IS 13182 : 1991
(Reaffirmed 1996)

भारतीय मानक

भवनों के नम क्षेत्रों को नमीसर और जलसर बनाना — सिफारिशें

Indian Standard

WATERPROOFING AND DAMP-PROOFING OF WET AREAS IN BUILDING — RECOMMENDATIONS

UDC 699·82

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1991

Price Group 5

Waterproofing and Damp-Proofing Sectional Committee, CED 41

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Waterproofing and Damp-Proofing Sectional Committee had been approved by the Civil Engineering Division Council.

Bathroom, kitchen, water closet and to a lesser extent varandah, balconies and sunshades may be termed as wet areas of a buildings which are more vulnerable to water due to their functional requirements. These wet areas are one of the main source of leakage and dampness in a building which leads to unhygeinic conditions affecting badly the health and comfort of the inhabitants and seriously deteriorating the stability of the building. The causes of dampness and leakage may be due to defective design, sub-standard material, improper execution and incorrect usage by the occupant. This standard is intended to provide guidance on provisions for preventing dampness and leakage arising out of the wet areas of a building under construction. Problem of leakage and dampness in building already in use require different approach in the analysis of the cause and remedial measures.

Indian Standard

WATERPROOFING AND DAMP-PROOFING OF WET AREAS IN BUILDING — RECOMMENDATIONS

1 SCOPE

1.1 This standard provides recommendations for planning, construction and installation aspect for waterproofing/damp-proofing of wet areas of a building which includes kitchen, bathroom, water closet, verandah, balcony, *chajja*, shaft, external wall and domestic overhead tank.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
702 : 1988	Specification for industrial bitumen (*second revision*)
1742 : 1983	Code of practice for building drainage (*second revision*)

3 WET AREAS OF A BUILDING

3.1 Balcony

A horizontal projection, including a handrail or balustrade, to serve as passage or sitting out place, normally exposed to atmosphere.

3.2 Bath Room

A bath room is a place for taking bath either from a shower or with the help of bucket and mug and in some cases using a bath tub.

3.3 *Chajja*

A sloping or horizontal structural overhang usually provided over openings on external walls to provide protection.

3.4 Kitchen

Kitchen is a room meant for cooking food wherein provision for washing used utensils and raw materials required for cooking is given.

3.5 Verandah

A covered area with at least one side open to outside with the exception of 1 m high parapet on the upper floors to be provided on the open side.

3.6 Water Closet

The room or compartment in which a water-flushed plumbing fixture designed to receive human excrement directly from the user of the fixture, is placed.

4 SOURCES OF LEAKAGE/DAMPNESS AND RECOMMENDATION FOR PREVENTION

4.1 General

Uses of sub-standard and non-standard materials or workmanship is one of the major cause of leakage/dampness in buildings. Hence all the appliances, fixtures and materials shall conform to the relevant Indian Standards where they exist and shall have good workmanship.

4.2 Water Closets

4.2.1 *Sources of Leakage and Dampness (see Fig. 1)*

a) The joint between flushing cistern and flushing pipe.

b) Use of downtake flushing cistern pipe made of material susceptible to corrosion.

c) Junction of the flushing pipe with the WC pan.

d) Junction of WC and foot rest with flooring.

e) Junction of WC and traps with the branch pipe.

f) Depressed reinforced concrete slab to accommodate the pan and trap.

g) Joints between flooring tiles.

h) Incorrect placement of overflow pipe.

j) Floor trap junction.

k) Faulty pipe joints.

m) Cut out in the structure for the branch pipe.

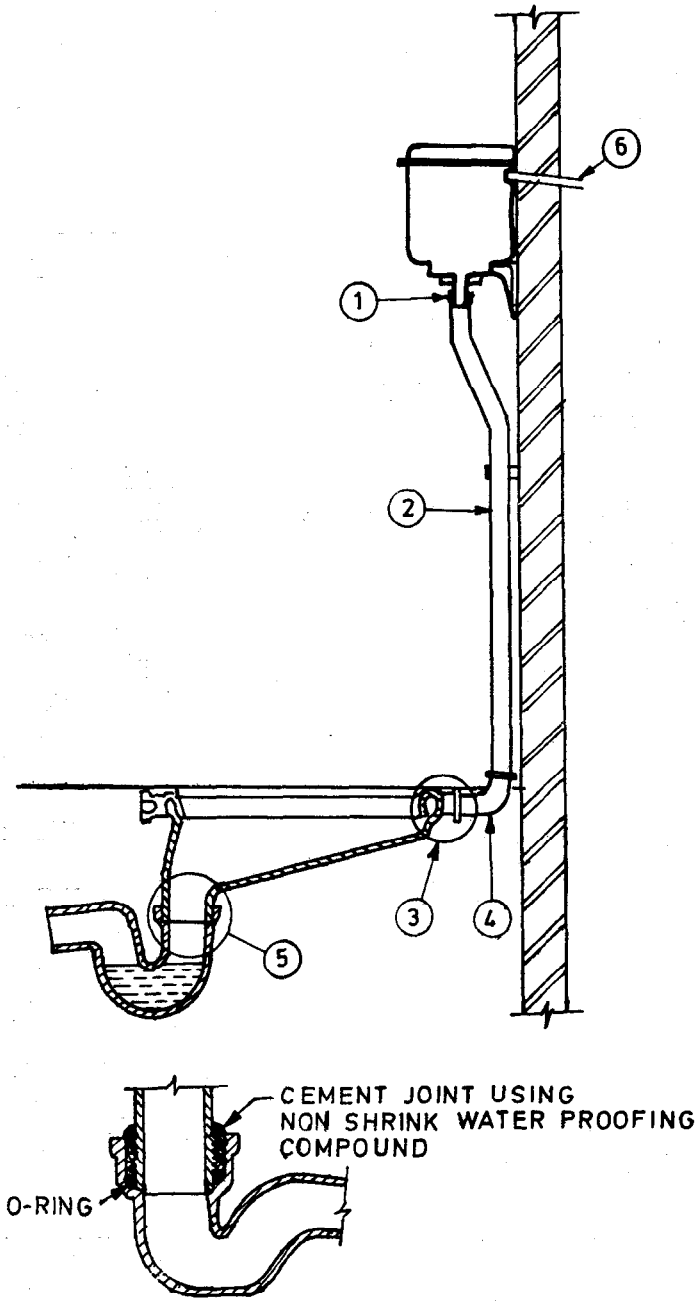
n) Indian type WC fixed loosely.

4.2.2 *Recommendations for Prevention of Leakage and Dampness*

a) The flush pipe shall be securely connected to the cistern outlet and made air-tight by means of a coupling nut. The nuts made of injection-moulded HDPE/PVC may be used only if the end pipe is also made of HDPE/PVC.

b) Flush pipe made of tin shall not be used as it is liable to corrode.

c) If GI pipe is used, pipe should be completely protected by bitumen painting and taping where it is embedded in concrete.



1. Joint between flushing cistern and flushing pipe
2. Downtake flushing pipe, if embedded
3. Junction of flushing pipe with the WC pan
4. The bend of the flushing pipe which is embedded in floor
5. Floor trap junction
6. In correct placement of overflow pipe

FIG. 1 SOURCES OF LEAKAGES IN WATER CLOSETS AND FLUSHING CISTERNS

d) Flush pipe should be properly fixed to the entry hole of the WC pan with the help of rubber gasket or gold-size quality putty.

e) Where squatting pan with traps are provided due consideration shall be given to the following:

i) Firstly, temporary laying of pipe line and WC pan should be done by giving temporary packings. The level should be checked and corrected taking into account the final finish level of flooring. The WC pan may be taken out and pipe joints filled up. After WC pan is fitted and jointed, cement concrete block should be put around this joint and then depressed portion filled up.

ii) A suitable slope should be given to the depressed RCC floor which accommodates the pan and trap to lead the water to the rear portion of WC pan. The slab should not be depressed much beyond what is necessary that is only that portion of the RCC slab which accommodates the pan and the trap should be depressed. A corrosion resistant GI pipe of 25 mm dia should be provided to drain off any water accumulated in the depressed area (*see* Fig. 2).

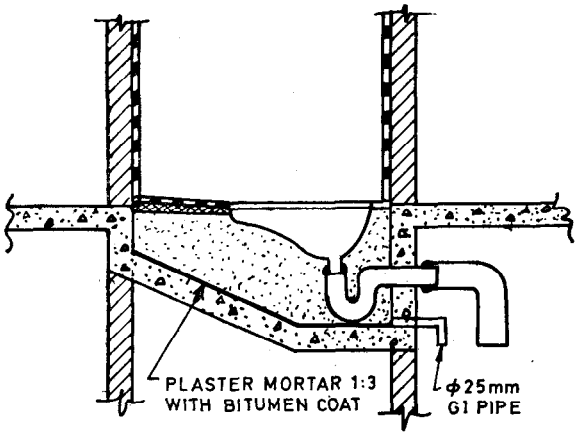


FIG. 2 TYPICAL SKETCH OF DEPRESSED SLAB AND ARRANGEMENT OF JOINTS IN WC

iii) In addition to the draining of the depressed portion, the depressed area should be made waterproof. For this, depressed portion should be plastered with cement mortar 1 : 3 and a coat of 85/25 grade bitumen conforming to IS 702 : 1988 at the rate of 1·5 kg/m² should be applied over it. Alternatively suitable waterproofing coating or waterproof cement plaster should be used.

iv) Finished floor should be sunk by 25 mm from the adjoining floor and walls up to at least 30 cm shall be made from an impervious material such as cement plaster (smooth finish), terrazo *in-situ* or tiles, glazed and ceramic tiles.

f) Where the bath and Indian type WC are accommodated in a single toilet connected to septic tank, the slope of floor in bath area should be away from the WC to avoid drainage of soapy water.

g) Where squatting pan is fixed with rim either in line with tile flooring below the flooring the junction of flooring tiles and rim is the main point of leakage. To avoid this suitable nonshrink, bonding material should be used for fixing the last tile and the joint between the flooring and the rim of the WC (*see* Fig. 3).

h) As far as possible integral tread WC pan should be preferred to avoid seepage from the joints. Where separate footrest is used, the joints between tread and flooring should be made leakproof by using nonshrink waterproof mortar.

j) The overflow pipe from cistern be brought right up to floor level and provided with right angle bend at the outlet over floor (*see* Fig. 4).

k) In the European type WC, the WC is fixed by screws using rubber washer to the floor. Rubber gasket should be used at the joint to aviod leakage. The junction between pan pedestal with flooring should be filled with cement mortar mixed with nonshrink waterproofiing compound (*see* Fig. 5).

m) The joint between the pan and trap shall be made leakproof with cement mortar 1 : 2 or 1 : 3 with nonshrink waterproofiing compound.

n) As far as possible jointless floor should be laid, however, where flooring tiles have been used these shall be laid on bed of waterproofing mortar and care should be taken to fill the joints effectively.

p) The cut out hole made for outlet pipe should effectively be sealed with waterproof cement mortar after the pipes are fixed.

q) Joints between trap and *Y* junction may be negotiated with long arm bend to avoid joints coming in the wall (*see* Fig. 2).

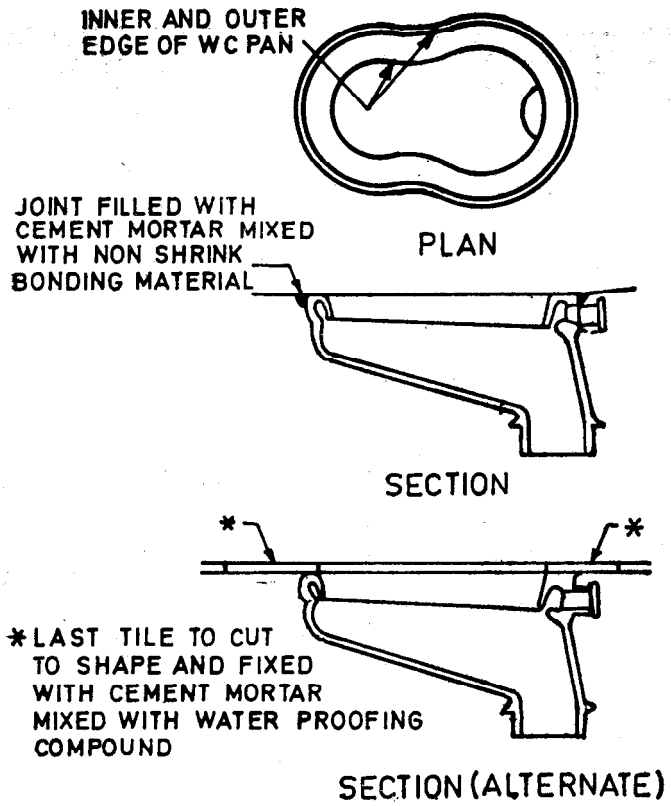


FIG. 3 FIXING OF INDIAN TYPE WATER CLOSETS

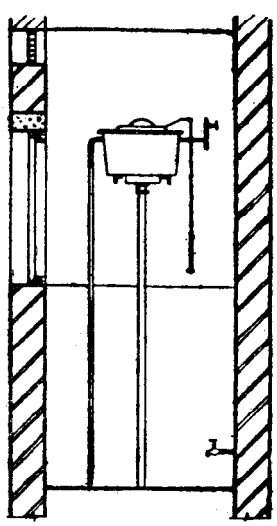


FIG. 4 TYPICAL ARRANGEMENTS OF OVERFLOW PIPE FROM CISTERN

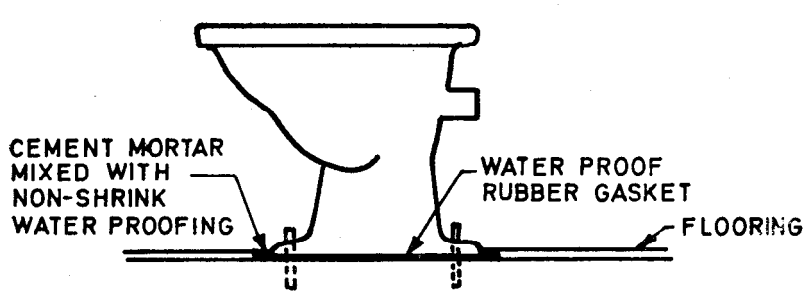


FIG. 5 FIXING OF EUROPEAN TYPE WATER CLOSETS

4.3 Bath Room

4.3.1 *Sources of Leakage and Dampness*

a) Junction of water pipe and floor/wall,
b) Floor and wall where shower splashes water,
c) Junction of door frame and floor on account of eventual rotting of door frame,
d) Wash basin,
e) Concealed piping and fitting,
f) Improper slope,
g) Joints between flooring tiles,
h) Cut out in the structure for the branch pipe, and
j) Floor trap junction (*see* **4.6**).

4.3.2 *Recommendation for Prevention of Leakage and Dampness*

a) The floor of every bath room shall be constructed of material which does not readily absorbs moisture and entire floor should be sunk by 25 mm from the adjoining floor. Surface of the wall and floor should be made of impervious material. The floor should be sloped away from the door (entrance) towards the outlets, a minimum slope of 1 in 60 is recommended.
b) Bath room floors and walls to a height of atleast 1 m from the finished floor and in case shower is provided 2 m from finished floor shall be made of impervious material such as waterproof cement plaster (smooth finish) terrazo *in-situ* tile, glazed tiles.
c) In case of concealed pipes, before plastering the joints and connection shall be tested according to IS 1742 : 1983.
d) For cut out procedure explained in **4.2.2** (q) should be followed.
e) As far as possible jointless floor should be laid, however, where flooring tiles have been used these shall laid on bed of waterproof mortar and care should be taken to fill the joints effectively.

4.4 Kitchen

4.4.1 *Sources of Leakage and Dampness*

a) Type of sink and placement of draining board.
b) Area surrounding the sink.
c) Joints between the sink and draining pipe.
d) Junction joint between kitchen platform and the wall.
e) Improper ventilation leading to condensation.
f) Floor traps (*see* **4.6**).
g) Floor level washing place.

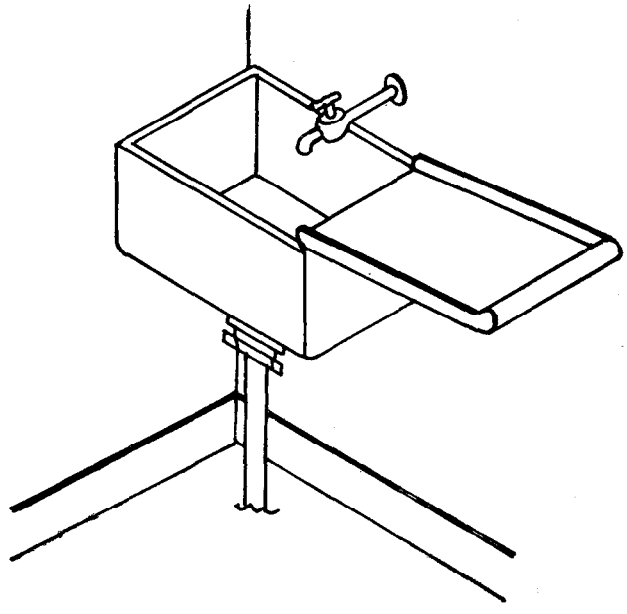
4.4.2 *Recommendations for Prevention of Leakage and Dampness*

a) Sink used should conform to the relevant Indian Standard for its quality. The draining board used with the sink should be placed in such a way that water which is being drained does not find the way towards the wall and it should overlap the side of the sink (*see* Fig. 6).
b) Area surrounding the sink should be made waterproof by using impervious material such as *in-situ* terrazo flooring mossaic tiles and glazed ceramic tiles.
c) Joints betweeen sink and draining pipe should be leakproof.
d) Waste pipe from the sink must discharge effectively into the floor trap. Preferably a cleanout junction should be used to facilitate periodical rodding.
e) Kitchen slabs made of stone or precast cement concrete slabs are normally fixed by inserting into the wall by making a chase and becomes source of seepage. To avoid seepage a skirting should be provided at the junction point.
f) Kitchen floor should preferably be jointless or with waterproofed fine joints where joints are unavoidable.
g) Proper ventilation should be provided in the kitchen to avoid condensation. For this exhaust fan may be fixed on the wall exposed to atmosphere.
h) Where floor level sink is provided, the entire floor of the washing place should be sunk by 25 mm for the surrounding floor and should be treated as explained in **4.2.2**(e) (iii).
j) A slope not less than 1 in 100 should be provided to the washing floor towards the drainage points with a floor trap.

4.5 Open Verandah, Balconies and *Chajja*

4.5.1 *Sources of Leakage and Dampness*

a) Inadequate protection from rain water.
b) Improper slope and level.
c) Improper and inadequate opening for draining off water.
d) Non-provision or improper dripcourse or throting.
e) Improper practices of raising flower bed and potted plants.
f) Junction of *chajja* aud wall.



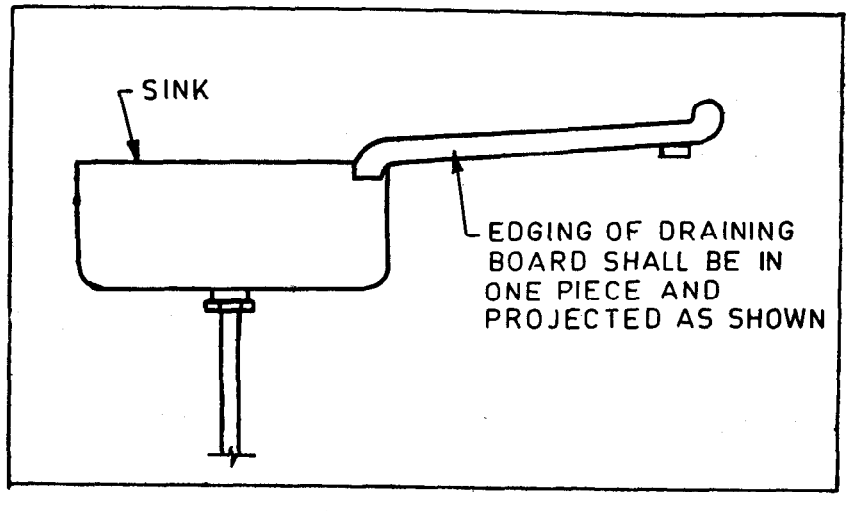


FIG. 6 TYPICAL ARRANGEMENT OF PLACEMENT OF DRAINING BOARD

4.5.2 *Recommendations for Waterproofing and Damp-Proofing*

a) Drops and parapet should be provided to protect open verandah and balconies from rain.

b) Open verandah and balconies should have a slope of 1 in 100 to drain off the water effectively.

c) Where open verandah or balconies are provided with solid parapet wall spouts of adequate dia and length should be provided at the floor level to drain off the water.

d) Proper dripcourse/throting should be provided to throw of the water effectively.

e) Floor of open verandah should be shunk by 25 mm and made from impervious material.

f) Fillet should be provided at the junction point of wall and *chajja* as shown in Fig. 7.

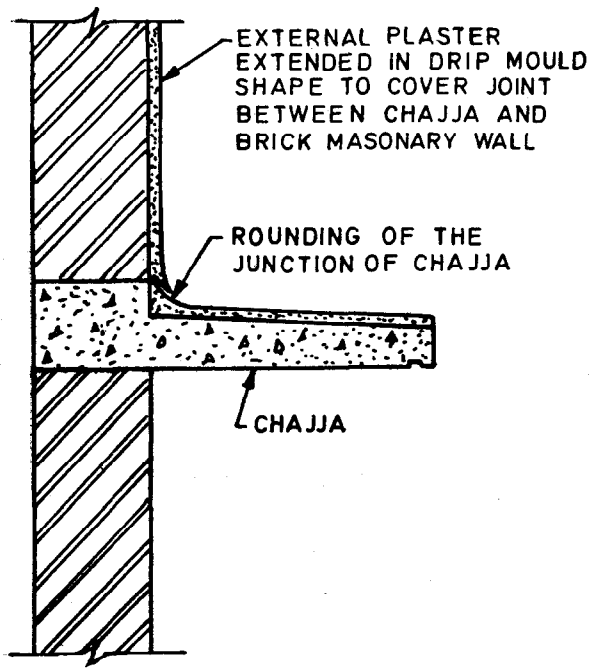


FIG. 7 FILLET AT THE JUNCTION POINT OF WALL AND *CHAJJA*

4.6 Floor Traps

Sanitary appliances differ from each other in the case of water closet, bath room and kitchen. However, floor trap is a common fitment to all. Improper design and installation of floor traps causes dampness and leakage in the building. For avoiding the dampness the trap should fulfil the following requirements:

a) It shall pass the used water freely without mechanical aid.

b) It shall prevent passage of foul air.

c) It shall be strong and proof against all leakage of gas or liquid.

d) It shall be self cleansing.

e) It shall have no mechanical moving part.

f) It shall have no recesses, cavities and pockets.

g) It shall have smooth surface without any internal projections.

h) It shall be capable of maintainnig water seal under all condition of flow.

4.6.1 *Defective Installation*

Following are the installation defects:

a) Installation where the trap is sealed deep from the floor level and there is gap between the floor level where the *jali* grating of the floor trap is kept and main body of the floor trap.

b) Installation where one or more pipes empty into the floor trap and either some pipe do not come up to the trap or the pipe overshoot the floor trap.

c) Improper location of floor traps, fittings and slope in floor.

d) Faulty jointing of the trap with drain pipes (*see* Fig. 8).

e) Floor traps loosely fixed.

4.6.2 *Recommendations for Prevention of Leakage/ Dampness Through Water Traps*

4.6.2.1 *Installation*

a) When floor trap is almost at the floor level, whenever a great amount of water is suddenly spilt, a pool of water is created around the trap which may cause dampness. To prevent this a well defined waterproof depression should be consturcted around the trap. Waterproofing of the depressed area should be done as explained in **4.2.2** (e) (iii).

b) The depression in the RCC slab for fixing of floor traps in kitchen and bath should be adequate.

c) When trap is located deep into the floor space, additional piece of pipe shall be provided to avoid any gap between floor level and the top of the trap. For this a galvanized or MS pipe which is custom built and which can be lead caulked properly with trap should be used (*see* Fig. 8).

d) For making the joints of the cast iron pipes and traps proper, a measuring mug made from galvanized sheet having capacity to have the quantity of lead as per the specification, shall be used. The quantity of molten lead to be used shall be marked in the mug. Mug shall be filled with molten lead up to the mark and all the lead shall be poured in the joint with the help of a iron spoon.

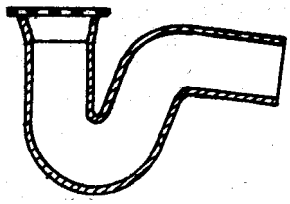
e) Smoke test/air test may be carried out before covering the joints from the tap to the stack.

4.7 Pipe Work for Building

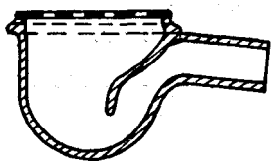
4.7.1 *Recommendations for Installation of Soil and Waste pipes in a Building to Avoid Dampness/ Leakage*

a) Pipe work and appliance should be so arranged as to allow close grouping of connections preferably with closet near the main soil pipe.

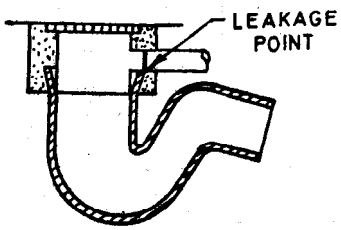
b) All joints in pipe work and of pipe work to appliances should be done according to IS 1742 : 1983. Care should be taken to ensure that no jointing material project inside the bore of the pipe.



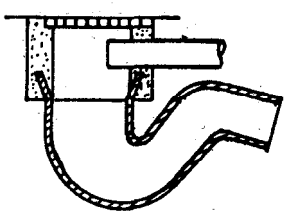
1. Correct type of floor trap



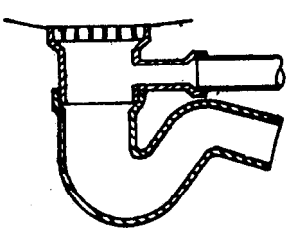
2. In-correct type of floor trap-purtition type. This is not self-cleansing and has projection where it can get clogged.



3. When a waste pipe discharges into the floor trap below floor level the junction is made of cement, concrete. Point 'A' below the pipe is vulnerable as a leakage point due to improper compaction of concrete below pipe.



4. More often the waste pipe is not cut to the exact size it may be short as in Fig. 3 or over shoot the edge as in Fig. 4 which again causes flooding of water and water may find its way into the floor filling below.



5. The correct method of making this joint is to have a G. I. or M. S. custom built 'T' junction with lead caulked joints.

FIG. 8 FLOOR TRAPS

c) Ample provision should be made for access to all pipe work. The embedding or joints in walls should be avoided as far as possible.

d) Soil and wastepipe shall be kept clear of the wall to avoid dampness in the wall in case of leakage. Fixed screw type grating should be preferred.

e) In case of soilpipe, fitment with inspection door should be provided at suitable location. Bolts of the inspection door of the fitments in the pipeline should be of non-rusting material.

4.8 Water Tank

4.8.1 *Sources of Leakages*

a) At the junction of the tank wall and the various pipe fittings in the wall.

b) Under the tank on account of usage of scour valve.

c) Overflow from the tank.

d) Vegetation around the tank.

e) Leakages through the pipelines due to disturbance on account of traffic.

f) Junction of terracing with tank support coloumns.

4.8.2 *Recommendations for Prevention of Leakages and Dampness*

a) The junction between tank wall and various pipelines outlet and inlet fittings have to be made with proper rubber/nylon washers to ensure water tightness.

b) While draining the tank water may seep into the terrace. The area of the terrace under the tank being in the shade, does not get dried quickly. The terrace below

the tank, therefore, should be given double treatment for waterproofing. Clearance between the terrace level and tank should be atleast one metre to facilitate repairs, if any. The scour pipeline should be led to suitable outlet to avoid damage to terracing due to flow of water. The pipe line should be capable of being cleared during maintenance.

c) Overflow from the overhead tank should not fall freely on the terrace damaging the waterproofing treatment. Overflow should be led to a rain water pipe or any other outlet and should end in a mosquito proof coupling.

d) Under the overhead tank vegetation like peepal, lichen, moss, etc, can grow damaging continuity of waterproofing layer thus providing direct access to the water to the building fabric. Special care has to be taken to avoid nooks and corners where moisture would encourage speedy growth of vegetation. Frequent inspections are necessary to remove vegetation.

e) On the terrace long horizontal lengths of piping are laid from the overhead tank to the shaft wherever water pipelines are taken down. These pipelines should be placed on proper pillars. The persons working on the terrace have a tendency to step on these pipelines, thus damaging the joints through which water leakages can take place. In addition, wherever these long lengths of pipelines have reverse level air lock can take place, therefore, such situation should be avoided.

f) The tank supports which may be of brick masonry, RCC and steel should have proper flushing with terracing.

4.9 Sanitary Shaft

4.9.1 *Sources of Leakages and Dampness*

a) Rain,

b) Leakage from both water and sanitary pipelines,

c) Rigidity of piping with respect to the building, and

d) Dampness due to bad ventilation.

4.9.2 *Recommendations for Prevention of Leakages/Dampness*

a) The sanitary shaft should end on the terrace with a proper cowl or louvred end in order that the rain does not get deflected into sanitary shaft due to any wind flowing and at the same time, the ventilation of sanitary shaft is not affected.

b) In case of water supply and sanitary piping, in course of time, some deficiencies in the maintenance may lead to pipe leakage. If the pipes are placed on the wall, the leaked water will create dampness on the wall. In the case of sanitary piping it should be separated by 100 mm from the wall surface and the water supply line should be separated by 40 mm from the surface.

c) The pipes either cast iron or asbestos are rigid compared with building. With the seasonal variation of temperature, buildings will have horizontal and vertical displacement. The pipe connections to the wall should be capable of absorbing these changes in the sanitary shaft in the vertical and horizontal directions. Use of flexible materials like lead for jointing allows certain amount of play whereas the cement joint will not allow the same. Embedding of pipes on the shaft walls or any other building portion increases the problems of such changes due to seasonal variations and special care has to be taken to allow for the freedom of movement while designing the pipe system along with shaft.

d) Sanitary shaft should be so designed that condensation of water does not take place.

4.10 External Wall

4.10.1 *Reasons and Sources for Dampness*

a) Use of non-waterproof cladding.

b) Nooks and corners which collect water.

c) Projections like sun shades, balconies, porches.

d) Projections from walls which create suction areas around the building thereby encouraging larger amount of rain to settle on the wall surface.

e) Vegetation including moss and lichen.

f) Bands.

4.10.2 *Recommendations for Prevention of Dampness*

a) Non-waterproof cladding is not to be allowed such as stone tiles with open joints. Extremely rough surface which would allow water to stagnate should be avoided.

b) The external walls in conjunction with horizontal cills should not give rise to places where water can collect. All such areas should be drained properly either by providing heavy slope and/or by proper waterproofing material.

c) Projections like *chajjas*, balconies and porches, should be so constructed, that they do not retain water (by edges on the end, thus, forming a tank).

d) Projections from the external wall should be properly designed to avoid the wall affect if the wind pattern around the buildings which in some cases give rise to heavy suction areas.

e) Vegetation like moss, lichen, decorative climbers, creepers which cause dampness in the wall should be periodically removed.

f) Bands should be properly sloped otherwise they help water to settle on the top of the surface causing dampness on the external walls.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference:

Doc : No. CED 41 (4567)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	{331 01 31 331 13 75
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola CALCUTTA 700054	87 86 62
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	53 38 43
Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113	235 02 16
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) BOMBAY 400093	632 92 95

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. PATNA. THIRUVANANTHAPURAM.

Printed at New India Printing Press, Khurja, India