

Chapter 6

Sanitary Drainage

6.1 PURPOSE

The purpose of this chapter is to set forth provisions for planning, design and installation of waste disposal systems in and out of buildings

6.2 SCOPE

6.2.1

This chapter specifies the general requirements for environmental sanitation for different categories of buildings according to their occupancy classification.

6.2.2

This chapter also covers the design, installation and maintenance of drainage systems together with all ancillary works such as manholes and inspection chambers used within the building and from the building to public sewers or to offsite waste disposal system (i.e. into septic tanks and seepage pits or subsurface drainage system).

6.2.3

The disposal of wastes from industries, nuclear plants, slaughter houses, etc. are not covered by this Code. These wastes shall be properly treated as specified by environmental quality standards of Bangladesh before their disposal into public sewers or into natural bodies of water.

6.3 TERMINOLOGY

This section provides an alphabetical list of all terms used and applicable to this chapter of the Code. In case of any conflict or contradiction between a definition given in this section and that in any other chapter or part of the Code, the meaning specified in this chapter shall govern for interpretation of the provisions of this chapter.

BEDDING FACTOR : The ratio of the product of design load and factor of safety to the minimum crushing strength.

BRANCH : Any part of the piping system other than a main, riser, or stack.

BRANCH INTERVAL : The length of soil or waste stack corresponding in general to a storey height, but in no case less than 2.5 m within which the horizontal branches from one floor or storey of building are connected to the stack.

BRANCH VENT : The vent connecting one or more individual vents with a vent stack or stack vent.

BUILDING DRAIN : The building (house) drain is that part of the lowest piping or open channel of a drainage system which receives the discharges from soil, waste, and other drainage systems inside the walls of the building and conveys the same to the building (house) sewer, beginning at 0.9 m outside the building wall.

BUILDING SEWER : The building (house) sewer is that part of the horizontal piping of a drainage system which extends from the end of the building drain and which receives the discharge of the building drain and conveys it to a public sewer, private sewer, individual sewage disposal system, or other point of disposal. Also known as SEWER.

CIRCUIT VENT: Venting of branch drainage pipe with which multiple fixtures are connected in battery.

DRAIN: A drain is any pipe or open channel which carries waste water or waterborne wastes in a building drainage system.

DRAINAGE SYSTEM: A drainage system (drainage piping) includes all the piping within public or private premises, which conveys sewage, rain water, or other liquid wastes to a legal point of disposal, but does not include the mains of a public sewer system or a private or public sewage treatment or disposal plant.

DRINKING FOUNTAIN: A fountain or a tap with potable water supply connection.

EXISTING WORK: The existing work is a plumbing system or any part thereof which was installed prior to the date of enforcement of this Code.

FIXTURE UNIT: A fixture unit is a quantity in terms of which the load producing effects on the plumbing system of different kinds of plumbing fixtures are expressed on some arbitrarily chosen scale.

FLUSH VALVES: A flush valve is a device installed on the fixtures for the purpose of flushing those fixtures.

FRENCH DRAIN: A shallow trench filled with coarse rubble, clinker or similar material with or without field drain pipes.

GRADE: The grade is the slope or fall of a pipe in reference to a horizontal plane. In drainage it is usually expressed as the fall in mm per m length of pipe.

HORIZONTAL BRANCH : A horizontal branch is a drain pipe extending laterally from a soil or waste stack or building drain, with or without vertical sections or branches, which receives the discharge from one or more fixture drains and conducts it to the soil or waste stack or to the building (house) drain.

HORIZONTAL PIPE: A horizontal pipe is any pipe or fitting which is installed in a horizontal position or which makes an angle of less than 45 degrees with the horizontal.

IMHOFF TANK: These are two-storeyed settling cum digestion tanks used for primary treatment of domestic sewage in a very anaerobic environment.

INDIVIDUAL VENT: An individual vent is a pipe installed to vent a fixture trap and which connects with the vent system above the fixture served or terminates in the open air.

INTERCEPTOR: An interceptor is a device designed and installed so as to separate and retain deleterious, hazardous, or undesirable matter from normal wastes and permit normal or liquid wastes to discharge into the disposal terminal by gravity.

INVERT: The lowest point of the internal surface of a pipe or channel at any cross-section.

KITCHEN SINK: Sink or washing facilities raised above or at the level of the floor fitted with a tap.

LEADER: A vertical drainage pipe that carries rainwater from roof or gutter drain to building storm drain or building drain or private disposal system. It is also called Rainwater Down Pipe (RDP)

LIQUID WASTE: The liquid waste is the discharge from any fixture, appliance, or appurtenance in connection with a plumbing system which does not receive faecal matter.

LOAD FACTOR: The load factor is the percentage of the total connected fixture unit flow rate which is likely to occur at any point in the drainage system. It varies with the type of occupancy, the total flow unit above the point being considered, and with the probability factor of simultaneous use.

LOCAL VENT STACK: A vertical piping to which connections are made from the discharge side of traps and through which vapour or foul gas is removed from the fixture or device used on bedpan washer.

LOOP VENT: Also called Circuit vent. See CIRCUIT VENT.

MAIN: The main of any system of continuous piping is the principal artery of the system, to which branches may be connected.

MAIN SEWER: See PUBLIC SEWER.

MAIN VENT: The main vent is the principal artery of the venting system, to which vent branches are connected.

MANHOLE : An opening through which a man may enter or leave a drain, a sewer or other closed structure for inspection, cleaning and other maintenance operations, fitted with a suitable cover.

MANHOLE CHAMBER: A chamber constructed on a drain or sewer so as to provide access thereto for inspection, testing or the clearance of obstruction.

NONSERVICE LATRINE: A latrine other than service latrine.

OFFSET : An offset in a line of piping is a combination of elbows or bends which brings one section of the pipe out of line but into a line parallel with the other section.

PIPE SYSTEM: The system to be adopted will depend on the type and planning of the building in which it is to be installed and will be one of the following:

- a) **Single Stack System** (see Fig 8.6.1) : The one pipe system without trap ventilation pipe work.
- b) **One Pipe System** (see Fig 8.6.2) : The plumbing system in which the waste from sinks, bath rooms and wash basins, and soil pipe branches are all collected into one main pipe connected directly to the drainage system. Gully traps and waste pipes are completely dispensed with but all the traps of water closets, basins, etc. are completely ventilated to preserve the water seal.
- c) **Two Pipe System** (see Fig 8.6.3) : A discharge pipe system comprising two independent discharge pipes, one conveying soil directly to the drain, the other conveying waste water to the drain through a trapped gully. The system may also require ventilating pipes.

PLUMBING : The plumbing includes the practice, materials, and fixtures used in the installation, maintenance, extension, and alteration of all piping, fixtures, appliances, and appurtenances in connection with any of the following : sanitary drainage or storm drainage facilities, the venting system and the public or private water supply systems, within or adjacent to any building, structure, or conveyance; also the practice and materials used in the installation, maintenance, extension, or alteration of the storm water, liquid waste, or sewerage, and water supply systems of any premises to their connection within any point of public disposal or other acceptable terminal.

PLUMBING FIXTURES : The plumbing fixtures are installed receptacles, devices, or appliances which are supplied with water or which receive or discharge liquids or liquid borne wastes, with or without discharge into the drainage system with which they may be directly or indirectly connected.

PLUMBING SYSTEM : The plumbing system includes the water supply and distribution pipes, plumbing fixtures and traps, soil, waste and vent pipes, building drains and building sewers, including their respective connections, devices, and appurtenances within the property lines of the premises, and water treating or water using equipment.

PUBLIC SEWER : A public sewer is a common sewer directly controlled by public authority. Also known as MAIN SEWER.

RELIEF VENT : A relief vent is a vent the primary function of which is to provide circulation of air between drainage and vent systems (Fig 8.6.6).

RISER : A water supply pipe that extends vertically one full storey or more to convey water to branches or fixtures.

SANITARY SEWER : A sanitary sewer is a pipe which carries sewage and excludes storm, surface, and ground water. Also known as SEWER.

SEEPAGE PIT : See SOAK PIT.

SEPTIC TANK : A septic tank is a watertight settling tank which receives the discharge of a drainage system or part thereof and is designed and constructed so as to separate solids from the liquid, digest organic matter through a period of detention, and allow the liquids to discharge into the soil outside the tank through a system of open joint or perforated piping or disposal pit (Fig 8.6.15).

SERVICE LATRINE : A latrine from which the excreta are removed by manual agency and not by water carriage.

SEWAGE : The sewage is any liquid waste containing animal or vegetable matter in suspension or solution and may include liquids containing chemicals in solution.

SEWER : See BUILDING SEWER or PUBLIC SEWER or SANITARY SEWER or STORM SEWER.

SLUDGE : A settled portion of the sewage or waste water effluent from a sedimentation tank in semi-solid condition.

SOAK PIT : A pit, dug into permeable soil lined to form a covered perforated chamber or filled with sand at the bottom and gravel or broken bricks at the top into which effluent from septic tank or storm water is led and from which these may soak away into the ground. Also known as SEEPAGE PIT or SOAK WELL.

SOAK WELL : See SOAK PIT.

SOIL PIPE : A soil pipe is any pipe which conveys the discharge of water closets, urinals, or fixtures having similar functions, with or without the discharge from other fixtures, to the building drain or building sewer.

SOIL VENT : See STACK VENT.

STACK : A stack is the vertical main of a system of soil, waste, or vent piping.

STACK VENT : A stack vent (sometimes called a waste vent or soil vent) is the extension of soil or waste stack above the highest horizontal drain connected to the stack. Also known as SOIL VENT.

STACK VENTING : Stack venting is a method of venting a fixture or fixtures through the soil or waste stack.

STERILIZER VENT : A separate pipe or stack, indirectly connected to the building drainage system at the lower terminal, which receives the vapour from non pressure sterilizers or the exhaust from pressure sterilizers and conduct the vapour directly to the outer air.

SUBSOIL DRAIN : A subsoil drain is a drain which receives only subsurface or seepage water and conveys it to a place of disposal.

SULLAGE : The discharge from wash basins, sinks and similar appliances, which does not contain human or animal excreta.

SUMP : A sump is a tank or pit which receives sewage or liquid waste, located below the normal grade of the gravity system, and which must be emptied by mechanical means.

SUPPORTS : The supports, hangers, and anchors are devices for supporting and securing pipe and fixtures to walls, ceilings, floors, or structural members.

TRAP : A trap is a fitting or device so designed and constructed as to provide, when properly vented, a liquid seal which will prevent the back passage of air or gas without materially affecting the flow of sewage or waste water through it.

TRAP SEAL : The trap seal is the maximum vertical depth of liquid that a trap will retain, measured between the crown weir and the top of the dip of the trap.

VENT PIPE : See VENT SYSTEM.

VENT STACK : A vent stack is a vertical vent pipe installed primarily for the purpose of providing circulation of air to and from any part of the drainage system.

VENT SYSTEM : A vent system is a pipe or pipes installed to provide a flow of air to or from a drainage system or to provide a circulation of air within such system to protect trap seals from siphonage and back pressure. Also known as VENT PIPE.

VERTICAL PIPE : A vertical pipe is any pipe or fitting which is installed in a vertical position or which makes an angle of not more than 45 degrees with the vertical.

WASTE PIPE : A waste pipe is a pipe which conveys only liquid waste free of faecal matter.

YOKE VENT: A yoke vent is a vent provided between drainage and vent stacks to provide circulation of air between drainage and vent systems (Fig 8.6.6).

6.4 DRAINAGE AND SANITATION PLANS

6.4.1 Requirement of Permit

Drainage and sanitation system shall not be installed until a permit for such work has been issued by the Authority for existing (only for addition or for alteration) or new building or for any other premises.

6.4.2 Application for Permit

An application for a permit for drainage and sanitation work shall be made on a prescribed form (see Appendix 8.5.A) by the licensed plumber and the owner, or by his appointed person or agent to install all or a self-contained or workable part of such work. The application shall accompany building drainage plans and adequate description of the proposed drainage and sanitation installation in a drawing (drawn to a scale not less than 1:100) with the following details:

- a) plan(s) of the building with typical arrangement of plumbing fixtures;
- b) sanitary waste disposal system;
- c) venting system in the building drainage system;
- d) materials, sizes and gradients of all proposed piping;
- e) the position of manhole, traps, waste pipe, rainwater pipe, vent pipe, water closet, urinal, lavatory, sink or other appliances in the premises and their connection with sewerage/drainage system or with private waste disposal system; the following colours may be used to indicate sewers, waste water pipes, rainwater pipes and existing works:

proposed sanitary sewers and sanitary waste disposal pipes : red

proposed sanitary sewers and sanitary waste disposal pipes : blue

existing network : black

- f) the position of refuse chute, inlet hopper and collection chamber for buildings more than six storeys high.

6.4.3

In addition to drainage plan a separate site plan of the building shall be submitted with the following particulars:

- a) adjoining plots and streets with their identification;
- b) the position and invert level of the public sewers (if any) and the direction of flow in it;
- c) the level of the proposed drains connecting to the sewers (if any);
- d) the position and layout of private waste disposal system (in absence of public sewers); and
- e) the alignment, size and gradients of all drains.

6.4.4

For high rise buildings, design calculations and specifications for various items of the work involved shall be submitted along with the drawings.

6.4.5 Permits and Approvals

The building official shall examine or cause to be examined all applications for permits and, amendments thereto within 45 days. If the application does not conform to the requirements of all pertinent laws, such application shall be rejected in writing, stating the reasons therefore. If the proposed work satisfies all the Code requirements, the Authority shall issue a nontransferable permit.

6.5 LICENSING OF PLUMBER

6.5.1 License Requirement

No individual, partnership, corporation or firm shall engage in the business of installation, repair, alteration or maintenance of plumbing, drainage and sanitation work without obtaining a license from the Authority.

6.5.2 Examination and Certification

The **Building** Authority shall establish a plumber's examination board. The board will determine the requirements for the qualification and procedures for examination of applicants for license. The Authority will issue license to such applicants who meet the qualifications therefore and successfully pass the examination conducted by the board.

6.5.3 Annulment of License

The license of a licensed plumber may be nullified by the **Building** Authority, if it is proved that a plumbing work has been completed and certified by the licensed plumber violating the provisions of this Code deliberately setting aside the approvals given in the permit or without receiving the permit from the **Building** Authority.

6.6 DRAINAGE AND SANITATION REQUIREMENT

6.6.1 General

6.6.1.1

Each family dwelling unit on premises abutting a public sewer or with a private waste disposal system shall have at least one water closet and one kitchen sink or washing facilities. It is recommended to have at least one bathroom with a bath tub or shower to meet the basic requirements of sanitation and personal hygiene and in that case bath and water closet shall be separately accommodated.

6.6.1.2

All other structures for human occupancy or use on premises abutting a sewer or with a private waste disposal system shall have adequate sanitary facilities but in no case less than one water closet and one other fixture for cleaning purposes.

6.6.1.3

There shall be one water tap and arrangement for drainage in the vicinity of each water closet in all buildings.

6.6.1.4

There shall be at least one water tap and arrangement for drainage in the vicinity of each urinal or group of urinals in all buildings.

6.6.1.5

There shall be separate facilities for each sex for public toilets and for public bathing places based on the percentage of each anticipated sex.

6.6.1.6

Where drinking water fountain is provided, it shall not be installed in toilet room.

6.6.1.7

Rooms containing water closets or urinals shall be separated by partition wall from places where food will be prepared and served.

6.6.1.8

All water closets and urinals shall be provided with flushing system.

6.6.2 Minimum Number of Fixtures

Table 8.6.1 and Sec 6.6.2.1 and 6.6.2.2 provide the minimum number of fixtures required for different categories of buildings according to their occupancy classifications. The fixture requirement for the occupancy not provided in these sections shall be subject to the approval of the Building Authority.

6.6.2.1

The Size of drainage pipe of fixtures shall be provided as shown in Table 8.6.0.

Table 8.6.0 :The minimum internal diameter for sanitary appliances shall be as follows:

Sanitary Appliance Minimum Internal Diameter of Waste Outlet mm	
Soil appliances	
a) Indian and European type water closets	100
b) Bed pan washers and slop sinks	100
c) Urinal with integral traps	75

d) Stall urinals (with not more than 50-120 mm of channel drainage)	40
e) Lipped urinal smallhge	40
Waste appliances	
f) Drinking fountain	25
g) Wash basin	32
h) Bidets	32
j) Domestic sinks and baths	40
k) Shower bath trays	40
m) Domestic bath tubs	50
n) Hotel and canteen sinks	50
p) Floor traps (outlet diameter)	65

6.6.2.2 Automatic Clothes Washers

Waste connection. The waste from an automatic clothes washer shall discharge through an *air break* into a standpipe in . The trap and *fixture drain* for an automatic clothes washer standpipe shall be a minimum of 2 inches (51 mm) in diameter.

6.6.2.3 Floor drains

Floor drains shall have removable strainers. The floor drain shall be constructed so that the drain is capable of being cleaned. Access shall be provided to the drain.

6.6.2.4 Physically Handicapped Plumbing Facilities

All buildings other than residential, educational, storage and hazardous according to building occupancy classification, having public toilet facilities with required number of fixtures shall have at least one water closet for each sex (or one unisex water closet facility) and one drinking fountain accessible to and usable by physically handicapped persons. The water closet compartment for physically handicapped persons shall be in accordance with Sec 6.9.4.

6.6.2.5 Drainage and Sanitation Requirements for Traffic Terminal Stations

a) The minimum sanitary conveniences provided at any traffic terminal station like railway station, bus station etc. shall consist of non service type latrines one for each sex, and one non service type urinal for males for a daily passenger volume up to 300 persons. For large stations and airports, sanitary arrangements shall be in accordance with Table 8.6.1.

b) There shall be adequate arrangements for satisfactory drainage of all sewage, sullage and waste water. The drainage shall be so designed as to cause no stagnation at the maximum discharge rate for which the different units are designed.

c) Adequate scavenging arrangements shall be provided to keep the stations or terminals clear of all refuse. Refuse containers shall be placed at convenient points.

6.6.3 Accessibility

The fixtures specified in Sec 7.6.2 for public building shall be located not more than one floor above nor more than one floor below the floor occupied by the people for whose use the fixtures are intended, unless elevator service is available, except that in buildings which are accessible to the physically handicapped, there shall be minimum facilities as specified by the Code. It is desirable that the path of travel to the facilities shall not exceed a travel distance of 150 m.

6.7 MATERIALS AND APPLIANCES

Different sanitary appliances, materials and fittings listed in Tables 8.6.1 to 8.6.4 and 8.5.9 (Chapter 5) shall conform to the standard or one of the standards cited against them. For other appliances, materials and fittings not provided in Tables 8.6.2 to 8.6.5 and 8.5.9 (Chapter 5) shall be subject to the approval of the **Building Authority**. Applicable standards for different materials and appliances have also been listed in Part 5.

Table 8.6.1: Plumbing Fixtures Requirement

Type of Building Occupancy	Water Closets*	Urinals**	Wash Basins ***	Bathtubs or Shower	Drinking Fountains	Other Fixtures
A Residential Buildings						
A1 Detached Single Family Dwelling A2 Flats or Apartments A4 Minimum Standard Housing	1 per dwelling or apartment	-	1 per dwelling or apartment	1 per dwelling or apartment	-	1 kitchen sink per dwelling
A3 Mess, Boarding Houses and Hostels						
For Residence and Residential Staff	Males: 1 for 8 persons Females: 1 for 6 persons	Males: 1 for 25 persons up to 150 persons. Add 1 fixture for each additional 50 persons	Males: 1 for 8 persons Females: 1 for 6 persons	Males: 1 for 8 persons Females: 1 for 6 persons	1 for 75 persons	1 kitchen sink in each kitchen
For Nonresidential Staff	Males: 1 for 1-15 persons 2 for 16-35 persons 3 for 36-65 persons 4 for 66-100 persons Females: 1 for 1-12 persons 2 for 13-25 persons 3 for 26-40 persons 4 for 41-57 persons 5 for 58-77 persons 6 for 78-100 persons	Males: Nil up to 6 persons 1 for 7-20 persons 2 for 21-45 persons 3 for 46-70 persons 4 for 71-100 persons	Males: 1 for 1-15 persons 2 for 16-35 persons 3 for 36-65 persons 4 for 66-100 persons Females: 1 for 1-12 persons 2 for 13-25 persons 3 for 26-40 persons 4 for 41-57 persons 5 for 58-77 persons 6 for 78-100 persons	-	1 for 100 persons	-
Rooms wherein Outsiders are Received	Males: 1 for 100 persons up to 400 persons and add 1 fixture for additional 250 persons Females: 2 for 100 persons up to 200 persons and add 1 fixture for additional 100 persons.	Males: 1 for 50 persons	Male: 1 per water closet and 1 per urinal or group of urinals Females: 1 per water closet	-	-	-

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Table 8.6.1 (Contd.)
Plumbing Fixtures Requirement

Type of Building Occupancy	Water Closets*	Urinals**	Wash Basins ***	Bathtubs or Shower	Drinking Fountains	Other Fixtures
Houses						
For Residential Public and Staff	1 for 8 persons omitting the occupant of the room with attached water closet; minimum of 2 if both sex are lodged.	-	1 for 10 persons omitting the wash basins installed in the room or suite.	1 for 10 persons omitting the occupants of the room with bath in suite.	1 for 100 persons	1 kitchen sink in each kitchen
For Public Rooms	Males: 1 for 100 persons up to 400 persons and add 1 for additional 250 persons or part thereof. Females: 2 for 100 persons up to 200 persons and add 1 for additional 100 persons or part thereof.	Males: 1 for 50 persons	Males: 1 per water closet and 1 per urinal or group or urinals Females: 1 per water closet	-	1 for 100 persons	-
For Nonresidential Staff	Males: 1 for 1-15 persons 2 for 16-35 persons 3 for 36-65 persons 4 for 66-100 persons Females: 1 for 1-12 persons 2 for 13-25 persons 3 for 26-40 persons 4 for 41-57 persons 5 for 58-77 persons 6 for 78-100 persons	Males: Nil up to 6 persons 1 for 7-20 persons 2 for 21-45 persons 3 for 46-70 persons 4 for 71-100 persons	Males: 1 for 1-15 persons 2 for 16-35 persons 3 for 36-65 persons 4 for 66-100 persons Females: 1 for 1-12 persons 2 for 13-25 persons 3 for 26-40 persons 4 for 41-57 persons 5 for 58-77 persons 6 for 78-100 persons	-	1 for 100 persons	-

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Table 8.6.1 (Contd.)
Plumbing Fixtures Requirement

Type of Building Occupancy	Water Closets*	Urinals**	Wash Basins ***	Bathtubs or Shower	Drinking Fountains	Other Fixtures
B Educational Building						
B1 Education Facilities	Males: 1 for 40 persons Females: 1 for 25 persons	Males: 1 for 20 persons	Males: 1 for 60 persons but minimum 2 Females: 1 for 40 persons but minimum 2	-	1 for 50 persons	Service sink: 1 per floor.
B2 Preschool Facilities	1 for 15 children	-	1 for 15 children	-	1 for 50 children	Service sink: 1 per floor
C Institutional Buildings						
C1 Institution for Care of Children	Boys: 1 for boys Girls: 1 for girls	Urinals may be provided in boys toilet rooms in lieu of water closets but for not more than ½ of the required number of water closets	Boys: 1 for 8 boys Girls: 1 for 6 girls	1 for 8 persons (boys or girls)	1 for 50 persons (boys or girls)	Service sink: 1 per floor
C2 Custodial Institutions for Physically Capable	1 unisex facility or 1 for each sex for 1-100 persons	-	1 for 200 persons	1 for 10 persons but not less than 1 for use by both sexes.	1 for 100 persons	Service sink: 1 per floor
C3 Custodial Institution for the Incapable	2 unisex facilities or 1 unisex facility and 1 for each sex for 100-200 persons. Over 200 persons one additional unisex facility or 1 for each sex for each additional 100 persons.	-				
C4 Penal and Mental Institutions	1 per cell	-	1 per cell	1 for 15 persons	1 for 100 persons	Service sink

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Table 8.6.1 (Contd.)
Plumbing Fixtures Requirement

Type of Building Occupancy	Water Closets*	Urinals**	Wash Basins ***	Bathtubs or Shower	Drinking Fountains	Other Fixtures
D Health Care Building						
D1 Normal Medical Facilities (Indoor Patient Ward)	1 for 8 patient (male or female)	-	2 up to 30 patients and add 1 fixture for additional 30 patients	1 for 8 patients	1 for 75 patients	Service sink: 1 for each ward. Bed pan washing sink: 1for each ward. Kitchen sink: 1 for each kitchen
D2 Emergency Medical Facilities and Outdoor Patient Ward	Males: 1 for 100 persons Females: 2 for 100 persons	Males: 1 for 50 persons	1 fro 100 persons	-	1 for persons	Service sink: 1 for each ward
E Assembly Building						
E1 large Assembly with Fixed Seats E2 Small Assembly with Fixed Seats E3 Large Assembly without Fixed Seats E4 Small Assembly without Fixed Seats						
Mosque	1 for 30 persons	-	-	1 for 100 persons	1 for 100 persons	Water taps with drainage arrangement: 1 for 10 persons
Junction Stations, Intermediate Stations, Terminal Stations and Bus Terminals	Males: Min 2, 4 for 1000 persons and add 1 for additional 1000 persons. Females: Min 2, 5 for 1000 persons and then add 1 for additional 1000 persons	Male: Min 2, 4 for 1000 persons and then add 1 for additional 1000 persons	Males: Min 2, 4 for 1000 persons and add 1 for additional 1000 persons. Females: Min 2, 6 for 1000 persons and then add 1 for additional 1000 persons	-	1 for 300 persons	Service sink: 1 per floor

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Table 8.6.1 (Contd.)
Plumbing Fixtures Requirement

Type of Building Occupancy	Water Closets*	Urinals**	Wash Basins ***	Bathtubs or Shower	Drinking Fountains	Other Fixtures
Domestic Airport Minimum for 200 persons for 400 persons for 600 persons for 800 persons for 1000 persons	Males: 2 Females: 2 Males: 4 Females: 5 Males: 6 Females: 8 Males: 8 Females: 10 Males: 9 Females: 13 Males:10 Females:13	Males: 1 Males: 2 Males: 4 Males: 5 Males: 6 Males: 7	2 4 6 8 9 10	-	1 per 300 persons	Service sink: 1 per floor
International Airport for 200 persons for 600 persons for 1000 persons	Males: 6 Females: 10 Males: 12 Females: 20 Males: 18 Females:29	Males: 8 Males: 22 Males: 22	10 20 25	4 shower stalls in the females or males toilet in the transit and departure lounge and also in the main concourse	1 for 300 persons	Service sink: 1 per floor
Cinemas, Concert halls, Theatres (for public use)	Males: 1 for 100 persons Up to 400 persons. Add 1 for each additional 250 persons. Females: 3 for 100 persons up to 200 persons. Add 2 for each additional 100 persons.	Males: 1 for 25 persons	1 for 200 persons	-	1 for 500 persons	Service sink 1
Cinemas, Concert halls, Theatres (for permanent employee use)	Males: 1 for 1-15 persons 2 for 16-35 persons Females: 1 for 1-12 persons 2 for 13-25 persons	Males: Nil up to 6 persons 1 for 7-20 persons 2 for 21-45 persons	Males: 1 for 1-15 persons 2 for 16-35 persons Females: 1 for 1-12 persons 2 for 13-25 persons	-	1 for 500 persons	-
Art Galleries, Libraries, Museums (for public use)	Males: 1 for 200 persons up to 400 persons. Add 1 for each additional 250 persons Females: 1 for 100 persons up to 200 persons. Add 1 for each additional 150 persons	Males: 1 for 50 persons	1 for 200 persons up to 200 persons and then add 1 for additional 250 persons	-	1 for 500 persons	Service sink: 1

Table 8.6.1 (Contd.)
Plumbing Fixtures Requirement

Type of Building Occupancy	Water Closets*	Urinals**	Wash Basins ***	Bathtubs or Shower	Drinking Fountains	Other Fixtures
Art Galleries, Libraries, Museums (for permanent employee use)	Males: 1 for 1-15 persons 2 for 16-35 persons Females: 1 for 1-12 persons 2 for 14-25 persons	Males: Nil up to 5 persons 1 for 7-20 persons 2 for 21-45 persons	Males: 1 for 1-15 persons 2 for 16-35 persons Females: 1 for 1-12 persons 2 for 14-25 persons	-	1 for 100 persons	-
E5 Sports Facilities	Males: 1 for 75 persons Females: 1 for 50 persons	Males: 1 for 75 persons	1 for 60 persons	1 for 50 persons	1 for 300 persons	Service sink: 1
F Business and Mercantile Building						
F1 Offices F4 Garages and Petrol Stations F5 Essential Services	Males: 1 for 25 persons Female: 1 for 15 persons	Males: Nil up to 6 persons 1 for 7-20 persons 2 for 21-45 persons 3 for 46-70 persons 4 for 71-100 persons Add@ 3% for 101-200 persons and @ 2.5% for over 200 persons	1 for 25 persons	-	1 for 100 persons	Service sink: 1 per floor.
F2 Small Shops and Markets F3 Large Shops and Markets	1 for 500 persons	Urinals may be provided in toilet room in lieu of water closets for men but for not more than ½ of the required number of water closets.	1 for 750 persons	-	1 for 1000 persons	Service sink:1

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Table 8.6.1 (Contd.)
Plumbing Fixtures Requirement

Type of Building Occupancy	Water Closets*	Urinals**	Wash Basins ***	Bathtubs or Shower	Drinking Fountains	Other Fixtures
G Industrial Buildings Factories	<p>Males: 1 for 1-15 persons 2 for 16-35 persons 3 for 36-65 persons 4 for 66-100 persons</p> <p>Females: 1 for 1-12 persons 2 for 13-25 persons 3 for 26-40 persons 4 for 41-57 persons 5 for 58-77 persons 6 for 78-100 persons</p>	<p>Males: Nil up to 6 persons 1 for 7-20 persons 2 for 21-45 persons 3 for 46-70 persons 4 for 71-100 persons Add@ 3% for 101-200 persons and @ 2.5% for over 200 persons</p>	1 for 25 persons	As required by particular trades or occupations	1 for 100 persons	Service sink: 1 per floor
H Storage Buildings	1 for 100 persons	-	1 for 100 persons	Provisions for emergency shower	1 for 1000 persons	Service sink:1
J Hazardous Buildings	1 for 100 persons	-	1 for 100 persons	Provisions for emergency shower	1 for 1000 persons	Service sink:1
<p>* Some of the water closets may be of European style. The water closet(s) shall not be oriented in the east-west direction. ** The urinal(s) shall not be oriented in the east-west direction. *** Toilet(s) of public use shall have at least one water tap with adequate drainage arrangement for ablution purpose when the numbers of devotees exceed twenty.</p>						

Table 8.6.2 Sanitary Appliances

Appliances	Standard
Ceramic wash basin and pedestals	BDS 1162-87
Ceramic wash down water closet pans	BS 1213
Foot rest vitreous china	BDS 1163-87 parts 1 & 4
Integrated squatting pans vitreous china	BDS 1163-87 parts 1 & 5
Metal hand rinse basin	BS 1329
Metal sink for domestic purpose	BS 1244
Urinals (bowl type) vitreous china	BDS 1163-87 parts 1 & 3
Wash-down water closet pans, vitreous china	BDS 1163-87 parts 1 & 2
Water closet seat plastic	BS 1254
Water closet flushing cisterns and pipes	BS 1125

Table 8.6.3 Building Drainage and Vent Pipe

Material	Standards
Acrylonitrile butadiene styrene (ABS plastic pipe)	ASTM D2661, ASTM F 628
Aluminum tubing	ASTM B429, ASTM B745M
Brass pipe	ASTM B43
Cast iron pipe	ASTM A74
Copper or Copper-alloy tubing	ASTM B75M, ASTM B88M, ASTM B251M, ASTM B306
Galvanized steel pipe	ASTM A53
Polyvinyl chloride plastic pipe	ASTM D2665, ASTM D2949, ASTM F891

Table 8.6.4 Building Sewer or Building Storm Sewer Pipe

Material	Standards
Acrylonitrile butadiene styrene (ABS plastic pipe)	ASTM D2261, ASTM D2751, ASTM F628, ASTM D2321
Bihuminized fibre pipe	ASTM D1861, ASTM D1862
Cast iron pipe	ASTM A74
Concrete pipe	ASTM C14M, ASTM C76M
Copper or Copper-alloy tubing	ASTM B75, ASTM B88M, ASTM B251M
Unplasticized Polyvinyl chloride (uPVC) plastic pipe	ASTM D2665, ASTM D2949, ASTM D3034, ASTM D2321, ASTM F891
Vitrified clay pipe	ASTM C4, ASTM C700

Table 8.6.5 Subsoil Drainage Pipe

Material	Standard
Bituminous fibre pipe	ASTM D2311
Cast iron pipe	ASTM A74
Concrete pipe	ASTM C654 M
Polyethylene (PE) plastic pipe	ASTM F405
Unplasticized Polyvinyl chloride (uPVC) plastic pipe	ASTM D2729, ASTM F891
Vitrified clay pipe	ASTM C4, ASTM C700

6.8 HANGERS AND SUPPORT AND PIPE JOINTING

6.8.1 Hangers and Support

The piping, fixtures and equipment used for plumbing, water supply and drainage system shall be provided with hangers and support in accordance with Sec 5.13 in Chapter 5.

6.8.2 Pipe Joints

The joints between different piping and fittings shall conform to the standards cited against them in Table 8.6.6. The requirements for the joints not specified in the table shall be subject to the approval of the Building Authority.

6.9 DESIGN CONSIDERATIONS

6.9.1 Objective

For the design of drainage and sanitation system of different buildings according to building classification, the objective shall be to safeguard against fouling, deposition of solids and clogging and with adequate cleanouts and inspection chambers so arranged that the drains may be readily cleaned without the risk of health hazard.

6.9.2 General

- a) The plumbing system shall be designed and adjusted to use the minimum quantity of water consistent with proper performance and cleaning.
- b) Plumbing fixtures, devices and appurtenances shall be supplied with required volume of water at pressures adequate to enable these to function properly and without undue noise under normal conditions of use.

6.9.3 Different Building Drainage Systems

For the design and installation for drainage piping, one of the following building drainage systems shall be adopted :

- i. single stack system,
- ii. one-pipe system, and
- iii. two-pipe system.

Table 8.6.6 Joints Between Different Pipes and Fittings

Material	Standard
ABS plastic pipe and fittings	ASTM D2235, ASTM D2661, ASTM D3212, ASTM F628 ASME B1.20.1
Aluminium tubing	ASTM C564
Asbestos cement pipe and fittings	ASTM D1869
Brass pipe and fittings	ASME B1.20.1
Cast iron pipe and fittings	ASTM C564
Concrete pipe and fittings	ASTM C443
Copper or Copper-alloy pipe and fittings	ASTM B32, ASME B1.20.1
Copper-alloy tubing and fittings	ASTM B32
CPVC plastic pipe and fittings	ASTM F493, ASME B1.20.1
Galvanized steel pipe and fittings	ASME B1.20.1
PE plastic pipe and fittings	ASTM D2657

Material	Standard
PVC plastic pipe and fittings	ASTM D2657, ASTM D2855, ASTM D3139, ASTM D3212, ASTM F402, ASTM F656, ASME B1.20.1
Vitrified clay pipe and fitting	ASTM C425

- a) Single stack system may be used with 100 mm diameter stack for buildings up to 5-storey height. The fixtures in each floor shall be connected to a single stack for increasing the rate of discharge in the downward direction. There shall be at least 200 mm vertical distance between the waste branch and the soil branch connection, while the soil pipe will be connected to stack above the waste pipe. The size of soil branch shall not be less than 100 mm. The horizontal branch distance for fixtures from stack and bend(s) at the foot of stack to avoid back pressure as well as the vertical distance between the lowest connection and the invert of drain shall be as shown in Fig 8.6.1. The recommended depth of water seal trap for different fixtures shall be in accordance with Table 8.6.7.

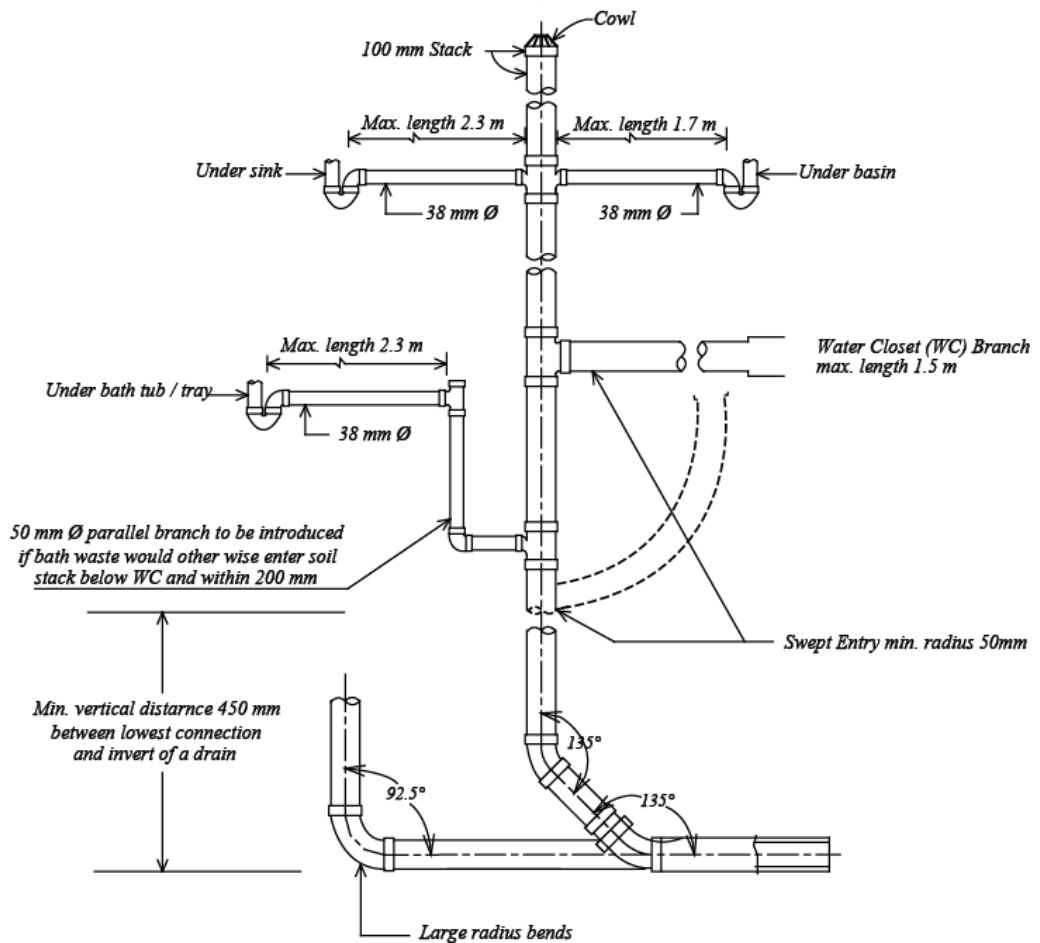


FIG. 8.6.1 SINGLE STACK SYSTEM

- b) Where all types of waste from the building are desired to be discharged into a common sewer or into same waste disposal system, one pipe system may be used (Fig 8.6.2).

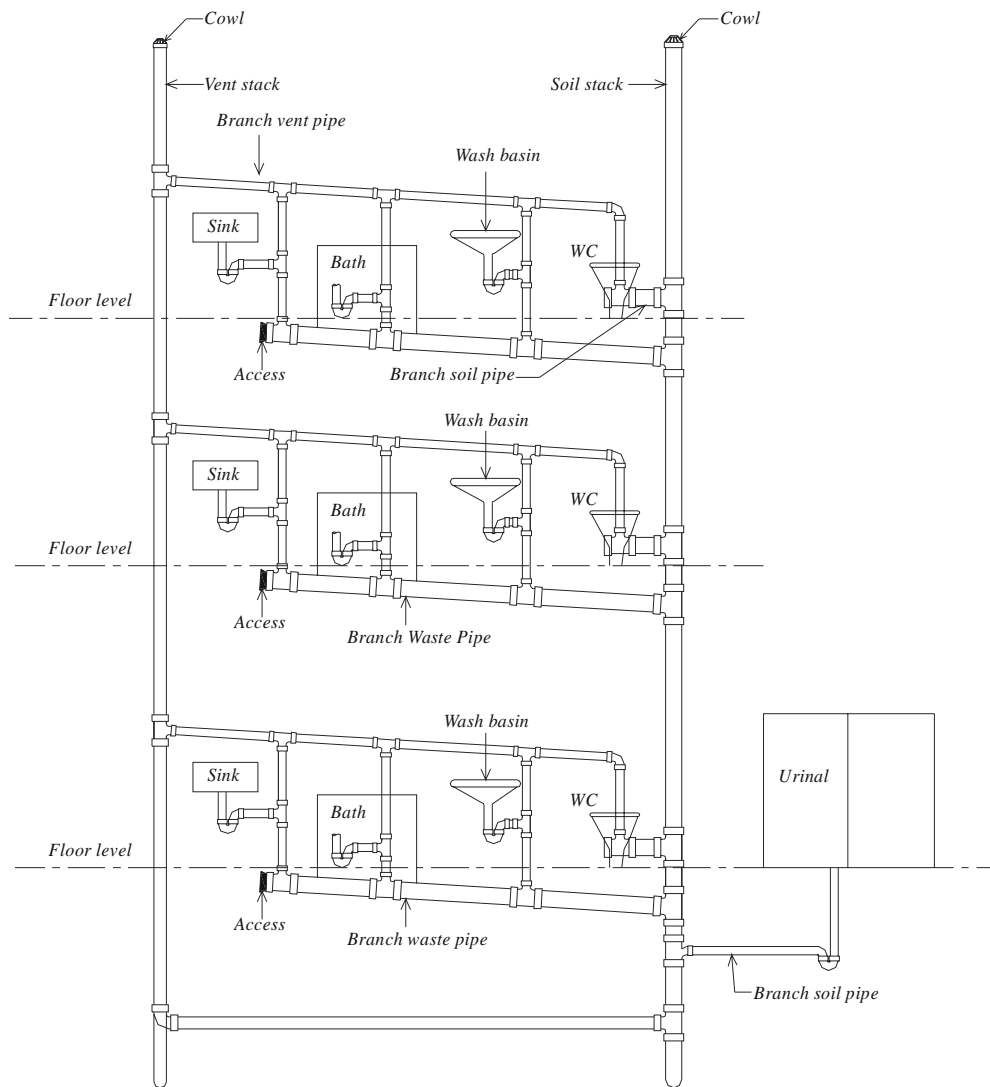


FIG. 8.6.2 DIAGRAM OF ONE - PIPE SYSTEM

- c) Where the sullage from kitchen and bath will be dealt with separately and where soil waste shall be discharged into septic tank or Imhoff tank, the two pipe system shall be used (Fig 8.6.3).

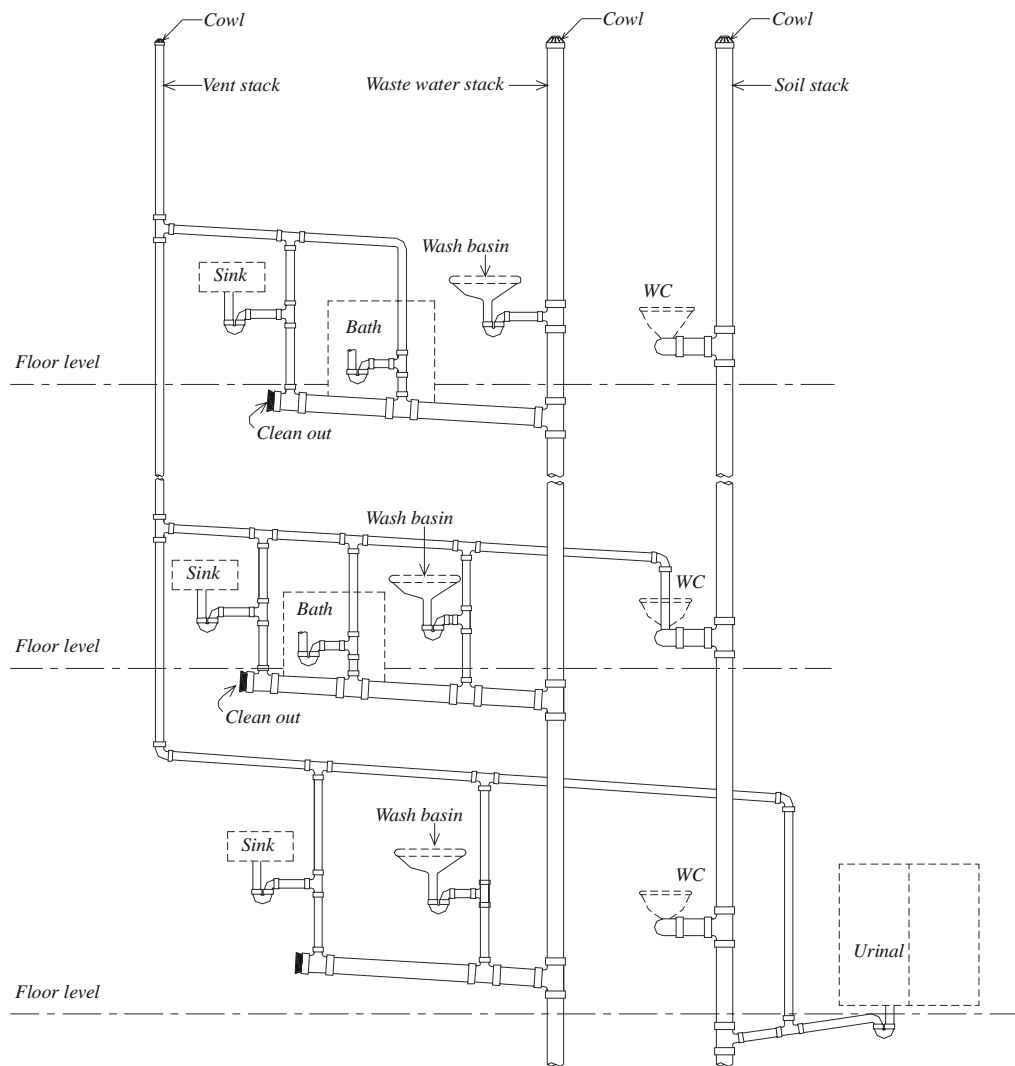
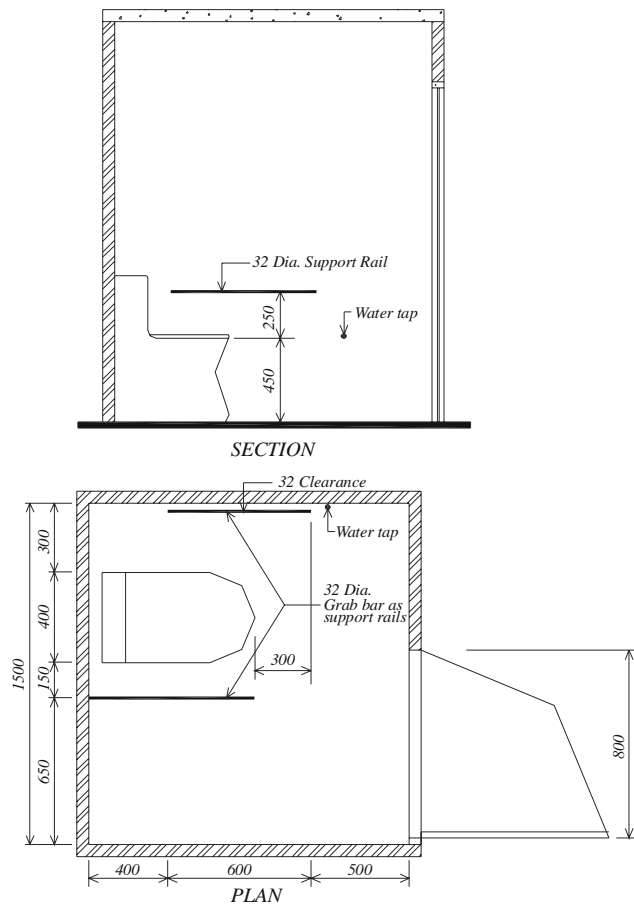


FIG. 8.6.3 DIAGRAM OF TWO PIPE SYSTEM

6.9.4 Water Closet Compartment for Physically Handicapped

6.9.4.1 Provision for Wheelchair Users

The water closet compartment for wheelchair users shall have at least the dimensions and fittings as shown in Fig 8.6.4.



(All dimensions in mm)

FIG. 8.6.4 WATER CLOSET COMPARTMENT FOR WHEELCHAIR USER

6.9.4.2 Provision for Ambulant Disabled People

The minimum dimension for water closet compartment and the fittings for ambulant disabled people shall be as shown in Fig 8.6.5.

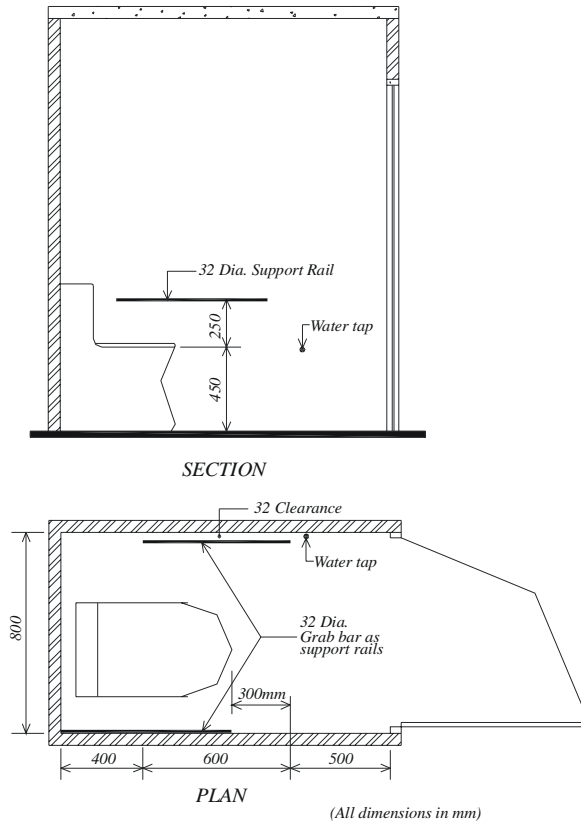


FIG. 8.6.5 WATER CLOSET STALL FOR AMBULANT DISABLED PEOPLE

Table 8.6.7 Recommended Depth of Water Seal Trap for Different Fixtures

Fixture	Water Seal (mm)
Water Closets	50
Floor Traps	50
For Waste Branch of 75 mm diameter or More	40
For Waste Branch of Less Than 75 mm diameter	75

6.9.5 Installation of Drainage System

6.9.5.1

All plumbing fixtures shall be made of smooth and nonabsorbent materials, free from concealed fouling surfaces and may be located in ventilated enclosures.

6.9.5.2

Whenever possible, all drainage system shall be drained to the public sewer or private waste disposal system by gravity.

6.9.5.3

Horizontal drainage piping of 75 mm diameter and less shall be installed with a fall of not less than 20 mm per m.

Horizontal drainage piping larger than 75 mm diameter shall be installed with a fall of not less than 10 mm per m.

It is a good policy to design the system for the highest possible velocity. However, consideration should be given to the fact that the high velocities in pipes with slopes greater than 20 mm per m may cause self-siphoning of trap seal.

6.9.5.4

Where conditions do not permit building drains and sewers to be laid with a fall as great as that specified, a lesser slope may be permitted provided the computed velocity in the drains will not be less than 0.6 m per second. The maximum recommended velocity will be 2.5 m per second.

6.9.5.5

The soil pipe conveying any solid or liquid filth to a drain shall be circular with a minimum diameter of 100 mm.

6.9.5.6

The waste branch from bath room, wash basin or sink shall be of 32 mm to 50 mm diameter and shall be trapped immediately beneath such wash basins or sink by an efficient siphon trap with adequate means of inspection and cleaning. The minimum recommended size of waste stack is 75 mm.

6.9.5.7

The soil and waste stack shall be continued upward undiminished in size 0.6 m above the roof surface when the roof will be used only for weather protection. Where the roof will be used for any purpose other than weather protection, the soil and vent stack shall run at least 2 m above the roof surface so that there shall be least possible nuisance.

6.9.5.8

The soil and waste stack shall be firmly attached to the wall with a minimum clearance of 25 mm from the wall.

6.9.5.9

All soil, waste, vent (ant siphoning) stacks shall be covered on top with cowl of same pipe material.

6.9.6 Installation of Venting System

6.9.6.1

The vent stack or main vent shall be installed in conjunction with a soil or waste stack in a building. One vent stack may serve not more than two soil or waste stacks.

6.9.6.2

Ventilating pipes should be so installed that water cannot be retained in them. They should be fixed vertically. Whenever possible, horizontal runs should be avoided. Ventilating pipe shall be carried to such a height and in such a position as to afford by means of the open end of such pipe or vent shaft, a safe outlet for foul air with the least possible nuisance.

6.9.6.3

The building with building drain shall have at least one 100 mm vent stack or stack vent carried full size to outdoor air above the roof in accordance with Sec 6.9.5.7 above.

6.9.6.4

The diameter of a vent stack shall not be less than 50 mm.

6.9.6.5

The diameter of a branch vent pipe on a waste pipe shall not be less than 25 mm or two-thirds of the diameter of the branch waste pipe ventilated.

6.9.6.6

The branch vent pipe on a soil pipe shall not be less than 32 mm in diameter.

6.9.6.7

All main vents or vent stacks shall connect full size at their base to the building drain or to the soil or waste stack at or below the level of the lowest drainage connection to them. All vent stacks shall extend undiminished in size above the roof or shall be reconnected to a vent header or to the stack vent portion of the soil or waste stack, at least 150 mm above the flood level of the highest fixture connection discharging into the soil or waste stack. Where the roof is to be used for any purpose other than weather protection, the vent extension shall be in accordance with the Sec 6.9.5.7.

6.9.6.8

In case of offsetting of stacks a relief vent shall be provided at the base of upper stack just above the start of offset and at top of the lower stack portion just below the end of offset.

6.9.6.9

In high rise buildings yoke vent shall be provided at 10 storey intervals counting down from top.

6.9.6.10

In case huge number of fixtures are installed in battery to a single branch drainage pipe, circuit or loop vents shall be provided after 8 fixtures interval for 100 mm drain pipe and 24 fixtures interval for 150 mm drain pipe as shown in fig. 8.6.7

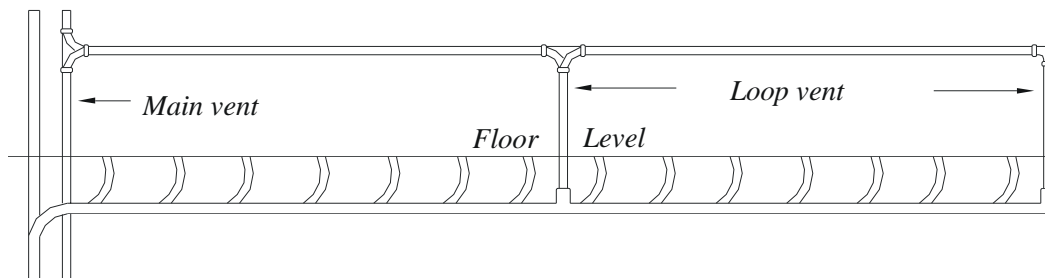


FIG. 8.6.7 CIRCUIT VENT FOR A BATTERY OF WATER CLOSETS

6.9.6.11

Offset in the stack vent portion of soil or waste stack, offset in vent stack and connection of vent stack at the bottom to soil or waste pipe or to the building drain shall be at an angle of at least 45 degrees to the horizontal.

6.9.6.12

All vent and branch vent pipe shall be so graded and connected that sufficient slope is provided for condensation to drain back to soil or waste pipe by gravity.

6.9.6.13

Where fixtures, other than water closets discharge into the stack downstream of a water closet, each fixture connecting downstream shall be individually vented.

6.9.6.14

Soil and waste stacks in a building having more than 10 branch intervals shall be provided with a relief vent (Fig 8.6.7) at each tenth interval counting from the top floor.

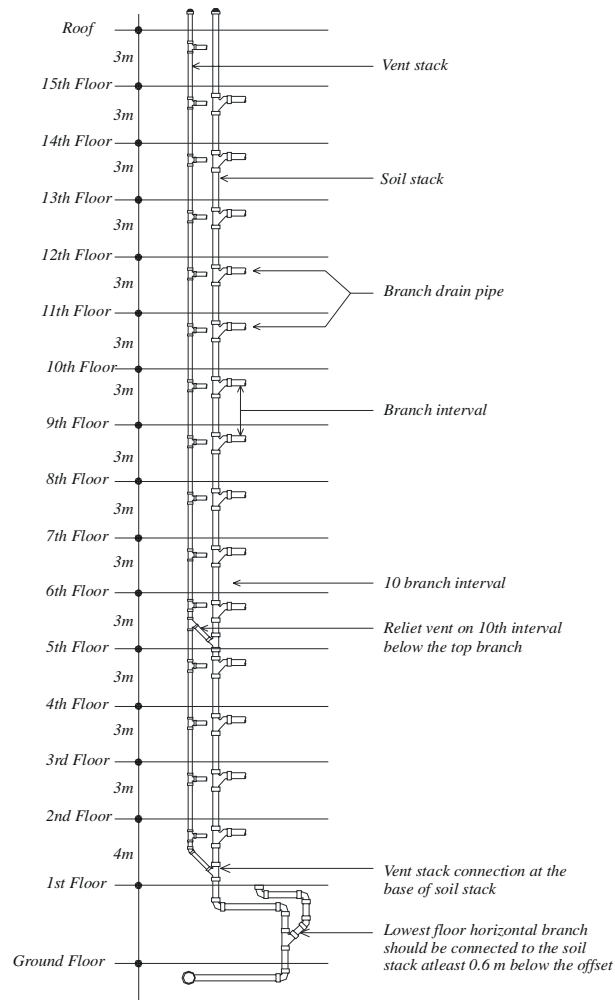


FIG. 8.6.7 RELIEF VENTS FOR STACK OF MORE THAN TEN BRANCH INTERVALS

6.9.6.15

In case the adjoining building is taller, the ventilating pipe shall be carried higher than the roof of the adjacent building, wherever it is possible.

6.9.6.16

The building drain intended for carrying waste water and sewage from a building shall be provided with at least one ventilating pipe situated as near as practicable to the building and as far away as possible from the point at which the drain empties into the sewer or other earner.

6.9.7 Clearance of Blockages

6.9.7.1

There shall be sufficient and suitable access points at every change of alignment, gradient or diameter or at bends and junctions for clearing blockages from drains which cannot be reached by any other means.

6.9.7.2

In case of straight run of pipes, access points shall be provided at intervals of 15 meter.

Tables 8.6.8 and 8.6.9 show the maximum spacing and the recommended minimum dimensions for access fittings and chambers for the specified depth.

Table 8.6.8 Maximum Spacing of Access Points

From	To			
	Access Fitting	Junction	Inspection Chamber	Manhole
	(m)	(m)	(m)	(m)
Start of external drain	12	-	22	45
Rodding eye	22	22	45	45
Access fitting †	-	12	22	22
Inspection chamber	22	22	45	45
Manhole	22	-	45	90

† higher spacing may be used for larger size access fitting.

Table 8.6.9 Minimum Dimensions for Access Points

Access Points	Depth (m)	Internal Sizes		Cover Sizes	
		Length x width (mm x mm)	Diameter (mm)	Length x width (mm x mm)	Circular (mm)
Rodding eye		min. 100 mm or size of drains			
Access fitting	0.6 or less	150 x 100	150	150 x 100	150
Inspection chamber	1.0 or less	450 x 450	450*	450 x 450	450*
Manhole	1.5 or less	1200 x 750	1050	600 x 600	600
	over 1.5	1200 x 750	1200	600 x 600	600
	over 2.7	12000 x 840	1200	600 x 600	600

* 190 mm dia may be used for depth ≤ 0.6 m

6.9.7.3 Access should be one of the following four types :

- i. rodding eyes - capped extensions of the pipes,

- ii. access fittings - small chambers (or an extension of the pipes) but not with an open channel,
- iii. inspection chambers - chambers with working space at ground level, and
- iv. manholes - large chambers with working space at drain level.

6.9.7.4

Inspection chambers and manholes shall have removable non-ventilating covers of durable material and be of suitable strength. Inspection chambers and manholes in buildings shall have mechanically fixed airtight covers unless the drain itself has watertight access covers. Manholes deeper than 1 m shall have **non-corrosive steps** or fixed ladders. Fig 8.6.8 and 8.6.9 show the details of typical manholes at smaller depth (<1 m) and at higher depth (>1 m) respectively. Fig 8.6.9 shows the details of a drop manhole. The drop manhole is a manhole that serves as a junction and receives sewer lines at two different elevations.

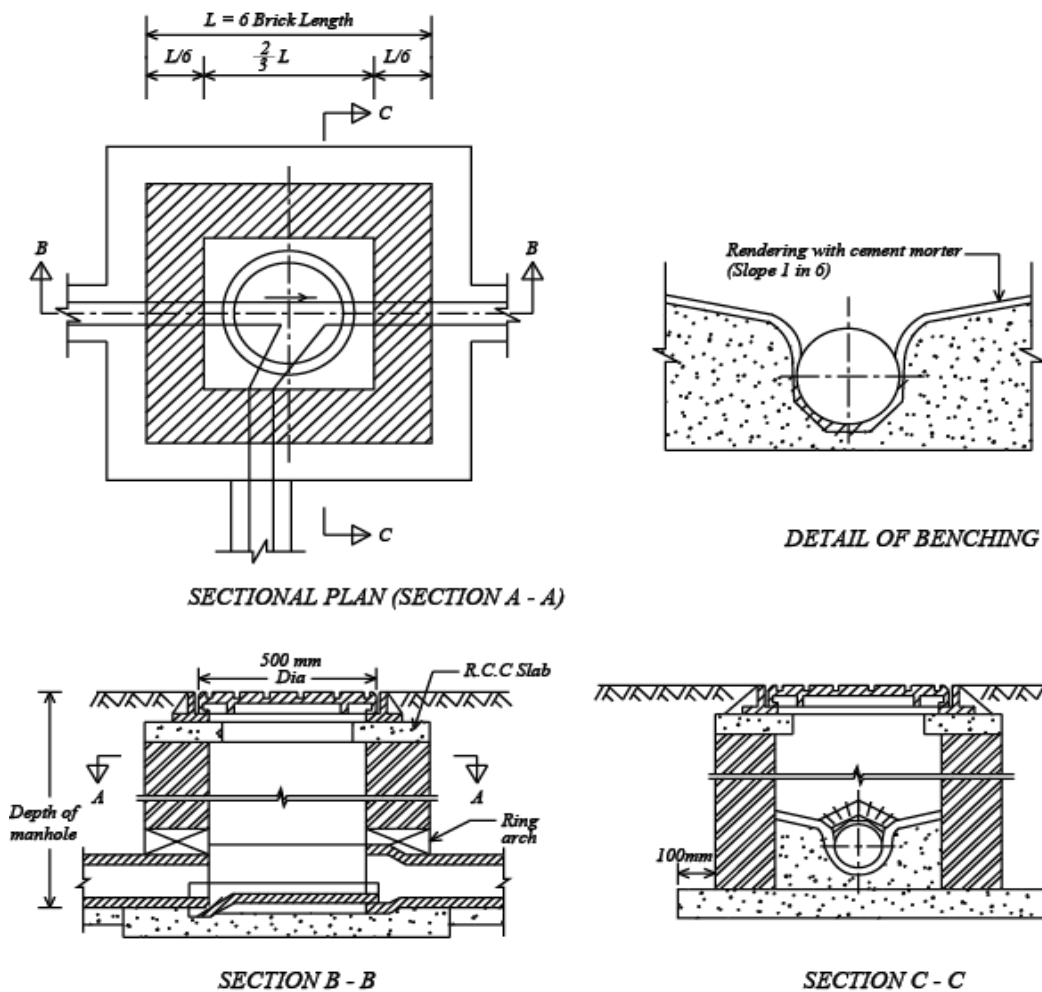


FIG. 8.7.8 DETAIL OF MANHOLE (Depth 1m And Below)

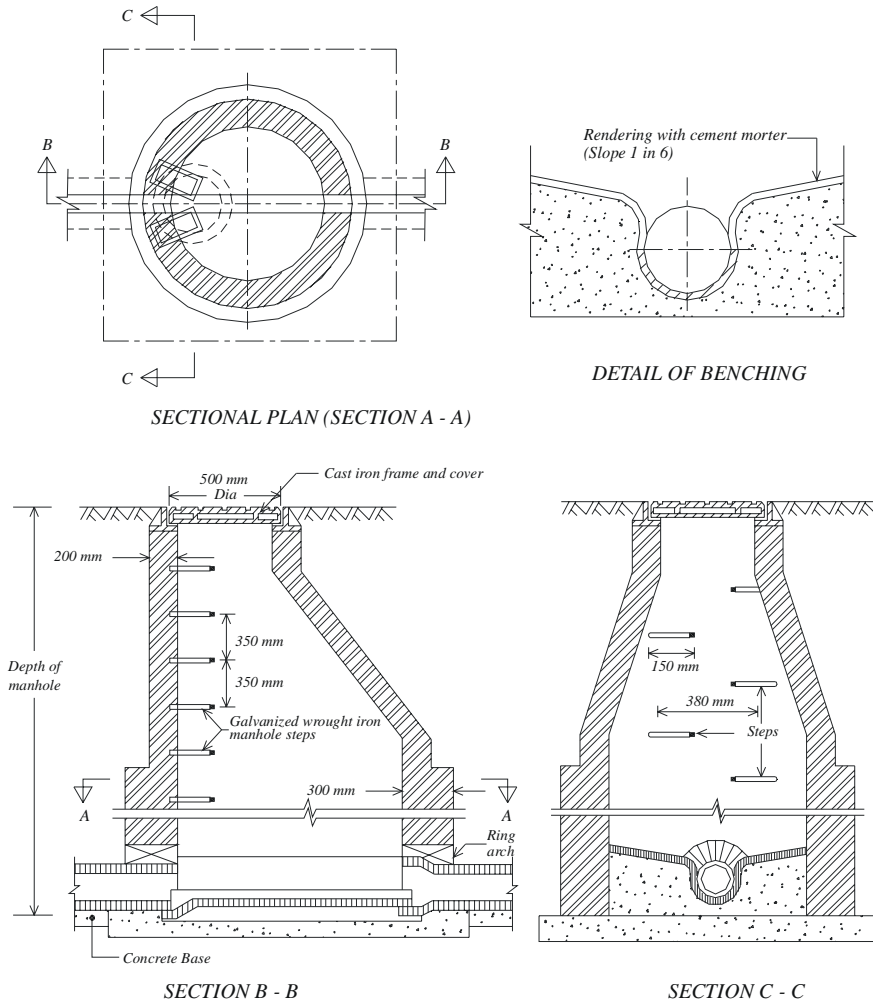


FIG. 8.6.9 DETAIL OF MANHOLE (Depth more than 1 m)

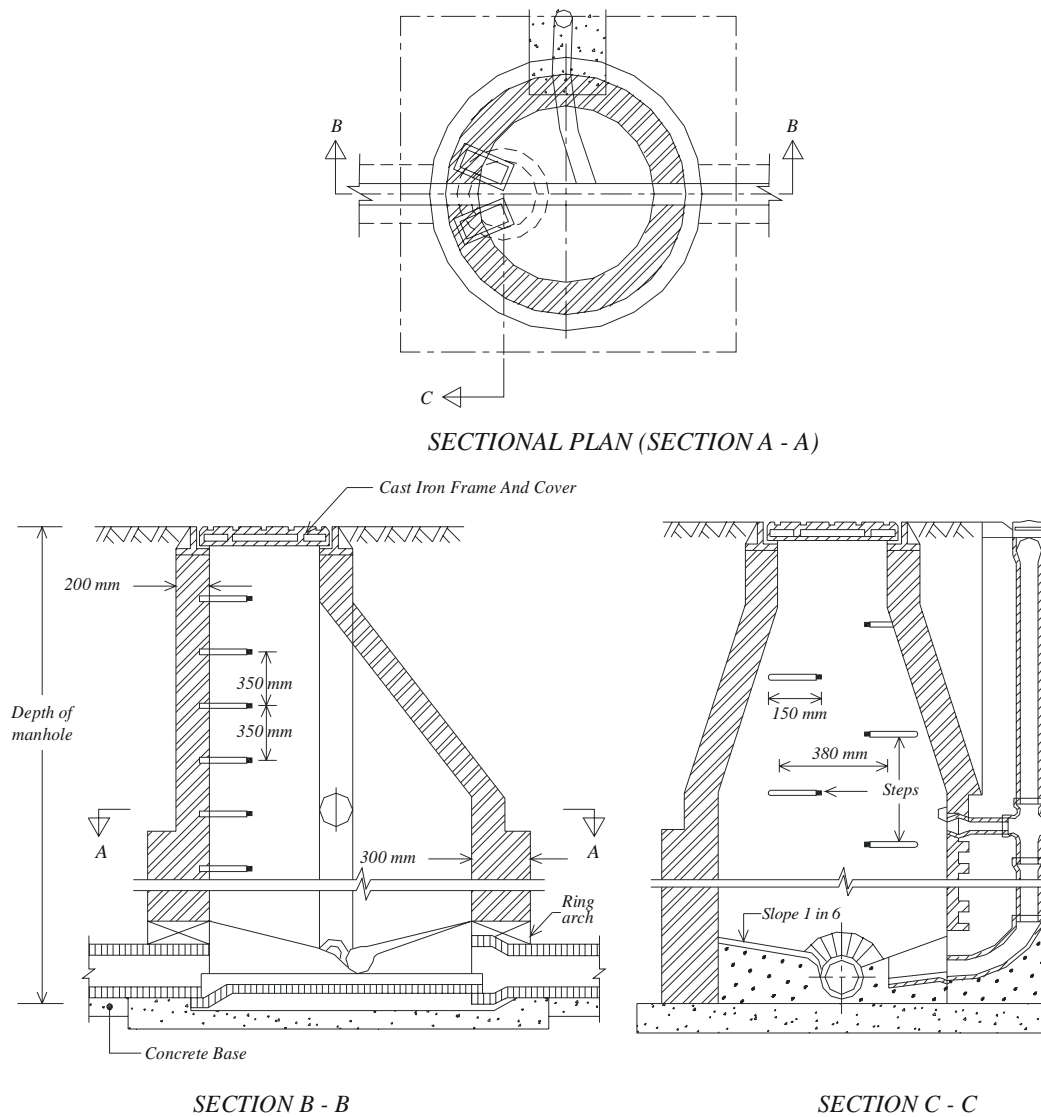


FIG. 8.6.10 DROP MANHOLE

6.9.7.5 Spacing of manholes

The spacing of manholes for a given pipe size should be as follows:

	Pipe Diameter (mm)	Spacing of Manhole (m)
a)	Up to 300	45
b)	301 to 500	75
c)	501 to 900	90
d)	Beyond 900 Spacing shall depend upon local condition and shall be gotten approved by the Authority	

6.9.8 Protection Against Rodent

Holes through walls shall be such that they will not provide passage of rodent or other insects from room to room or from floor to floor. Materials used for embedding pipes shall be rodent proof.

6.9.9 Bedding and Backfilling

The choice of bedding and backfilling depends on the depth of the bed, and size and strength of the materials. Fig 8.6.10 and Table 8.6.10 show two types of bedding and backfilling and minimum and maximum depth of cover for each type of bedding for rigid pipings. The bedding and backfilling for flexible pipings is shown in Fig 8.6.11. The minimum depth of bedding for flexible pipings shall be 0.3 m where there will be no extra surcharge load coming on pipe other than back filling.

The depth shall not be more than 10 m. The flexible pipe may be laid with less cover in fields and gardens. The bedding and backfilling shall be in accordance with Fig 8.6.12.

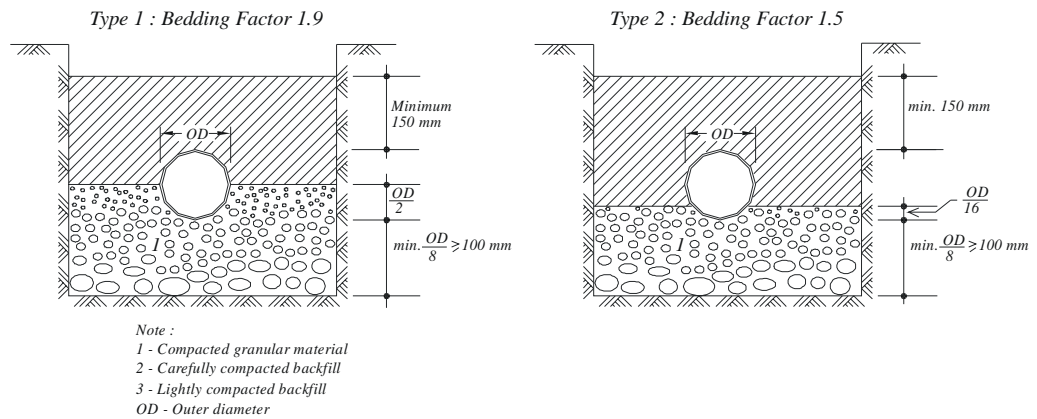


FIG. 8.6.11 BEDDING FOR RIGID PIPES

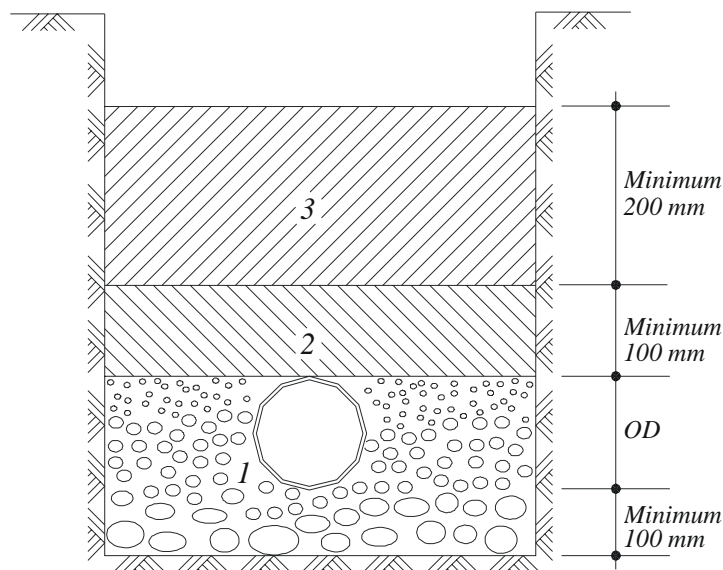


FIG. 8.6.12 BEDDING FOR FLEXIBLE PIPES

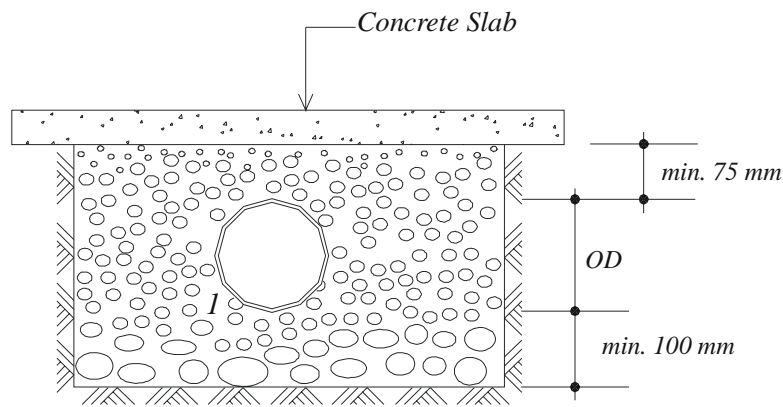


FIG. 8.6.13 FLEXIBLE PIPES BEDDING UNDER CONCRETE SLAB

Table 8.6.10 Limits of Cover (m) for Standard Strength Rigid Pipes in any Width of Trench

Pipe Bore (mm)	Bedding Class	Fields and Gardens		Light Traffic Roads		Heavy Traffic Road	
		Min	Max	Min	Max	Min	Max
100	Type 1	0.3	7.4	0.4	7.4	0.4	7.2
	Type 2	0.3	5.8	0.5	5.8	0.5	5.5
150	Type 1	0.6	5.0	0.6	5.0	0.6	4.6
	Type 2	0.6	3.9	0.7	3.8	0.7	3.3

6.9.10 Grease Traps

Oil and grease is found in wastes generated from kitchens in hotels, industrial canteens, restaurant, butcheries, some laboratories and manufacturing units having a high content of oil and greases in their final waste.

Waste exceeding temperature of 60° C should not be allowed in the grease trap. When so encountered it may be allowed to cool in a holding chamber before entering the grease trap.

Oil and greases tend to solidify as they cool within the drainage system. The solidified matter clogs the drains and the other matter in the waste stick to it due to the adhesion properties of the grease. Oil and greases are lighter than water and tend to float on the top of the waste water.

Grease traps shall be installed in building having the above types of wastes. In principle the grease laden water is allowed to retain in a grease trap which enables any solids to be settled or separated for manual disposal. The retention time allows the incoming waste to cool and allow the grease to solidify. The clear waste is then allowed to discharge into the building's drainage system.

6.9.11 Oil Interceptors

Oils and lubricants are found in wastes from vehicle service stations, workshops manufacturing units whose waste may contain high content of oils. Oils, for example, petroleum, kerosene and diesel used as fuel, cooking, lubricant oils and similar liquids are lighter than water and thus float on water in a pipe line or in a chamber when stored. Such oils have a low ignition point and are prone to catch fire if exposed to any flame or a spark and may cause explosion inside or outside the drainage system. The flames from such a fire spread rapidly if not confined or fire vented at the possible source. Lighter oils and lubricants are removed from the system by passing them through an oil interceptor/petrol gully. They are chambers in various compartments which allow the solids to settle and allow the oils to float to the top. The oil is then decanted in separate containers for

disposal in an approved manner. The oil free waste collected from the bottom of the chamber is disposed in the building drainage system.

6.9.12 Septic Tank

6.9.12.1

Septic tank(s) (Fig 8.6.15 and 8.6.16) discharging into either a subsurface disposal field or one or more seepage pits shall be required for the approval of drainage and sanitation plans for the places where public sewers are not available.

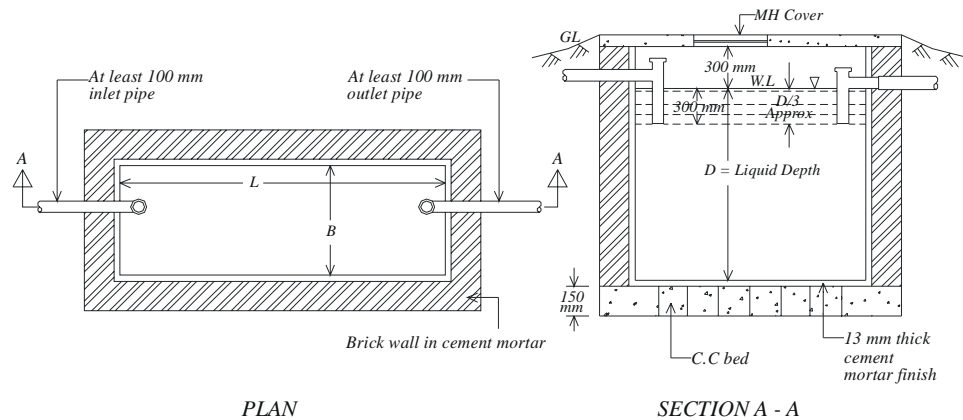


FIG. 8.6.16 TYPICAL ONE CHAMBER BRICK SEPTIC TANK

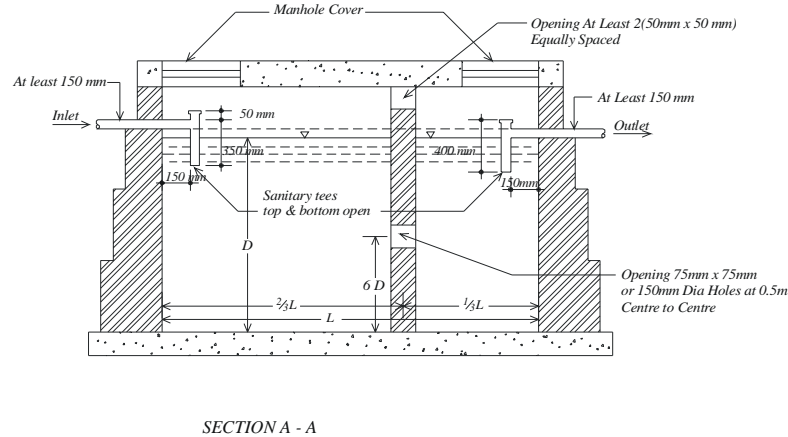


FIG. 8.6.17 TYPICAL TWO CHAMBER CONCRETE SEPTIC TANK

6.9.12.2

Such disposal method shall be designed by a licensed professional in accordance with the requirement of the provisions of this Code and regulations of the concerned authorities.

6.9.12.3

The design of such system shall be on the basis of location with respect to wells or other sources of water, soil permeability, ground water elevation, area available and maximum occupancy of the building.

6.9.12.4

Sullage water shall not be discharged into the septic tank.

6.9.12.5

Effluent from septic tank(s) shall not discharge into open water courses.

6.9.12.6

The minimum distance for various components of the disposal system shall be in accordance with Table 8.6.11.

6.9.12.7

The flow into a septic tank may be calculated on the basis of plumbing fixtures discharging soil wastes simultaneously into it. The capacity of septic tank for residential buildings shall be determined according to the formula in Appendix 8.6.C. For other occupancies a reduction factor shall be used as shown in Table T1 in Appendix 8.6.C.

6.9.12.8

The septic tank shall have a minimum liquid capacity of 2000 liters, minimum width 1 m and minimum liquid depth 1 m. The minimum length of a septic tank shall be at least thrice its width. It is recommended that the maximum length of a septic tank shall be not more than 4 times its width.

6.9.12.9

The maximum size of a septic tank shall be limited to the number of users not exceeding 300 persons for residential buildings.

6.9.12.10

The volume required for digested sludge and scum may be computed on the basis of 0.04 m³/capita/year. There shall be a clearance between top of the liquid level and bottom of the tank cover slab which shall be at least 300 mm.

6.9.12.11

The liquid retention time of a septic tank shall be at least 1 day.

6.9.12.12

The de sludging frequency of a septic tank shall be at least 6 months interval and maximum once a year.

6.9.12.13

It is recommended to use two chamber septic tank when the capacity of a septic tank exceeds 3000 liters. The inlet compartment of a two chamber septic tank shall have a capacity not less than two-third of its total capacity (Fig 8.6.16).

Table 8.6.11 Location of Components of Sewage Disposal System

System Component	Distance (m)				
	Building Foundation	Well	Stream	Seepage Pit	Dry Well
Septic tank	1.5	8	-	1.5	-
Disposal field	3	15	7.5	6	6
Seepage pit	4.5	15	15	6	6
Dry well	3	15	-	6	-

6.9.12.14

The septic tank shall be constructed of corrosion resistant material and be of permanent water tight construction. The manhole cover and the roof of the tank shall be designed for at least 7 kPa live load. The inlet compartment shall be provided with a manhole. Outlet compartment shall also be provided with a manhole. The design guideline of a septic tank is presented in Appendix 8.6.C.

6.9.13 Imhoff tank(s)

6.9.13.1

Imhoff tank(s) (Fig 8.6.17) discharging into either a subsurface disposal field or one or more seepage pits shall be required for the approval of drainage and sanitation plans for the places where public sewers are not available.

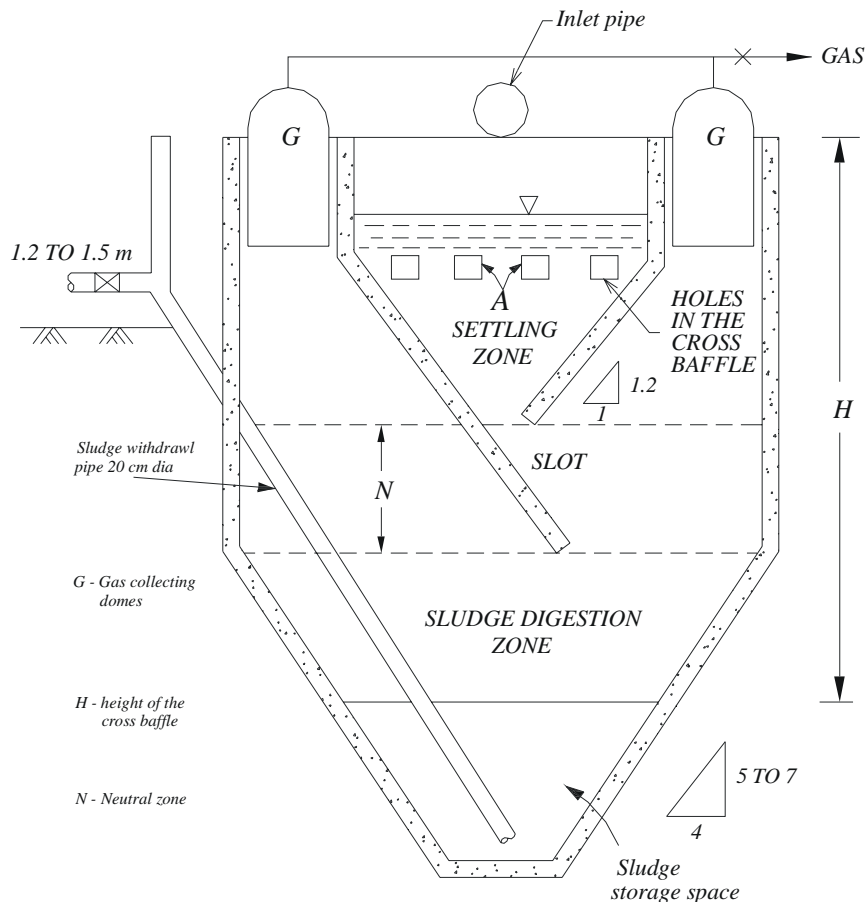


FIG. 8.6.18 CROSS SECTION OF AN IMHOFF TANK

6.9.13.2

Imhoff tanks shall be used where more than 300 peoples of residential buildings are to be served.

6.9.13.3

The settling chamber shall be designed for a detention period of 1.5 to 4.0 hours and an over flow rate of 0.95 to 1.4 m/hr. The displacement velocity should not be more than 18 m/hr. Sloping sides of settling chamber shall have inclination 1.0 horizontal to 1.2 vertical. The slot at the bottom is 0.15 to 0.25 meter measured along the slope of the hopper. The width of the side spaces should not be less than 0.45 meter. The digestion chamber should have a capacity to store about 6 to 12 months digested sludge. Capacity of the digestion chamber can be found from the following formula-

$$C = [V_f - 2/3 (V_f - V_d)] t.$$

Where C is the volume of the digestion tank in m³/capita below the neutral zone which is 0.2 m below the slot. V_f is the volume of fresh sludge in m³/capita day and V_d is the volume of the digested sludge in m³/capita day and t is the time required for digestion. The digestion chamber should have sloping side with a ratio of 4 horizontal to 5 vertical.

6.9.13.4

The Capacity found in sec. 6.9.12.3 is true for residential buildings. For other occupational buildings use a reduction factor as shown Table 8.6.C.1 in Appendix 8.6.C.

6.9.14 Installation

Septic and Imhoff Tank shall be located with a horizontal distance not less than specified in Table 802.8 between various elements. Tanks installed in ground water shall be securely anchored. A 3-inch-thick (76 mm) compacted bedding shall be provided for all septic and other treatment tank installations. The bedding material shall be sand, gravel, granite, lime rock or other noncorrosive materials of such size that the material passes through a 0.5 inch (12.7 mm) screen.

Table : Minimum horizontal separation distances for treatment tanks element distance (feet)

Building	5
Cistern	25
Foundation wall	5
Lake, high water mark	25
Lot line	2
Pond	25
Reservoir	25
Spring	50
Stream or watercourse	25
Swimming pool	15
Water service	5
Well	25

Each cleanout shall be installed so that it opens to allow cleaning in the direction of flow of the soil or waste or at right angles thereto, and except in the case of wye branch and end-of-line cleanouts, shall be installed vertically above the flow line of the pipe.

The bath tub shall be fitted with overflow and waste pipe of nominal diameter of not less than 32 mm and 40 mm respectively.

6.9.15 Disposal Field and Seepage Pit

6.9.15.1

A distribution box shall be provided to receive the effluent from the septic tank or Imhoff tank to assure equal distribution to each individual line of disposal field. The distribution box shall be connected to the septic tank or Imhoff tank by a watertight sewer line and shall be located at the upper end of disposal field. Fig 8.6.19 shows the plans and sections of typical distribution boxes.

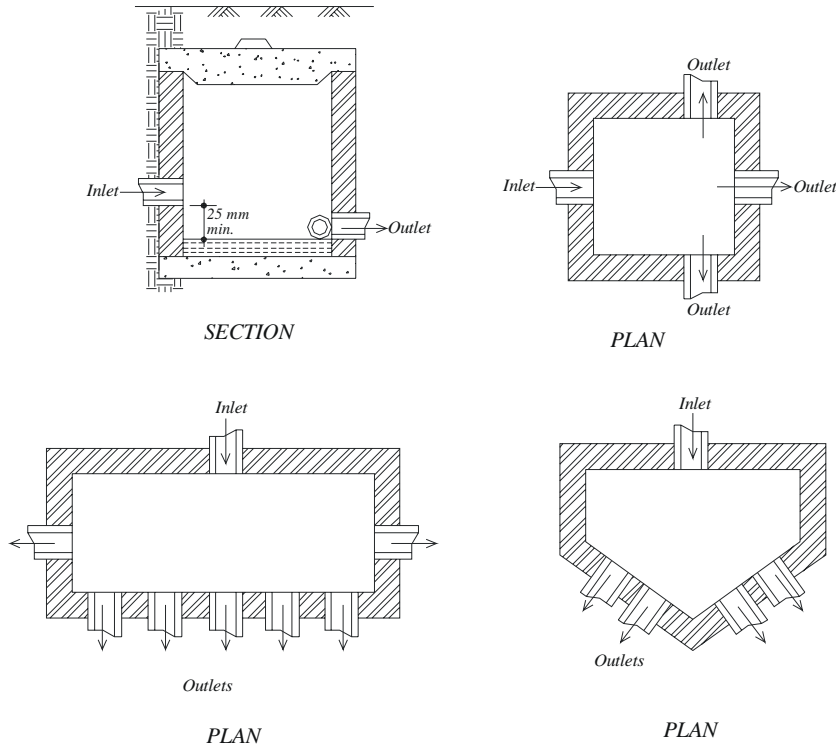


FIG. 8.6.19 DISTRIBUTION BOXES

6.9.15.2

Soil percolation tests (at least for three holes) shall be performed at the site of a proposed individual sewage disposal system installation to determine the suitability of soil and site.

6.9.15.3

The liquid capacity (volume below inlet line) of seepage units (disposal field or seepage pit) shall be at least twice that of a septic tank or Imhoff tank. Effective absorption area of seepage unit may be computed in accordance with Table 8.6.12.

6.9.15.4

No seepage unit shall be extended into water table directly. **The bottom of seepage unit shall be at least 1 meter above the highest water table.**

6.9.15.5

Each disposal field shall have at least two outlet distribution lines from the distribution box. No portion of disposal field shall be installed under any pavement or any area where there will be vehicular traffic or parking

6.9.15.6

Minimum standards for disposal field construction shall be as shown in Table 8.6.13.

Table 8.6.12 Absorptive Capacity of Disposal Field and Seepage Pit

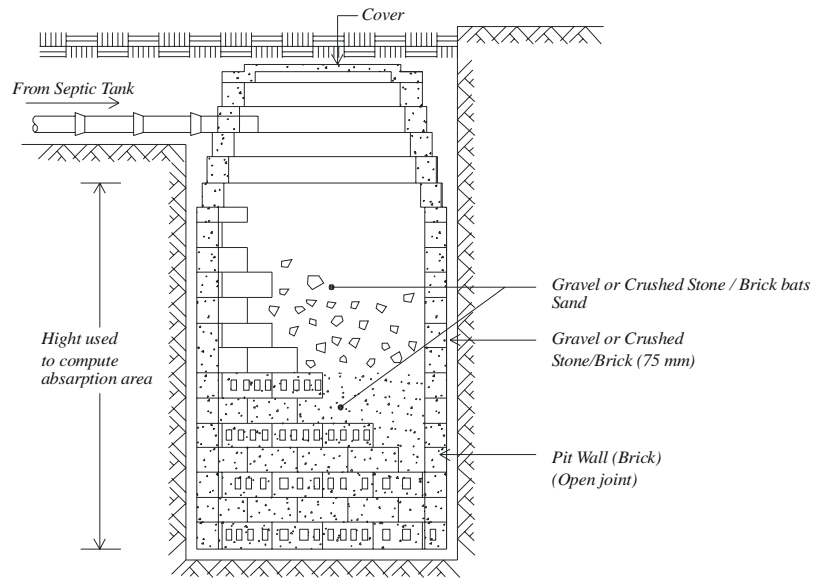
Percolation Test Rate in Minutes for Water to Fall 25 mm	Effluent Allowance Rate of Seepage Unit in litre per m ² per day	
	Disposal Field Trenches (bottom of trench)	Seepage Pit (wall area)
2 or less	128	172
5	96	128
10	68	92
30	32	44
60 (not recommended)	16	24
over 60 (not suitable)	-	-

Table 8.6.13 Design Features of Disposal Field

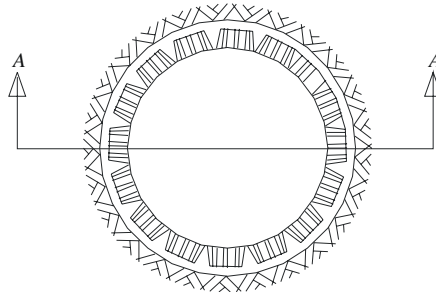
Number of lateral branches	2
Maximum length of branch	20 m
Minimum diameter of field distribution pipe	100 mm
Maximum slope of field distribution pipe	3.3 mm per m
Depth of trench	0.45 m to 9 m
Trench bottom, minimum above ground water	0.61 m
Trench bottom width	0.45m to 0.75m
Depth of coarse material under pipe	150 mm
over pipe	50 mm
Size of coarse material	12 mm to 63 mm

6.9.15.7

Seepage pit (soak pit) shall be lined with stone, brick or concrete blocks laid up dry with open joints that are backed up with at least 75 mm coarse aggregate. The joints above the inlet shall be sealed with cement mortar. A reinforced concrete cover shall be provided. For cover area more than 0.75 m² the pit shall have an access manhole. The bottom of the pit shall be filled with coarse gravel, or crushed stone/brick to a depth of 0.3 m. Figure 8.6.20 provides the details of a seepage pit.



SECTION A - A



PLAN

FIG. 8.6.20 TYPICAL SEEPAGE PIT

6.9.15.8

Large dry well shall be constructed in accordance with the requirements for seepage pit (Sec 6.9.12). However, for small dry wells handling limited quantities of wastewater the pit may consist of a 2.0 metre deep and 1.0 m diameter pipe filled with crushed bricks/ stone.

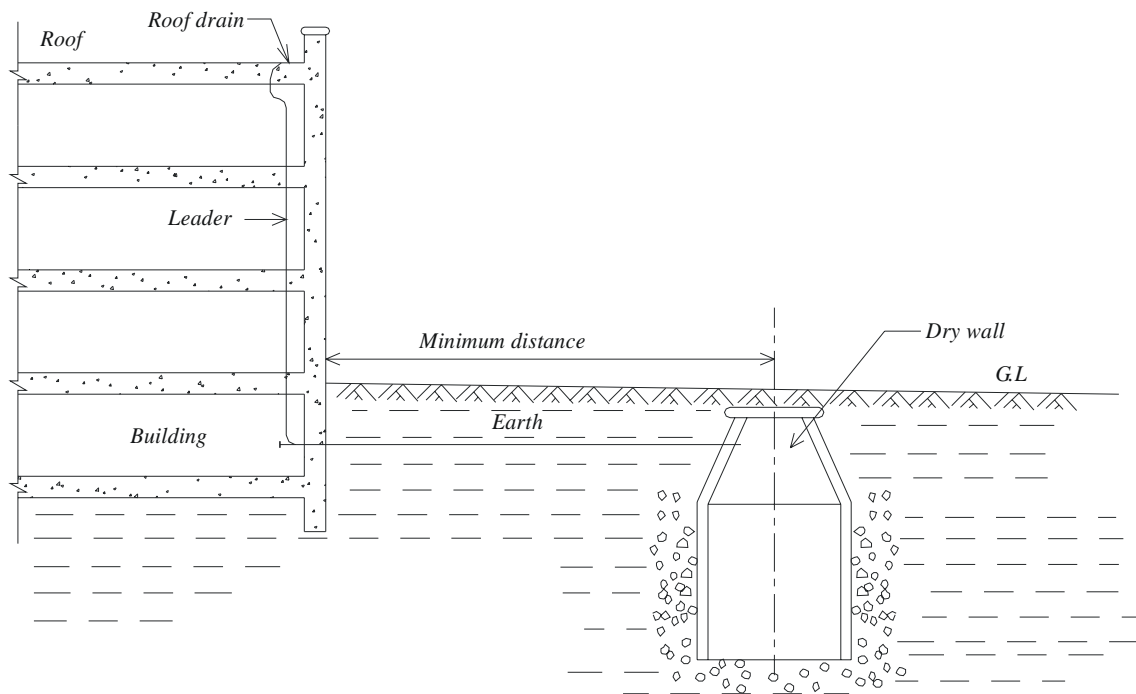


FIG. 8.6.21 TYPICAL LOCATION OF A DRY WALL

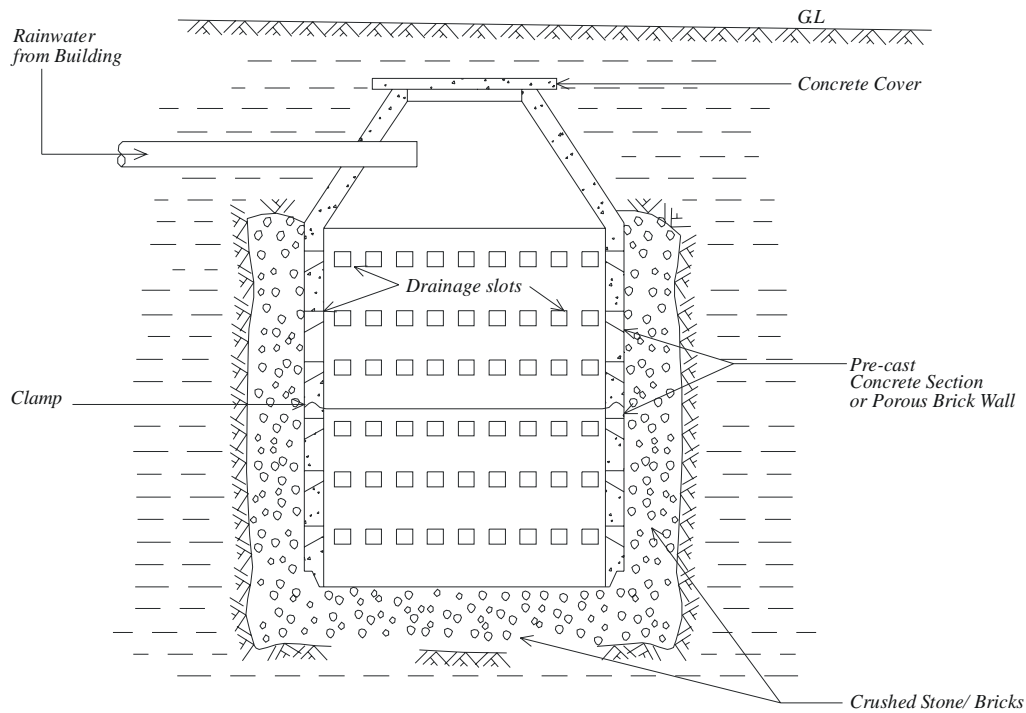


FIG. 8.6.22 INSTALLATION DETAILS OF A DRY WALL

6.9.15.9

French drains may be employed as surface water drains for drainage of unpaved surfaces.

6.10 DESIGN OF DRAINAGE AND SANITATION SYSTEM

6.10.1 Estimation of Maximum Load Weight of Waste Water

To estimate the total load weight carried by a soil or waste pipe, the relative load weight for different kinds of fixtures are provided in Table 8.6.14. Table 8.6.15 provides an approximate rating of those fixtures not listed in Table 8.6.14.

6.10.2 Gradient and Size of Pipe**6.10.2.1**

The building drains and sewer shall be designed to discharge the peak simultaneous load weight flowing half-full with a minimum self-cleansing velocity of 0.75 m per second. However, flatter gradient may be used if required but the minimum velocity shall not be less than 0.6 m per second. Again, it is undesirable to employ gradients giving a velocity of flow greater than 2.5 m per second.

6.10.2.2

The maximum number of fixture units that may be connected to a given size of building sewer, building drain, horizontal branch or vertical soil or waste stack shall be provided as in Tables 8.6.16 and 8.6.17.

6.10.3 Size of Vent Piping**6.10.3.1**

The size of vent piping shall be determined from its length and the total number of fixture units connected thereto in accordance with Table 8.6.21.

6.10.3.2

The branch vent shall be sized in accordance with Table 8.6.22.

6.11 CONSTRUCTION RELATING TO CONVEYANCE OF SANITARY WASTES

6.11.1 Conveyance of Sanitary Wastes**6.11.2**

The layout of drainage systems shall be simple. Change of direction and gradient shall be minimized and shall be as easy as practicable.

6.11.3

The excavation, where necessary, shall be made in accordance with Table 8.6.23.

Table 8.6.14 Fixture Units for Different Sanitary Appliances or Groups

Type of Fixture	Fixture Unit Value as Load Factors
One bathroom group consisting of water closet, wash basin and bath tub or shower stall :	
a) Flush Tank water closet	3
b) Flush-valve water closet	6
Bathtub*	2
Bidet	2
Combination sink and tray (drain board)	2
Drinking fountain	0.5
Floor traps†	1
Kitchen sink, domestic	2
Wash basin, ordinary‡	1
Wash basin, surgeon's	2
Shower stall, domestic	2
Shower (group) per head	3
Urinal, wall hung	4
Urinal, stall	4
Water closet, tank operated	3
Water closet, valve operated	6

* A shower head over a bath tub does not increase the fixture unit value.

† Size of floor trap shall be determined by the area of surface water to be drained.

‡ Wash basin with 32 mm and 40 mm trap have the same load value.

Table 8.6.15 Fixture Unit Values for Fixtures Based on Fixture Drain or Trap Size

Fixture Drain on Trap Size	Fixture Unit Value
30 mm and smaller	1
40 mm	2
50 mm	3
65 mm	4
75 mm	5
100 mm	6

Table 8.6.16 Maximum Number of Fixture Units that can be Connected to Branches and Stacks

Diameter of Pipe (mm)	Maximum Number of Fixture Units that can be Connected			Total for Stack	Total at One Storey or Branch Interval
	Any Horizontal Fixture Branch ^a	One Stack of 3 Storeys in Height or 3 Intervals	More than 3 Storeys in Height		
30	1	2	2	2	1
40	3	4	8	8	2
50	6	10	24	24	6
65	12	20	42	42	9
75	20	30	60	60	16
100	160	240	500	500	90
125	360	540	1100	1100	200
150	620	960	1900	1900	350
200	1400	2200	3600	3600	600
250	2500	3800	5600	5600	1000
300	3900	6000	8400	8400	1500
375	7000	b	b	b	b

^a Does not include branches of the building sewer.

^b Sizing load based on design criteria

Table 8.6.17 Maximum Number of Fixture Units that can be connected to Building Drains and Sewers

Diameter of Pipe (mm)	Maximum Number of Fixture Units that can be Connected to any Portion* of the Building Drain or the Building Sewer for Various Slopes			
	1/200	1/100	1/50	1/25
100	-	180	216	250
150	-	700	840	1000
200	1400	1600	1920	2300
250	2500	2900	3500	4200
300	2900	4600	5600	6700
375	7000	8300	10000	12000

* Includes branches of building sewer

Table 8.6.18 Size of Vertical Leaders*

Size of Leader ** (mm)	Maximum Projected Roof Area and Flow	
	(m ²)	(ℓ/min)
50	202	87
65	367	155
75	598	253
100	1287	544
125	2336	986
150	3790	1602
200	8180	3450

* Table 8.7.18 is based upon a maximum rainfall of 25 mm per hour for a 1-hour duration. The figure for drainage area shall be adjusted to local conditions (Appendix 8.6.C).

** The equivalent diameter of square leader will be the diameter of that circle which can be inscribed within the cross-sectional area. The equivalent diameter of the rectangular leader will be the short dimension of the rectangular leader. However, the ratio of width to depth of rectangular leader shall not exceed 3:1.

Table 8.6.20 Size of Semicircular Roof Gutters*

Dia of Gutter (mm)	Maximum Projected Roof Area for Gutter of Various Slopes							
	5 mm per m		10 mm per m		20 mm per m		40 mm per m	
	m	ℓ/min	m ²	ℓ/min	m ²	ℓ/min	m ²	ℓ/min
75	61	25	87	36	123	51	174	73
100	130	55	185	77	260	110	370	155
125	227	96	320	136	455	192	645	273
150	350	148	495	210	700	296	1010	425
175	503	210	710	300	1000	425	1420	600
200	725	307	1020	430	1300	610	2040	862
250	1300	555	1850	785	2610	1110	3650	1540

* Table 8.7.20 is based upon a maximum rainfall of 25 mm per hour for 1-hour duration. The figure for drainage area shall be subject to local conditions in accordance with Appendix 8.6.C.

6.11.3.1

The depth of cover shall be in accordance with Sec 6.9.8.

6.11.3.2

The pipe shall be laid to even gradients and change of gradient shall be combined with an access point (Sec 7.9.6). However, access points shall be provided only if blockages could not be cleared without them.

6.11.3.3

The joints and connection in drainage and venting system shall be gastight and watertight for the pressures required by the test, with the exception of those portions of perforated or open joint piping which will be installed for the purpose of collecting and conveying ground or seepage water to the underground storm drains.

6.11.3.4

Piping in drainage and venting system shall be installed without undue strains and stresses and provision shall be made for expansion, contraction and structural settlement. Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and carry the weight of the piping and its content. The horizontal piping shall be supported at sufficiently close intervals (Sec 6.8) to keep it in alignment and to prevent sagging.

6.12 REFUSE CHUTE SYSTEM

6.12.1

All buildings higher than 6-storeys shall be provided with refuse chute system for transporting and collecting refuse from different floors in a sanitary way. The refuse shall be received from the respective floor through an inlet hopper in to the chute which conveys refuse and discharges into the collection chamber. The refuse from the collection chamber shall be cleared at suitable intervals.

6.12.2

The refuse chute, inlet hopper and collection chamber shall be constructed with smooth and nonflammable materials.

6.12.3

The hopper shall be self-cleaning and shall be fitted with self-closing shutter to prevent the passage of foul gases inside the building.

6.12.4

The diameter of the chute shall not be less than 300 mm. It shall be adequately ventilated at the top. The chute shall be provided with suitable arrangements for flushing with water for the full length.

6.13 BASEMENT FLOOR DRAINAGE SYSTEM

6.13.1

All buildings having basement floor below the surrounding sewer system and area more than 1000 sqm shall have pumping system to drain out wastewater.

6.13.2

All buildings having basement floor below the surrounding sewer system and area more than 1000 sqm shall have one sump pit for every 1000 sqm .

6.13.3

For more than one sump pit, pits shall be connected to a master sump pit from where pumping shall be done to drain out the waste. Minimum diameter of sump pit connection drain pipe shall be 75 mm.

6.13.4

For wastewater and sewage drainage from basement floor separate drainage system shall be provided.

Table 8.6. 21 Size and Length of Vent Stacks and Stack Vents

Diameter of Soil or Waste Stack (mm)	Total Fixture Unit (FU) Connect ed to fixture	Maximum Development Length of Vent (m)* for Diameter (mm) of Vent Pipes										
		30	40	50	65	75	100	125	150	200	250	300
30	2	9										
40	8	15	45.5									
40	10	9	30.5									
50	12	9	22.5	61								
50	20	8	15	45.5								
65	42		9	30.5	91.5							
75	10		12.5	45.5	109.5	317						
75	21		9.5	33.5	82	247						
75	53		8	28.5	70	207						
75	102		7.5	26	64	189						
100	43			10.5	26	76	298.5					
100	140			8	19.5	61	228.5					
100	320			7	16.5	52	195					
100	540			6.5	15	45.5	176.5					
125	190				8.5	25	97.5	301.5				
125	490				6.5	19	76	231.5				
125	940				5.5	16	64	204				
125	1400				4.5	15	58	180				
150	500					10	39.5	122	305			
150	1100					6.5	30.5	94.5	237.5			
150	2000					6	25.5	79	201			
150	2900						23.5	73	183			
200	1800						9.5	29	73	286.5		
200	3400						7	22	58	219.5		
200	5600						6	19	48.5	186		
200	7600						5.5	17	42.5	170.5		
250	4000							9.5	23.5	94.5	292.5	
250	7200							7	18	73	225.5	
250	11000							6	15.5	61	192	
250	15000							5.5	14	55	173.5	
300	7300								9.5	36.5	116	286.5
300	13000								7	28.5	91.5	219.5
300	20000								6	24	76	186
300	26000								5.5	22	70	152.5
375	15000									12	39.5	94.5
375	25000									9.5	29	73
375	38000									8	24.5	61
375	50000									7	22.5	55

* The development length shall be measured from the vent connection to the open air

6.13.5

The collection chamber shall be of suitable size and located at ground level.

6.13.6

The design and arrangement of the system shall be in accordance with established engineering practices.

6.14 Health care drainage system

6.14.1 General

The health care drainage system shall comply with applicable drainage and venting requirements specified in this chapter and with this section.

6.14.2 Special Fixtures and Equipment

The hospital shall be provided with clinical sink, bedpan washer and such other fixtures and equipment for disposal of bedpan contents and for the cleansing and disinfection of such fixtures. A clinical sink shall not be considered as a substitute for service sink.

Table 8.6.22 Minimum Diameter and Maximum Length of Individual, Branch, and Circuit Vents for Horizontal Drainage Branches

Diameter of Horizontal Drainage Branch (mm)	Slope of Horizontal Drainage Branch (mm/m)	Maximum Development Length of Vent (m) for Diameter (mm) of Vent Pipe									
		30	40	50	65	75	100	125	150	200	250
30	20	NL*									
	40	NL									
40	20	NL	NL								
	40	NL	NL								
50	10	NL	NL	NL							
	20	88	NL	NL							
	40	45	115	NL							
65	10	54	137	NL							
	20	29	73	NL	NL						
	40	15	39	NL	NL						
75	10	-	58	NL	NL	NL					
	20		29.5	128	NL	NL					
	40		15	67	NL	NL					
100	10		-	58	NL	NL	NL				
	20			30	94	NL	NL				
	40			14.5	48.5	125	NL				
125	10				58	149	NL	NL			
	20				29.5	76	NL	NL			
	40				14	39.5	NL	NL			
150	10					58	NL	NL	NL		
	20					29.5	76	NL	NL		
	40					14	39.5	NL	NL		
200	10						58	NL	NL	NL	
	20						27.5	94.5	NL	NL	
	40						11.5	45.5	125	NL	NL
250	10							58	152	NL	NL
	20							26	73	NL	NL
	40							9.5	33.5	NL	NL
300	10								54.5	NL	NL
	20								24	128	NL
	40								8	61	NL

* NL means no limit; Actual value in excess of 150 m.

Table 8.6.23 Minimum Width at Bottom of Trench

Depth of Trench (m)	Width of Trench (m)
Up to 1.2	Diameter of pipe plus 0.4
Above 1.2	Diameter of pipe plus 0.45

Note: Trench top width shall not be less than 0.75 m for depths exceeding 0.9 m

6.14.3 Bedpan Washer and Clinical Sink

Bedpan washer and clinical sink shall be connected to soil branches and soil stacks through a water seal trap. The bedpan washer with vapour vent connection shall be provided with additional local vent stack. The minimum vent stack size for bedpan washer shall be in accordance with Table 8.6.24.

Table 8.6.24 Minimum Vent Stack Size in Bedpan Drainage

No of Bedpan Washer	Diameter (mm)
Up to 3 bedpan washers at different floors	50
4 to 6 bedpan washers	75
7 to 12 bedpan washers	100

The bottom of the bedpan local vent stack (except for one bedpan washer) shall be drained indirectly into sanitary drainage system through traps. The size of the trap and connecting pipe shall be at least the size of the vent stack. At least 6 mm diameter water supply piping shall be taken from each flush supply of each bedpan washer on the discharge side of vacuum breaker, trapped to form 75 mm or more trap seal and connected to the local vent stack on each floor.

6.14.4 Sterilizer Vent Stack

The pressure or non-pressure sterilizer shall have vent connection to the sterilizer vent stack. This vent connection shall be accessible for inspection and cleaning. The size of sterilizer vent stack shall be as follows:

6.14.4.1 Pressure Sterilizers :

The minimum diameter for pressure sterilizer vent stack shall be 63 mm. The stack size for combinations of pressure sterilizer exhaust shall be in accordance with Table 8.6.25.

6.14.4.2 Pressure Instrument Washer Sterilizers :

The minimum size of sterilizer vent stack for instrument washer sterilizer shall be 50 mm for up to two sterilizers. The 75 mm stack will serve up to four sterilizers.

6.14.4.3 Non-pressure Sterilizers :

The minimum diameter of non-pressure sterilizer vent stack shall be 50 mm for utensil sterilizer and 38 mm for instrument sterilizer. Multiple installations shall be sized in accordance with Table 8.6.26.

6.14.4.4 Bedpan Steamers :

The diameter for one bedpan steamer shall be 38 mm. The stack size for combinations shall be in accordance with Table 8.6.26.

Table 8.6.25 Pressure Sterilizer Vent Stack Size

Stack Size (mm)	Number of Connections Permitted for Different Combination Sizes (mm)			
	19	25	31	38
38	3	-	-	-
38	-	2	-	-
38	-	-	1	-
38	2	1	-	-
50	6	-	-	-
50	-	3	-	-
50	-	-	2	-
50	-	-	-	1
50	3	2	-	-
50	2	1	1	-
50	1	1	-	1
75	15	-	-	-
75	-	7	-	-
75	-	-	5	-
75	-	-	-	3
75	1	5	-	1
75	-	1	2	2

6.14.5 Vent Extension

The termination of vent stack shall be in accordance with Sec 6.9.5.7 and 6.9.6.6.

6.14.6 Special Fixture Drainage

The device, appurtenance and appliance required for special purposes such as refrigerators, ice boxes, cooling or refrigerating coils etc. shall be protected against backflow with adequate air gap between the equipment inlet and drainage outlet.

Table 8.6.26 Non-pressure Sterilizer Vent Stack or Bedpan Steamer Sizes

Stack Sizes (mm)	No of Connections Permitted for Different Connection Sizes(mm)	
	38	50
38	1	-
50	2	-
50	-	1
50	1	1
75	4	-
75	-	2
75	2	2
100	8	-
100	-	4
100	4	4

6.14.7 Mental Health Care Centre and Prisoners Cell

The pipes and traps used in mental health care buildings and prisoner cells shall not be exposed and all fixtures shall be securely bolted through walls.

6.15 INSPECTION, TESTING AND COMPLETION CERTIFICATE

6.15.1 Inspection

The new drainage and sanitation system or part of the existing system shall not be covered or enclosed or put into operation until it has been inspected, tested and approved by the Building Authority. The Authority may examine the appliances and fittings before their installation or during the progress of the work. An installation of plumbing work, whether new or existing, which is found to be defective or unsafe shall not be allowed to continue in use unless corrections have been made to comply with the Code requirements.

6.15.2 Testing

6.15.2.1 Drainage and Venting System :

The piping of drainage and venting system shall be tested first with water. The final test of completed drainage and venting system may be done by smoke test. The water and smoke tests shall be performed as described below:

- a) Water Test : The water test shall be applied to the drainage and venting system either for the whole system or part (section) thereof . For the entire system, all openings in the piping except the highest opening shall be closed, and the system filled with water to the point of overflow. For the system to be tested in sections, each opening shall be tightly plugged except the highest opening of the section under test and each section shall be filled with water but no section shall be tested with less than a 3 m head of water. In testing successive sections, at least the upper 3 m of the next preceding section shall be tested so that no joint or pipe in the building (except the top most 3 m of the system) shall have been submitted to a test of less than a 3 m head of water. The water shall be kept in the system or in the portion under test for at least 15 minutes before the inspection starts. The system or the part of the system under test shall be watertight at all points.
- b) Smoke Test : The final test for gas and water tightness of the completed drainage and venting system may be performed by smoke test. The test is performed by filling all traps with water and then introducing smoke into the system produced by one or more smoke machines. When the smoke appears at the stack openings on the roof, they shall be closed and a pressure equivalent to 25 mm head of water shall be built and maintained for 15 minutes before inspection starts.

6.15.2.2 Building Sewer :

The Connection between building sewer and public sewer or individual sewage disposal system shall be closed by inserting a test plug. The building sewer shall be filled with water under a pressure of not less than 30 kPa for at least 15 minutes. The system shall be able to maintain the test pressure.

6.15.3 Completion Certificate

After the installation of drainage and sanitation system, the licensed plumber shall give a completion certificate to the authority in a prescribed form (Appendix 8.6.D) for inspection and testing. After testing, the Authority will give the final approval (as presented in completion certificate form, in the Appendix 8.6.D) to use the system .

6.16 GUIDE TO MAINTENANCE

6.16.1

The drainage and sanitation system shall be maintained in a sanitary and safe operating condition by the owner or his designated agent. All device or safeguards required by the Code shall be maintained in working order.

6.16.2

The following operations shall be carried out during periodical cleaning of a drainage and sanitation system:

- a) The covers of inspection chambers and manholes shall be removed and the side benching and channels shall be scrubbed.
- b) All lengths of main and branch drains shall be rodded by means of drain rods and a suitable rubber or leather plunger. After rodding, the drains shall be thoroughly flushed with clean water.
- c) The ladders/rings in deep manholes and the manhole covers shall be painted.
- d) All surface drains shall be cleaned.
- e) All subsoil drains shall be examined for obstruction at the open joints.
- f) Refuse chute system shall be cleaned.

Related Appendices:-

Appendix 8.6.A Application for Permit to Construct Drainage and Sanitation System

Appendix 8.6.B One-hour Rainfall

Appendix 8.6.C Design Guideline of a Septic Tank

Appendix 8.6.D Completion Certificate (Drainage and Sanitation Works)