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SANITARY FITTINGS

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CAMTECH/2011/C/SANITARY FITTINGS/1.0
uoEcj & 2011
November – 2011

अआसं RDS रेल अग्रदूत Transforming Railways

An ISO 9001:2000 Certified Organisation

Excellence In Maintenance

Indian Railways
Centre for Advanced Maintenance Technology

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SANITARY FITTINGS

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Foreword

Sanitary fittings are provided in all types of buildings and their uses are becoming a common need to maintain hygienic conditions within the premises.

The booklet prepared by CAMTECH incorporates various kinds of fittings generally adopted to keep the house drainage and sewerage system in good condition.

It is expected that this booklet will be quite helpful to civil engineering personnel of Indian Railways engaged in this activity.

CAMTECH/GWALIOR ***Peeyoosh Gupta***
DATE: 15.11.2011 ***Executive Director In-charge***

Hkfedk

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Preface

Indian Railways is a big organisation having large assets of civil engineering structures and buildings. In buildings, various kinds of sanitary fittings are provided, not only for comfort and convenience, but also from considerations of health and cleanliness.

Sanitary fittings made of fire clay are quite strong and tough and suitable for rough use in lavatory blocks at public places, and that of earthenware and chinaware are impervious, light, elegant and aesthetically sound and usually provided in residential buildings. These fittings are in the form of water closets, bath tubs, bidets, wash basins, sinks, etc.

This booklet is prepared with the objective to provide informative technical details on *'Sanitary Fittings'* for the guidance of civil engineering personnel involved in maintenance work. This booklet does not supersede any existing instructions from Railway Board, RDSO & Zonal Railways and the provisions of IRWM, BIS codes & reports on the subject.

This booklet is not statutory and contents are only for the purpose of guidance. Most of the data & information mentioned herein are available in some form or the other in various books and other printed matter and at Internet. For more in-depth information, the relevant codes and reports on the subject may be referred before final implementation of any technique/ or method described in this booklet.

We welcome any suggestions from readers for further improvement.

CAMTECH/GWALIOR ***S. K. Saxena***
DATE: 02.11.2011 ***Dy. Director/Civil***

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ISSUE OF CORRECTION SLIPS

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

CAMTECH/2011/C/SANITARY FITTINGS/1.0/CS. # XX date .....

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

CORRECTION SLIPS ISSUED

Sr. No. of C.Slip	Date of issue	Page no. and Item No. modified	Remarks

1.0 ifjp;/ Introduction

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*."

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 are generally made from vitreous chinaware and glazed fire clay sanitary 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.

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.

2.0 lfuVjh o;j/ Sanitaryware

A generic term used to describe items which traditionally were made from pottery i.e. WC's, Washbasins and Bidets.

2.1 i;Dr lkexh/ Materials Used

- *Vitreous China*: It is made from a mixture of fired white clays and finely ground minerals and is the most common material used for the manufacture of WC's, wash basins (wall hung, pedestal and hand rinse), bidets and urinal bowls. Exposed surfaces are coated with an impervious acid and alkali resistant non-crazing vitreous glaze usually white.
- *Fireclay*: An older technology traditionally used when very heavy duty wares such as shower trays, sinks, slab urinals, hospital sanitary-ware, medical sinks and heavy duty WC's and basins is required.
- *Acrylic/Resin*: Acrylic baths, bath panels and wash basins manufactured in this material are warm to the touch, shapely and targeted at the domestic market. They will not rust or corrode but can be damaged by cigarette burns and some chemicals.

Manufacturing process

Acrylic sheet with an original thickness usually between 3mm to 10mm is heated until it becomes soft. The sheet is then placed over an aluminium mould, in the shape of the final product, and the air below

extracted. The pliable acrylic is sucked into the shape of the mould and the product is formed. This is called 'vacuum forming'.

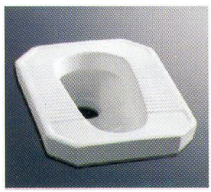


Acrylic sheet can be delicate and when used as a bath it needs to be strengthened. The back of the acrylic is covered with glass reinforced polyester (GRP). Then a timber baseboard and a wooden or steel top frame are applied. Finally the bath is drilled for the waste, overflow and grips and the packaged leg-set included prior to despatch to the customer. Acrylic products are versatile and modern in design. They suit a variety of budgets and style preferences. Installation is relatively easy owing to their lighter weight.

- *Stainless Steel*: A wide variety of stainless steel products such as inset and wall hung wash basins, bucket sinks, WC's and urinals generally used in hospitals and care homes, where the hygienic properties of stainless steel in terms of ease of cleaning is required

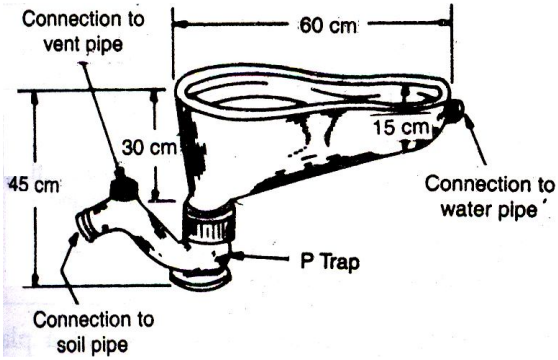
3.0 okVj Dyksts/ Water Closet

A soil appliance classified as ordinary or wash-down type and the siphonic type is designed to receive human excreta directly from the user and is connected to the soil pipe by means of a trap. The following varieties of water-closets are in common use.



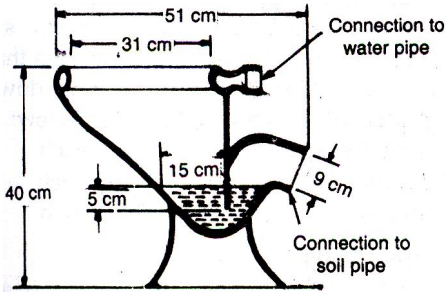
3.1 LDofVx vFkok Hkkjrh; idkj/ Squatting or Indian Type, usually made of vitreous china clay is available in the market in the patterns such as Long pattern, Orissa pattern (preferred in a house)

and integrated type where the squatting pan and trap are made integrally. Glass reinforced polyester (GRP) squatting pans are also being manufactured and can be installed with ease.



The pan is provided with an integral flushing rim of suitable type. The inside of the bottom of the pan should have sufficient slope towards the outlet for quick disposal during flushing. The pan is connected to the flushing cistern by means of flushing pipe. The top of the trap is connected to the anti-siphon or vent pipe.

3.2 ok'k Mkmu vFkok if'peh idkj/ Wash Down or Western Type WC Seat, an alternate to the squatting pan, is most popular and commonly used in high class buildings or in luxury homes and quite convenient for the aged persons.





It is provided with a wide flushing rim and a trap normally available in one piece construction with an inlet or supply horn for connecting to the flushing pipe. It may be provided with P and S trap as desired. These types of water closets require less space than

squatting pattern type and can be flushed by independent cisterns which may be installed either at high or low level or be of a single unit having both the seat and the cistern.

3.3 lkbQkfud ok'k Mkmu idkj/ Siphonic Wash Down Type (SP 35:1987 - Handbook on Water Supply and Drainage), an excellent fitting used in siphonic flushing cisterns, in which the pressure of the atmosphere is utilized to assist the cleaning of sanitary fittings. Atmospheric pressure permits the use of water seals of greater depth in siphonic closets than as practicable in fittings which depend entirely upon the flushing power of water delivered from an ordinary flushing cistern.

A "*true siphonic water closet*" can be easily identified by the noise it makes. If it can be heard to suck air down the drain at the end of a flush, then it is a true siphonic water closet. If not, then it is a non-siphoning toilet. Broadly there are two types of siphonic water closet.

- One type is directly dependent upon the actual flushing force of the discharge from the cistern for its siphonic action in the basin provided with 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.

- In the other the siphonic action is set up indirectly by means of an injector arranged in the upper portion of the flushing pipe

provided with double trap pattern, the first trap being an 'S' one and the second trap being a 'P' one. In this pattern 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.

Note: IS: 2556 (Part 8)-1973 lays down the specific requirements of siphonic wash down water-closets of vitreous china for the two patterns. The depth of seal for single trap and for each seal in the case of double trap shall not be less than 50 mm.

3.4 ;fuoly ;k vkX;-Hkkjrh; idkj/ Universal or Anglo-Indian Type of water closet is suitable both as a squatting pan of the Indian type or as a sitting pan of the European type. The top of the pan of the wash-down or European type is flared out to provide for the foot rests when used as the Indian type. For use as the European type, the seat hinged to the closet structure can be turned on to rest over the foot rests. A cover is also hinged to closet structure as in the case of the European type for covering the pan, if so desired.

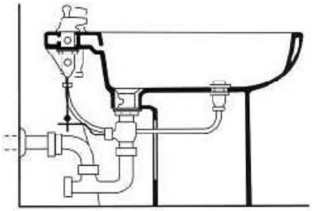


3.5 Nyd fld/ Slop Sinks are hopper-shaped sinks with a flushing rim and outlet similar to a water-closet pan which is used

for the reception and discharge of excreta collected in bed pans of patients. They should be provided with siphonic flushing cisterns or flushing valves in the same way as water-closets and connected to the soil pipe. In hospitals and similar institutions, slop sinks are provided with both hot and cold water supplies.



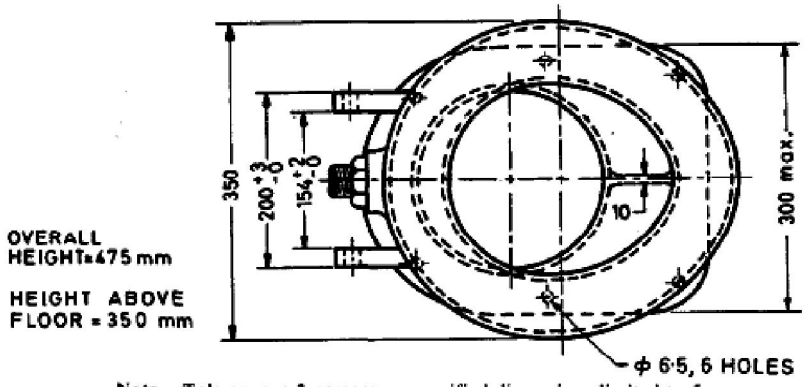
3.6 fctV/ Bidet is a sanitary fitting on which person sits for washing the excretory organs, especially after using the WC. It is classed as an ablution fitting and provided with hot and cold water supplies. Sometimes it is provided with a sitz jet or any submerged inlet.



The branch supply pipe which is connected to the submerged inlet should join the main supply service not at the level of the fitting itself but at a point not less than 1.6 m above that level. The passage of water by siphonage from the fitting back into the supply service would then require a negative pressure equal to 1.8 m head of water which is unlikely to be obtained. Where this arrangement is not practicable, the fitting of a 'non-return', 'back pressure' or 'reflux' valve in the branch supply pipe, at a point immediately above the fitting, may afford adequate protection. A secondary but important use of the bidet is as a footbath. They can be Floor Standing, Wall Hung or of Back to Wall design.

3.7 bueYM dkLV vk;ju jYo Vkbi okVj Dyktv/ Enameled Cast Iron Railway Type Water-Closet is one piece construction generally used in the coaching stock of the Indian Railways. Bottom flange shall not be less than 10 mm thick, and shall be provided with not less than 6 holes of 6.5 mm diameter. Inlet or supply horn shall

consist of 20 mm diameter threaded nipple fixed to threaded hole cast in the body of the water-closet and secured by a check nut. Inlet shall protrude out at least by 25 mm.



Note—Tolerance ±3 percent on specified dimensions limited to 5 mm.

All dimensions in millimetres

3.8 Hkkjrh; jy d ,y ,p ch dkpk e fu;f=r fMLpkt Vk;yV fl LVe/ Controlled Discharge Toilet System in LHB Coaches of Indian Railways

LHB Coaches have both Oriental and European type of lavatories with controlled discharge toilet system that facilitates to avoid soiling of track in station and inhibited areas.

The toilet system is designed to operate with a pressurised water bowl wash that covers 100% of the toilet bowl area. Water consumption is only 2.5 litres per flush cycle for the Indian style toilet bowl and 1.5 litres for the European style toilet bowl. The waste is removed from the toilet bowl and transferred to a retention tank with a minimal amount of water. The waste is stored in to the retention tank until the two parameters are satisfied a) a

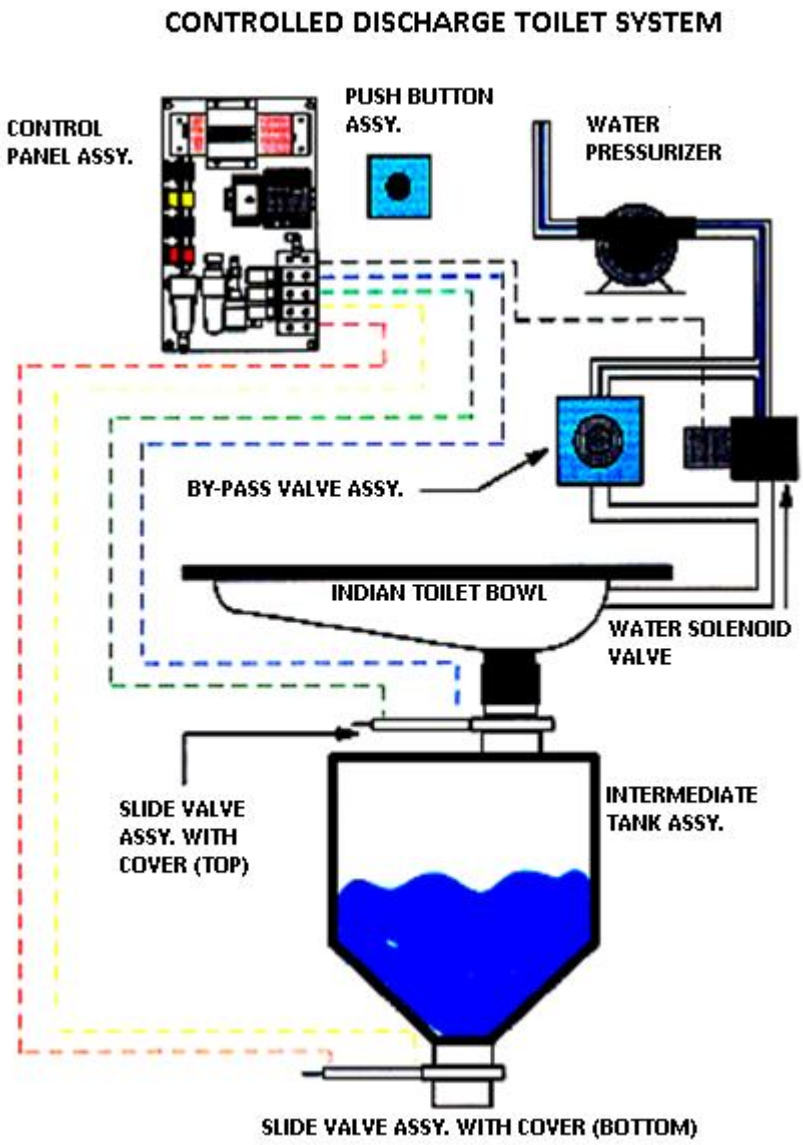
predetermined number of flush counts have been recorded and b) the train reached a minimum speed of above 30 kmph.

At a time, the above two parameters have been met, the retention tank discharge valve opens expelling the contents of the tank to the rail side, away from the railway stations and heavily populated areas. The valve remains open only for a small period of time (one minute or less) long enough to completely drain the retention tank, then closes and remains closed until the above mentioned parameters are again satisfied.

Both Indian and European style toilet system have been provided with a fail safe mode to enable use of toilet in the event of loss of air, loss of electricity or both. In case, loss of air and/or electricity occurs, the retention waste tank inlet slide valve will automatically revert to the open position, and remain in open position until air and electricity are restored. Tanks have a capacity of storage of material for fifteen flushes and needs to be emptied before it can be used further.



A push button style water bypass valve is provided on the interior toilet room wall so that water may be manually turned on by the passenger to supply a small amount of water to the toilet in an emergency situation. Water will flow in to the toilet bowl as long as the push button on the water bypass valve is depressed. When the push button is released the flow of water will automatically stop.


CONTROLLED DISCHARGE TOILET SYSTEM
CONTROL PANEL ASSY.
PUSH BUTTON ASSY.
WATER PRESSURIZER
BY-PASS VALVE ASSY.
INDIAN TOILET BOWL
WATER SOLENOID VALVE
SLIDE VALVE ASSY. WITH COVER (TOP)
INTERMEDIATE TANK ASSY.
SLIDE VALVE ASSY. WITH COVER (BOTTOM)

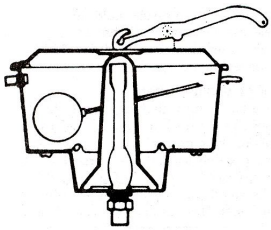
3.9 lhV doj/ Seat Covers are installed over the seats which have to match the dimensions of the seat below it. These covers help in the use of the seat and prevent any foul smell emanating out of the system when not in use. Plastic seats and covers for use with water closets generally made of phenolic plastics, polystyrene, urea formaldehyde or polypropylene shall withstand load of 1150 N at specified locations for 30 minutes without any damage or permanent distortion.



3.10 ty /kkou Vdh/ Flushing Cisterns are meant to flush or drain out the human waste from the toilets and urinals after use. These can either be operated manually or can run automatically. They can be installed at high levels and operated through a chain or at a low level and operated through a handle. These cisterns can be of cast iron, vitreous china, pressed steel or plastic. They are usually supported on cast iron brackets, embedded in the wall.



- **cy-Vkbi ty /kkou Vdh/ Bell-type Flushing Cistern:** The bell is kept over the outlet pipe, the inlet end of which is slightly above the water level. When the chain is pulled the bell is lifted causing water to spill over the outlet pipe and starting the siphonic action due to which the whole water rushes towards the outlet and flushes the water closet.



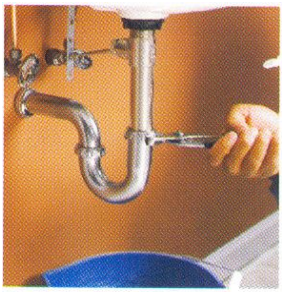
- **nkgjh ty /kkou Vdh/ Dual Flushing Cistern:** Due to drastic cuts in water supply, there is a need to economise the water consumption. CBRI, Roorkee has developed dual flushing cistern, which allows fractional or full discharge of cistern at a time. To operate for fractional discharge, the chain is pulled and left while for full discharge, the chain is pulled and held in that position until the full capacity is discharged.

  The existing bell-type flushing (siphonic type) cistern can be converted into dual flushing cistern by making a provision to break the vacuum created at predetermined level of water. The conversion is easy and can be done by average plumber by inserting a 6 mm dia. rubber tube in the bell of cistern at a predetermined height. The other end of the rubber tube is connected to a plastic pipe with a stopcock at the end to control entry of air. The cistern gives full discharge with stopcock closed and fractional discharge with stopcock open.

- **e=ky;k d fy, Lopkfyr ty /kkou Vdh/ Automatic Flushing Cistern for Urinals:** CBRI, Roorkee has developed it for urinals. This eliminates the use of copper fittings which are presently provided with public urinals cisterns. The new fittings consist of a U-tube made of plastic pipe. When the water level in the cistern reaches the level of the bend, the siphonic action takes place and the water present in the cistern rushes to the urinals. The material used is indigenous and saves the cost of copper fitting which is about 80%. It can be cheaply manufactured and easily fixed in the position.

3.11 Vil/ Traps are essential fittings provided in a drainage system in a house or any other type of building to prevent the entry

of foul gases into the house from the sewer or drain. This is achieved by providing a double bend pipe for retaining water, which serves as a seal.



A number of different types of traps are available in the market for installation at different sections of the house plumbing system. The most common ones used in a house are the P and S shaped trap, called the P trap and S trap respectively. They are so shaped so to be perfectly self condensing. They are of uniform diameter throughout, have no nooks or corners to accumulate undesired matter.

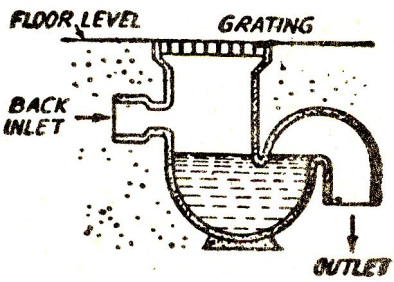
Trap can broadly be classified as under, depending upon the use and location:

a. **¶ykj Vi ;k ugkuh Vi/ Floor Trap or Nahani Trap:** Floor trap or Nahani trap are provided in floors to collect the used water from the floors, bathrooms, kitchen, etc. They are provided with a removable grating at the top.

- It should be checked for cracks, burr internal shape before fixing on site.
- The connector is used to connect the Nahani trap to the vertical stack.
- Mouth of trap should be protected with small gummy bag piece and then a coat of Plaster of Paris should be applied to avoid choke up during the work activities.

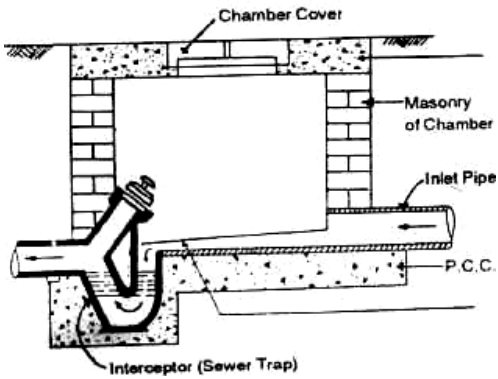
b. **xyh Vi/ Gully Trap:** Gully trap is a deep seal trap and is provided on the external face of the wall for disconnecting the

waste water coming from the kitchen, bath, wash basin and floor from the main drainage system. Normally 15 cm x 15 cm size Gully trap made of stoneware clay is used.



- Used between sanitary fittings and the building drain.
- Used for admitting surface water from yard and paved walks in to the drain.
- A gully trap will disconnect a building from a building drain by means of a 75 mm water seal depth and thus prevent sewage gases entering the building.
- The top of the gully trap must be sufficiently deep to prevent splashing over.
- If planned carefully, sink and bath wastes could be discharged into one gully trap.
- Gully trap is so fixed that its chamber top is above ground level.

c. **bVjIflVx Vi/ Intercepting Trap:** Intercepting traps are provided at the junction of the house drain and the street sewer for preventing the foul smell of the street sewer into the house drain.



- Stoneware intercepting sewer trap is used before a building drain

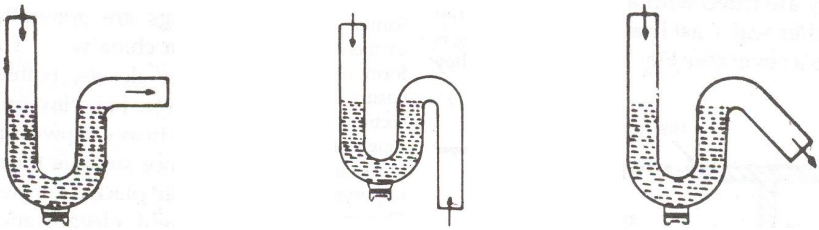
is connected to public sewer.

- This trap has a water seal of about 10 cm. The purpose of this trap is to prevent of objectionable, poisonous and harmful gases from public sewers of building.

d. **xhl Vi vkj flYV Vi/ Grease Trap and Silt Trap:** Grease traps and silt traps are normally not provided in the house drainage system. They are provided where large amounts of the grease or silt expected to flow into the street sewer.

e. **'ih' ;k ',l' Vi/ 'P' or 'S' Trap** is provided for discharging the soil waste from WC toilet maintaining constant water seal to avoid entry of foul gases.

- Trap to be checked for cracks, burr, internal and base shape.
- Trap should be fixed after adjusting the height of W.C. pan or commode with respect to F.F.L.
- Trap should be protected with small gunny bag piece and then a coat of Plaster of Paris should be applied to avoid choke up due to other work activities.



P-Trap S-Trap Q-Trap

Fig. - Traps for Long Pattern and Orissa Pattern Pans

Note: Traditionally WC's were manufactured with 'P' traps or 'S' traps formed as an integral part of the casting. From a cost and logistics viewpoint this was expensive so today nearly all WC's have a simple

horizontal outlet and the connection to the drains is made by plastic connectors available in a number of configurations which replicate the 'P' and 'S' configurations.

3.12 ikbik l nf"kr ok; fudkl h/ Venting of Pipes: A proper vent pipe has to be provided for the trap under fixtures or otherwise the water seal is liable to be siphoned off. The vent pipe also serves the purpose of letting the foul smell out of the house.

All types of pipe, including wrought, cast, and galvanised iron, lead, brass, plastic, and copper, have been used for vents, depending on the pipe used in other parts of the system, the coat involved and the type of sewage handled by the drainage system. As certain kinds of sewage amid different gases, they may corrode certain metals more readily than others.

4.0 ok'k cf l u/ Wash Basin



As the name suggests, these are provided in a house for casual washing of hands and face etc. and also for the purpose of carrying out morning chores of brushing shaving etc.



These can be installed as an individual unit having a pipe to drain out the water or as a combined unit having both the basin and the pedestal. They are usually made of vitreous china and are commonly available in various designs and colours. One wash basin requires following fittings and materials:

- Wash Basin – 1 no.
- Waste coupling – 1 no.
- Side bracket – 2 nos.
- 75 mm screws/nails.
- Pillar tap – 2 nos. (one for hot and one for cold water)
- Stop valve – 2 nos.
- C.P. bottle trap – 1 no.
- P.V.C. inlet 15 mm – 2 nos.
- Waste pipe – 1 no.

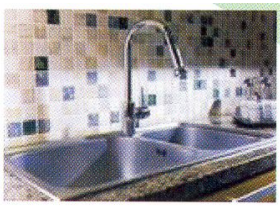


The various patterns and sizes are as follows:

Pattern	Size in mm
1. Flat back wash basin (surgeon's basin)	660 X 460
2. Flat back wash basin with two tap holes	630 X 450 550 X 400
3. Flat back wash basin with single tap hole	630 X 450 550 X 400 450 X 300
4. Angle back wash basin	600 X 480 400 X 400

5.0 fdpu fld/ Kitchen Sink

It is an essential feature of a house as it not only helps in the cleaning of utensils, but also serves as part storage of the used utensils. It thereby gives more working space on the kitchen platform. These sinks are available in



different sizes and shapes to suit the working platform and easy workability in the kitchen. The most commonly used sinks are of stainless steel, which are easy to install and can be cleaned easily.

A full threaded coupling is used for outlet which is connected to bottle trap or P.V.C. pipe. It is fixed at height of 585 mm above the finish floor level. It is required following fittings and material:

- Sink – 1 no.
- Waste coupling full threaded 32 mm – 1 no.
- P.V.C waste pipe 32 mm – 1 no.
- 15 mm C.P. bib tap (long arm) – 1 no.

6.0 ok'k cflu ,o fld d fy, dkLV vk;ju cdV ,o vk/kkj/ Cast Iron Brackets and Supports for Wash Basin and Sink

- Brackets for building into wall shall include a lugged portion, and a flange at bottom to indicate wall line. Lugged portion shall be slotted.
- Brackets for screwing to wall shall have back fixing plate.
- Supports with horizontal strap and supporting leg or cast iron brackets with supporting leg shall be arranged for wall fixing.
- Leg support shall be 15 mm bore steel tube or casting and shall terminate in a flange for fixing to floor.
- Strap or bracket and supporting leg shall be made separately.

7.0 ckFk VCk/ Bath Tub

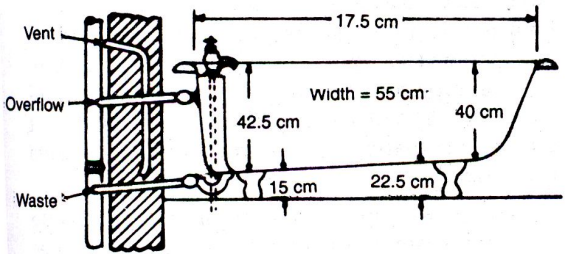
This can be provided in houses where there is sufficient area available in the bath rooms. They can be made out of galvanized sheets, stainless steel or cast iron stoneware, porcelain, PVC, etc.

Any of these may be used, the selection depending chiefly upon their cost and upon the personal preference of house owners. Porcelain bath tubs, although perfectly non-absorbent, clean and attractive in appearance are not much in use, being very expensive and heavy.



a. It is provided with hot and cold water connection and inlet usually of 15 mm dia. each and outlet of 32 mm dia. connected to waste pipe.

b. The waste pipe is connected to main vertical stack through a trap, so as to prevent the entry of foul gases in the bath-tub.



c. It is also provided with an overflow pipe to drain the excess water.

7.1 vkoj¶yk ikbi/ Overflow Pipe is customary to be provided in bath tubs, wash bowls, and pantry sinks, in order to prevent flooding of floors, if the outlet of any of the fixtures gets closed or a tap in a fixture is left running. Since overflow pipes are seldom flushed they are liable to become foul with soap etc. emitting unpleasant odours over a period of time.

8.0 ;fjuy/ Urinal

Urinals are soil appliances and connected to a soil pipe after a suitable trap. The urinals shall be of one of the following patterns:

8.1 ckmy Vkbi / Bowl Type

- One piece construction with integral flushing box rim with minimum of 12 holes.
- Not less than 2 fixing holes on each side of minimum diameter of 6.5 mm.
- When installed there shall be no liquid left over in the bottom of the pan of the urinal after flushing.

a) **Flat Back -** 430 mm, Min X 260 mm, Min X 350 mm, Min

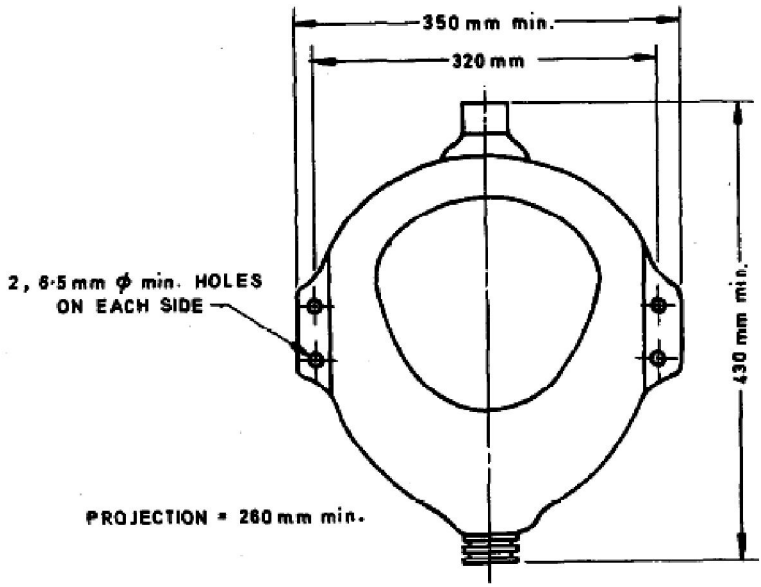


Fig. - Bowl Pattern Urinal (Flat Back)

b) **Angle Back -** 340 mm X 410 mm, Min X 265 mm, Min

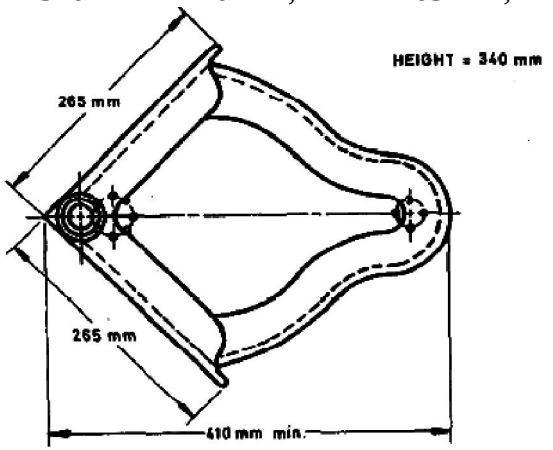


Fig. - Bowl Pattern Urinal (Angle Back)

8.2 gkQ LVky ;fjuy/ Half Stall Urinal

These are one piece construction with or without integral flushing box rim. Those without such rim shall have ridges in sides of interior of bowl to divert water towards front lip. Where specified, the waste fittings shall be glazed vitreous ware.

a) **Flat Back** – 580X380X350 mm, Min 450X350X300 mm, Min

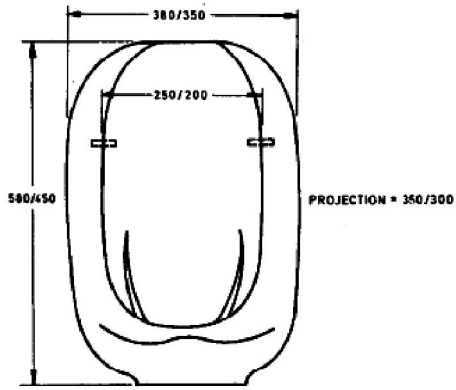
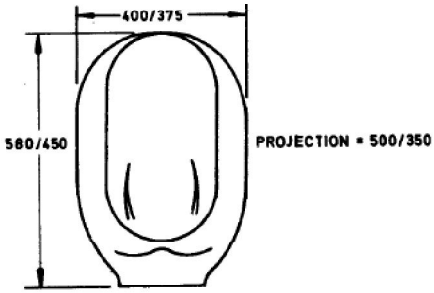


Fig. - Half Stall Flat Back Urinal

All dimensions in millimetres.

b) **Angle Back** -
580X400X500 mm, Min
450x 375 x 350 mm, Min



All dimensions in millimetres.

Fig. - Half Stall Angle Back Urinal

8.3 LDofVx lyV Vkbi ;fjuy/ Squatting Plate Type Urinal is a one piece construction generally used by women. It is having an integral longitudinal flushing pipe of suitable type which may be connected to the flush pipe. The integral flushing type shall be connected to the sump by three 13 mm dia holes.



9.0 lyfEcx vki'kU l/ Plumbing Operations

9.1 cdVl] gDl] bR;kfn dh fQfDlx/ Fixing of brackets, hooks, etc.: The brackets of wash basins, sinks, flushing cisterns, geysers, etc. are fixed in the walls at proper positions. Generally the holes are made in the walls and after placing the brackets at proper level and positions in the holes, they are filled with rich 1:4 cement sand mortar. The line of the water pipe is marked on the wall or floor at the proper place and the pipe hooks are inserted in the walls with their ends sufficiently projected from the walls for placing of water pipes in proper position.

9.2 luVjh fQfVXl ;k midj.kk dh fQfDlx/ Fixing of Sanitary Appliances or Fittings: The sanitary fittings are fixed on the brackets, when the joints of the brackets with walls are cured.

- For fixing of *Indian W.C.*, first of all the bottom trap is fixed in position and connected with the outlet earthenware or A.C. pipe. The W.C. seat is fixed over the trap. The joint between the seat and the trap is filled with rich cement mortar properly. Now the space around the trap and seat is filled with concrete of suitable mix up to required height, over which the flooring is made. The foot rests are fixed on the floor at proper place. The flushing pipe connections are made to the seat from the flushing cistern before laying of floor.
- The *Western W.C.* is laid and fixed on the floor, but its trap and the outlet pipe are laid before laying of floor. Therefore, care should be taken while fixing these types of W.C.
- *Urinals* are fixed on the wooden pegs fixed in the walls at proper heights. These are fixed by means of screws to the pegs.
- The high level *Flushing Cisterns* are fixed on the steel brackets, whereas the low level cisterns are fixed on the wooden pegs or brackets as the case may be.
- The *Bath Tub* is directly laid on floor. Sometimes it is embedded in masonry work while glazed tiles or terrazzo finish is provided over it.
- *Kitchen Sink*, *Sinks* and *Geysers* are fixed on the steel brackets fixed in the walls. The kitchen sink drain board is supported on one side on the sink and on the other side on the steel bracket.
- All the *Miscellaneous Fittings* such as mirror, tooth brush holder, soap tray, towel hooks, sanitary paper reel, towel rod, etc. are all on the wooden pegs provided at the proper height and place.

9.3 fofHkUu luVjh fQfVXl dk tkMuk/ Connections to various Sanitary Fittings: After laying the pipeline, the connections to the various sanitary appliances are given. In case of washbasins, kitchen sinks, urinal etc. lead or plastic connectors are used for giving connections. All the joints should be made water-tight by wrapping jute yarn soaked in white lead paint.

9.4 vif'k"V ty d lxg d fy, ikbi ykbuk dk fcNkuk/ Laying of Pipe lines for Collection of Waste Water: A.C. or stoneware or earthen ware pipes are used for the collection of waste water. Care should be taken to take the foul water i.e. from water closets and urinals in a separate pipeline. The un-foul water from wash basins, kitchen sinks, bath tubs, bathroom, etc. is taken in separate set of pipe line, because soapy water may kill all the bacteria responsible for the treatment of sewage in the septic tanks. But nowadays single stack system is also used in which all types of waste water is collected and taken in one set of pipe lines.

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REFERENCES

Sr. No.	Description
1.	**Handbook on Water Supply and Drainage**, BIS publication SP 35:1987
2.	**Indian Railways Works Manual – 2000 (Internet Version), embodying all advanced correction slips up to no. 10 dated 17.02.05,** published by Ministry of Railways, Govt. of India.
3.	Aam Aadmi Series–11, **House Building Digest (Sanitary and Drainage)** published by Building Materials and Technology Promotion Council (BMTPC), Ministry of Housing and Urban Poverty Alleviation, Govt. of India, New Delhi.
4.	**Introduction Handbook on LHB Coaches**, published by CAMTECH, Gwalior.

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OUR OBJECTIVE

To upgrade Maintenance Technologies and Methodologies and achieve improvement in Productivity and Performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability and Utilisation.

If you have any suggestion & any specific comments, please write to us:

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