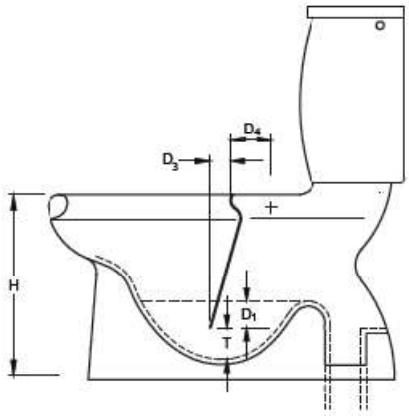
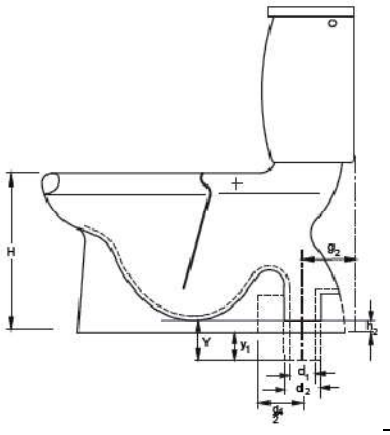
S. No.	Description	Ref in Fig. 10	Washdown with P or S-Trap (Fig. 10A)
1	Pattern No.	-	3
2	Height	H	390, 470[1)]
3	Width	W	360
4	Depth of water seal	D_1	50 Min
5	Distance from centre line of seat bolt holes to front of WC	D_2	415 to 445
6	Length of opening	P	290 Min

7	Width of opening	Q	240 Min
8	Distance between a vertical line from tip of back plate to inside face of flush rim at back	D_3	70 Max
9	Distance from centre of seat bolt hole to inside face to flush rim at back	D_4	80 Max
10	Trap inlet depth	T	75 Min
[1)]Height for water closets for non-ambulant disabled persons.			

Connecting Dimensions (in mm) for Washdown Pedestal Water Closet (P or S-Trap)
(Ref: Table 2 of IS 2556-8)

S. No.	Description	Ref in Fig. 10	Washdown with P or S-Trap (Fig. 10B)
1	Internal diameter of outlet[1)]	d_1	80 Min
2	External diameter of outlet[1)]	d_2	102±5
3	Height of centre line of outlet from floor level, for P-trap only	h_1	180±10
4	Distance from end of trap to floor, for S-trap only	h_2	15±5
5	Length of outlet for P-trap only	l_1	40 Min
6	Distance between centre of seat bolt holes	n	160 to 175
7	Diameter of seat bolt holes	d_3	15±2
8	Distance between back of cistern and outside of the outlet for P-trap	g_1	70 Min
9	Distance between back of cistern and centre line of outlet for S-trap	g_2	85 Min
10	Radius of free space (to be measured from the centre of the outlet, taken at a distance 40 mm from the end of the outlet)	$d_4/2$	75 Min
11	Angle of outlet	θ	104^0
12	Length of extended outlet into the floor	y_1	-
13	Length of extended outlet, for S-trap only	Y	40 Min
[1)] Ovality is permissible within the tolerance limits of internal diameter and external diameter			

(C) Washdown Pedestal Water Closet with Concealed S-Trap (Pattern 3)

Fig. 11A Functional Dimensions (in mm)	Fig. 11B Connecting Dimensions (in mm)
	

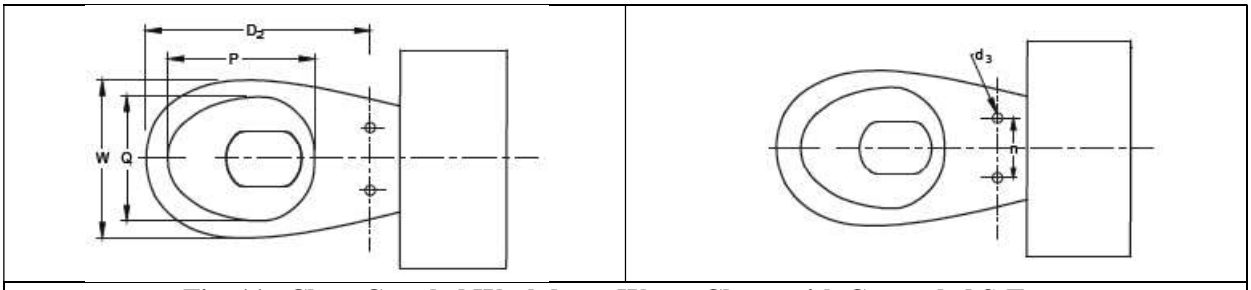


Fig. 11 Close-Coupled Washdown Water Closet with Concealed S-Trap

Functional Dimensions (in mm) for Washdown Pedestal Water Closet (Concealed S-Trap)
(Ref: Table 1 of IS 2556-8)

S. No.	Description	Ref in Fig. 11	Washdown with Concealed S-Trap (Fig. 11A)
1	Pattern No.	-	3
2	Height	H	390 470[1)]
3	Width	W	360
4	Depth of water seal	D_1	50 Min
5	Distance from centre line of seat bolt holes to front of WC	D_2	415 to 445
6	Length of opening	P	290 Min
7	Width of opening	Q	240 Min
8	Distance between a vertical line from tip of back plate to inside face of flush rim at back	D_3	70 Max
9	Distance from centre of seat bolt hole to inside face to flush rim at back	D_4	80 Max
10	Trap inlet depth	T	75 Min
[1)]Height for water closets for non-ambulant disabled persons.			

Connecting Dimensions (in mm) for Washdown Pedestal Water Closet (Concealed S-Trap)
(Ref: Table 2 of IS 2556-8)

S. No.	Description	Ref in Fig. 11	Washdown with Concealed S-Trap (Fig. 11B)
1	Internal diameter of outlet[1)]	d_1	80 Min
2	External diameter of outlet[1)]	d_2	102±5
3	Height of centre line of outlet from floor level, for P-trap only	h_1	180±10
4	Distance from end of trap to floor, for S-trap only	h_2	15±5
5	Length of outlet for P-trap only	l_1	-
6	Distance between centre of seat bolt holes	n	160 to 175
7	Diameter of seat bolt holes	d_3	15±2
8	Distance between back of cistern and outside of the outlet for P-trap	g_1	-
9	Distance between back of cistern and centre line of outlet for S-trap	g_2	85 Min
10	Radius of free space (to be measured from the centre of	$d_4/2$	75 Min

	the outlet, taken at a distance 40 mm from the end of the outlet)		
11	Angle of outlet	θ	-
12	Length of extended outlet into the floor	y_1	32±5
13	Length of extended outlet, for S-trap only	Y	40 Min
[1)] Ovality is permissible within the tolerance limits of internal diameter and external diameter			

(D) Washdown Pedestal Water Closet with Horizontal Outlet P-Trap (Pattern 4)

Fig. 12A Functional Dimensions (in mm) | **Fig. 12B Connecting Dimensions (in mm)**

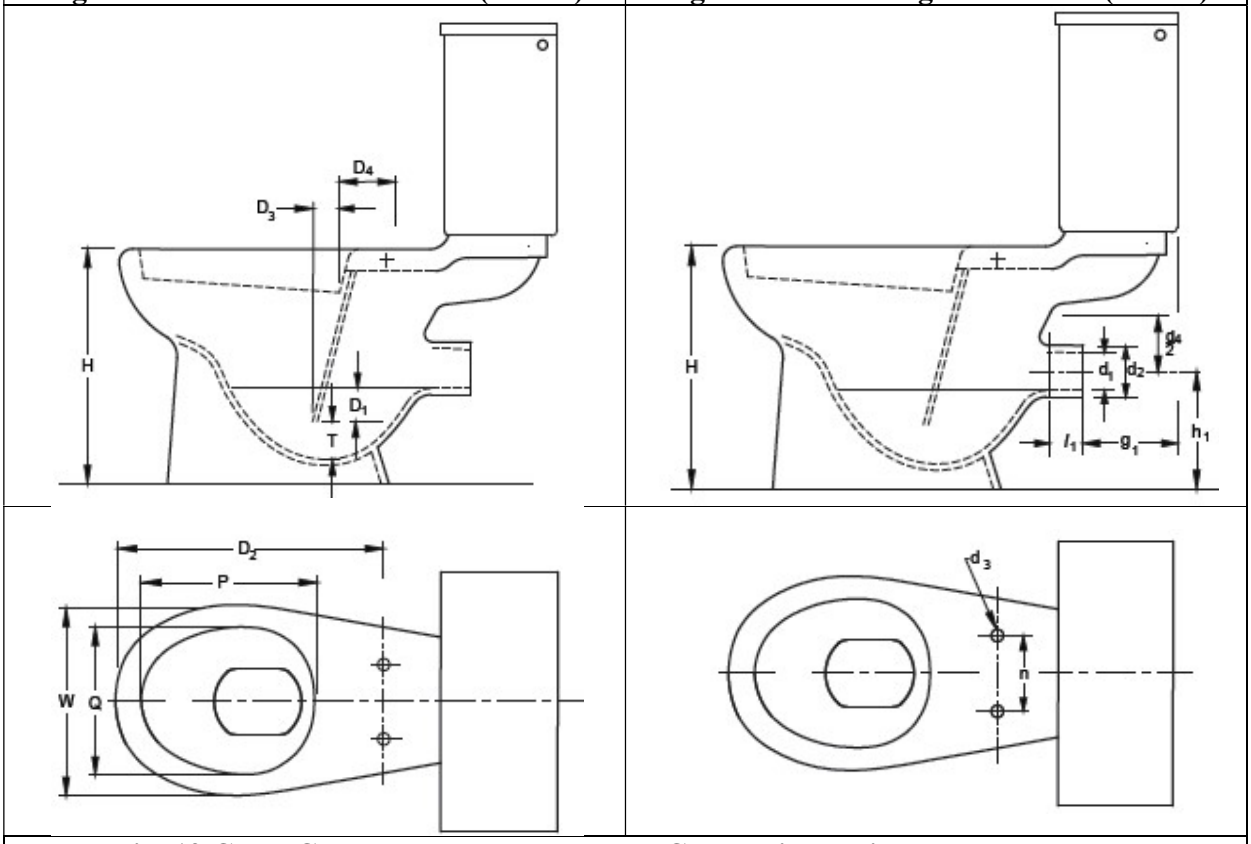


Fig. 12 Close-Coupled Washdown Water Closet with horizontal outlet P-trap

Functional Dimensions (in mm) for Washdown Pedestal Water Closet (Horizontal Outlet P-Trap)
(Ref: Table 1 of IS 2556-8)

S. No.	Description	Ref in Fig. 12	Washdown with horizontal outlet P-trap (Fig. 12A)
1	Pattern No.	-	4
2	Height	H	390, 470[1)]
3	Width	W	360
4	Depth of water seal	D_1	50 Min
5	Distance from centre line of seat bolt holes to front of WC	D_2	415 to 445

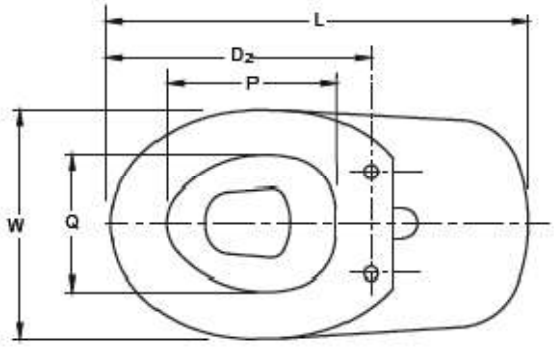
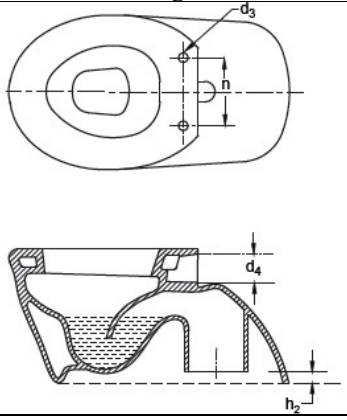
6	Length of opening	P	290 Min
7	Width of opening	Q	240 Min
8	Distance between a vertical line from tip of back plate to inside face of flush rim at back	D_3	70 Max
9	Distance from centre of seat bolt hole to inside face to flush rim at back	D_4	80 Max
10	Trap inlet depth	T	75 Min
[1)]Height for water closets for non-ambulant disabled persons.			

Connecting Dimensions (in mm) for Washdown Pedestal Water Closet (Horizontal Outlet P-Trap)

(Ref: Table 2 of IS 2556-8)

S. No.	Description	Ref in Fig.12B	Washdown with horizontal outlet P-trap (Fig. 12B)
1	Internal diameter of outlet[1)]	d_1	80 Min
2	External diameter of outlet[1)]	d_2	102±5
3	Height of centre line of outlet from floor level, for P-trap only	h_1	180±10
4	Distance from end of trap to floor, for S-trap only	h_2	-
5	Length of outlet for P-trap only	l_1	40 Min
6	Distance between centre of seat bolt holes	n	160 to 175
7	Diameter of seat bolt holes	d_3	15±2
8	Distance between back of cistern and outside of the outlet for P-trap	g_1	70 Min
9	Distance between back of cistern and centre line of outlet for S-trap	g_2	-
10	Radius of free space (to be measured from the centre of the outlet, taken at a distance 40 mm from the end of the outlet)	$d_4/2$	75 Min
11	Angle of outlet	θ	90^0
12	Length of extended outlet into the floor	y_1	-
13	Length of extended outlet, for S-trap only	Y	-
[1)] Ovality is permissible within the tolerance limits of internal diameter and external diameter			

(E) Washdown Pedestal Water Closet for Children (Pattern 5)

Fig. 13A Functional Dimensions (in mm)	Fig. 13B Connecting Dimensions (in mm)
	

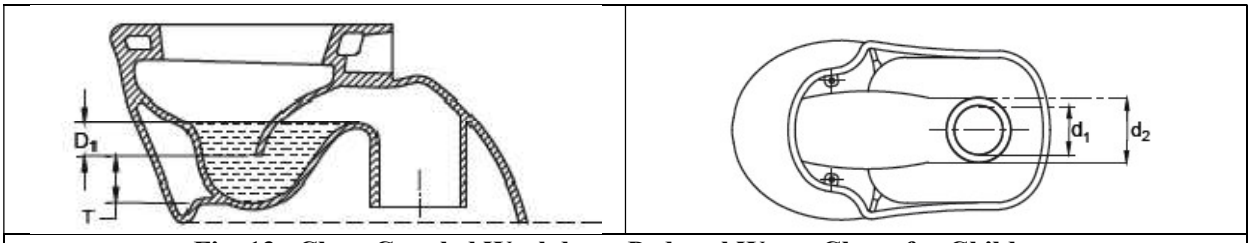


Fig. 13 Close-Coupled Washdown Pedestal Water Closet for Children

Functional Dimensions (in mm) for Washdown Pedestal Water Closets for Children
(Ref: Table 3 of IS 2556-8)

S. No.	Description	Ref in Fig. 13	Water Closets for Non-ambulatory Disabled Persons and Children (Fig. 13A)
1	Pattern No.	-	5
2	Length	L	500
3	Height	H	260
4	Width	W	270
5	Depth of water seal	D_1	45 Min
6	Distance from centre line of seat bolt holes to front of WC	D_2	315
7	Distance between centre of outlet to wall	B	100
8	Length of opening	P	200
9	Width of opening	Q	175
10	Trap inlet depth	T	55 Min
[1)]Height for water closets for non-ambulant disabled persons.			

Connecting Dimensions (in mm) for Washdown Pedestal Water Closets for Children
(Ref: Table 4 of IS 2556-8)

S. No.	Description	Ref in Fig. 13	Water Closets for Non-ambulatory Disabled Persons and Children (Fig.13B)
1	Internal diameter of outlet[1)]	d_1	80 Min
2	External diameter of outlet[1)]	d_2	102±5
3	Diameter of seat bolt holes	d_3	15±2
4	Inlet diameter	d_4	50 Min
5	Distance between centre of seat bolt holes	n	120
6	Distance from end of trap to floor	h_2	20 Min
[1)] Ovality is permissible within the tolerance limits of internal diameter and external diameter			

3.1.2.2.2 One-Piece Water Closet

The one-piece pedestal water closets should be one of the following patterns:

a) Washdown water closet with horizontal outlet P-trap or S-trap
(Fig. 14 for horizontal outlet P- trap, and Fig. 15 for S-trap) (Pattern 6)
b) Syphonic water closet with horizontal outlet P-trap or S-trap (Fig. 16) (Pattern 7)

(A) Washdown Water Closet with Horizontal Outlet P-Trap or S-Trap (Pattern 6)

Fig. 14A Functional Dimensions (in mm)	Fig. 14B Connecting Dimensions (in mm)

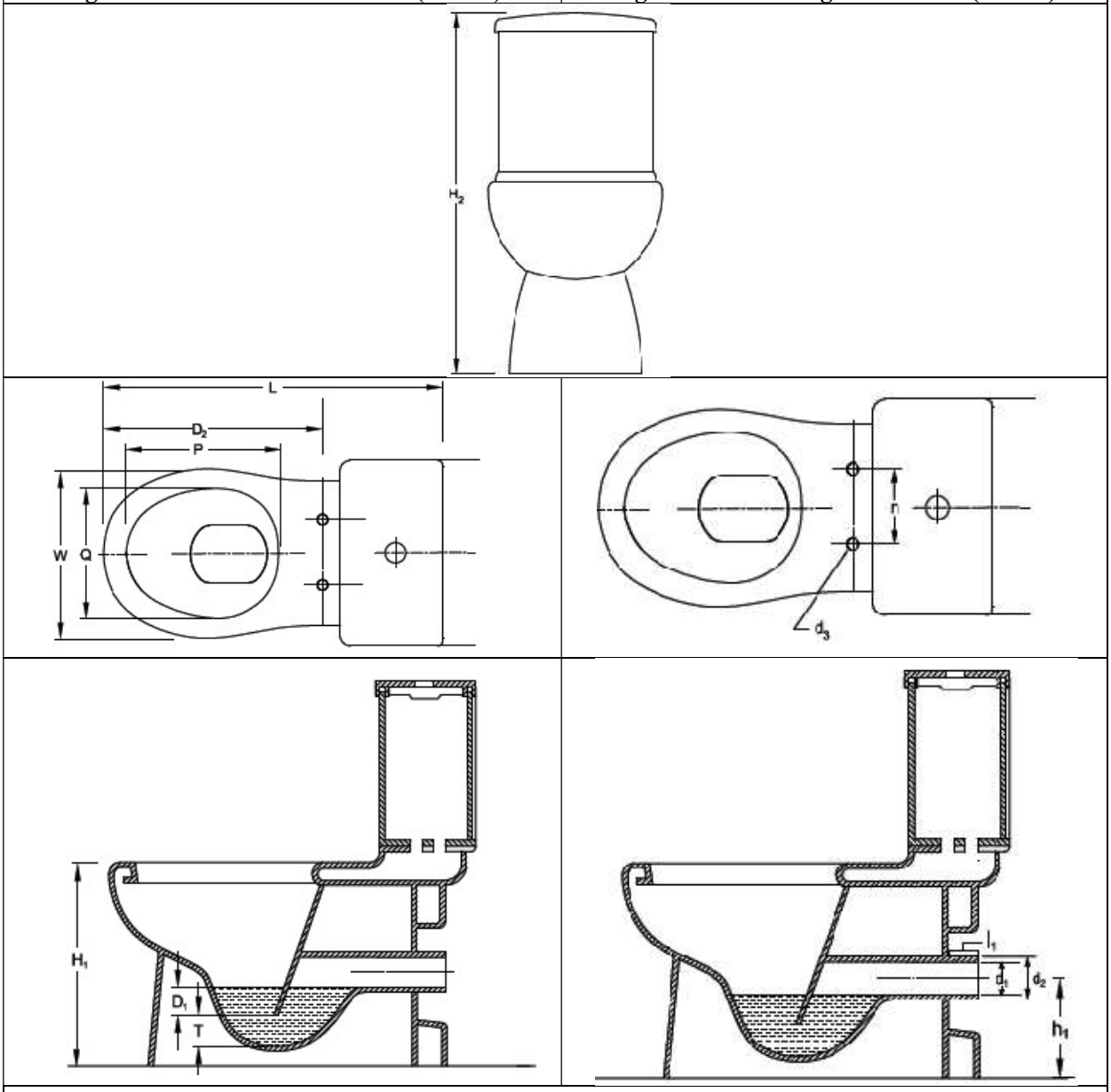


Fig. 14 One-Piece Washdown Water Closet with Horizontal Outlet P-Trap

Fig. 15A Functional Dimensions (in mm)	Fig. 15B Connecting Dimensions (in mm)

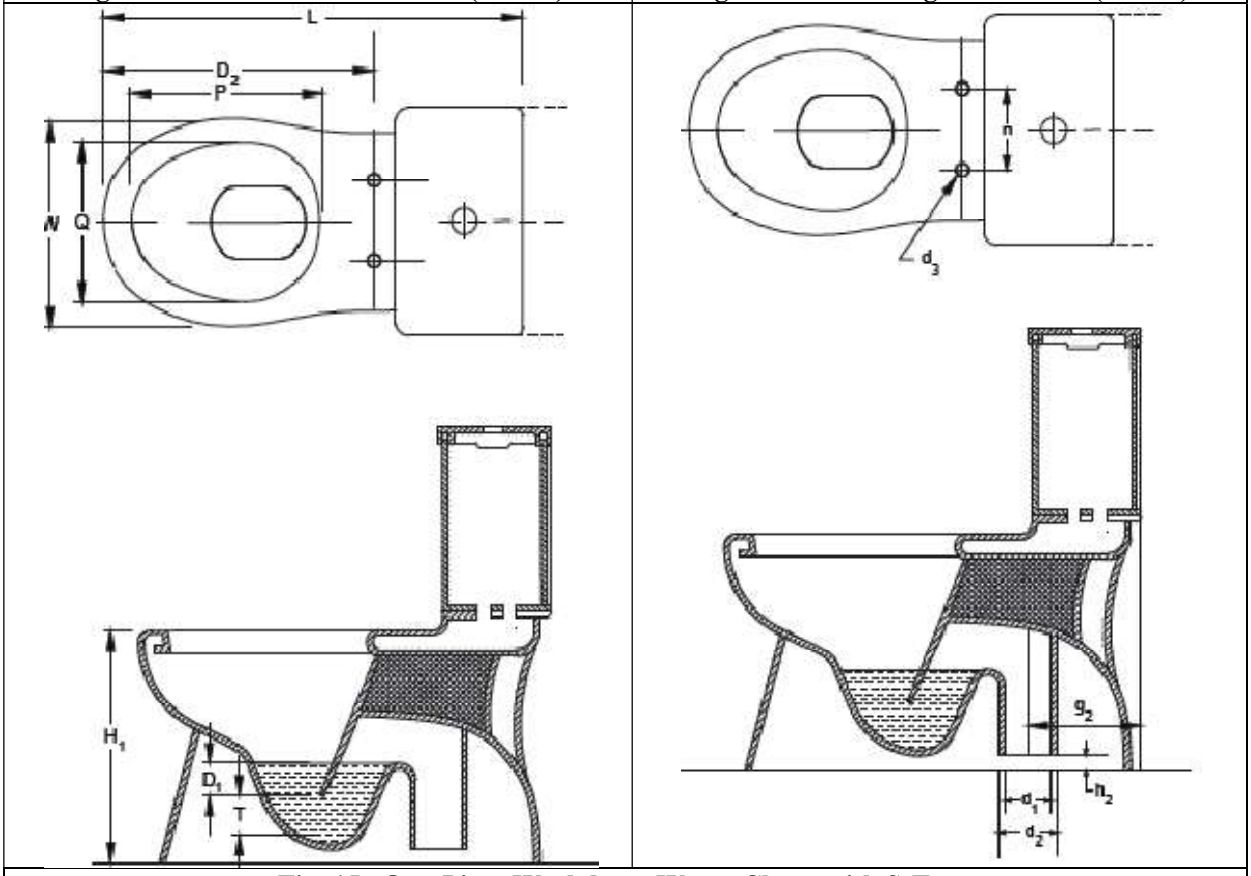


Fig. 15 One-Piece Washdown Water Closet with S-Trap

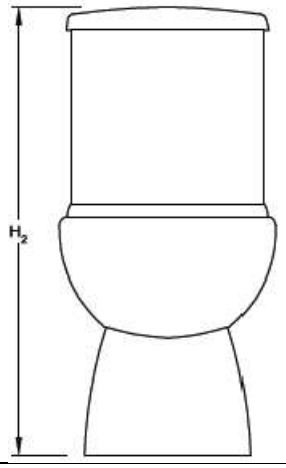
Functional Dimensions (in mm) for Washdown Water Closet (Horizontal Outlet P-Trap or S-Trap)
(Ref: Table 5 of IS 2556-8)

S. No.	Description	Ref in Fig.	Washdown with horizontal outlet P-trap (Fig. 14A) or S-trap (Fig. 15A)
1	Pattern No.	-	6
2	Overall Length	L	670
3	Width	W	350
4	Height from front rim	H_1	385
5	Total Height with cistrn	H_2	750
6	Length of opening	P	290 Min
7	Width of opening	Q	240 Min
8	Depth of water seal	D_1	50 Min
9	Trap inlet depth	T	75 Min

Connecting Dimensions (in mm) for Washdown Water Closet (Horizontal Outlet P-Trap & S-Trap)
(Ref: Table 6 of IS 2556-8)

S. No.	Description	Ref in Fig	Washdown with horizontal outlet P-trap (Fig. 14B)	Washdown with S-trap (Fig. 15B)
1	Internal diameter of outlet[1)]	d_1	80 Min	80 Min
2	External diameter of outlet[1)]	d_2	102±5	102±5
3	Diameter of seat bolt holes	d_3	15±2	15±2
4	Distance between centre of seat bolt holes	n	160 to 175	160 to 175
5	Distance between centre line of seat bolt hole to front rim	D_2	415 to 445	415 to 445
6	Distance between centre of outlet and wall, for S-trap only	g_2	-	100±10 220±10 300±10
7	Distance between centre of outlet to floor, for P-trap only	h_1	180±10	-
8	Distance between bottom of outlet to floor, for S-trap only	h_2	-	15±5
9	Length of outlet	l_1	40 Min	40 Min
[1)] Ovality is permissible within the tolerance limits of internal diameter and external diameter				

(B) Syphonic Water Closet with horizontal outlet P-trap or S-trap (Pattern 7)

Fig. 16A Functional Dimensions (in mm)	Fig. 16B Connecting Dimensions (in mm)
	

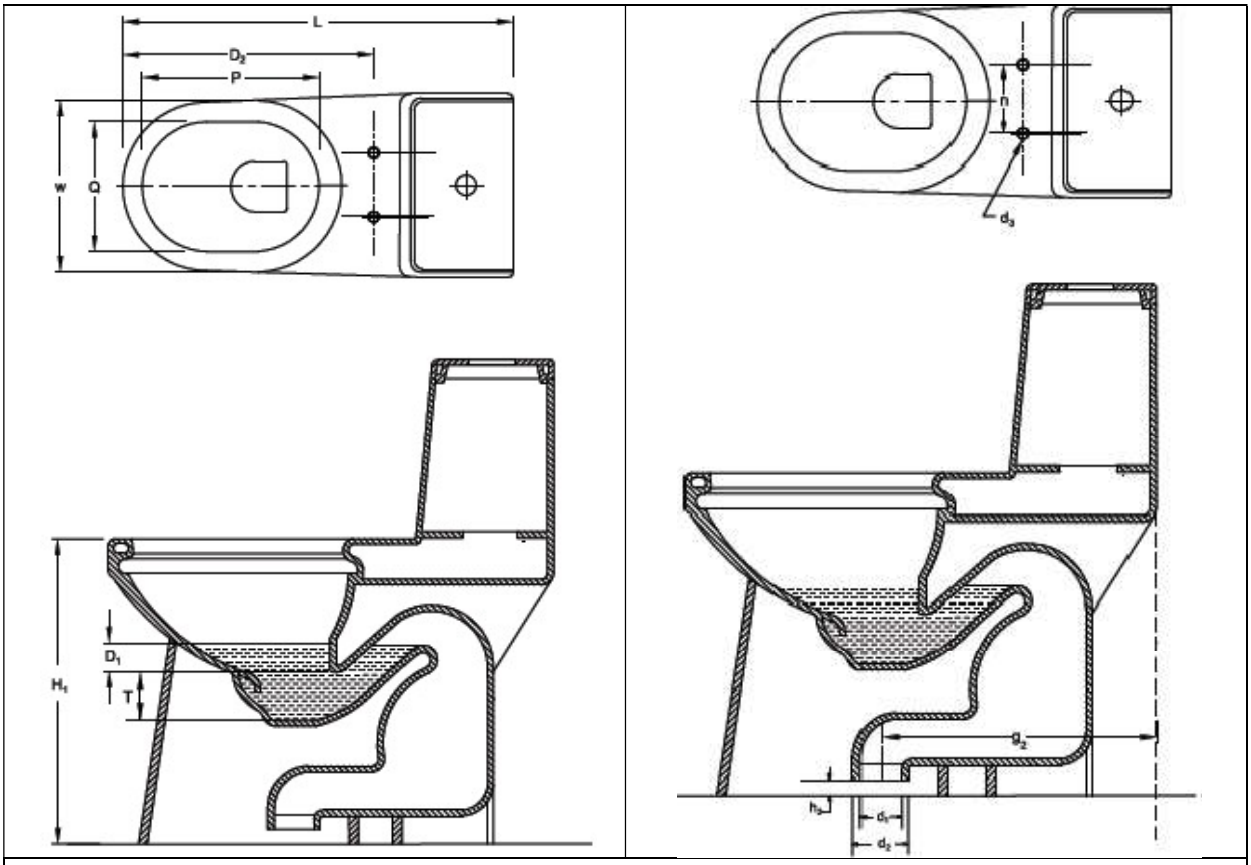


Fig. 16 One-Piece Syphonic Water Closet with S-Trap

Functional Dimensions (in mm) for Syphonic Water Closet (S-Trap or Horizontal Outlet P-Trap)
(Ref: Table 5 of IS 2556-8)

S. No.	Description	Ref in Fig.	Syphonic with S-trap or horizontal outlet P-trap (Fig. 16A)
1	Pattern No.	-	7
2	Overall Length	L	670
3	Width	W	350
4	Height from front rim	H_1	385
5	Total Height with cistrn	H_2	750
6	Length of opening	P	290 Min
7	Width of opening	Q	240 Min
8	Depth of water seal	D_1	50 Min
9	Trap inlet depth	T	65 Min

Connecting Dimensions (in mm) for Syphonic Water Closet (S-Trap or Horizontal Outlet P-Trap)
(Ref: Table 6 of IS 2556-8)

S. No.	Description	Ref in Fig	Syphonic with horizontal outlet P-trap (Fig. 16B)	Syphonic with S-trap (Fig. 16B)
1	Internal diameter of outlet[1)]	d_1	55 Min	55 Min
2	External diameter of outlet[1)]	d_2	90±5	90±5
3	Diameter of seat bolt holes	d_3	15±2	15±2
4	Distance between centre of seat bolt holes	n	160 to 175	160 to 175
5	Distance between center line of seat bolt hole to front rim	D_2	415 to 445	415 to 445
6	Distance between centre of outlet and wall, for S-trap only	g_2	-	100±10 220±10 300±10
7	Distance between center of outlet to floor, for P-trap only	h_1	180±10	-
8	Distance between bottom of outlet to floor, for S-trap only	h_2	-	15±5
9	Length of outlet	l_1	40 Min	40 Min
[1)] Ovality is permissible within the tolerance limits of internal diameter and external diameter				

Note:

- To ensure the stability of the seat with its cover in the upright position, it is recommended that the cistern and its lid be entirely below plane ‘aa’ passing through the centre of the fixing holes of the seat and making an angle of not less than 8° with the vertical axes of the holes.

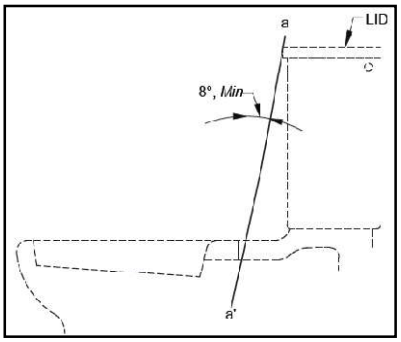


Fig. 17 Seat Fixing Angle

- In case of syphonic water closets with S-trap, wax gasket as shown in Fig. 18 should be used at the connection between closet outlet and outlet pipe, for completely sealing the periphery of the outlet. The diameter of seating surface of outlet wax gasket, d, should match with the outer diameter of the outlet pipe.

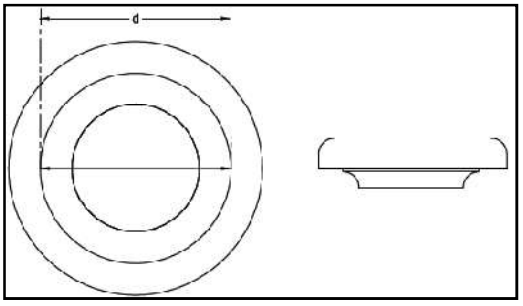


Fig. 18 Wax Gasket

- Special connectors, which are required to connect the horizontal outlet of water closet to the drainage system, should be supplied by the manufacturer of water closet. The straight part of the outlet of water closets should be without grooves.
- The close-coupled pedestal water closets for non-ambulatory disabled persons should have functional and connecting dimensions as given in corresponding Tables, except the height (H) which should be such so as to ensure that the height of the top of the water closet from the floor is between 450 mm and 480 mm. Also, the minimum distance from the front edge of the water closet to the rear wall should be between 650 mm and 800 mm.
- There should be a suitable back support to reduce the chance of imbalance or injury caused by leaning against exposed valves or pipes. The distance from the front of the water closet seat to the backrest should range between 500 mm and 550 mm.
- For water efficiency rating and labelling of close-coupled water closets and one-piece water closets, the requirements given in IS 17650 (Part 1) should be complied with.

3.1.2.3 Washdown Wall Mounted Water Closets

Wall mounted water closets are manufactured similar to the conventional water closets. There is no much difference in the manufacturing process. Wall mounted water closets give better aesthetic and hygienic effects in the toilets. The water closet is connected to concealed water storage arrangements with a capacity of 10 litres discharge.

IS 2556-16 deals with specific requirements of Washdown Wall Mounted Water Closets. The following requirements as part of selection process of appliances should be considered.

- Wall mounted water closet should be of one piece construction
- Each closet should be provided with not less than two fixing holes to enable the WC to be securely installed to the wall using metallic corrosion resistant bolts and nuts and an independent concealed support frame.
- The flushing rim and inlet should be of the self-draining type and a weep-hole should be provided at the flushing inlet of the closet.
- Inside surface of the water closets and traps should be uniform and smooth in order to ensure efficient flush.
- The flushing tests as required should be carried out by using the flushing cistern of the capacity with which the appliance is to be used.
- Each closet should be clearly and indelibly marked at a suitable place indicating the name or trade-mark of the manufacturer and batch/lot number.

Wall mounted water closets should be of one of the following patterns.

a) WC with frame rag bolts fixing and concealed outlet (Fig. 19) (Pattern 1)
b) WC with fixing arrangement on top of bracket (Fig. 20) (Pattern 2)

(A) Washdown Water Closet with Frame Rag Bolts Fixing and Concealed Outlet (Pattern 1)

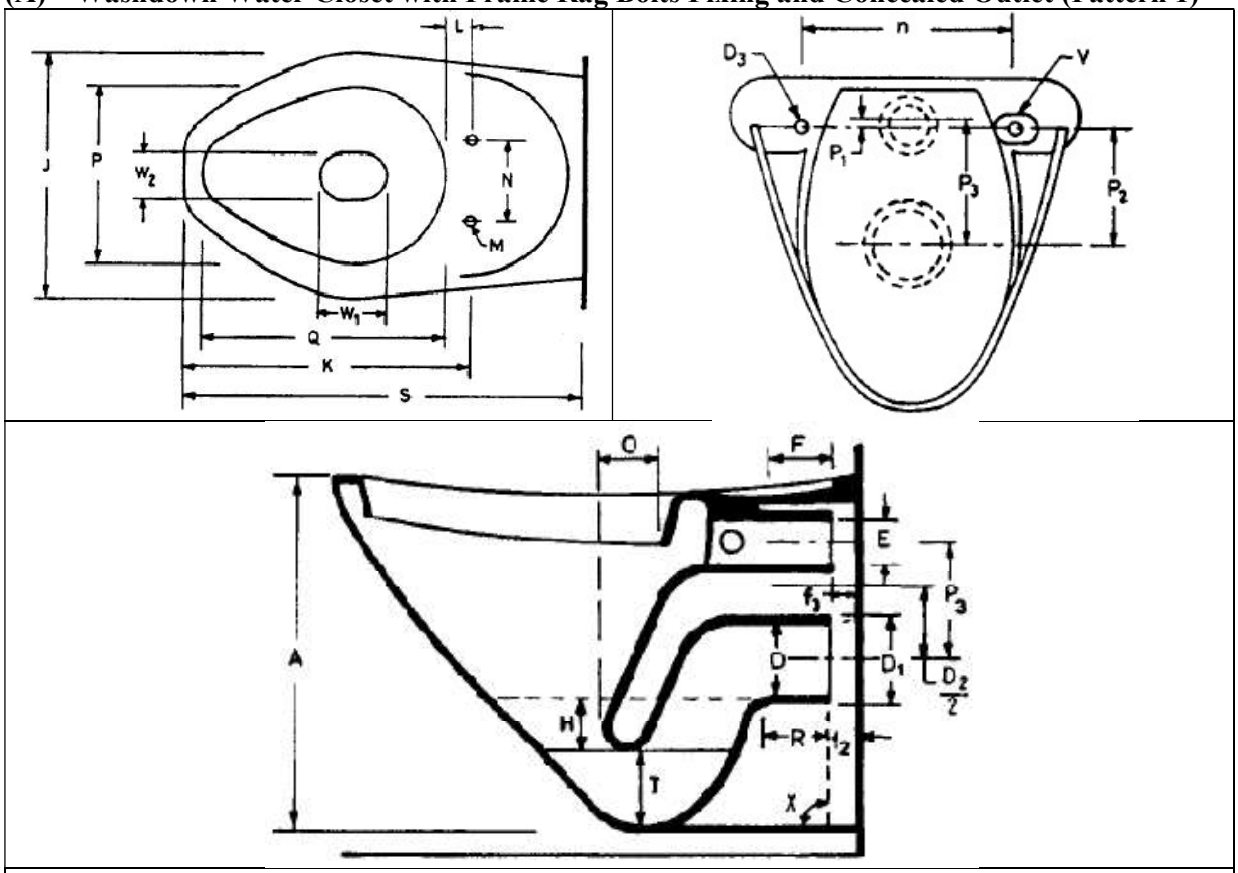
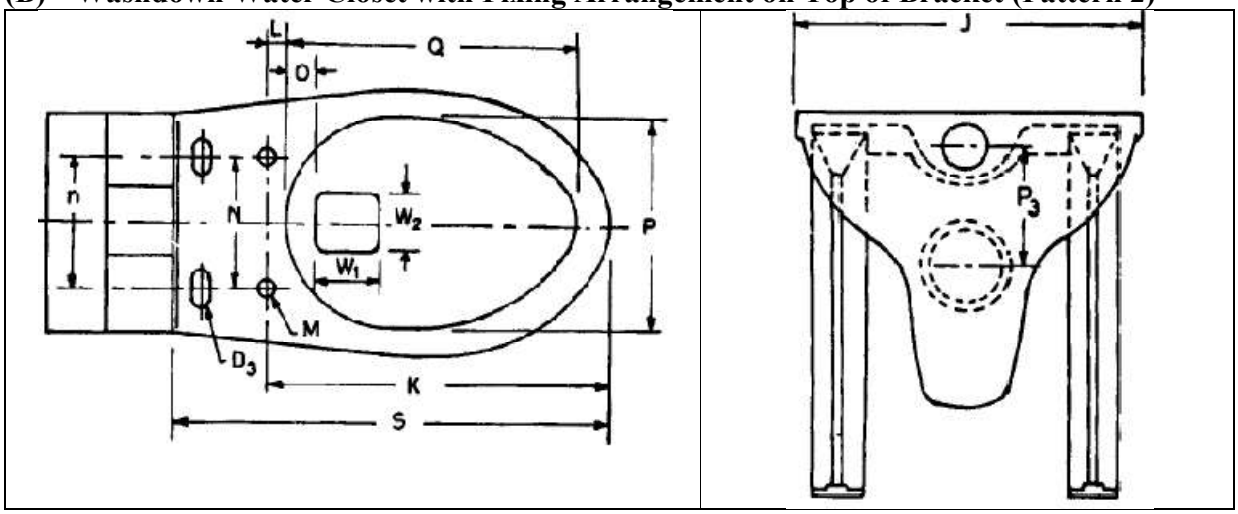


Fig. 19 Water Closet with Frame Rag Bolts Fixing and Concealed Outlet

(B) Washdown Water Closet with Fixing Arrangement on Top of Bracket (Pattern 2)



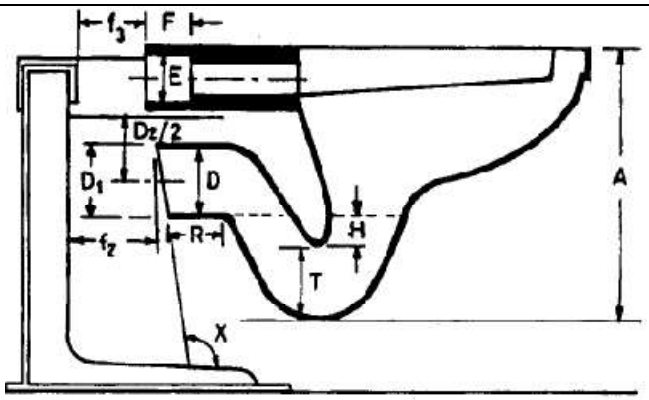


Fig. 20 Water Closet with Fixing Arrangement on Top of Bracket

Functional Dimensions (in mm) for Washdown Wall Mounted Water Closet
(Ref: Table 1 of IS 2556-16)

S. No.	Description		Ref. to Fig. 19 and 20	Pattern 1	Pattern 2
1	Height		A	350	350
2	Depth of water seal, Min		H	50	50
3	Width of water closet		J	360±10	360±10
4	Distance from centre of seat bolt hole to front of water closet		*K*	415 to 445	415 to 445
5	Distance from centre of seat bolt hole to inside face of flush rim at back, Max		*L*	80	80
6	Distance between a vertical line from tip of back plate to rim at back, Max		O	70	70
7	Width of opening, Min		P	240	240
8	Length of opening, Min		Q	290	290
9	Over all length		S	500 to 575	500 to 575
10	Trap inlet depth, Min		T	75	75
11	Water surface:	Back to front	W_1	150 min	150 min
		Side to side	W_2	110 min	110 min

Connecting Dimensions (in mm) for Washdown Wall Mounted Water Closet
(Ref: Table 2 of IS 2556-16)

S. No.	Description	Ref. to Fig.19 and 20	Pattern 1	Pattern 2
1	Internal dia. of inlet	E	55^{+3}_{-1}	50±3
2	Depth of socket, Min	F	25	25
3	Internal dia. of outlet, Min	D	80	80
4	External dia. of outlet	D_1	102±5	102±5
5	Free space around the outlet from the centre, up to a distance of 40 mm, Min	D_2 / 2	75	75
6	Distance from supporting plane to face of supply opening, Min	f_3	15	15

7	Horizontal distance from supporting plane to face of outlet, Min	f_2	15	15
8	External cylindrical part of the outlet with or without grooves, Min	R	40	40
9	Distance between centre-line of fixing hole	n	230±5	180±5
10	Distance between centre of inlet to centre of fixing holes	P_1	35±5	NA
11	Distance between centre of outlet to centre of fixing hole	P_2	100±10	NA
12	Distance between centre of inlet to centre of outlet	P_3	135±5	135±5
13	Size of fixing hole	D_3	(30x25) ±3	(20x12) ±2
14	Thickness of appliances around fixing hole, Max	V	75	NA
15	Dia. of seat bolt hole	M	15±2	15±2
16	Angle of outlet	X	$90^0 \pm 3^0$	$104^0 \pm 3^0$
17	Distance between centre of seat bolt holes	N	155±10	165^{+10}_{-5}

Notes:

1. *Circular fixing hole is also permitted. Fixing hole diameter shall be 20±2 mm for Pattern 1 and 15±2 mm for Pattern 2.*
2. *Ovality is permissible within the dimensions for inlet and outlet diameters and within the variation allowed for the dimension.*
3. *Tolerance where not specified shall conform to IS 2556 (Part 1).*
4. *For Pattern 1, recommended diameter of fixing bolts is 14±2 mm and same should be of a suitable material which passes the load test as specified in 9 of 1S 2556 -16. For Pattern 2, recommended diameter of fixing bolts is 10±1 mm and same should be of a material which passes the load test as specified in 9 of 1S 2556 -16.*
5. *Wall mounted WC shall be installed with a minimum gap of 40 mm from the lowest portion of the WC to the finished floor.*

Note:

- Each wall mounted water closet should have an integral trap with P type outlet conforming to Fig. 19 and Fig. 20 as specified.
- Special connectors, which are required to connect the horizontal outlet of pattern 1 wall mounted water closet to the drainage system, should be supplied by manufacturer of closet.
- The outlet, if without serration, should be glazed and if same is with serration, may not be glazed.

3.1.3 Universal or Anglo-Indian WC Pan

This type of WC is suitable for both squatting as well as sitting posture. It can be used as squatting pan by lifting seat below which foot rests are provided. It can be used in sitting posture by putting hinged seat. This functions just like a Wash down WC. These can be attached to either P or S trap. The P trap is made integral with the WC but S trap may be integral or supplied separately. The outlet internal diameter is 80 mm and outer diameter is 110 mm. Depth of water seal should in no case be less than 50 mm.

IS 2556-15 deals with specific requirements of Universal or Anglo-Indian WC Pan. The following requirements as part of selection process of appliances should be considered.

- Each closet should be provided with not less than four fixing holes having a minimum diameter of 6.5 mm and should have an integral-flushing rim of suitable type.
- The inlet should be of the self-draining type and a weep-hole should be provided at the flushing inlet of the closet.
- 'S' trap should be provided in one or two pieces.
- Inside surface of the water closets and traps should be glazed uniform and smooth in order to ensure efficient flush.
- The flushing tests as required should be carried out by using the flushing cistern of the capacity with which the appliance is to be used.
- Each closet should be clearly and indelibly marked at a suitable place indicating the name or trade-mark of the manufacturer and batch/lot number.

These are made in two sizes of dimensions indicated in table as Size 1 & Size 2, and also in other sizes where so agreed between the manufacturer and the purchaser. The functional and connecting dimensions of Universal or Anglo-Indian WC Pan are given in table, read with the figures as indicated below.

Functional Dimensions (in mm)
(Ref: Table 1 of IS 2556-15)

S. No.	Description	Ref in Fig. 21	Size 1	Size 2
1	Overall Length	L	570	650
2	Width of closet	W	460	460
3	Height	H	380	380
4	Width of Opening, Min	W_1	220	220
5	Length of Opening, Min	L_2	370	370
6	Length of seat (bolt hole centre to front of closet)	L_1	450	530
7	Length of foot rest, Min	L_3	260	330
8	Trap inlet depth, Min	T	75	75
9	Depth of water seal, Min	D	50	50

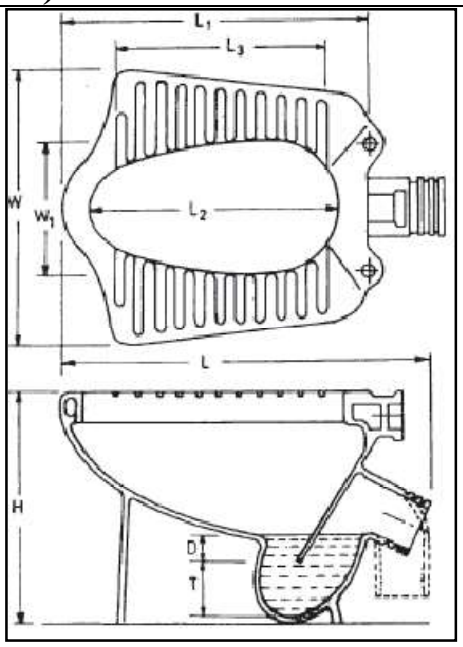


Fig. 21 Universal Water Closet

Note: Tolerances where not specified shall conform to IS 2556-1.

Connecting Dimensions (in mm)
(Ref: Table 2 of IS 2556-15)

S. No.	Description	Ref in Fig. 21	Size 1	Size 2
1	Height of centre line of inlet from floor level, min	h_1	310	310
2	Height of centre line of outlet from floor (for 'P' trap only)	h_2	180^{+15}_{-10}	180^{+15}_{-10}
3	Distance from outlet end to floor (for 'S' trap only)	h_3	20±5	20±5
4	Internal diameter of outlet1), Min	d_1	80	80
5	External diameter of outlet1)	d_2	102±5	102±5
6	Internal diameter of flush inlet socket2)	d_3	50±3	50±3
7	Depth of flush inlet socket, Min	A	25	25
8	Distance from end of flush inlet socket to outside of outlet, Min	B	45	45
9	Diameter of seat bolt	d_4	15±2	15±2
10	Radius of free space (to be measured from the centre of the outlet, distance being 40 mm from the end of the outlet), Min	$d_5/2$	75	75
11	Distance between centres of seat bolt holes	n	165^{+15}_{-10}	165^{+15}_{-10}
12	Length of grooved part of outlet, Min	M	40	40
13	Angle of the outlet of P trap with the vertical plane	θ_1	104^0	104^0
14	Slope of the back plate	θ_2	125^0	125^0

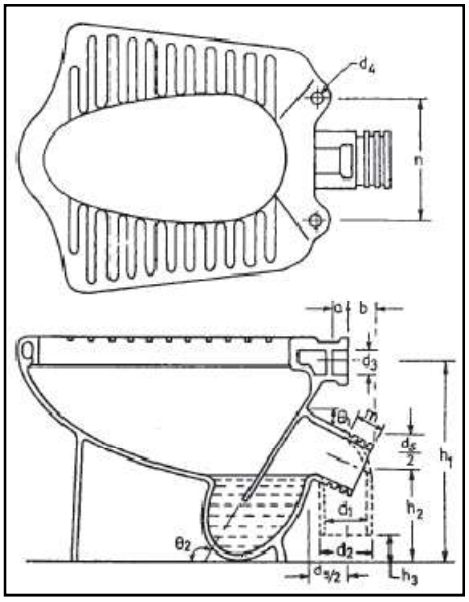


Fig. 21 Universal Water Closet

(1) Ovality is permissible within the dimensions allowed for the internal and external diameters.
(2) Ovality is permissible within the variation allowed for the dimension.

3.1.4 Flushing Tests

The various flushing tests are carried out by fixing the flushing cisterns conforming to relevant Indian Standards. The flushing cistern attached to following types of water closet should be provided in accordance with codal provisions as mentioned below:

- **Squatting or Indian type (IS 2553-3),** provided that the height between the top of closet pan and bottom of the cistern is 1250 mm, minimum for high level and 700 mm, minimum for low level and the closet pan is connected with cistern by a 40 mm outer diameter pipe. The flushing cistern is used of the capacity with which the appliance is to be used. The flushing cistern, which is connected to closet pan should conform to IS 774.
- **Integrated Squatting Pan (IS 2556-14),** provided that the height between top of the pan and bottom of the cistern is 125 cm and the pan is connected with the cistern by 32 mm dia pipe. A flushing cistern of 10 litre capacity and conforming to IS 774 should be fixed.
- **Washdown Water Closets (IS 2553-2),** provided that the height between the top of the water closet and the bottom of the cistern should not be more than 300 mm and the water closet should be connected to the cistern by 40 mm normal diameter flushing pipe. The flushing cistern is used of the capacity with which the appliance is to be used. The flushing cistern connected to water closet is a low level cistern conforming to IS 774 or IS 7231.
- **Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets (IS 2556-8),** provided that the flushing cistern should be of low level coupled type or one-piece, as applicable, and should conform to the requirements specified in IS 774 for ceramic and one-piece cisterns, and IS 7231 for plastic cisterns, except that it will be permissible to have the inlet and the overflow from the bottom of the cistern, where required and no separate flush pipe is necessary.
- **Wash Down Wall Mounted Water Closets (IS 2556-16),** provided that the water closet is connected to concealed water storage arrangements with a capacity of 10 litres discharge.
- **Universal or Anglo-Indian WC Pan (IS 2556-15),** provided that the height between the top of the closet and the bottom of the cistern should be 30 cm and the closet should be connected to the cistern by 40 mm nominal diameter flush pipe.

The tests, which are required to be conducted as acceptance criteria of appliance used, are detailed as follows:

- **Toilet Paper Test:** The pan (or water closet) should be filled with water to its nominal water seal level and charged with six pieces of usual toilet paper or polythene sheet of thickness 0.05 mm approximately 150 mm x 115 mm in size and loosely crumpled. It should then be flushed. This test should be repeated four times and the pan (or WC) should discharge the full charge of the paper at least thrice out of four times.

  This test is applicable for following WC pans:
  - Squatting or Indian type
  - Integrated Squatting Pan
  - Washdown Water Closets
  - Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets

- Wash Down Wall Mounted Water Closets
- Universal or Anglo-Indian WC Pan

- **Smudge Test:** The whole of the interior surface of the pan (or WC) to 40 mm below the flushing rim should be smudged with quartz powder of contrasting colour passing through 1.18 mm IS sieve and should then be flushed, carefully observing the surface of the pan (or WC) during the flushing. Immediately after the flushing, there should be no smudge left on the pan (in case of squatting and integrated type) or bowl (in case of washdown WC and universal WC).

  This test is applicable for following WC pans:
  - Squatting or Indian type
  - Integrated Squatting Pan
  - Washdown Water Closets
  - Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets
  - Wash Down Wall Mounted Water Closets
  - Universal or Anglo-Indian WC Pan

- **Water Holding Capacity Test:** The pan (or WC), when sealed at the outlet and vent (if fitted) with water-tight seal, should be capable of holding not less than 10 litre of water between the normal water-level and the highest possible water-level of the pan as installed.

  This test is applicable for following WC pans:
  - Squatting or Indian type
  - Integrated Squatting Pan
  - Washdown Water Closets
  - Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets
  - Wash Down Wall Mounted Water Closets
  - Universal or Anglo-Indian WC Pan

- **Saw Dust Test:** For conducting the test, 20 g of dry saw dust test sifted through 2 mm sieve is required. Set up the pan (or WC), cistern or flush valve and flush pipe (if required) as specified by the manufacturer. Charge the pan (or WC) with water to its designed water seal level. Fully wet the entire internal surface of the pan (or WC) below the rim. Sprinkle 20 g of fine dry saw dust of above specification on the inside of the pan (or WC) between the normal water level and the flushing rim as completely and evenly as possible. Then flush the pan (or WC). The sprinkle saw dust should be cleaned below 40 mm of rim of pan (or WC).

  This test is applicable for following WC pans:
  - Squatting or Indian type
  - Washdown Water Closets
  - Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets
  - Universal or Anglo-Indian WC Pan

- **Splash Test:** Set up pan (or WC), cistern or flush valve and flush pipe (if required) as specified by the manufacturer. Charge the pan (or WC) with coloured water to its design water seal level. Ensure that the floor area is cleaned and dry where the splash test to be carried out. Activate the flush valve or cistern to discharge the squatting pan (or WC). Observe and record whether flushing water splashed over rim onto the floor. Repeat the test 5 times. Record whether the flushing water splash over the rime onto the floor. Isolated droplets up to 10 Nos. should not be the cause for rejection.

  This test is applicable for following WC pans:
  - Squatting or Indian type
  - Washdown Water Closets
  - Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets
  - Universal or Anglo-Indian WC Pan

- **Ball Test:**
  a) *Single Ball Test* – The ball should be made of non-absorbent material. The relative density of the ball should be between 1.075 and 1.080. The diameter of the ball should be 43 ± 0.5 mm. Place the ball into the water closet to be tested and then flush the water closet. The ballI should be discharged in the normal manner.

  b) *Fifty Ball Test* – Fifty balls of non-absorbent material, having a mass each of 3.7 ± 0.1 g, and a diameter of 20 ± 0.1 mm should be dropped into the water closet bowl and flushed. Repeat the test five times. A minimum of 85 percent of all balls should be flushed out in the five tests.

  This test is applicable for following WC pans:
  - Integrated Squatting Pan – Only single ball test is carried out.
  - Washdown Water Closets
  - Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets
  - Wash Down Wall Mounted Water Closets – Only single ball test is carried out.
  - Universal or Anglo-Indian WC Pan

- **Load Bearing Test:** The WC should be fixed in a stable arrangement on the floor with proper screw. A load of 400 +5/-0 kg or a force of 4+0.05/-0 kN should be applied for period of one hour by placing it on a wooden beam with a cross section of 100 mm x 100 mm positioned across the centre of the opening of the top surface of the WC. There should be no damage or defect which should occur to the WC.

  In case of Washdown Wall Mounted Water Closets, the fixing arrangements should be in accordance with the fastening supplied and manufacturer's instructions on a smooth surface with a layer of mortar or other facing material used for pointing between the back of the WC and the smooth surface. Thereafter, the water closet should be tested as per procedure given above.

This test is applicable for following WC pans:
- Washdown Water Closets
- Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets
- Wash Down Wall Mounted Water Closets
- Universal or Anglo-Indian WC Pan

3.2 Flushing Cisterns

The flushing cistern made of vitreous china or plastic materials is the appliance connected to water closet, which should be flushed immediately after use and provision, therefore, should be made for the storage and discharge of water by means of flushing apparatus. The flushing cistern should conform to the requirements specified in IS 774 for ceramic and one-piece cisterns, and IS 7231 for plastic cisterns.

- A *cistern* is a device intended to operate at a height not exceeding 300 mm between the top of the pan and the underside of the cistern. In case of Orissa pan/squatting pan, minimum distance between top of the pan and the underside of the cistern should be 700 mm.
- A *close coupled cistern* is a device intended to operate, and placed on the flat surface provided at the back portion of washdown water closets. It is of low level coupled type or one-piece, as applicable. It is permissible to have the inlet and the overflow from the bottom of the cistern, where required and no separate flush pipe is necessary.
- A *dual-flush cistern* is a construction that enables the user to cause a reduced flush of partial discharge when only urine needs to be flushed away instead of the customary full flush. It is manually operated and has a capacity of 6/3 litres, 4.8/2.8 litres and 4/2 litres for water closets including squatting pans and urinals, together with flush pipe.

Materials for Various Components of Flushing Cisterns *(Ref. Table 1 of IS 774 & IS 7231)*: Flushing cisterns made of vitreous china or plastic (for WC and Urinals) should be supplied complete with all the components as listed below in Table including flush pipes.

S. No.	Component(s)	Material	Requirement/ Conforming to
1.	Vitreous China Cistern	Vitreous China	IS 2556 (Part 1)
	Plastic Cisterns	High density polyethylene (HDPE) or	IS 7328
		Polystryene, high impact or	IS 2267
		Polypropylene[1)] or	-
		Acrylonitrile-butadiene-styrene (ABS) Or	-
		Glass Fibre reinforced plastic (GRP)	As per clause 4 of IS 11426
2.	Flush pipe	Polyethylene pipe or	IS 4984
		Unplasticized PVC (Poly Vinyl Chloride) plumbing pipe or	IS 4985
		Polypropylene pipe	-
3.	Cover	Same material as that of the cistern body	-

4.	Overflow pipe	Polyethylene pipe or	IS 4984
		Unplasticised PVC or	IS 4985
		Any other corrosion-resistant material	-
5.	Beta (outflow) valve	-	IS 17585
6.	Operating mechanism	Non-ferrous metal or any other corrosion-resistant material	-
7.	Float valve	-	IS 12234/IS 13049
8.	Polyethylene float for float valve	-	IS 9762
9.	Coupling nut and lock-nut	Injection-moulded high density polyethylene (HDPE)/ Polyacetal/ Polypropylene[1)]	-
[(1)]*Talc as filler, if used shall not exceed 20%*			

Note: Where the requirements for the material of any component or the relevant Indian Standard designation for any material are not specified, these shall be as agreed to between the manufacturer and the purchaser.

Cistern: The thickness of the body including cover should be not less than (a) 6 mm for vitreous china (b) 2 mm for glass fibre reinforced plastic (GFRP), and (c) 3 mm for other plastic materials.

- The outlet of each syphon or stand pipe should be securely connected to the cistern by means of lock nut. In the case of plastic siphon, it should be provided with suitable means of ensuring and maintaining water tight and airtight joint to the cistern.
- The cistern should be free from manufacturing faults and other defects affecting their utility.
- All working parts should be designed to operate smoothly and efficiently.
- Cistern should be mosquito proof. A cistern should be considered mosquito proof only if there is no clearance anywhere which would permit a 1.6 mm wire to pass through in the permanent position of the cistern i.e. in the flushing position or filling position.

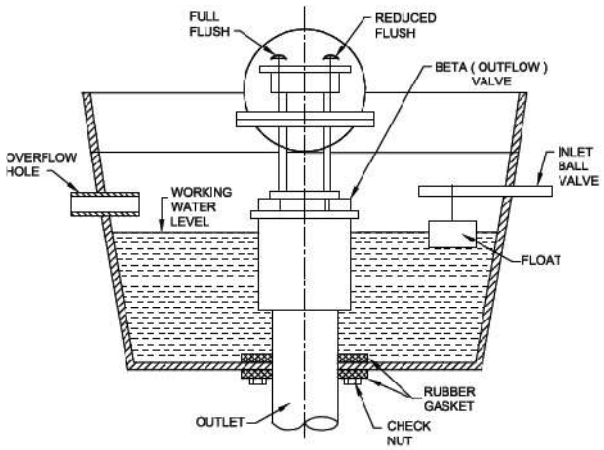


Fig. 22 Dual-Flush Cistern

Cover: The cistern should have a removable cover which should fit closely on it and be secured against displacement. In designs where the operating mechanism is attached to the cover this may be made in two sections, but the section supporting the mechanism should be securely bolted (or fixed) or screwed (booked) to the body.

Flush Pipe: The outside diameter of the flush pipe (2 mm wall thickness) should be 38 ± 1 mm and should be securely connected to the cistern outlet by means of coupling nut to make it air-tight.

- The nominal internal diameter of cistern outlet should be not less than 38 mm,
- There should be no leakage from the joint under a full load of 6 litres.
- A vertical polyvinyl chloride (PVC) pipe, 300 mm long in case of water closet, having a nominal internal diameter of 38 mm and outer diameter of 40 mm. In case of squatting pan, the flush pipe should be minimum 700 mm and rest will be the same.
- The centre of the outlet hole should be generally central to the length of the cistern. The visible length of the outflow valve, when fitted should be 37 ± 2 mm.

Inlet and Overflow Holes: The cistern should be provided with inlet and overflow holes, situated one at each end, which should be capable of accommodating an overflow pipe of not less than 20 mm nominal bore and a 15 mm size float valve.

Float Valve: The float valve should be of 15 mm nominal size and should conform to IS 1703 or IS 12234 or IS 13049 except IS 1703 in case of plastic flushing cistern. The design should permit the cistern to fill in rapidly and close effectively when the level of water reaches the working water level.

Operating Mechanism: Each cistern should incorporate a dual control push-knob type operating mechanism that may be operated by two buttons or two handles/knobs or two concentric but separate knobs/handles or any other device in which one knob/handle actuates the full flush and the other knob/handle actuates the reduced flush.

Overflow Pipe: The overflow pipe should be of not less than 20 mm nominal bore and should incorporate a non-corrodible mosquito-proof device. No provision of such device should be made whereby the overflow from the cistern discharges directly into the water closet or soil pipe without being detected.

The invert of the overflow pipe should be 19 mm minimum above the working water level. The working water level should be a minimum of 6.5 cm below the effective top edge of the cistern. Effective top edge should be taken as edge of the top of the body without considering bead.

Finish: The surface of the cistern including cover should be smooth and free from blisters and reasonably free from flow lines, streaking or colour variations, and

a) in case of vitreous china flushing cistern, should comply to the requirements given in IS 2556 (Part 1).
b) in case of plastic cistern, when tested as per IS 12235-3 should be opaque to light, transmitting not more than 0.2 percent of the visible light falling on them.

- The surface of the cistern (vitreous china) should be free from all types of joint and any hole which may cause leakage.

- The surface of the cistern (plastic) should be such to not allow any leakage. The concealed cistern should be covered with net for installation purposes.

Freedom from Leakage: The flushing system should be capable of being rapidly brought into action when the water is at the working water level, but should not leak into the flush pipe when the water is up to 10 mm above the invert of the overflow pipe.

Reduced Water Level: The discharge should operate satisfactorily when the cistern is filled to a level up to 10 mm below the working water level.

Discharge Capacity & Discharge Rate: When tested according to IS 774 for vitreous china cistern and IS 7231 for plastic cistern, the discharge capacity & discharge rate for dual-flush cisterns should be as follows:

S. No.	Cistern Discharge Capacity	Full Flush	Discharge Rate	Reduced Flush	Discharge Rate
1	6 litre	6 ± 0.5 litre	within 4 seconds	3 ± 0.5 litre	within 2 seconds
	3 litre				
2	4.8 litre	4.8 ± 0.5 litre	within 3.2 seconds	2.8 ± 0.5 litre	within 1.9 seconds
	2.8 litre				
3	4 litre	4 ± 0.5 litre	within 2.7 seconds	2 ± 0.5 litre	within 1.4 seconds
	2 litre				
The cisterns shall be so designed that there is no appreciable variation in the force of flush during the discharge of the required quantity of water.					

Test of Discharge Capacity: With the water supply shut off or the cistern disconnected, and with the float valve fitted, fill the cistern with water up to the marked water line. Operate the flush mechanism and on completion of the flush, measure the quantity of water that has to be added to refill the cistern to the level of the marked water line. Alternatively, any suitable device may be used for measuring the quantity of water discharged from the cistern. The cistern should have a flush pipe fitted but need not be connected to a pan for this test.

Test for Discharge Rate: The cistern is connected to an appropriate flush pipe. It is filled with water to the water line as for the capacity test. A vessel is placed under the open end of the flush pipe.

- Operate the flush mechanism and as water appears at the open end of the flush pipe start a stop watch.
- At the end of 4.0 s for full flush and 2.0 s for reduced flush in case of a dual-flush cistern of 6/3 litre capacity; 3.2 s for full flush and 1.9 s for reduced flush in case of a dual flush cistern of 4.8/2.8 litre capacity; and 2.7 s for full flush and 1.4 s for reduced flush in case of a dual flush cistern of 4/2 litre capacity, rapidly draw the vessel clear or otherwise divert the flow of water.
- Ascertain either by measuring or weighing the volume of water collected in the vessel.
- For measuring the discharge rate, repeat the same operation for full flush and that for reduced flush, separately for 3 times each and calculate the average discharge rate of full flush and reduced flush of the cistern.

Special Requirements in case of Plastic Flushing Cisterns

- **Test for Distortion Resistance:** The cisterns, complete with its fittings, should be installed and filled with water to the marked water line and observed for any distortion. The cistern should not bulge more than 6 mm and the cover should not be dislodged.
- **Dead Load Test:** When the flushing mechanism incorporates lever, the cistern, complete with its fittings, when installed and filled with water to the marked water line and tested by the application of a dead load of 230 N applied 6 mm from the end of the operating lever arm for 30 sec, should not distort to such an extent that any part becomes detached. In the case of other operating mechanism, the dead load applied should be a mass equivalent to the operating force required to overcome the normal hydrostatic head. Thirty seconds after the load is removed, the function and appearance of the cistern should not be impaired. For top actuation flushing cistern, such as those with push-knob at the top, this test is not applicable.
- **Front Thrust Test:** The front thrust test should be applied only to cisterns intended for low-level use. The cistern, complete with its fittings, when installed and filled with water to the marked water line and tested by the method described in Annex B of IS 7231, should not distort to such an extent as to be inoperable or unsightly when the load is removed.
- **Impact Test:** The cistern, complete with its fittings, when installed and filled as described in Annex C of IS 7231, should show no defect after one impact. The test should be repeated with empty cistern. The cistern should show no defect after the further impact.

Marking

- Each cistern should be marked with the manufacturer's name or trade-mark on the body, either inside or outside as found convenient to the manufacturer.
- The discharge capacity should also be marked on the cistern indelibly.
- The operating instructions in the form of a leaflet should be provided with the cistern
- A suitable declaration should be put on each unit indicating to the consumer the list of components supplied.
- The flushing cistern should also be provided with an instruction specifying that a particular rated cistern capacity should be used with compatible sanitary appliance of equivalent capacity.

3.3 Fittings Required

3.3.1 Plastic Seat and Covers for Water Closet

IS: 2548-1&2 deals with the requirements of plastic seat and cover under the following circumstances.

- In personal dwelling, the seat and cover of the WC are made of moulded thermoplastic (polystyrene and polypropylene) and are more flexible. The underside of the seat may be either flat or recessed. Preferred design of the seat is flat underside.

- In public buildings, where rough and heavy use of seats and covers are common, plastic seats are moulded out of thermosetting materials (phenolic or urea formaldehyde), which are more rigid. The underside of the seat is flat with solid moulding.

The central opening should be 250 mm x 215 mm (minimum) and 290 mm x 240 mm (maximum). The thickness of the seat and cover at the thinnest point should be 3 mm. The seat and cover are hinged to the closet structure at one end. Each seat should be provided with not less than three rubber or plastic buffers of size 25 mm x 40 mm x 10 mm securely fixed to the inside of the seat, which are so located that the seat is properly supported by the top surface of the water closet.

Each cover should be fitted with the same number of buffers so provided for the seat. The buffers below the seat and those in the cover should be placed vertically over each other. The surfaces of the seats, covers and components should be smooth, free from blisters and de-lamination, non-absorptive, free from cracks, crevices and internal voids, and not adversely affected by common solvents or household cleaners.

The seats should withstand without permanent distortion of the seat or hinge fittings or damage to any finish, a load of 1150 N for 30 minutes applied in the manner prescribed in IS 2548.

3.3.2 Traps

Traps are fittings or parts of appliances that retain water seal so as to prevent the passage of foul air into the building. The trap is always fitted close to the waste or soil fitting. Trap has following features:

a) Trap is made of vitreous china, cast iron, or un-plasticized PVC.
b) A trap may be formed as an integral trap with the appliance during manufacture, as in some models of European WC, or it may be a separate fitting called an attached trap, which may be connected to the waste or foul water outlet of the appliance.
c) Trap should always be of a self cleaning pattern.
d) Traps for use in domestic waste installations and all other traps should be conveniently accessible and provided with cleansing eye.
e) A good trap should maintain an efficient water seal under all conditions of flow, both during the water flow as well as in the absence of water flow.

Water Seal in a trap is the depth of water, which does not permit foul gases to escape from the pipes. Traps are useless unless they retain their soils at all times. The depth of water seal in various sanitary appliances should be as given.

Water closet	50 mm
Floor trap	50 mm
Other fixtures directly connected to the stack through branch waste pipe of dia. 75 mm	40 mm
'Hand-poured flushed' type, rural WC	20 mm

3.3.2.1 Traps for Squatting Pan

Each pan should be provided with a trap where so specified. The trap for Long and Orissa pattern pan should have either P or S outlet with or without inspection vent and should conform to the requirements given in IS 2556-7.

The functional surface of trap that comes in contact with water should be internally glazed uniform and smooth, in order to ensure an efficient function and use.

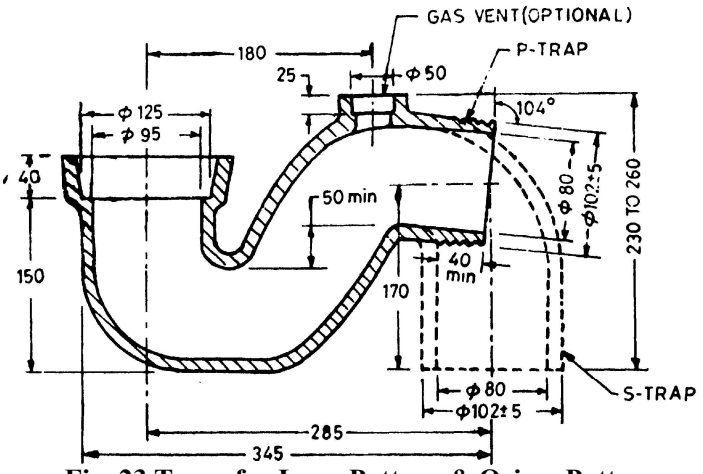


Fig. 23 Traps for Long Pattern & Orissa Pattern Squatting Pans

The flushing test should be performed in accordance to the provisions stipulated in IS 2556-3 and covered in *Para 3.1.4 of this handbook.*

3.3.2.2 Traps for Washdown WC

Trap in washdown WC is an integral part manufactured with the appliance, and connected to the waste or foul water outlet of the appliance. Each water-closet should have an integral trap with either P or S outlet. For P trap, the slope of outlet should be 14^0.

In the double trap pattern in syphonic washdown type WC, the first trap being an 'S' one and the second trap being a 'P' one, and in the single trap pattern with S trap, the inlet from the trap is first enlarged and then somewhat suddenly contracted.

4.0 WASTE APPLIANCES

The appliances such as drinking water fountains, wash basin, kitchen sink, bathtub etc. are waste water appliances, which are commonly used for facilitating the user for their intended purpose. These appliances and their components should be durable, impervious, corrosion resistant and have smooth surface which may be easily cleaned. They should conform to relevant Indian Standard where they exist; otherwise they should be of the best quality and workmanship which should be approved by a competent authority.

4.1 Wash Basin

The provision of hand wash basin in housing or in public toilet has become a necessity for personal care.

The wash basin is generally used in standing posture for washing hands, face, hairs, shaving and also for makeup. It is generally made of vitreous china and is available in wide range of various design, shape, size and colour. It is of one-piece construction having a combined overflow and preferably should have soap holding recess or recesses that should properly drain into the bowl.

Inside surface of wash basins should be glazed uniform and smooth in order to ensure efficient draining. All internal angles are designed so as to facilitate cleaning.

Each basin should have circular waste hole of flange diameter of 64 mm (IS 2963), through which the liquid content of the basin should drain. Each wash basin has a rim on all sides, except sides in contact with the wall and has a skirting at the back. The entire flat surface should have sloped inside towards the bowl. Flat back wash basin (surgeon's basin) for use in surgeon's room and operation theatre should not be provided with soap holder recess and combined overflow.

Wash basins are provided with five, three, two or single tap hole, round in shape and symmetrical about the centre line of the basin and either fully punched or semi-punched. The tap holes should be suitable for fixing pillar taps conforming to IS 1795-1982 or to IS 893-1993. The level of the top of the platform which accommodates the taps is not to be below the spillover level of the basin irrespective of the overflow arrangement. For angle back basin, provision should be made for one or two tap holes in any suitable position in accordance with the design of the manufacturer.

IS 2556-4 deals with the requirements of vitreous china wash basins. The codal requirement has been discussed in brief as follows:

4.1.1 Patterns (or Types) and Sizes and Dimensions

The wash basins are of two types, vanity basins fitted in the counter, or wall hung basins. Wall hung basins are either of flat back or angle back (to fit in corner) pattern. Vanity wash basins (counter top and counter sunk) are available in numerous patterns and sizes, most popular patterns being round or oval. Wash basins may be made in other patterns and sizes where so agreed to between the manufacturer and the purchaser.

Functional Dimensions: The functional dimensions of various patterns and sizes of wash basins are indicated as below:

(Ref. Table 2 of IS 2556-4)

S. No.	Pattern	Size (mm)	Functional Dimensions (in mm) (Ref. in Fig. 24 & 25)		
			Length (A)	Breadth (B)	Height (Min) (C)
1	Flat back wash basin (surgeon's basin)	660x460	660	460	200
2	Flat back wash basin	630x450 550x400 450x300	630 550 450	450 450 300	290 290 225
3	Angle back wash basin	600x480 400x400	600 400	480 400	290 290

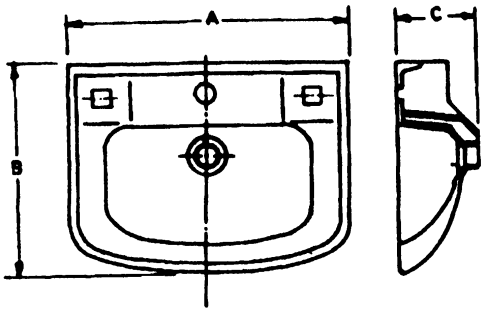


Fig. 24 Flat Back Wash Basin

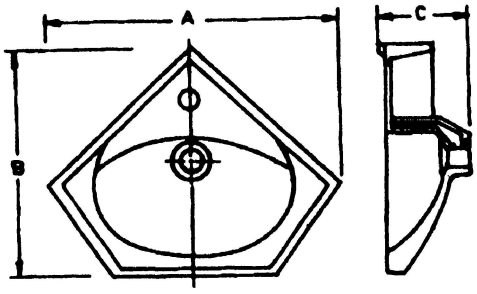


Fig. 25 Angle Back Wash Basin

Connecting Dimensions: The connecting dimensions are critical for plumbing applications and these should be strictly complied with irrespective of the pattern and design.

A) Connecting Dimensions for Single Tap Hole Wash Basins

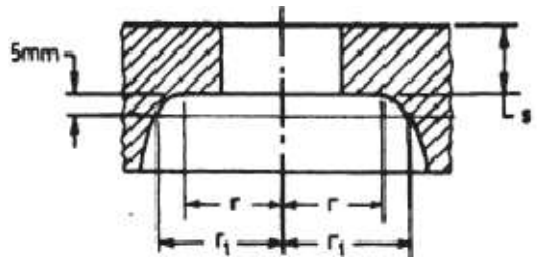


Fig. 26 Details Of Tap Fitting Hole (As Measured After The Holes Punched)

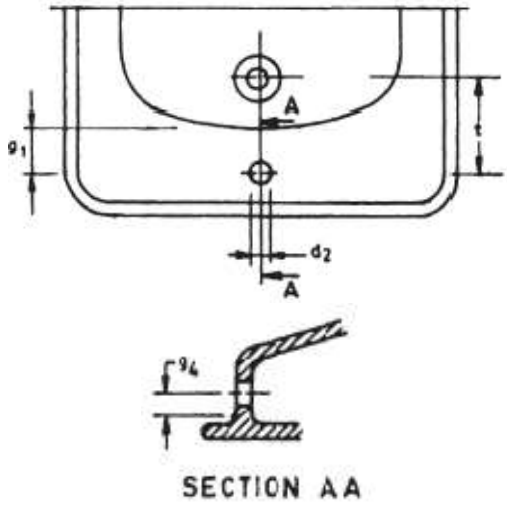


Fig. 27 Connecting Dimensions for single tap Hole Wash Basins

(Ref. Table 4 of IS 2556-4)

S. No.	Description	Ref. in Fig. 26 and 27	Dimensions (in mm)
i)	Diameter of tap hole	d_2	35+2 - 1
ii)	Horizontal distance between centre line of tap hole and the edge of bowl	g_1	80, Max
iii)	a) Distance from wall or inside of skirting (where provided) and centre line of tap hole	8_4	32, Min
	b) Distance from wall (where skirting is not provided) and centre of tap hole	8_4	40, Min

iv)	Radius of a cylinder with the same axis as the fitting hole which permits the following free space below the inside edge of the tap fitting hole: a) of 0 to 5 mm height b) of 5 mm and more height	 r r_1	 25, Min 30, Min
v)	Wall thickness in the zone of the tap fitting hole	r ,	18, Max
vi)	Horizontal distance between the axis of the tap hole to the axis of the waste outlet opening	s	170, Ma
Notes: Dimension 't' is not applicable for angle back wash basin and 450 mm x 300 mm wash basin.			

B) Connecting Dimensions for Wash Basins with Five, Three and Two Tap Hole Set

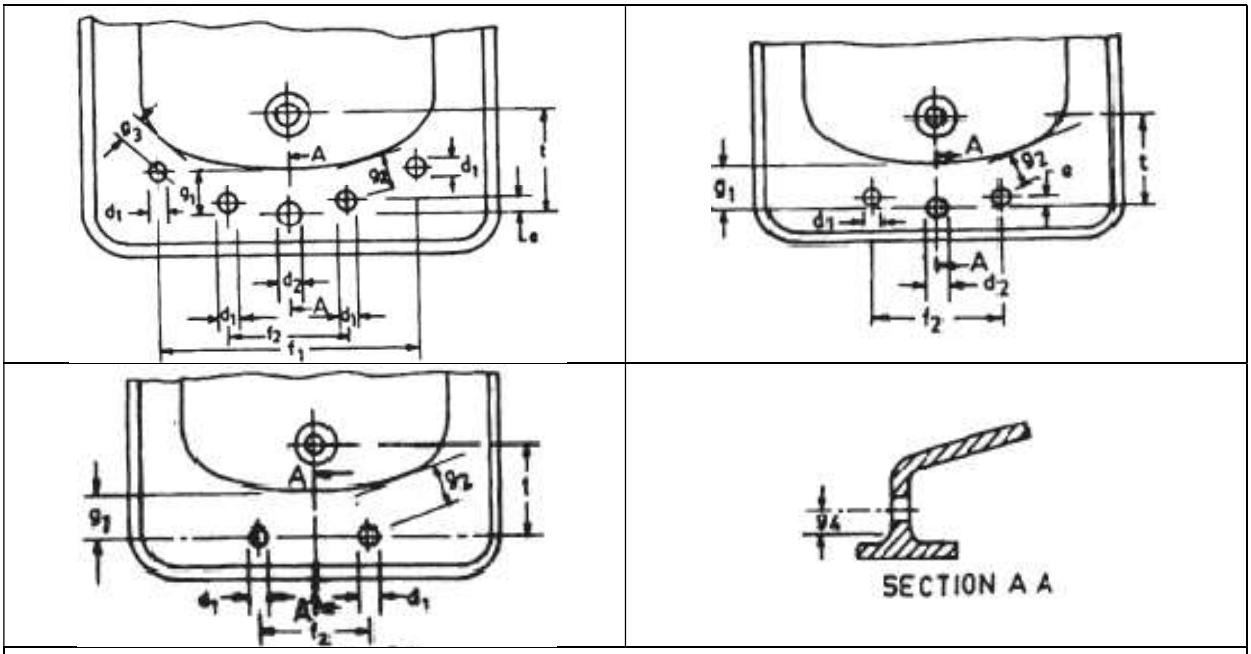


Fig. 28 Connecting Dimensions of Wash Basins with Five, Three and Two Tap Holes

(Ref. Table 3 of IS 2556-4)

S. No.	Description	Ref. in Fig. 28	Dimensions (in mm)
i)	Diameter of outer tap holes	d_1	30+ 2 -0
ii)	Diameter of central tap hole	d_2	35+2 - 1
iii)	Distance from vertical planes passing through the centre line of the central tap hole and the centre line of the outer (adjacent) tap holes	e	0 to 15
iv)	Distance between the centre lines of the two outer (distant) tap holes: a) For size 630x 450 b) For size 550 x 400	f_1	 480 400

v)	Distance between the centre lines of the two adjacent outer tap holes	f_2	200+ 4 - 4
vi)	Horizontal distance between centre line of the central tap hole and the edge of the bowl	g_1	80, Max
vii)	Horizontal distance between centre line of a distant hole and the edge of the bowl	8_2 , 8_3	65. Max
viii)	a) Distance from wall or inside of skirting (where provided) and centre line of central tap hole b) Distance from wall (where skirting is not provided) and centre of tap hole	8_4 8_4	32, Min 40, Min
ix)	Radius of a cylinder with the same axis as the fitting hole which permits the following free space below the inside edge of the tap fitting hole: a) of 0 to 5 mm height b) of 5 mm and more height	 r r_1	 25, Min 30, Min
x)	Wall thickness in the zone of the tap fitting hole	r ,	18, Max
xi)	Horizontal distance between the axis of the central tap hole to the axis of the waste outlet opening	s	170, Ma
Notes: 1) Dimension 't' is not applicable for angle back wash basin and 450 mm x 300 mm wash basin. 2) Dimension f_2 is not applicable for 450 mm x 300 mm wash basin.			

C) Dimensions of Waste Outlet Hole

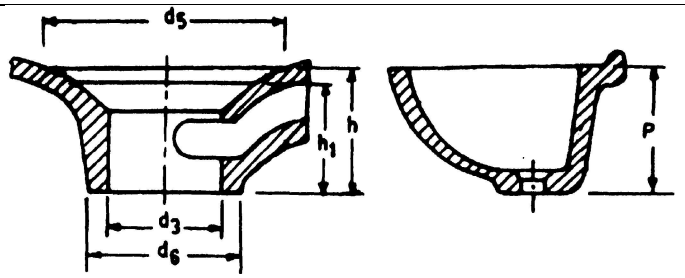


Fig. 29 Waste Outlet Hole

(Ref. Table 5 of IS 2556-4)

S. No.	Description	Ref. in Fig. 29	Dimensions (in mm)
i)	Diameter of waste outlet opening	d_3	46+2 - 3
ii)	Maximum diameter at the bevelled portion of the waste outlet opening	d_5	75, Max
iii)	Outside diameter of the seating face of the waste outlet opening	d_6	60, Min
iv)	Depth of outlet for wash basin	h	45, Min 50, Max
v)	Depth of overflow slot for waste outlet hole with integral overflow	h_1	40, Min 45, Max
v)	Vertical distance between the tap platform and the lower plane of the waste outlet hole	P	250, Max

D) Fixing (Mounting) Dimensions for Wall Hung Basin

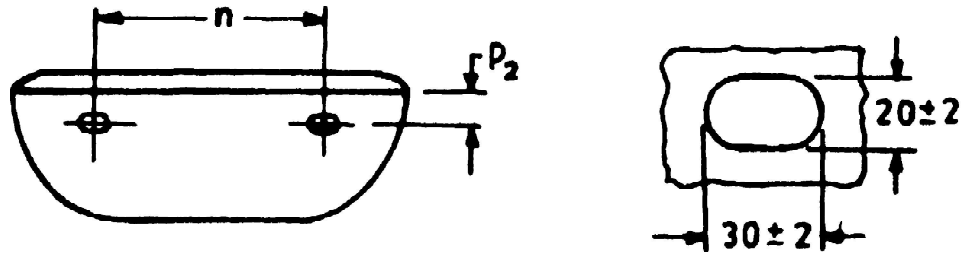


Fig. 30 Wall Hung Basin

(Ref. Table 6 of IS 2556-4)

S. No.	Description	Ref. in Fig. 30	Size of Wash Basin	Dimensions (in mm)
i)	Horizontal distance between the axis of two fixing holes	n	a) Up to and including 550 x 400 b) Above 550 x 400	240±10 280±10
ii)	Vertical distance between the centre lines of the fixing holes and the tap platform	P_2	All size of flat back wash basins (except 450 x 300) and angle back wash basin	40, Min 72, Max

Note: Where tolerances are not given for specific dimensions, these should be in accordance with IS 2556(Part 1).

4.1.2 Full Pedestal Wash Basin

Glazed pedestals for wash basin should be supplied with quality and thickness not less than that of the basins with which it is to be installed. Pedestal is provided to hide the trap, waste and hot and cold water service pipes to enhance the looks of the wash basin. The pedestals are so constructed as to support the wash basin rigidly and adequately.

Suitable provision is to be made to fix the pedestal to the flooring at a height from the floor to top of the rim of basin between 750 to 800 mm. The bottom of the pedestal is provided with holes for screwing in masonry screws into the floor for fixing.

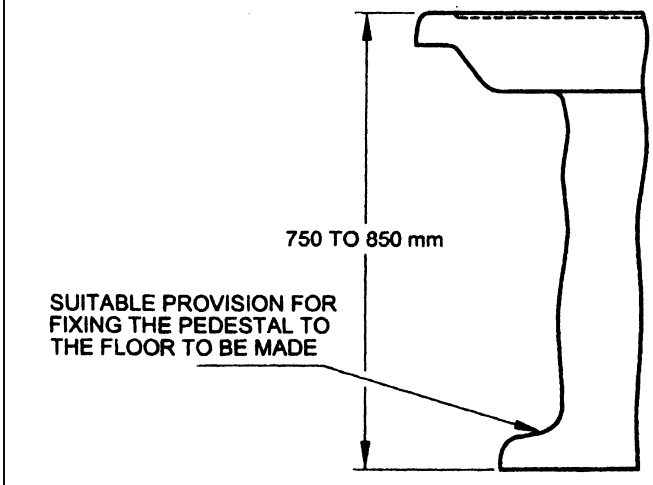


Fig. 31 Full Pedestal Wash Basin

4.1.3 Traps for Wash Basins

IS: 5219 deals with the requirements of cast copper alloy traps for wash basin, bath tubs and similar waste appliances. The traps are classified as a) Cast traps 'P', 'S', b) Tube traps 'P', 'S', c) Bottle traps with division, and d) Bottle trap with dip tube.

The nominal sizes of cast traps 'P', 'S' are 32, 40 and 50 mm, and that of tube traps and bottle traps are 32 mm and 40 mm.

Cast traps 'P' and 'S' and cast body of bottle traps should in all respects be sound, free from laps, blow holes, pitting and other manufacturing defects. External and internal surface should be clean and smooth.

The traps consist of different components such as a) Body cast trap, tail nut and body bottle trap b) Body tube trap, inlet and outlet pipe, c) Dip tube, d) 'O' Ring e) Gaskets conforming to the materials as specified in IS 5219.

The dimension of cast trap, tube trap and bottle trap are given in table, read with figures as shown below:

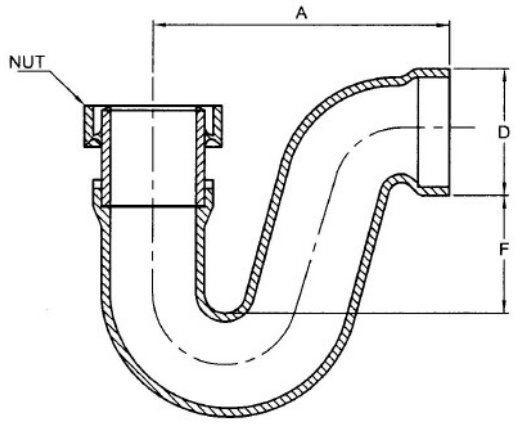


Fig. 32 Cast 'P' Trap

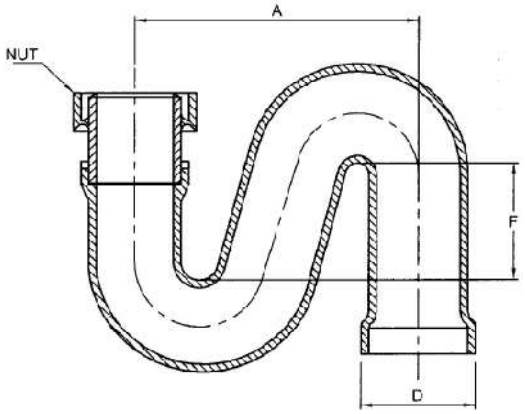


Fig. 33 Cast 'S' Trap

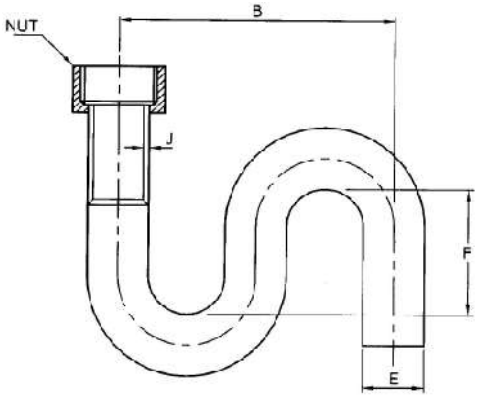


Fig. 34 Tube Trap 'S'

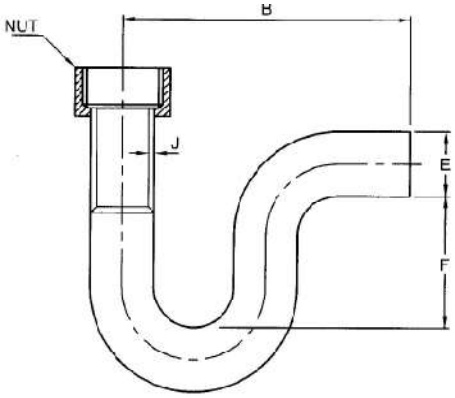


Fig. 35 Tube Trap 'P' (One Piece)

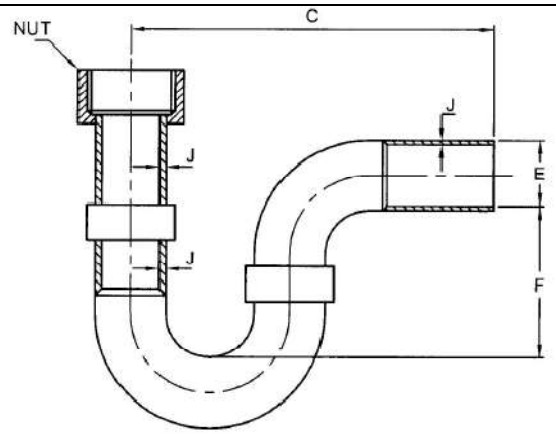


Fig. 36 Tube Trap 'P' (Multiple Piece)

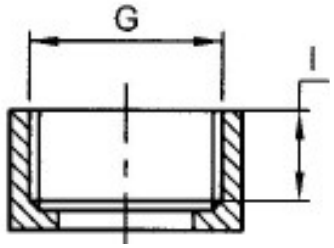


Fig. 37 Connecting Nut

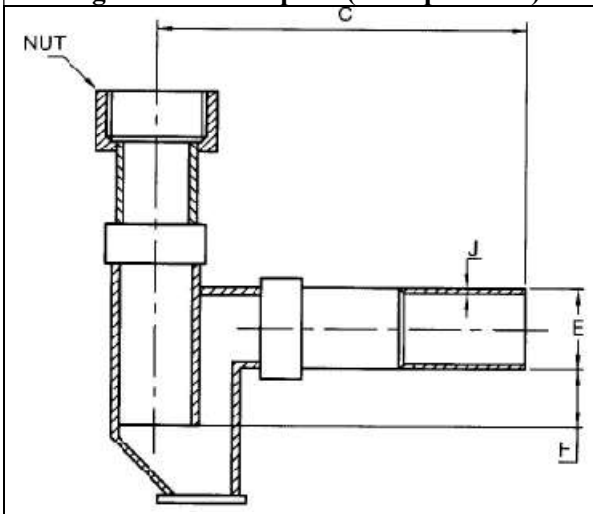


Fig. 38 Bottle Trap with Division

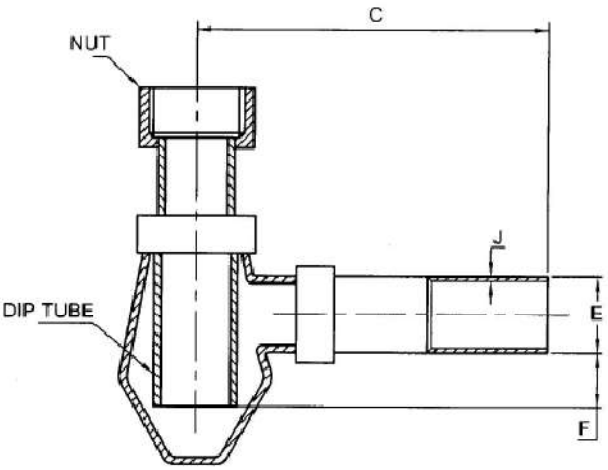


Fig. 39 Bottle Trap with Dip Tube

Dimension of Cast Trap, Tube Trap and Bottle Trap: The minimum thickness of Cast 'P', 'S' traps and cast body of bottle traps should be 1.5 mm, except where a lesser thickness is specified.

(Ref. Table 2 of IS 5219)

S. No.	Particulars (Fig. 32 to Fig. 39)	Nominal Size of Trap (in mm)		
		32	40	50
i)	Distance between axis, A	95, Min	110, Min	130, Min
ii)	Distance between axis, B	110, Min	110, Min	—
iii)	Distance between axis, C	245, Min	245, Min	—
iv)	Connecting threads, D	G 1¼B	G 1½B	G 2B
v)	Diameter of outlet pipe, E	30, Min	38, Min	—
vi)	Depth of water seal, F	50, Min 5	0, Min	50, Min
vii)	Connection of trap to waste outlet, G	G 1¼	G 1½	G 2
viii)	Useful length of thread for tightening nut, H	6.5-10	6.5-10	6.5-10
ix)	Thickness of tube, J	0.5, Min	0.5, Min	—

It is a general practice to provide integral threads on the inlet of the traps and to facilitate connection with waste bodies, use of inlet tail pipe and coupling out should be made. External threads are provided on the outlet in case of screwed outlet traps for connection to waste pipes.

Performance Test: All traps should comply with the requirements specified as under:

a) ***Hydraulic Property*:** This test consists of determining the flow rate of water with constant pressure head. the reference outlet as shown in figure is fitted to the test apparatus. The measurement is to be taken with a water height of 120 mm after ensuring that the water level has stabilized. The value of flow rate should not be less than 0.7 litre/sec.

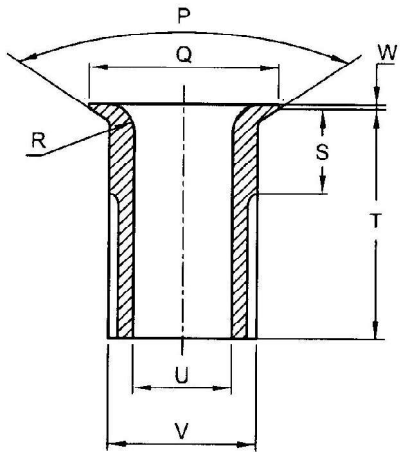


Fig. 40 Reference Outlet

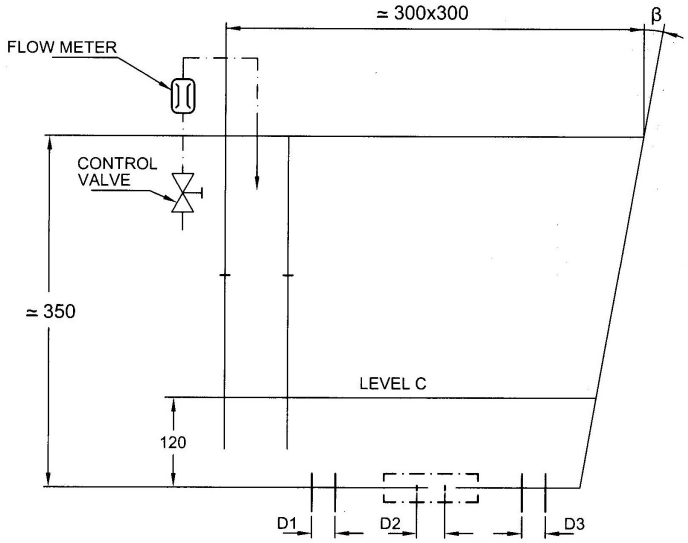


Fig. 41 Apparatus for measuring flow rate

(Ref. Table 3 of IS 5219)

S. No.	Legend (Fig. 40)	Dimensions for Nominal Size		
		32	40	50
i)	*P*	110°, *Min*	120°, *Min*	120°, *Min*
ii)	*Q*	60 to 63	70, *Max*	85, *Max*
iii)	*R*	15	20	25
iv)	*S*	36, *Max*	42, *Max*	42, *Max*
v)	*T*	70, *Min*	70, *Min*	70, *Min*
vi)	*U*	32, *Max*	41, *Max*	51, *Max*
vii)	*V*	G 1¼B	G 1½B	G 2B
viii)	*W*	1.0, *Max*	1.0, *Max*	1.0, *Max*

Ref. to Fig. 41

β = 8°±5°
C = water level for waste outlet test.
D1 = diameter of NB 32 waste outlet.
D2 = diameter of NB 40 waste outlet.
D3 = diameter of NB 50 waste outlet.

b) ***Leak Tightness Test:*** All trap elements and connections have to be leak tight when subjected to a pressure of 0.01 MPa (1 m height water column). There should be no water leakage 1 h after the test assembly has been filled as shown in figure.

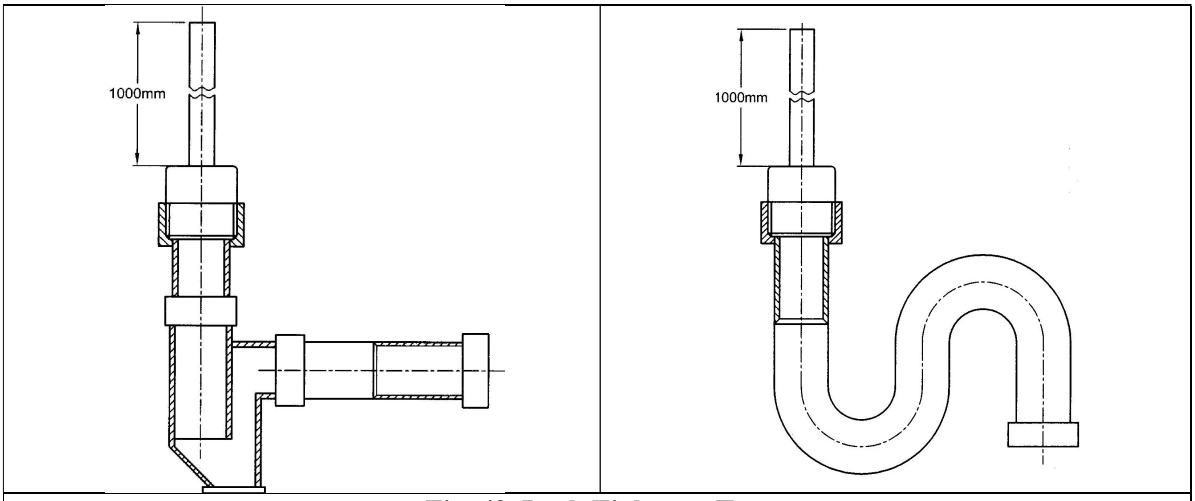


Fig. 42 Leak Tightness Test

Marking: Each trap should be legibly marked on any portion with the a) Manufacturer's name or trade-mark; and b) Batch No./Date of manufacture.

4.2 Sink

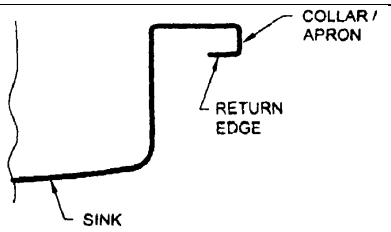
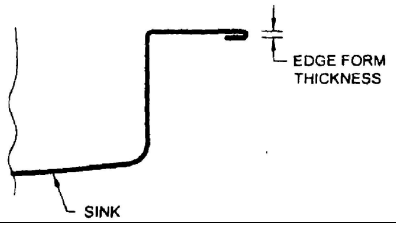
The sink is a waste appliance commonly used in kitchen and laboratory for the purpose of cleaning utensils/ apparatus and also serves the purpose of providing water for general usage.

- The sinks are made of vitreous china and stainless steel with or without overflow arrangement.
- The sink should be of one-piece construction including combined overflow, where provided.
- The sink should have a circular waste hole into which the interiors of the sink should drain. The waste hole should be either rebated or bevelled with an overall diameter of 65 mm and a depth of 10 mm to suit a waste fitting having a flange of 64 mm diameter.
- The sink may be provided with a rim.
- The waste fitting may be of glazed vitreous ware, if so desired or else it should conform to IS 2963.

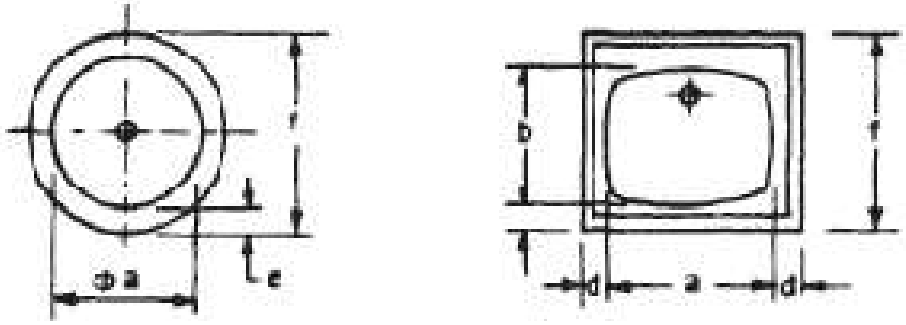
4.2.1 Kitchen Sinks

IS 13983 deals with the requirements of kitchen sinks provided in the kitchen. The kitchen has many uses including the preparation of meals, food preservation, and storage of food and utensils, and also in many cases for eating and laundering. The most commonly used sinks are of stainless steel, which are easy to install and can be cleaned easily.

As per IS 13983, there are sit-on and inset type stainless steel sinks for domestic purposes. Options are specified for sinks with or without overflow holes, tap holes or selected waste facilities.

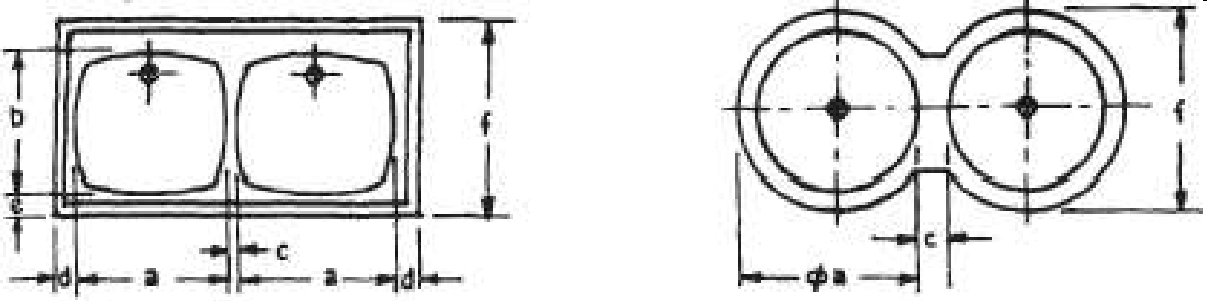
Sit-On Sink which when installed fits on top of and lines up with a base unit of suitable dimensions, such that the aprons of the sink form a continuation of the sides of the base unit.	
Insert Sink which is constructed to fit into an aperture in a work top so that when installed, it only projects above the working surface by an amount equal to the edge formed thickness.	

Types: The kitchen sinks are available in different sizes and shapes to suit the working platform and easy workability in the kitchen. The kitchen sink should be one of the following types as given below.



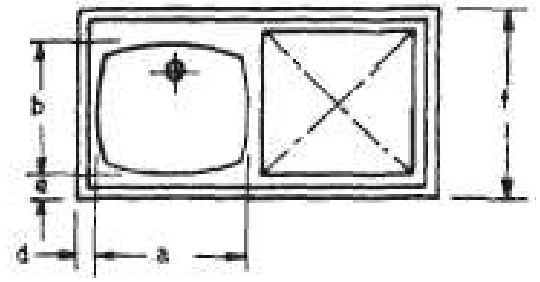
Type A1 **Type A2**

Single bowl without drainer

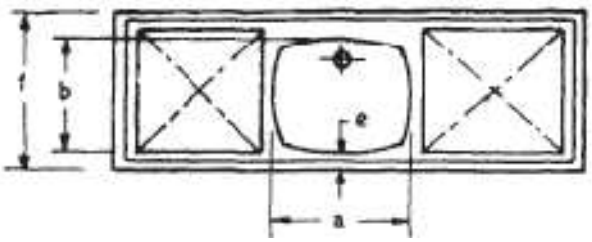


Type B1 **Type B2**

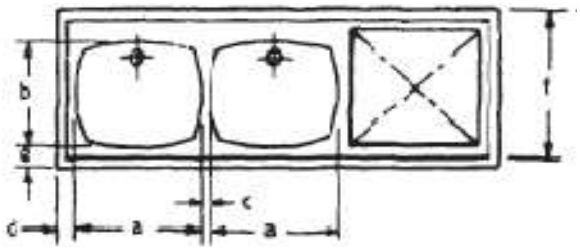
Double bowl without drainer



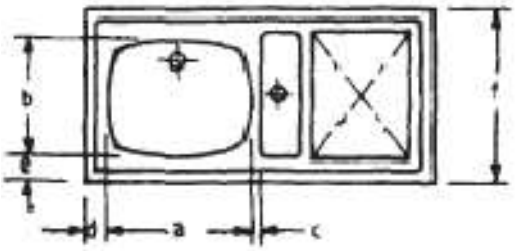
Type C
Single bowl single drainer, right or left hand



Type D
Single bowl double drainer

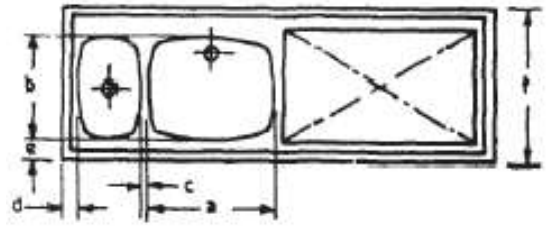


Type E1

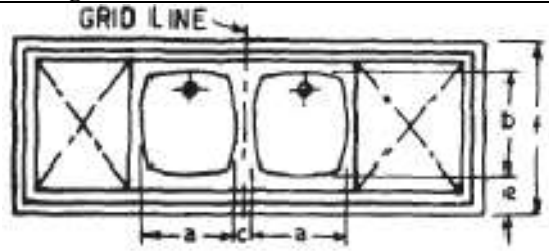


Type E2

Double bowl single drainer, right or left hand



Type E3
Double bowl single drainer, right or left hand



Type F
Double bowl double drainer

Fig. 43 Different Types Of Sink

Coordinating Sizes: The dimensions of the sink should comply with Table as given below in relation to the types given in figures above.

(Ref. Table 1 of IS 13983)

Reference to Fig. 43	Dimensions in mm (Minimum Unless Specified)
a	370 (for rectangular bowl) 360 (for round bowl)
b	320
c	20
d	30
e	45
f	440 mm Max for 500 mm worktop 515 mm Max for 600 mm worktop

- The sink surfaces should be free from any sharp edges.
- Sink bowl should have rounded corners to facilitate cleaning.
- Folded corners may be drawn or welded.

- All welded surfaces should be adequately cleaned off inside and outside the sink.
- The edges of any holes in the sink should not show evidence of undulation, chips, cracks or any other defect which would impair its appearance or performance.
- When examined by an unaided eye of an experienced observer, from a distance of 600 ± 100 mm from exposed surfaces, the sink should be free from visible defects.
- The visual examination should be carried out with uniform illumination at the surface of the sink of 300 lux and with the sink positioned so that it is between the light source and the observer.
- Drainers should be fluted or grooved and should be inclined towards the sink bowl.
- The waste outlet fitting should be recessed type.
- When sink is provided with tap holes, the centres of tap holes should be more than 60 mm from the nearest back edge of the bowl and not less than 50 mm to the front face of the upstand.
- When sink is provided with overflow hole, it should have a horizontal dimension not greater than 64 mm, and a vertical height not less than 15 mm giving an area of not less than 640 mm^2, and located completely below the spillover level of the sink.
- Sinks may be supplied with a bright or dull finish as desired by the purchaser.

Marking: Each sink should be clearly and permanently marked with the information in such a way that it can be easily seen after installation: a) the manufacturers name or identification mark, b) type and size of sink, and c) year of manufacture.

4.2.2 Laboratory Sink

IS 2556-5 deals with the requirements of laboratory sink, made of vitreous china. It should be of one-piece construction including overflow, and restricted to laboratory use only as it is not found suitable for kitchen use. Where an overflow hole is provided, it should be of 25 mm diameter. Inside surfaces of sinks should be uniform and smooth in order to ensure an efficient draining. Laboratory sinks should be provided with waste outlet fittings conforming to the requirements of IS 2963

The sinks suitable for laboratory use should be in the sizes and dimensions as given in table, read with figure below.

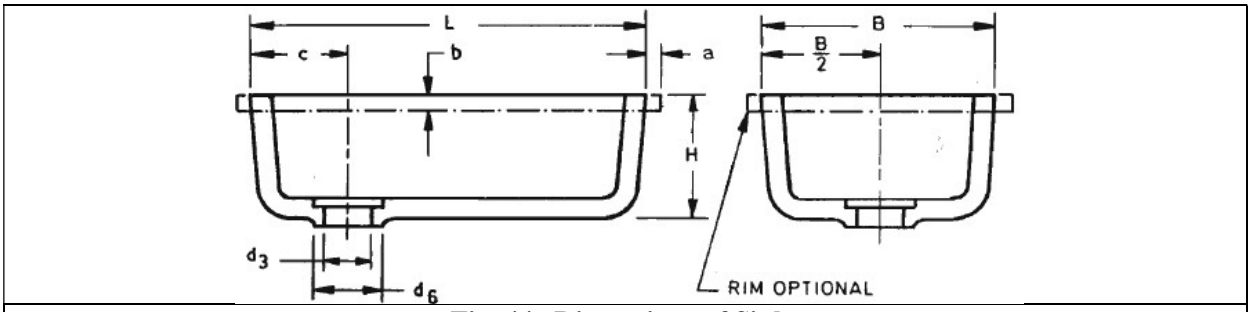


Fig. 44 Dimensions of Sinks

Dimensions of Laboratory Sinks (in mm)
(Ref. Table 1 of IS 2556-5)

Sizes (Fig. 44)	L	B	H	a	b	c
400 X 250 X 150 mm	400	250	150	15 min	15 min	90 min
450 X 300 X 150 mm	450	300	450	15 min	15 min	90 min
500 X 350 X 150 mm	500	350	150	15 min	15 min	90 min
600 X 400 X 200 mm	600	400	200	15 min	15 min	90 min
600 X 450 X 200 mm	600	450	200	15 min	15 in	90 in

Waste Outlet Hole: The sink should have a circular waste hole through which liquid content of the sink should drain. The base of the sink should have proper and sufficient slope to drain the liquid content into the waste hole. The waste hole should be bevelled internally. The dimensions of the waste outlet hole are given in table, read with figure.

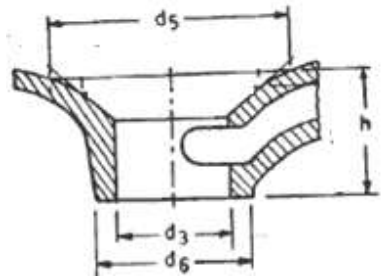


Fig. 44 Dimensions of Waste Outlet Hole

Dimensions of the Waste Outlet Hole
(Ref. Table 2 of IS 2556-5)

S. No.	Particulars	Ref. in Fig. 44	Dimensions (in mm)
1	Diameter of waste outlet opening	d_3	46^{+2}_{-3}
3	Maximum diameter at the bevelled portion of waste outlet opening	d_5	75 Max
4	Outside diameter of the seating face of the waste outlet opening	d_6	60 Min
5	Depth of outlet for sinks with integral overflow	h	45 Min, 50 Max

Marking: The sinks should be clearly and indelibly marked at a suitable place with the a) Name or trade-mark of the manufacturer; and b) Batch/Lot number.

4.3 Waste Fittings for Wash Basins and Sinks

IS 2963 deals with the requirements of copper alloy waste fittings and waste plugs used in sanitary appliances such as washbasin and sinks for evacuation of water from the bowl directly and through the overflow by means of fitting a device known as waste outlet. Waste outlet can be sealed by means of a flap or a plug with or without grill. Waste outlet without flap should be with grill. The waste fittings consist of different components such as a) body and back nut b) plug or flap, grill pop-up waste mechanism, chain, c) 'O' ring, d) gasket e) chain, plug shackle conforming to the materials as specified in IS 2963.

Waste outlet: Waste outlet is one-piece construction or may comprise various pieces joined together mechanically. It can be classified as under:

a) *Grill waste outlet:* It is the waste outlet without sealing by flap or plug and comprises of safety grill at the inlet intended to check objects which may fall into sanitary appliances.
b) *Plug waste outlet:* It is the waste outlet with non-mechanical control.
c) *Pop-up waste outlet:* It is the waste outlet sealed mechanically by a flap with or without grill and has a mechanical control either internal or external.

Waste outlet may be with or without overflow slot, and if provided, two slots on opposite sides are to be made.

Dimensions of Waste Outlet: The dimensions as given in table are read with the figures as under:

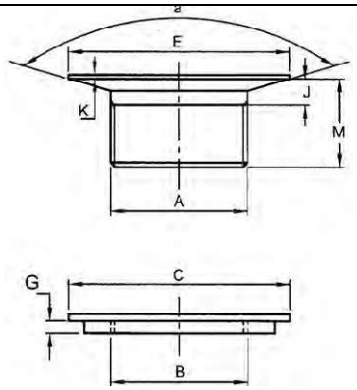


Fig. 45 Waste Outlet without Overflow

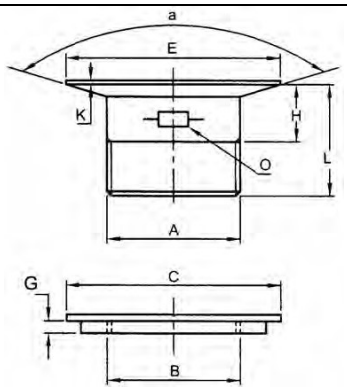


Fig. 46 Waste Outlet with Overflow

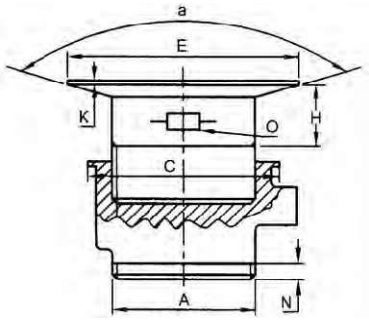


Fig. 47 Waste Outlet with Overflow and Pop Up Waste

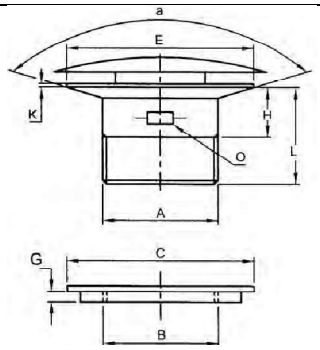


Fig. 48 Waste Outlet with Overflow and Cover

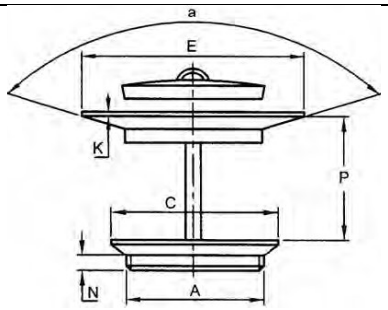


Fig. 49 Waste Outlet with Plug

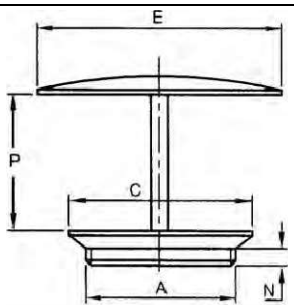


Fig. 50 Waste Outlet with Grill

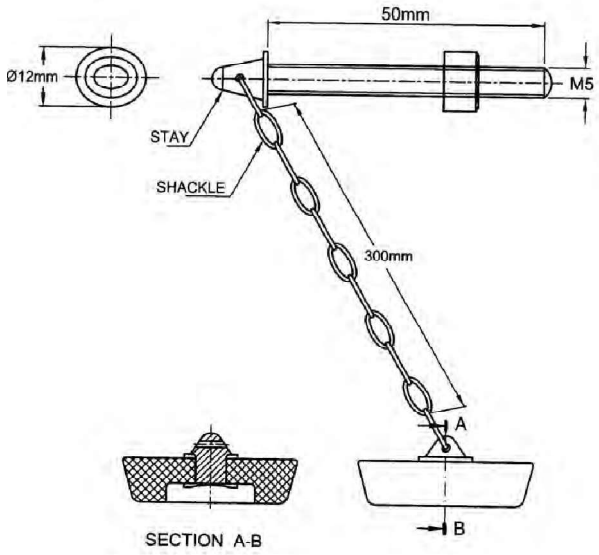


Fig. 51 Details of Waste Plug and Chain with Stay for Wash Basin and Sink

(Ref. Table 2 & Table 3 of IS 2963)

S. No.	Particulars	Dimension (in mm)		
		For Wash Basin (Ref. Fig. 45,46,47,48)	For Sink (Nominal Size) (Ref. Fig. 45,46,49,50)	
			40	50
i)	Fixing angle, *a*	110° *Min*	130° *Min*	130° *Min*
ii)	Body thread, *A*	G 1¼B	G 1 1/2 B	G2 B
iii)	Back nut thread, *B*	G 1¼	G 1 1/2	G2
iv)	Flange diameter of back nut, *C*	60 *Min,*	65 *Min*	80 *Min*
v)	Flange diameter of body, *E*	60 *Min,* 63 *Max*	67 *Min,* 70 *Max*	80 *Min,* 85 *Max*
vi)	Height of hexagon, *G*	5 *Min*	5 *Min*	5 *Min*
vii)	Height of un-threaded portion, *H*	36 *Max*	42 *Max*	42 *Max*
viii)	Height of un-threaded portion, *J*	12 *Max*	15 *Max*	15 *Max*
ix)	Thickness of flange, *K*	1 *Max*	1 *Max*	1 *Max*
x)	Height, *L*	70 *Min*	90 *Min*	90 *Min*
xi)	Height, *M*	50 *Min*	70 *Min*	70 *Min*
xii)	Length of thread for tightening connecting nut, *N*	6.5 *Min*	6.5 *Min*	6.5 *Min*
xiii)	Area of each slot, *O*	300 mm² *Min*	400 mm² *Min*	400 mm² *Min*
xiv)	Clamping height of waste outlet, *P*	-	66 *Max*	66 *Max*

- Waste fittings should in all respects be sound, free from laps, blow holes, pitting and other manufacturing defects. External and internal surface should be clean and smooth.
- The outlet connection threads shall be pipe threads conforming to IS 2643.
- The waste plug shall be made of rubber of durable quality having sufficient chemical resistance to resist normal disinfectants used in cleaning wash basin and sinks.
- The depth and thickness of the plug shall be such as to provide and maintain required rigidity and water tightness.

- The waste plug shall have a loose shackle which provides a suitable anchor for the plug chain.
- Waste plug with chain shall conform to the values specified with Fig. 51.
- Waste fitting for wash basin should be of nominal size. Waste fitting for sink should be of nominal size 40 and 50.
- Except where a lesser thickness is specified, the fittings should have a minimum thickness of 1.5 mm.
- All waste fittings should be capable of complying with test as follows:
  - *Load Test:* The complete assembly of waste plug and chain with stay should be capable of withstanding a load of not less than 200 N (20 g) without visible deformation.
  - *Hydraulic Properties:* This test consists of determining the flow rate of water with a constant pressure head. The value of flow rate should not be less than 0.6 litres.
- Each fitting or plug should be legibly marked on any portion with the a) Manufacturer's name or trade-mark; and b) Batch No./Date of manufacture.

***

REFERENCES

S. No.	Description
1.	*IS 774 - Ceramic (Vitreous China) Flushing Cisterns for Water Closets and Urinals-Specification*
2.	*IS 2548-1 Plastic Seats and Covers for Water Closets-Specification (Thermoset Seats and Covers)*
3.	*IS 2548-2 Plastic Seats and Covers for Water Closets-Specification (Thermoplastic Seats and Covers)*
4.	*IS 2556-1 Vitreous China Sanitary Appliances - Specification - General Requirements*
5.	*IS 2556-2 Vitreous Sanitary Appliances (Vitreous China) - Specification - Specific Requirements of Washdown Water Closets*
6.	*IS 2556-3 Vitreous Sanitary Appliances (Vitreous China) – Specification - Specific Requirements of Squatting Pans*
7.	*IS 2556-4 Vitreous Sanitary Appliances (Vitreous China) – Specification - Specific Requirements of Wash Basins*
8.	*IS 2556-5 Vitreous Sanitary Appliances (Vitreous China) - Specification - Specific Requirements of Laboratory Sinks*
9.	*IS 2556-7 Vitreous Sanitary Appliances (Vitreous China) - Specification - Specific Requirements of Accessories For Sanitary Appliances*
10.	*IS 2556-8 Vitreous China Sanitary Appliances - Specification - Specific Requirements of Close-Coupled and One-Piece Pedestal Washdown and Syphonic Water Closets*
11.	*IS 2556-14 Vitreous Sanitary Appliances (Vitreous China) - Specification - Specific Requirements of Integrated Squatting Pans*
12.	*IS 2556-15 Vitreous Sanitary Appliances (Vitreous China) – Specification - Specific Requirements of Universal Water Closets*
13.	*IS 2556-16 Vitreous Sanitary Appliances (Vitreous China) – Specification - Specific Requirements of Wash Down Wall Mounted Water Closets*
14.	*IS 2963 Copper Alloy Waste Fittings And Waste Plug For Wash Basin And Sinks - Specification*
15.	*IS 5219 Cast Copper Alloy Traps - Specification*
16.	*IS 7231 Plastic Flushing Cisterns for Water Closets and Urinals - Specification*
17.	*IS 13983 Stainless Steel Sinks For Domestic Purposes - Specification*
18.	*Handbook on Water Supply and Drainage (SP 35)*
19.	*Plumbing And Pipe Line Work (IRICEN)*

NOTES

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