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GUIDELINES FOR EXECUTION OF SANITARY WORKS

PWD PUBLIC HEALTH
(GOVT. WORKS) BRANCH
GOVT. OF PUNJAB

INDEX

FOREWORD

Provision of sanitary fittings in Govt. buildings is one of the very important functions of the P.W.D. Public Health Branch and the department has been performing this function since decades. Various B.I.S. Codes, Punjab P.W.D. Specifications and certain departmental circulars provide all the required guidance regarding different aspects of sanitary work in buildings. However the selection, location & installation of sanitary fittings in the field leaves much to be desired. It is atleast partly due to the reason that all the books & circulars are not available with the departmental officials especially at the lower levels who actually execute the work in the field. There is, therefore, a great need for consolidating all the relevant matter regarding sanitary works in one volume.

This booklet has been prepared to fulfil this longstanding need. It gives all important guidelines for execution of sanitary works. It has been divided into three parts. *The Ist part deals with the selection & installation of sanitary fixtures & fittings & general precautions to be observed while executing sanitary works. The 2nd part pertains to the testing of pipe-lines, while in the 3rd part, the type & scale of sanitary fixtures/fittings to be provided in different types of buildings and flooring & internal finishing of toilets & kitchens* standardised in consultation with the Chief Architect Punjab have been specified.

This booklet is the first in the series of such departmental handbooks proposed to be brought out in the near future pertaining to estate water supply, sewerage & drainage, fire fighting, air-conditioning, hospital engineering service and maintenance manuals etc. It is therefore titled as Volume 1, First Edition. *Revised Editions of this booklet shall also be brought out as and when necessary to incorporate any suggestions received from the users and eminent*

engineers working in the field and new developments from time to time.

I appreciate the hard work put in by Er. Jatinder Singh, Superintending Engineer who not only prepared the draft for these guide-lines but also gave them the present shape. He was ably assisted by Er. S.S. Ubhi, Executive Engincer and Er. Mohammed Ishfaq, Sub Divisional Engineer and Er. S.R. Aggarwal, Sub Divisional Engineer.

I am sanguine that the guide-lines given in the booklet shall be meticulously followed in the field which will improve the standard of the work & enhance the reputation of the department & its Engineers.

Dated: January 1, 1995

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Chief Engineer, Punjab,
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Patiala.

PART - I

SELECTION AND INSTALLATION OF SANITARY FIXTURES

PWD PUBLIC HEALTH (GOVT. WORKS) BRANCH

GOVT. OF PUNJAB

1995

PART - I

GUIDELINES FOR SELECTION AND INSTALLATION OF SANITARY FITTINGS AND GENERAL PRECAUTIONS TO BE FOLLOWED WHILE EXECUTING SANITARY WORKS

The sanitary fittings and appliances include bath room fittings, Showers, bidets and accessories fittings, wash basin and fittings and towel rails, drinking fountains, closets, cistern and fittings, kitchen sinks and laboratory sinks, urinals and fittings and hospitals appliances etc.

All the sanitary appliances and their components should be durable, impervious, corrosion resisting and have a smooth surface which can be easily cleaned. All materials shall conform to the relevant Indian Standards where they exist, and shall be I.S.I. marked otherwise they shall be of the best quality and workmanship & of makes approved by the deptt.

The details of various fittings and fixtures and their installations is given as under :-

1. WATER CLOSET (W.C.), CISTERN AND FITTINGS

1.1 Indian type/Orissa type water closet

The Indian W.C./O.W.C. shall consist of squatting pan, cistern, flush pipe, overflow pipe, P-trap, ablution tap.

1.1.1 Squatting Pan

China ware vitreous pan shall conform to IS 2556/Part-III-1981 & shall bear the I.S.I. mark.

1.1.2 Flushing Cistern

a) High Level Cistern

Generally high level valveless syphonic type C.I. flushing cistern (Pull and let go type) shall be provided conforming to IS 774-1971 duly I.S.I. marked with a discharge capacity of 10 litres.

i. The cistern shall be supported on brackets of M.S. angle iron 32x32x5mm size firmly embedded in the wall. The height of brackets from the floor shall not be less than 1.80 metres.

ii. Nuts and bolts for attaching cistern lid with shell must be provided. The inside of the cistern and its internal fittings shall be painted with approved black bitumestick paint over a priming coat of redoxide and the outside of the cistern, brackets, overflow and flush pipe etc. shall be painted with priming coat of redoxide and finished with two coats of white enamel paint.

iii. Cistern shall be connected with water supply by 15 mm i/d pipe through brass stop cock and P.V.C. connection from storage tank. Water supply point shall be 30 cm. higher from the top of the cistern brackets and 37.5 cm away from centre line of the cistern.

b) Low level cistern/flush cocks for I.W.C./O.W.C.

Generally I.W.C. or O.W.C. shall be connected with high level cistern only. However under some special circumstances mentioned below low level cistern of flush valve/flush cocks shall be provided.

i. Low level cistern shall be provided for Orissa W.C. only. This may be provided in the attached toilet for Officers, residences of officers. Height of the brackets for installation of low level cistern shall be 61 cm above floor level and water supply point

shall be at a height of 109 cm above floor level, 40 cm away from the cistern.

It has been observed in the field that there is an acute problem of theft of cistern or its syphon, where the W.C.s are located outside the main buildings in Public Institutions. In all such cases flush cocks (railway type) shall be provided. The G.I. down pipe from the tank to flush cock will be G.I. medium class 32 mm i/d pipe.

1.1.3 Flush Pipe

The outlet flush pipe from the cistern shall be G.I. medium Class, which shall be connected to the W.C. Pan through G.I. bend by means of cement or putty joint. Flush pipe shall have nominal internal dia of 32 mm for high level cistern. It shall be fixed to the wall by using heavy duty holder bat clamps.

1.1.4 Overflow Pipe

20 mm G.I. medium class pipe shall be provided either outside the wall or in the chase in the back wall with the end elbow (with P.V.C. mosquito proof cap) at 15 cm above floor level. Height of the top elbow shall be 195 cm above floor level and 34 cm away from centre line of the cistern.

1.1.5 Trap

W.C. Pan shall be connected to 100 mm i/d H.C.I. P-trap having 50 mm water seal with Other specifications conforming to IS - 1729 & I.S.I. marked. The centre line of the H.C.I. P-trap shall be 30-33 cm away from the back finished wall and minimum 40 cm from the side wall in case of combined toilet. The joint between the pan and P-trap shall be made with cement sand mortor 1:1 and shall be leak proof.

1.1.6 Ablution Tap

Tap shall be provided at height of 20 to 30 cm above floor level and shall be 90-95 cm away from the back wall. It shall be fixed preferably on the left side of the pan. Self closing (antiwaste) tap should preferably be provided.

1.1.7 Fixing

The W.C. Pan shall be sunk into the floor. The floor shall be suitably sloped so that the waste water is drained into the pan. The pan shall be embedded in proper concrete base of minimum thickness of 7.5 cm in 1:2:4 mix. Proper care shall be taken that P.C.C. cushion is uniform without having any hollows between the concrete base and the pan.

1.2 European type Water closet (E.W.C.)

The E.W.C. shall be of wash down type of white vitreous china conforming to IS-2556 (Part-II) 1981 and shall be I.S.I. marked. It shall be with an intergral P or S trap having 50 mm deep water seal with or without Vent arm.

1.2.1 Seat and Cover

Seat and cover shall be made of material that will not absorb moisture preferably plastic seat and covers shall be used conforming to IS-2548 (Part I & II) 1983 & shall be I.S.I. marked.

1.2.2 Traps

P-trap E.W.C. shall be connected to 100 mm i/d H.C.I. collar fixed in the wall at an angle of 140 degree to the floor and centre of the collar shall be 18 cm from the floor level and projecting 33 cm from the wall.

S-trap E.W.C. shall be connected to 100 mm i/d H.C.I. Heel rest bend fixed in the floor, centre of heel rest bend shall be 33 cm away

from the back finished wall.

The E.W.C. shall be properly fixed in the floor with brass screws & rawl plugs.

1.2.3 Low level cistern

Generally china ware low level cistern is connected with E.W.C. It shall conform to IS - 774 - 1984. However, if plastic flushing cistern is provided it shall conform to IS - 7231 - 1984. In both cases, it should bear the I.S.I mark. Top of brackets shall be at the height of 57 cm from the floor level. Inlet water supply point shall be fixed at a height of 105 cm from the floor level and 40 cm away from the centre of cistern or centre of the heal rest bend. Cistern shall be connectred to the E.W.C. through a 40 mm i/d 90 degree flushing bend (made of C.P.Copper Alloy). This C.P. bend shall be jointed by means of Indian rubber adapter joint.

1.3 Syphonic Water Closet

The salient features of syphonic water closet are :-

i. High flushing capacity.

ii. Silence in action.

iii. Large water area.

Broadly there are two types of syphonic water closets :-

a) Single trap Syphonic W.C. with P-trap or S-trap

b) Double trap Syphonic W.C. with P-trap or S-trap

Syphonic water closets shall conform to IS - 2556 - (Part - B) 1985 & shall be I.S.I. marked. The flushing cistern shall be of low level type and shall conform to IS - 774 - 1984 & duly I.S.I. marked, discharge capacity of cistern shall not be less than 10 litres.

1.3.1 Fixing of S-trap syphonic W.C. (single & double trap.)

For W.C. attached with 10 litres capacity low down cistern, heal rest bend shall project 1.25 cm above floor level and centre of heal

rest bend shall be 7.5 cm away from the finished back wall, where as for W.C. attached with 12.5 litres capacity cistern the centre of the heal rest bend shall be 11 cm away from the back wall. The height of the water inlet point shall be at 105 cm from floor level

1.3.2. Fixing of P-trap Syphonic W.C.

Centre of H.C.I. collar shall be kept 11 cm above floor level and it shall be fixed at an angle of 140 degree to the floor. All other details shall remain same as per 1.3.1

1.3.3 Syphonic closet with flush valve

W.C. may be connected with flush valve instead of flushing cistern. It shall be connected with water supply from storage tank and shall be fixed at a height of 101 cm from floor level.

1.4 Universal or Anglo Indian Water Closet

Anglo Indian W.C. shall conform to IS - 2556 (Part-15) 1974 and shall bear the I.S.I. mark. For fixing S-trap to anglo Indian W.C., the centre of the heal rest bend shall be 17 cm away from the finished back wall and shall project 1.25 cm above floor level.

For P-trap anglo Indian W.C. height of centre of H.C.I. collar shall be 19 cm from floor level and shall be at 140 degree to the floor. Other specifications shall remain the same as per European water closet.

2. URINALS AND FITTINGS

2.1 Flat back - Lip type urinals

The urinal basin shall be flat back or angular with lipped front and of white vitreous conforming to IS - 2556 (Part - 6 Section (i)) - 1989 & duly I.S.I. marked.

2.1.2 Fixing

Urinal shall be fixed in position by means of wooden plugs properly embedded and screwed in the wall.

i. The height of urinal lip shall be 60 cm from the floor/platform level for adults.

ii. Clear distance between partitions shall be minimum 60 cm. Top of partitions shall be 137 cm above floor level/platfrom level. Chinaware partitions shall conform to IS - 2556 (Part-6 Section 4) 1974. Width of the partitions shall be 30 cm and length shall be 80 cm.

iii. Top of the cistern bracket shall be 191 cm above floor level and shall be placed actually above the centre of middle urinal (in case of three urinal set) Bracket shall be of M.S. angle iron of minimum 25x25x5 mm size.

iv. Each urinal shall be connected to 40 mm dia B-class G.I. pipe or P.V.C. pipe (2 kg per/cm^2) discharging into a channel or floor trap.

v. Joint between urinal basin and the flush pipe and waste pipe shall be made of putty or white lead mixed with chopped hemp.

2.1.3 Constructiondetails of platform

Where a range of urinals is to be provided, a platform 7.5 to 10 cm higher than the floor level and of width 67.5 cm should be constructed. Along side the wall china ware glazed channel 150 mm i/d half round shall be provided over 75 mm thick 1:2:4 P.C.C. base concrete. Platform shall be sloped towards the drain.

2.1.4. Flushing

Flushing of urinals shall be done by an automatic flushing cistern of a valveless syphon conforming to IS - 774 & duly I.S.I. marked. The cistern shall be connected to the urinal basin by means of G.I. flush pipe. Non automatic flushing cistern or push cock shall be provided to economize the use of water.

2.1.5 Capacity of flushing cistern

No. of urinals in a range	Capacity of cistern	Size of the flushpipe	
		Main	Distribution
1	5 litre	-	15 mm
2	10 litre	20 mm	15 mm
3	10 litre	25 mm	15 mm
4	Two nos of 5 litre cistern each connected to two urinals	20 mm	15 mm

2.2 SQUATTING PLATE URINALS

2.2.1 Description

Squatting plate urinals shall conform to IS - 2556 (Part - 6 section 3) - 1981 and shall bear I.S.I. mark. It shall consist of squatting plate, glazed china ware channel, automatic flushing cistern and flush pipe with fitting etc.

2.2.2. Fixing

The floor shall be suitably sunk to receive plate. Where floor is not sunk it shall be fixed on a raised platform. The top edge of a squatting plate should be flush with finished floor level. It should be embedded on a layer of 20 mm thick cement mortar 1:3 laid over a bed of 1:2:4 cement concrete, 7.50 cm thick. There shall be 150 mm i/d half round channel fixed in the floor in cement mortor 1:3 laid over 5.5 cm 1:2:4 cement concrete. The joint of the drains shall be flushed with white cement. There shall be 1.2 m high, 60 cm wide, 10 cm thick partition wall on either side. Exposed face of the wall shall be lined with glazed tiles.

2.2.3 Capacity of flushing cistern

No. of urinals in a range	Capacity of cistern	Size of the flushpipe	
		Main	Distribution
1	5 litre		20 mm
2	10 litre	25 mm	20 mm
3	12.5 litre	32 mm	20 mm
4	Two cistern of 10 litre capacity connected to each set of 2 urinals	As per two urinal range	

2.3 Large Flat back urinals

It shall consist of urinal (single or range) and automatic flushing cistern, C.P. brass standard flush pipes, C.P. brass spreader and C.I. trap with tail and outlet grating of C.P, brass. The capacity of automatic cistern shall be adopted as given under 2.1.4

2.4 Stall Urinals

The installation shall consist of stall urinal (single or range), an automatic flushing cistern, C.P. brass standard flush pipe, C.P. brass spreader and C.I. trap with tail and outlet grating of C.P. brass. The capacity of the flushing cistern and relevant size of flush pipes shall be as given below :-

No. of urinals in a range	Capacity of cistern	Size of the flushpipe	
		Main	Distribution
1.	5 litre		15 mm
2.	10 litre	20 mm	15 mm
3.	15 litre	25 mm	15 mm
4.	15 litre	25 mm	15 mm

The floor slab shall be suitably sunk to receive the stall urinals. A fine sand cushion of 25 mm thick shall be placed below the stall. The lip of the stall urinal shall be flush with finished floor level adjacent to it. In case the floor slab is not sunk the stall urinal shall be installed over a platform. Division plates of white glazed tiles or marble as specified may be provided.

2.5 Slab Urinals

The slab urinals consist of urinal slab, End screens, divisions and floor channels etc. These shall be of white glazed fire clay/marble. Raised plat form of 750 cm width & 100 mm height with a common 100 mm i/d glazed chinaware channel near the wall should be provided. The urinal slabs, screens and divisions shall be fixed on

wall & floor channel in the floor/platform by setting in cement sand mortor 1:2. Flushing shall be done by G.I. perforated pipes provided with suitable number of plastic push cocks.

3. WASH HAND BASIN

The basins shall conform to IS 2556 - (Part 4) - 1972 & shall be I.S.I. marked.

3.1 Fixing

3.1.1 Rectangular/Angular/Surgeon's W.H.B. shall be fixed over brackets of M.S. angle iron size 32x32x5 mm and shall be properly grouted with cement concrete and a stud shall be provided at the front end or the front portion shall be cut and bent, so as to fit in the grove of W.H.B. for anchorage. Counter tap wash basins, circular or oval shall be fixed in platform. Rim of the W.H.B. shall be kept level with top surface of counter.

3.1.2 The wash basin may be set at any convenient point against the wall or corner, The top of rim of W.H.B. shall be 75 to 80 cm above floor level. Where wash basins are to be provided in the school, school hostel, the following height shall be adhered to :-

Age group	Height of rim of W.H.B. from floor level
5 - 7 years	58 cm
7 - 9 years	63 cm
9 - 11 years	68 cm
Above 11 years	75 to 80 cm

3.2 Lavatory Ranges

When more basins are required to be fixed at one place, a lavatory range shall be provided. They shall be placed at centre to centre distance of atleast 75 cm from each other and centre line of last basin shall be kept at least 40 cm away from a adjacent wall.

3.3 Waste pipe

W.H.B. shall be connected with 32mm i/d B - class G.I. pipe, centre of 32 mm waste pipe elbow shall be fixed 50 cm above floor level for wash basins to be used by adults.

3.4 Inlet water supply

Inlet water supply point to W.H.B. shall be 45 cm above floor level if angle valve is fixed with inlet pipe. However height of water supply point shall be 40 cm above floor level if stop cock with elbow is us ed to connect water supply to pillar cock. Water supply point shall be fixed 15 cm side ways from centre of waste pipe. In case of intermittent water supply, a separate pillar cock shall be provided connected to the storage tank on roof. This shall not apply where provision of hot water supply to the W.H.B. has been made.

3.5 Waste fittings and other fittings

C.P. waste fittings shall conform to IS 2963 - 1979. Waste plug, if provided, shall conform to IS - 3311 - 1979 & shall be I.S.I. marked.

3.6 Use of G.I. tee in place of bottle trap

It has been seen that bottle traps are prone to theft, these are costlier and also costlier to maintain as they are easily tampered by the users in public place. At such places, G.I. Tee arrangement to connect C.P. waste with G.I. waste pipe may be used. However at places where floor traps below W.H.B.'s can not be provided, plastic

bottle traps or G.I. S-traps may be provided in place of Tee arrangement.

3.7 Use of marble trough in place of W.H.B.'s

Architects generally make provision of W.H.B.s in public toilets such as in Hospitals, Hostels, Institutions, police barracks etc., However it will be desirable that a marble sink of suitable length is provided with battery of anti-waste plastic taps, and this arrangement can be utilized for washing of hands and for drinking purposes in Public places.

Marble sink can be made out by casting R.C.C. trough and lining it with marble. One or more G.I. waste pipes can be provided according to the length of the trough as compared to the number of W.H.Bs which were to be provided as per the architectural drawings. 40 mm C.P. Waste & Waste pipe of 40 mm G.I. medium class with G.I. Tee arrangement instead of bottle trap may be provided.

4. SINK

4.1 Vitreous chinaware sinks shall conform to IS - 2556 (Part-5) - 1979 and shall be I.S.I. marked. Vitreous chinaware sinks have been restricted to laboratory use only as they are not found suitable for kitchen use. Howeve for kitchen use, R.C.C. cast-in-situ sinks with marble linning or vitreous enamelled steel, kitchen sinks conforming to IS - 8718 - 1978 or stainless steel sinks or fire clay chinaware sinks as per IS : 771 - 1985 shall be provided.

4.2 Cast in situ sinks shall be provided with 40 mm X 15 cm long waste

4.3 Waste pipe shall be of 40 mm i/d G.I. B-class pipe duly painted with primer and enamel paint.

4.4 Kitchen sink

Bottom end of G.I. Waste connected to kitchen sink shall be provided with 40 mm G.I. elbow projecting towards the floor trap and 40 to 50 mm above floor level. Khura below sink of size 45 cm x 45 cm shall be provided and its floor shall be depressed by 25 mm to 50 mm than adjoining floor level. Extra bib tap shall be provided below sink and at 30 cm height from floor level.

4.5 Finished top level of sink shall be 80 cm above floor level or it should be level with slab laid.

4.6 Taps for sink shall be 22 cm above top of sink level and provided with a G.I. nipple projecting min. 10 cm from the wall.

4.7 Laboratory sink

Bottom end of waste pipe connected to laboratory sink shall be fixed with elbow embedded in the bottom khura and directly draining into floor trap.

5. BATHS AND FITTINGS

5.1 The floor traps in the baths shall be properly fixed with minimum 10 cm P.C.C. 1:2:4 all around and the centre of the floor trap should be 17.5 cm away from the walls.

5.2 Height of bath tap shall be at least 60 cm above floor level and shall not be more than 105 cm. It may be projected outside 20 cm from the back wall.

5.3 Whenever battary of taps (multiple baths) are provided in a row, such as in hostel buildings, one floor trap may be provided for 3 to 4 baths connected through hygenical open drain running along the back wall of the baths.

5.4 Hot and cold bath taps, wherever provided shall be 15 cm apart.

5.5 Shower

i Height of the shower inside the bath shall be 2.0 m above floor level.

ii. Concealed stop cock to regulate the flow of water in shower shall be fixed at 1.25 m above floor level.

5.6 Mirror

i. Framed mirror should not be provided in public places as these are easily removeable and prone to theft.

ii. The mirror shall be of superior glass of bevelled edges. The size of the mirror shall be 60x40 cm or 55x40 cm or as specified with a thickness of not less than 6 mm.

iii. The mirror shall be mounted on asbestos sheet and is fixed in position by using 4 C.P. brass screws and washers over rubber washers and rawls embedded in the wall.

iv. The bottom of the mirror should be 145 cm above floor level.

v. The shelf below the mirror, if required to be provided, may be fixed with its bottom at 90 cm above floor level.

vi. Towel rail shall be fixed at a convenient place at a height of 90 cm above floor level.

5.7 Geyser

i. The water supply connection to the geyser should always be from the over head storage tank.

ii. It shall be provided with safety valve and a non return valve.

iii. Inlet and outlet water supply points of the geyser shall be 25 cm below the bottom of the geyser.

iv. For hot water outlet either lead connection or C.P. brass connection may be used.

v. For hot water taps red washers or taps marked H be provided and for cold water taps, blue washers or taps marked C may be provided.

6. INTERNAL DRAINAGE WORKS

6.1 Gully Traps

i. All Gully traps shall be fixed on the foundation of 68 cm x 68 cm x 10 cml. C.C. 1:4:8. After fixing and testing gully and branch drain, a brick massonary chamber 300x300 cm inside in B.B. 1:5 with 11.25 cm (half brick) thick wall around the gully should be built up to ground level. The space between chamber walls and gully shall be filled with C.C. 1:4:8. The upper portion of the chamber shall be plastered inside with 1:3 cement sand mortor finished with floating coat. The inside opening of the C.I. cover and frame shall be 30 cm x 30 cm and should be provided with 1:2:4 C.C. coping. Steel fibre reinforced RCC gully cover and frame may be provided in place of C.I. cover and frame which is prone to theft.

ii. The top level of the gully trap cover shall be the same as the level of the plinth protection.

6.2 Inspection Chamber

i It is suggested that round steel fibre R.C.C. manhole cover and frame should be provided instead of C.I. cover and frame as C.I. cover is prone to theft and also steel fibre R.C.C. manhole cover is cheaper than C.I. cover.

ii. Top level of inspection chamber cover and frame should be the same as the road level or plinth level.

6.3 Inspection Chamber in Ducts

The inspection chamber can be constructed in the duct in case there are large number of connections in the duct. The duct floor shall be properly laid with slope to one end and an extra floor trap shall be provided to drain off the leakage water/main water. The floor sould be depressed by minimum 2.5 cm below the adjoining floor level.

6.4 Khura

The Khura of size 75 cm x 75 cm x 5 cm shall be provided in the backyard of the kitchen with one tap and disposal arrangement for washing vegetables and large utensils.

7. G.I. PIPES AND FITTINGS

7.1 Materials

Unless otherwise specifieded, the pipes shall be medium quality galvanised mild steel continuous welded tubes conforming to IS 1239 - 1979 duly I.S.I. marked, suitable for screwing to pipe threads conforming to IS 554 - 1975.

7.2 G.I. specials should be of best quality/ISI marked. These should be tested by hammer test in the field and when no cracks should appear in it on hammering.

7.3 The water supply pipe should always be laid in wall and its laying under floors should be avoided so as to facilitate repairs at a later stage. Whenever it is to be laid in floors or through walls, it should be encased in sleeve and annular space between pipe and sleeve be filled with white lead or other suitable material.

7.4 Water supply to the W.C.s, Urinals and Geysers should always be from the roof storage tanks.

7.5 Proper thread and white lead should be used in joints.

7.6 G.I. Nipples should not be purchased from market but be made out of G.I. pipe supplied by the deptt.

7.7 Cover to G.I. pipe should be sufficient to give proper thickness of plaster. If G.I. pipe in chase is fixed with hooks, the hooks are not payable extra.

7.8 While tightening the pipe, the wrench should be used in such a way that the zinc plating is not damaged.

7.9 Chase should not be cut on the outer face walls of the building.

7.10 Testing of pipes should be done before back filling of trenches/ chase.

7.11 Connection from down pipe should be taken directly and not by taking it down and then upwards.

7.12 G.I. work when executed outside the wall with clamps should have 1.5 cm clear space between the wall and G.I. pipe. The holder bats should be provided at proper intervals.

7.13 Independent G.I. up pipe should be taken to the storage tanks and also independent outlet pipe from tank to each floor should be provided.

7.14 Where G.I. pipe work is not concealed, no horizontal pipe should be seen to be running at a height of more than 25 cm from the floor.

8. H.C.I. PIPES

8.1 All H.C.I. soil, waste and vent pipes and fittings shall conform to IS-1729 & shall bear the I.S.I. mark.

8.2 Pipes should fall gradually and continuously in the direction of flow.

8.3 The minimum slope of the HCI pipe should be between 1 in 20 for 50 mm pipes,1 in 30 for 80 mm pipes & 1 in 40 for 100 mm pipes.

8.4 All vertical pipes should have access door at ground level.

8.5 Starting/first inspection chamber of the sewer should be provided with the vent pipe.

8.6 Concrete block should be laid under H.R. bend.

8.7 The HCI pipe/ventilating pipe should be taken just above top of parapet, where there is no stair case to the roof and 120 cm above top of parapet where access to the roof is available.

8.8 The distance between gully trap and inspection chamber should not exceed 6 mtr.

8.9 Anti syphonage pipe 50 mm i/d should be provided if the same pipe is to be used for discharging the sewage from various floors so that the water seal of the W.C.s remains intact.

8.10 Clamps for HCI pipes

The clamps of 5 mm thickness should be provided with HCI stack and having clear distance 7.5 cm from the wall. Where there are large numbers of pipes in the duct, two R.S. joists of size 150 mm X 75 mm be provided 1.5 m below each floor level in the duct, so that the plumber can stand at these joists whenever any repairs are to be carried out or the blockages are to be opened.

8.11 Lead Jointing of HCI Pipes

All HCI pipes shall be jointed using lead and spunyarn. Quantity of lead should be used as per following:-

S. No.	Size of Joint mm	Quantity of Lead per joint Kg
1	50	0.91
2	75	1.13
3	100	1.36

9. DRAINAGE IN TOILETS

It is an established fact that wheneve there is seepage/leakage in larger toilets, such as hostels of multistoreyed buildings, the seepage water emerges out at the floor of toilets. It is of utmost importance to check such seepage and provide suitable drainage measures. The following filtering arrangement may be provided.

9.1 The floors of the toilets at Ist and subsequent floor should be given longitudinal and transverse slopes towards the outer wall or towards the duct by laying cement concrete 1:1.5:3 with water proofing compound

9.2 The side walls of depressed portion should also be given water proofing treatment.

9.3 The sloped surface and the walls upto floor level should be given bitumen coating.

9.4 P.V.C. or G.I. pipe filter similar to the one that is used in the Hand Pumps should be got prepared and the length of the filter should be 50 to 60 cm less than the length of the toilet and one end of the filter should be plugged and on the other end, there should be a solid piece of pipe approximately 50 cm long. This filter should be placed where transversal slopes of the floor meet, and the 50 cm long solid portion of pipe should pass through the outer wall or into the duct and it should project approximately 10 to 15 cm out side the wall. The hole made in the wall for passing the filter pipe should be properly plugged. Before filling cinder in the depressed portion, a layer of gravel should be put arround the filter and the a layer of course sand should be laid after which cinder should be filled. It should also be ensured that this gravel and sand around the filter are not distrubed while filling cinder.

10. GLAZED TILE WORK IN TOILETS

10.1 Glazed tiles in W.C. room should be upto the height of 60 cm and in the case of baths without shower should be upto 135 cm height and where showers are provided it should be 205 cm.

10.2 The glazed tiles should never be provided upto the floor level causing seepage at the joints. The dado varying from 10 cm

to 15 cm should be provided between the floor and the tiles and dado should take care of slope in the floors.

10.3 Tiles and dado should be flush with each other.

11. JOINERY WORK IN TOILET

11.1 It has generally been seen that bottom edges of vertical members of the chowkats become a source of seepage into the floor due to damage to wood and rusting of steel chowkats. It is thus preperable if chowkats are placed 50 to 75 mm above floor level with suitable additional hold fasts.

11.2 The shutters shall be raised by 50 to 75 mm from floor level, in case of Public toilets and 40 mm above floor level in case of residential toilets to avoid damage to bottom rails from water.

11.3 The aluminium sheet must be provided on the back of shutters of W.C. and baths upto suitable height.

12. STORAGE TANK

12.1 W.C. cisterns, urinal cisterns, push cocks, flush valves, ablution taps shall be connected to storage tanks kept at the roof of the buildings, capacity of the storage tank shall be fixed as per IS - Hand book S.P. 35 (SNT) 1987.

12.2 The tanks may be of cast in situ masonry cum R.C.C., steel A.C., R.C.C. or L.D.P.E. Preference may be given to L.D.P.E. tanks as they are easy. to instal & maintain.

12.3 The over flow pipe from the tank shall be carried to the rain water khura.

12.4 Air vent pipe shall be provided to prevent air locking.

12.5 The outlet pipe shall be fixed 50 to 75 mm above bottom of tank and fitted with strainer.

12.6 Large steel tank or L.D.P.E. tanks shall be supported on girders

resting on load bearing walls and not on R.C.C. slab. The bottom of the girders shall be raised 45 cm above the roof level.

12.7 Disinfection of storage tanks and down take distribution pipes

The storage tanks and pipes shall first be filled with water and thoroughly flushed out. The storage tank shall then be filled with water again and a disinfecting chemical added gradually, while the tanks are beingfilled, to ensure thorough mixing. Sufficient quantities of chemicals shall be used to give the water a dose of 50 parts of chlorine to one million parts of water. If ordinary bleaching powder is used, the proportion will be 150 gm of powder to 1000 litres of water. The powder shall be mixed with water to a creamy consistency before being added to the water in the storage tank. When the storage tank is full, the supply shall be stopped and all the taps on the distribution pipe opened successively working progressively away from the storage tank. Each tap shall be closed when the water discharged begins to smell of chlorine. The storage tank shall then be filled up with water from the supply pipe and with more disinfecting chemical in the recommended proportions. The storage tank and the pipes shall then remain charged for atleast 3 hours. Finally the tank and the pipes shall be thoroughly flushed out before any water is used for domestic purposes.

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PART - II

GUIDELINES FOR TESTING OF PIPE LINES AND SANITARY FITTINGS

PWD PUBLIC HEALTH (GOVT. WORKS) BRANCH

GOVT. OF PUNJAB

1995

PART II

GUIDELINES FOR TESTING OF PIPE LINES AND SANITARY FITTINGS

13. TESTING OF WATER SUPPLY MAIN (ESTATE WATER SUPPLY)

Main water supply lines shall be subjected to pressure test and leakage test. Before testing, trench shall be partially back filled, except at the joints.

13.1 Pressure Test

13.1.1 Procedure

After laying and jointing, the main shall be slowly and carefully charged with water so that all air is expelled from the main, by providing a 25 mm inlet with a stop cock, and allowed to stand full of water for a few days, if time permits and then tested under pressure. The test pressure shall be 6 kg/square cm or the maximum working pressure plus 50 percent, which ever is greater. The pressure shall be applied by means of a manually operated test pump, or in case of long mains or mains of large diameter, by a power driven test pump, provided that the pump is not left un-attended. In either case due precaution shall be taken to ensure that the required test pressure is not exceeded. Pressure gauges shall be accurate and shall preferably have been re-calibrated before the test.

The test pump having been stopped, the test pressure shall maintain itself without measurable loss for at least half an hour.

The mains shall be tested in sections as the work of laying proceeds; it is an advantage to have the joints exposed for inspection during the testing. The open end of the main may be temporarily closed for testing under moderate pressure by fitting a water tight

expanding plug of which several types are available. The end of the main and the plug shall be secured by struts or otherwise, to resist the end thrust of water pressure in the mains. If the section of the main tested terminates with a sluice valve, the wedge of the valve shall not be used to retain the water; instead the valve shall be temporarily fitted with a blank flange, or in case of a socketted valve with a plug and wedge placed in the open position while testing. The end support shall be secured as explained above.

13.1.2 Test Pressure

The field test pressure to be imposed shall not be less than the greatest of the following :-

i. One and half times the maximum sustained operating pressure.

ii. One and half times the maximum pipe line static pressure.

iii. Sum of the maximum static pressure and the surge pressure subject to works test pressure.

13.2 Leakage Test

13.2.1 Procedure

A leakage test shall be conducted concurrently with the pressure test. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section there of within 0.035 N/mm^2, of the specified leakage test pressure, after the air in the pipe line has been expelled and the pipe has been filled with water.No pipe installation shall be accepted untill the leakage is less than that determined by the formula.

$$ql = \frac{N \times D \sqrt{P}}{3.3}$$

where

ql = The allowable leakage in cubic cm / hour

N = No. of joints in the length of the pipe line.

D = Diameter in mm and

P = The average test pressure during the leakage test, in kg/cm^2

Where any test of pipe laid indicates leakage greater than that specified above, the defective joints shall be repaired until the leakage is within the specified allowance. When the joints are made with lead, leaking joints shall be recaulked until water tight. When joints are made with cement or rubber gasket, such joints shall be cut out and remade.

14. TESTING OF SEVICE PIPES AND FITTINGS

When the service pipe is complete, it shall be tested immediately. No finishing work like laying of floors or dadoes shall be started till testing of internal Water Supply pipe lines has been done.

14. 2. Test Procedure

Service pipe shall be slowly and carefully charged with water, allowing all air to escape and avoiding all shock or water hammer. Working pressure shall be applied to the service pipe by a manually operated pump or by connecting it with existing water supply mains. The service pipe shall then be inspected under working conditions of pressure and flow, when all draw-off taps are closed. The service pipe shall be absolutely water tight.

15. TESTING OF G.I. PIPES INSIDE AND OUTSIDE THE BUILDING

15.1 Hydraulic Test

i. All G.I. pipes shall be approved water tight, by subjecting it to 6 kg/square cm hydraulic pressure for 24 hours.

ii. Testing of pipes shall be done before back filling of trenches/ chases.

16. SEWER LINE (FOR STONEWARE PIPE / R.C.C. PIPES)

16.1 Hydraulic Test

All Stoneware pipe sewers (Non pressure type) shall be subjected, before covering them with top concrete, to hydraulic test as laid down in IS 4127-1983 clause 7, 7.1, 7-2, 7.2 and appendix B. Brief details are given below :-

16.1.1 Test Pressure

All S.W. pipe lines shall be subjected to a test pressure of at least 2.5 meter head of water at the highest point of the section under test. The tolerance of 2 litres per centimeter of dia-meter per kilometer may be allowed, during a period of 10 minutes.

16.1.2. Test Procedure

Before commencing the hydraulic test, the pipe line shall be filled with water and maintained fully for 24 hours by adding water, if necessary, under a head of 0.6 meter of water. The test shall be carried out by suitably plugging the lower end of the drain and ends of the connections, if any, and filling the system with water.

Typical arrangement for hydraulic test of sewer

i. Typical arrangement for hydraulic test apparatus is shown in drawing 'A'. The sewer testing plug is inserted at the up stream and down stream end and also in the various service tappings and plugged. The testing plug comprises of two flanges, one rubber ring, wing nuts etc. (refer drawing 'A')

ii. The plug is inserted at the up stream and the lock is obtained by expanding the ring against the pipe wall by tightening the wing nut. To build up necessary compressive force, to cause expansion of the rubber ring, a roller washer is used.

iii. Water for filling is let through the funnel connected to the plug provided at the up stream end. To allow air to escape, a small hole is made on the pipe wall at the up stream end and after filling the pipe completely the hole is plugged with a wooden plug wound with hamp.

iv. The funnel is kept at a height of 2.5 meter from the invert of the sewer duly filled with water. Subsidence of the water may be due to one or more of the following causes.

a. Absorption by pipes and joints.

b. Sweating of pipes or joints.

c. Leakage at joints or from defective points.

d. Trapped air/allowance shall be made for (a) by adding water until absorption has ceased and after which the proper test should commence.

v. Any leakage will be visible and the defective part of the work should be cut out and made good. A slight amount of sweating which is uniform may be over looked; but excessive sweating from a particular joint shall be watched for and taken as indicating a defect to be made good.

vi. The pipe is considered sound if the water in funnel does not empty within 30 minutes (suitable allowance of loss in water due to absorption by the pipes in joints shall be made.)

16.2 Rectification of faulty joints.

Any joint found leaking or sweating shall be rectified or embedded into 150mm layer of cement concrete 1:2:4, 300mm in length and the section shall be retested.

16.3 Test for straightness and obstruction.

The following test shall be carried out.

16.3.1 Ball test.

By inserting at the up stream end of the sewer a smooth ball of a diameter 13mm less than pipe bore. In the absence of obstruction such as yarn or mortar projecting through the joints, the ball should roll down the invert of the pipe and emerge at the lower end.

16.3.2. Lamp & mirror test.

Illuminated lamp is placed at one end of the pipe and viewing mirror is placed at the other end. If the pipe line is straight, the full circle of the light may be observed. If the pipe line is not straight, this will be apparent. The mirror will also indicate obstruction in the barrel.

16.3.3. Rectification.

If during testing, sewer fails to conform to above test it shall be rectified at the risk and cost of the contractor and restested. Cast iron sewers and drains shall be tested as for stone ware and concrete pipes. However the drain plug shall be suitably struted to prevent their being forced out.

17. TESTING OF SOIL PIPE, WASTE PIPE/VENT PIPE.

17.1. Smoke test.

All soil pipes, waste pipes and vent pipes and all other pipes, when above ground, shall be approved Gas tight by a smoke test, conducted under a pressure of 25 mm of water maintained for 15 minutes, after all trap seals have been filled with water, or by Hydraulic Test as per 17.2

17.1.1 Test procedure.

i. All traps are filled with water before starting smoke test.

ii. A smoke testing machine shall be used which shall consist of a length of flexible rubber tubing (heavy duty) and bellows. (Instrument for creating stream of air).

iii. The smoke is produced by burning only waste or tar paper, or similar material in the combustion chamber of a smoke machine. Chemical smokes are not satisfactory.

iv. Smoke is pumped into the drains and pipes through a clay plug in an inspection chamber, outside gully or an inlet ventilator, In making a smoke test, the top ends of the soil and ventilating pipes are left open, until smoke is seen to emrge. Then the openings are plugged securely with wet cloth or wet clay tied in a cloth and the smoke is pumped in for some reasonable time.

17.2. Hydraulic Test.

All soil pipes, waste pipes shall be subjected either to smoke test or to water test. Work under ground or under floors shall be tested before it is covered. Drain pipes shall be approved to be water tight under 1.8 m head of water.

17.2.1 Procedure for hydraulic test

i. Each stack or pipe shall be separately tested.

ii. Down stream end shall be plugged.

iii. A pipe of 1.85 meter height and of same size as that of the pipe line under test, shall be fixed at the up stream end of C.I. Special (bend, P-trap, floor trap etc.). Water shall be poured into the pipe to exert 1.8 meter head of water.

iv. No leakage or loss of water shall be observed for 30 minutes.

18. TESTING OF WASH DOWN WATER CLOSETS.

18.1. Flushing test.

(Conforming to IS-2556 (Part-II) 1981)

The water closet shall satisfy the requirements of below mentioned three tests. These tests shall be conducted by

connecting the water closet to a low level cistern of 10 litre capacity which shall be fixed such that the height between the top of the water closet and the bottom of the cistern shall be 30 cm and the water closet shall be connected to the cistern by 40 mm nominal dia-meter flush pipe.

Test No. I

The water closet shall be filled with water to its normal water seal level and charged with 6 pieces of usual toilet paper or polythene sheet of 0.05 mm thickness, approximately 150 x 115 mm in size and loosely crumpled. It shall then be flushed. This test shall be repeated four times and the pan shall discharge full charge of the paper at least thrice out of the four times.

Test No. 2

The whole of the interior surface of the box rim water closets to 40 mm below the flushing rim shall be smudged with quartz powder of contrasting colour passing through 1.18 mm sieve and shall then be flushed carefully, observing the surface of the water closet during flushing. Immediately after the flushing, there shall be no smudge left on the bowl.

Test No. 3

The water closet, when sealed at the bottom of the trap in line with the back plate, shall be capable of holding not less than 10 litres of water between the normal water level and the highest possible water level of the water-closet as installed.

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PART - III

TYPE AND SCALE OF SANITARY FIXTURES/ FITTINGS TO BE PROVIDED IN DIFFERENT TYPES OF GOVERNMENT BUILDINGS.

PWD PUBLIC HEALTH (GOVT. WORKS) BRANCH

GOVT. OF PUNJAB

1995

PART - III

TYPE AND SCALE OF SANITARY FIXTURES/ FITTINGS TO BE PROVIDED IN DIFFERENT TYPES OF GOVT. BUILDINGS

19. TOILETS FOR CIRCUIT HOUSE

Flooring	Marble flooring with size of blocks, 300 mm x 300 mm to 600 mm x 600 mm.
Skirting	Marble upto 150 mm
Dado	Coloured/white Glazed tiles, size 200mmx100mm upto door level i.e. 6'-9" or 205 cm height from floor level
Fixtures	
W.C.	Europeon type double trap syphonic with low level chinaware cistern. Plate flushing jet may be provided for each W.C.
Bidet	One bidet be provided in V.V.I.P toilet only
Bath tub	One bath tub of chinaware in V.V.I.P. toilet only The bath tub area should be seperated by providing plastic curtains on C.P. pipe railing at 205 cm height
Bathing space	Additional Bathing space of 750 mm width shall be provided having Telephonic Shower with hot & cold water mixer.
Shower	One telephonic shower for V.V.I.P. toilet with Hot & Cold water mixer and one adjustable shower with Hot & Cold water mixer with C.P. arm in other toilets.
W.H.B	One number Wash Hand Basin embedded in

	marble slab, in V.V.I.P. Toilet & Other toilets where ever possible, with C.P. bottle trop
Mirror	One number mirror of 6 mm thickness of size equivalent to the length of W.H.B. slab and of suitable height as per site conditions.
Towel Rail	One/two number C.P. towel rail of 600 mm x 20 mm size
W.H.B.Pillar Taps	Hot and Cold water mixer be provided
Bath Taps	One C.P. tap with Hot & Cold water mixer
Soap-dish	One number soap dish of chinaware of recessed type near bath taps & one C.P. Soap dish near W.H.B., where ever necessary.
Toilet Paper Holder	One number toilet paper holder of recessed type of chinaware should be provided
Geyser	One Number geyser of 35 ltr. capacity should be provided. WHB taps and bath taps should also be connected to the geyser
Exhaust Fan	One number 12" dia exhaust fan of standard make preferably ISI marked should be provided in each toilet

20. TOILETS FOR REST HOUSE

Flooring	Marble flooring with size of blocks 300 mm x 300 mm to 600 mm x 600 mm.
Skirting	Marble upto 150 mm
Dado	Coloured/ White Glazed tiles, size 200 mm x 100 mm upto door level i.e. 6'-9" or 205 cm height from floor level

Fixtures

W.C.	Europeon type double trap syphonic with low level cistern in V.V.I.P toilet and in other toilet one number Eurpeon type W.C. with low level chinaware cistern. Plate flushing jet may be provided for each E.W.C.
Shower	One telephonic shower for V.V.I.P. toilet with Hot & Cold water mixer and one adjustable shower with Hot & Cold water mixer with C.P. arm in other toilets
W.H.B.	One number Wash Hand Basin embeded in marble slab with C.P. bottle trap in V.V.I. P. toilet and in other toilets one number W.H.B. of 22" x 16" size with C.P. bottle trap with glass/marble/chinaware shelf above W.H.B.
Mirror	One number mirror of 6 mm thickness of size equivalent to the length of W.H.B. slab and of suitable height as per site conditions in V.V.I.P. toilet and in other toilets one number bevelled edge mirror of 6 mm thickness of 22" x 16" size fixed with screws above each W.H.P.
Towel Rail	One number C.P. towel rail of 600 mm x 20 mm size
W.H.B.Pillar Taps	Hot & Cold water mixer be provided
Bath Taps	One C.P. tap with Hot & Cold water mixer
Soap-dish	a. One number soap dish of chinaware of recessed type near bath taps b. One number C.P. soap dish near each W.H.B.
Toilet Paper holder	One number toilet paper holder of recessed type of chinaware should be provided

Geyser — One number geyser of 35 ltr. capacity should be provided. WHB taps and bath taps should also be connected to the geyser

Exhaust Fan — One number 12" dia exhaust fan of standard make preferably ISI marked should be provided in each toilet.

21. TOILETS ATTACHED WITH OFFICES OF SENIOR OFFICERS/COMMITTEE ROOMS

Flooring — Marble flooring with size of blocks 300 mm x 300 mm to 600 mm x 600 mm

Skirting — Marble upto 150 mm

Dado — While Glazed tiles size 200 mm x 100 mm upto door level i.e. 6'-9" or 205 cm height from floor level

Fixtures

W.C. — European type double trap syphonic with low level chinaware cistern in toilets for Head of the department and above and for other Senior Officeres European type W.C. with low level chinaware cistern

Plate flushing jet may be provided for each European type W.C.

W.H.B. — One number Wash Hand Basin embedded in markble slab, 22" x 16" size with C.P. bottle trap

Mirror — One no. mirror of 6 mm thickness of size equivalent to the length of the W.H.B. for Head of the deptt. & above for other officers one number mirror of 22" x 16" size bevelled edge of 6 mm thickness fixed with screws above W.H.B.

Towel Rail	One number C.P. towel rail of 600 mm x 20 mm size.
W.H.B. Pillar Taps	Hot & Cold water mixer for Head of the deptt & above and One number C.P. tap may be provided for other officers
Soap-Dish	One number C.P. soap dish near W.H.B.
Toilet Paper holder	One number toilet paper holder of recessed type of chinaware should be provided.
Geyser	One number instant geyser should be provided in toilet attached with the office of Head of the department and above. WHB taps should also be connected to the geyser
Exhaust Fan	One number 12" dia exhaust fan of standard make preferably ISI marked sould be provided in each toilet.

Note:

I. All taps should be of one make having the heads of same shape. Hot taps should be fitted with red washers and Cold taps with blue washers. If red or blue washers are not provided 'H' or 'C' should be written on the caps of heads. Only chromium plated taps, mixers and other fittings be provided in the toilets and the make should be ESSCO/SOMA/JAL/ PARCO/ESSESS or as approved by chief Engineer from time to time.

II. Four numbers C.P. hooks for hanging of clothes should be provided on the rear side of the toilet door for Circuit Houses & Rest Houses.

22. TOILETS AND KITCHEN FOR GOVERNMENT RESIDENTIAL HOUSES.

22 (a). GOVT. RESIDENTIAL HOUSES		
	1800 sft & above	1300 sft
Flooring*	Marble 300 mm x 300 mm size blocks	Marble 300 mm x 300 mm size blocks
Skirting*	Marble upto 150 mm	Marble upto 150 mm
Dado*	White glazed tiles upto door level i.e. upto 205 cm height	White glazed tiles upto door level i.e. upto 205cm height
W.C.	2 No. E.W.C., 1 No. Orisaa Pan	1 No. E.WC., 1 No. Orissa Pan
Cistern	2 No. low level chinaware for E.W.C., 1 No. High level for Orissal Pan	1 No. low level tap chinaware for E.W.C., 1 No. High level for Orissa Pan
Bath	2 No. C.P. Hot & Cold water mixer, 1 No. long body C.P. bib tap one each for Hot & Cold water	1 No. C.P. Hot & Cold water mixer in one toilet. Long body C.P. bib taps one each for Hot & Cold water in other toilet
Shower	With adjustable C.P. arm in each toilet	With adjustable C.P. arm in each toilet
W.H.B.	2 No. white WHB of chinaware with Hot & Cold water mixer 1 No. white WHB of chinaware with one C.P. pillar cock	White WHB of chinaware with one C.P. Pillar cock in each toilet
Taps	C.P. short body bib tap for ablution & C.P. stop cock	C.P. short body bib tap for ablution & C.P. Stop cock
Kitchen	Marble slab topping with glazed tiles upto 80 cm height above platform level or upto bottom of the shelves.	Marble slab topping with glazed tiles upto 80 cm height above platform level or upto bottom of the shelves.
Sink	Cast-in-situ lined with marble	Cast-in-situ lined with marble

* Subject to approval of the Govt andGovt. approval is awaited.

Please refear note on page 40

22 (b). GOVT. RESIDENTIAL HOUSES

	1000 sft	800/750 sft
Flooring*	Marble 300 mm x 300 mm size blocks	Terrazo
Skirting*	Marble upto 150 mm	
Dado*	white glazed tiles upto 135 cm height	Terrazo upto 135 cm height
W.C.	1. No. E.W.C., 1 No. Orissa Pan	1 No. Orissa Pan
Cistern	Low level plastic for E.W.C. and High level for Orissa Pan	High level
Bath	Long body C.P. taps one for Hot & one for Cold in each toilet	Brass taps one Hot & one Cold
Shower	C.P. Rose shower in each toilet	C.P. Rose Shower in the bathroom
W.H.B.	White WHB of Chinaware with one number C.P. Pillar cock in each toilet	White WHB of Chinaware with plastic pillar cock
Taps	C.P. short body bib tap for ablution & C.P. stop cock	Brass bib tap & brass stop cock
Kitchen	Marble slab topping with glazed tiles upto 80 cm height above platform level or upto bottom of the shelves.	Terrazo topping with terrazo lining upto 80 cm height above working plat form or upto bottom of the shelves.
Sink	Cast-in-situ lined with marble	Cast-in-situ lined with terrazo

* Subject to approval of the Govt. Govt. approval is awaited.

Please refear note on page 40

22 (c). GOVT. RESIDENTIAL HOUSES

	600 sft	400 sft
Flooring*	Terrazo	Terrazo
Skirting*		-
Dado*	Terrazo upto 135 cm height	Terrazo up to 135 cm height
W.C.	1 No. Orissa Pan	1 No. Indian type W.C. (with seperate foot rests)
Cistern	High level	High level
Bath	Brass taps one Hot & one Cold	1 No. brass tap
Shower	C.P. Rose Shower in the bathroom	
W.H.B.	White W.H.B. of Chinaware with plastic pillar cock	White WHB of chinaware small size with plastic pillar cock
Taps	Brass bib tap & brass stop cock	Brass bib tap
Kitchen	Terrazo topping with terrazo lining upto 80 cm height above working plat form or upto bottom of the shelves.	RCC slab finished topping with piaster 1:2 With neat cement floating coat upto 80 cm height above working platform or upto bottom of the shelves.
Sink	Cast-in-situ lined with terrazo	Brass tap with khurra

* Subject to approval of the Govt. Govt. approval is awaited.

Please refear note on page 40

i. Toilet paper Holder of plastic type for E.W.C.

ii. One number 6 mm thick bevelled edge mirror of 22"x16" size fixed with screws above each W.H.B.

iii. For 1800 sft, 1300 sft and 1000 sft quarters, plastic/glass/ chinaware shelf for each W.H.B.

iv. One number C.P. towel rail of 20mm dia 600mm long for 1800 sft, 1300 sft and 1000 sft quarters and plastic towel rail of 600mm x 20mm in other quarters may be provided near each W.H.B.

v. One number nitch of 40 cm x 30 cm and 10 cm deep with glazed tiles at the back and sides should be provided for 1800 sft, 1300 sft and 1000 sft houses, similar nitch finished with terrazo for 750/600 & 400 sft houses.

vi. Four number plastic/C.P. hooks for hanging of clothes should be provided on the rear side of the toilet door for 1800 sft, 1300 sft and 1000 sft and four number M.S. hooks be provided for 750/600 sft and 400 sft.

vii. Every fitting should be ISI marked.

23. PUBLIC TOILETS

Item	Hospital / General Administration/ Schools & Colleges	Police barracks
Flooring	Marble 300 mm x 300 mm blocks	Terrazo
Skirting	Marble upto 150 mm	---
Dado	Glazed (white) tiles upto 135 cm height in general area & upto 60 cm height in W.C. rooms	Terrazo upto 135 cm height in general area & upto 60 cm height in W.C. rooms

Fixtures

W.C. Stainless steel Orissa Pan in Hospitals and Colleges. For other public toilets chinaware orissa pan may be provided

One number Europeon type W.C. may be provided in each public toilet of hospital where more than one number W.C. are to be provided

Cistern Railway type C.I. flush cocks for each W.C.

Bath One number plastic tap in each bath

W.H.B. Where-ever W.H.B. is required it is to be replaced by RCC trough of size 600 mm x 375 mm lined inside with glazed tiles. Plastic taps with anti-waste should be provided in the troughs

The length of the trough should be as per number of W.H.B.s with 40 mm i/d C.P. waste & waste pipe of 40 mm i/d G.I. pipe through chase and G.I. tee instead of bottle trap. In case floor trap can not be provided the bottle trap should be replaced by G.I. S-trap or plastic bottle trap.

Ablution Tap	Plastic ablution taps with anti waste arrangement should be provided.
Urinals	Marble slab urinal may be provided. Raised platform of 750 mm width and 100 mm height with marble top & with common 100 mm inside glazed chinaware channel near the wall should be provided.
Flushing	Flushing of urinals by G.I. perforated pipe provided with suitable number of push cocks.
Exhaust Fan	One 300 mm or 450 mm exhaust fan in each toilet with grill arrangement to avoid theft may be provided.
NOTE :	All gully trap covers and inspection chamber cover shall be of fiber rainforeced concrete.

24. KITCHENS FOR CIRCUIT HOUSE/REST HOUSE AND INSTITUTIONS

Flooring	Marble, 300 mm x 300 mm
Working Platform	RCC slab with marble toping with full width marble slab. The marble should be extended 15 mm beyond RCC slab
Cup board Partitions under working plat-form	Brick masonary in 1:5, 115 mm thick with cement plaster of 1:4.Cup board shutters should be of haulak wood frame and wire gauge of good quality fixed inside & 50% of wood shutters.
Cup board	Cup board floor should be raised 100 cm above the adjoing floor
Flooring	and 25 mm thick conglomerate flooring should be done in cup board portion.
	Depressed floor 450 mm x 450 mm x 150 mm deep should be provided inside the cup board for

placing of Gas Cylinder under the place where gas stove is to be kept in the working platform. A sleeve piece of 20 mm i/d be fixed in the working platform for passing the gas pipe on the side of gas stove.

Sink — Stainless steel sink with drainage board should be provided/embeded in the working platform at the required place.

Depressed floor (khurra) 450 mm x 450 mm x 15 mm depth be provided under the waste of the sink where the floor trap is to be provided.

Glazed tiles on walls — All walls of the kitchen should also be lined with glazed tiles from the skirting of the floor upto 205 cm height above floor level.

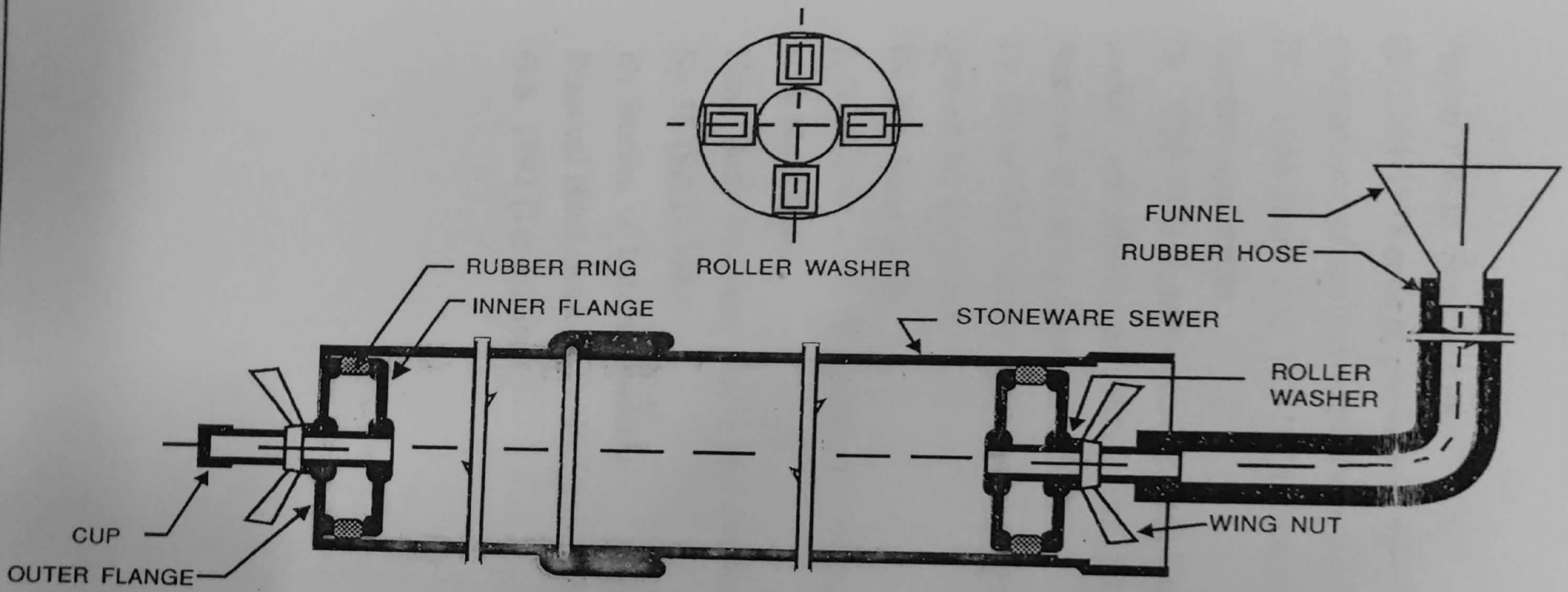
Taps — Hot water and Cold water taps should be provided approx. 220 mm above the top of the (working platform) sink. Gun metal bib tap with 100 mm G.I. extension piece should be provided.

Geyser — Arrangement for fixing of geyser and for Hot & Cold water pipe line should be made. Electric point for geyser should also be ensured by the B & R (Electrical Wing)

Exhaust Fan — Minimum one 450 mm dia exhaust fan with removable frame fitted with wire gauge may be provided.

In case specific kitchen equipment is required to be provided, the provision of working platform or cupboards etc. may be modified accordingly and the kitchen equipment of best quality as per requirement of the institution may be provided. ★ ★ ★

FIG. "A"



TYPICAL ARRANGEMENT FOR HYDRAULIC TEST OF SEWERS.

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