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(Fatehabad)

PLUMBING SERVICES

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PLUMBING

- The art and science of creating and maintaining sanitary conditions in building used by humans.

- It is also defined as the art and science of installing, repairing and servicing the pipes, fixtures and appurtenances necessary for bringing in water supply and removing liquid and water-borne wastes;

PLUMBING

- the art and science of installing in buildings the pipes, fixtures and other appurtenances for bringing in the water supply and removing liquid and waterborne wastes. It includes the fixtures and fixture traps; the soil and waste pipes; vent pipes; the building drain and building sewer; and the storm drainage pipes; with their devices, appurtenances and connections to all within or adjacent to the building.

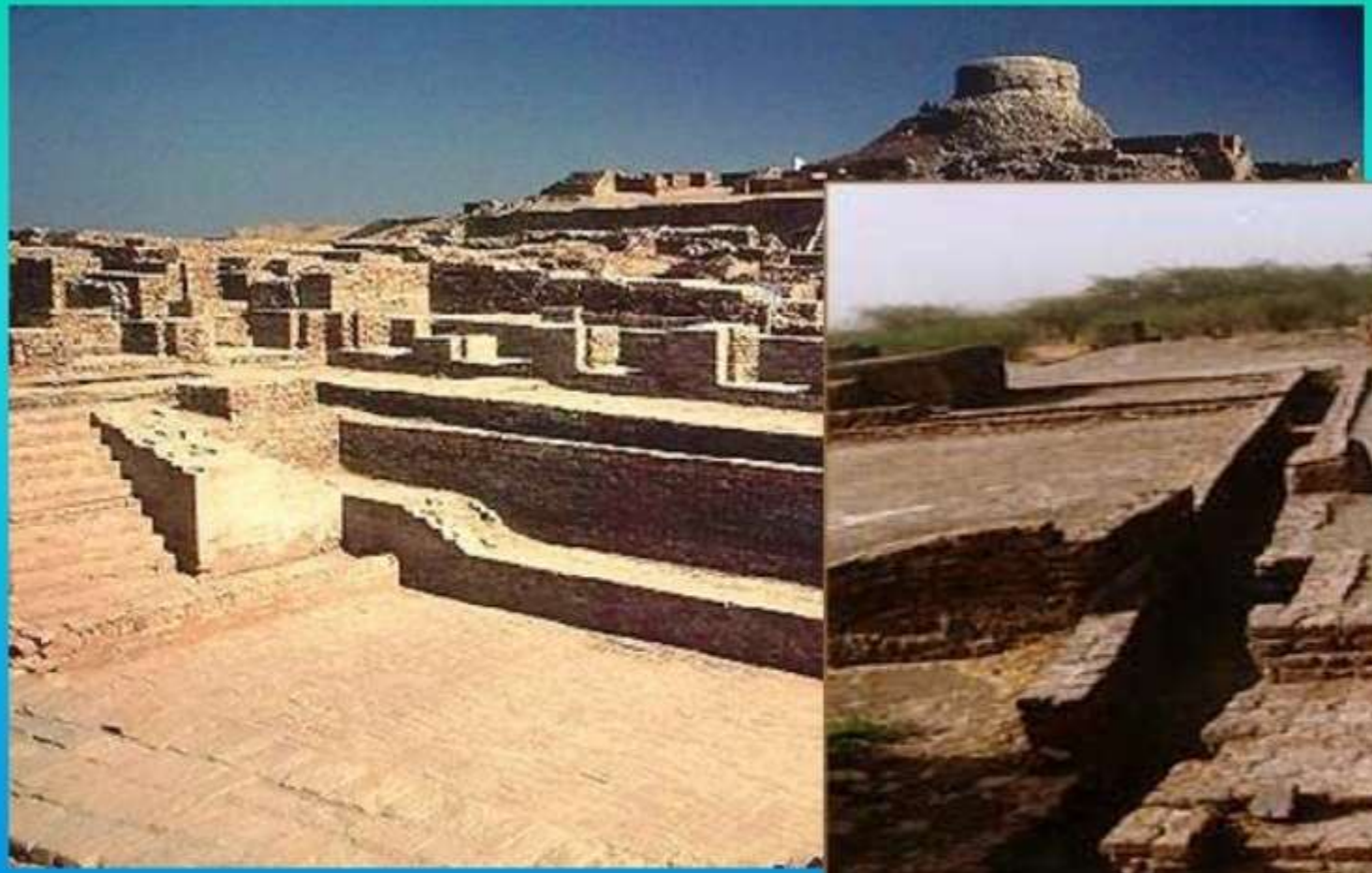
Historical Background

- Since the dawn of civilization plumbing and sanitation has been part of human lives. All human beings, regardless of culture and race had been practicing the act of disposing waste since time immemorial.

- Historians, in their attempt to trace the history of plumbing, events which had brought about changes that led towards the plumbing system that we know today, had painstakingly devised records of chronological

Historical Background

- The first artifact to have been unearthed was a copper pipe used in a water system in the ancient palace ruins in the Indus Valley. It was estimated to be 5,500 years old. Such discovery established the earliest known knowledge on plumbing systems.
- Around 2,500 BC, the Egyptians used copper pipes in their irrigation and sewerage systems. In the ancient Babylon, the science of hydraulics had been established as evidenced by their skillful planning in their network of canals. The



Historical Background

- During the Roman Empire (500BC - 455AD), enormous concerns on the field of sanitation and plumbing had been observed those times. Aqueducts were built to convey water from sources to houses. Extensive underground sewer systems were constructed. Notable among these developments is the construction of underground public water supply system made of cast lead sections.

- Public baths had proliferated; one particular example is the Bath of Diocletian, a bath that could accommodate 3,200 bathers at one time. These baths were lines with ceramic tiles. In addition. Roman bathhouses also include large public latrines, sometimes with marble seats.

- The quality of plumbing declined after the fall of the Roman Empire in AD 476. During the middle ages, people disposed of waste

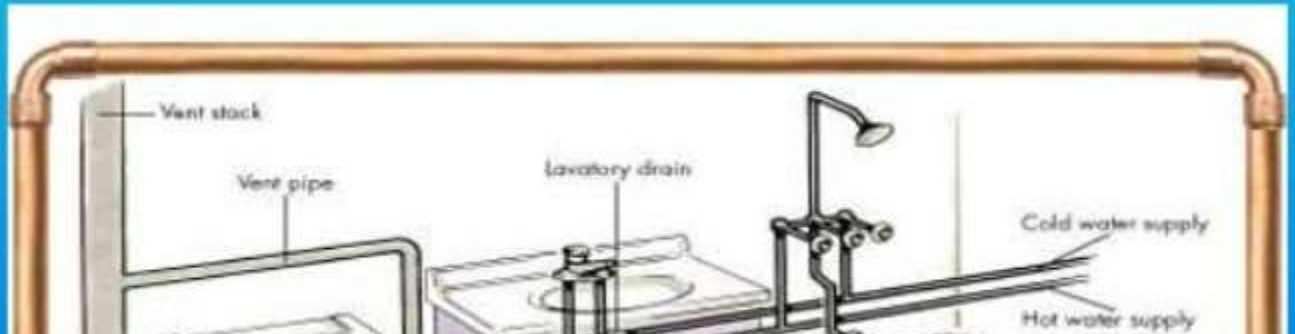
Roman Aqueducts

Roman Bathhouse (Thermae)

Roman lead pipe with a folded seam

Definitions and Basic Plumbing Principles
Plumbing System

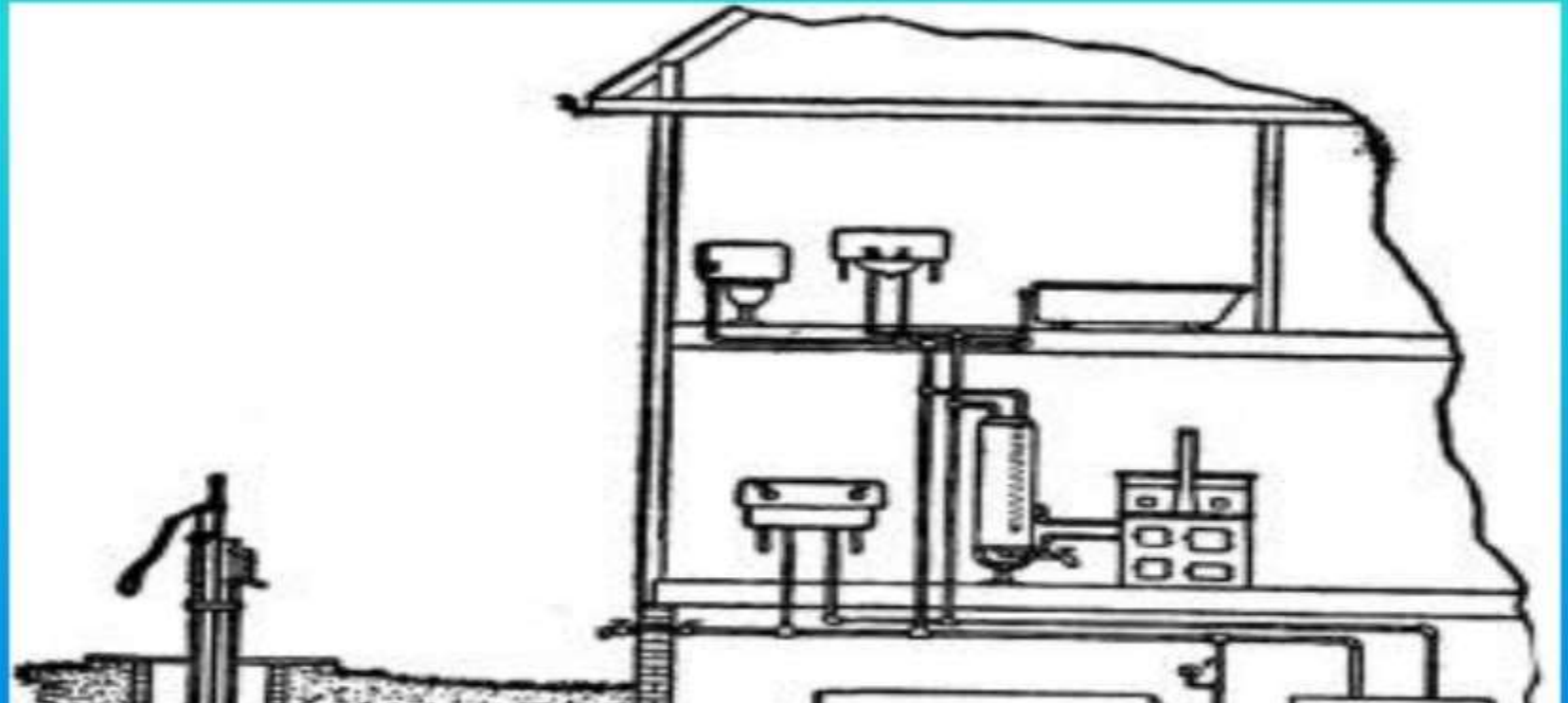
- The plumbing system of a building includes the water supply distributing pipes; the fixture and fixture traps; the soil, waste and vent pipes; the building drain and building sewer; the storm water drainage, with their devices, appurtenances and connections within the building and outside the building within the property line.



Water Supply System

- A system in plumbing which provides and distributes water to the different parts of the building or structure, for purposes such as drinking, cleaning, washing, culinary use, etc.; it includes the water distributing pipes, control devices, equipment, and other appurtenances.

Water Supply System



Drainage System

- All the piping within a public or private premises which conveys sewage, rainwater or other liquid wastes to a point of disposal. A drainage system does not include the mains of public sewer systems or a private or a public sewage treatment or disposal plant.

Drainage System

Sanitary Drainage and Vent Piping System

- The sanitary drainage and vent piping system are installed by the plumber to remove wastewater and water-borne wastes from the plumbing fixtures and appliances, and to provide circulation of air within the drainage piping.

Sanitary Drainage

Vent Piping System

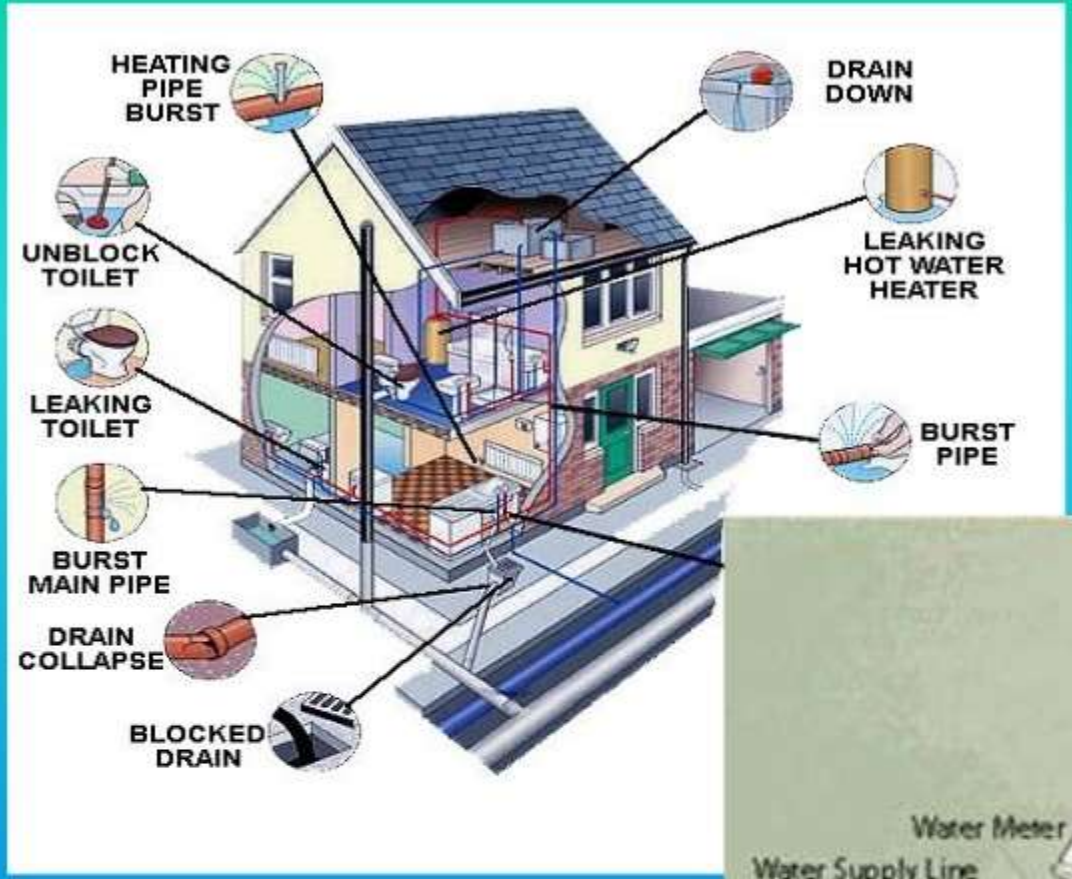
Sanitary Drainage Pipes

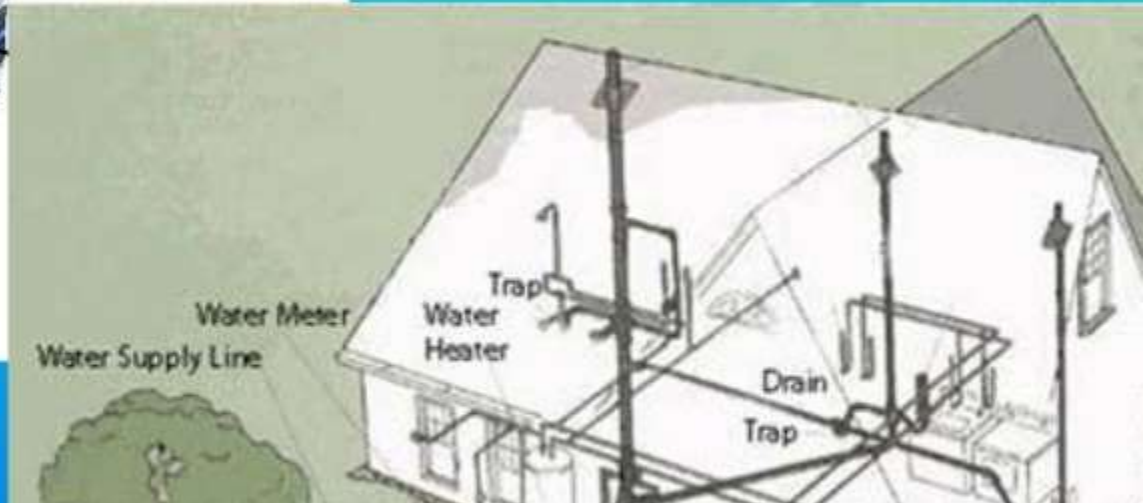
- Pipes installed to remove the wastewater and water-borne wastes from plumbing fixtures and convey these to the sanitary sewer and other point of disposal.

SANITARY DRAINAGE SYSTEM

- BUILDING/HOUSE SEWER

That part of the drainage system that extends from the end of the building drain and conveys its discharge to the public sewer, private sewer, individual sewage disposal system, or other appropriate point of disposal.


HEATING PIPE BURST
DRAIN DOWN
UNBLOCK TOILET
LEAKING HOT WATER HEATER
LEAKING TOILET
BURST PIPE
BURST MAIN PIPE
DRAIN COLLAPSE
BLOCKED DRAIN


Trap
Water Meter
Water Heater
Water Supply Line
Drain
Trap

Privy

– The oldest form of disposal of organic waste

– It consists of a water tight vault constructed of concrete for the collection of raw sewage and a wooden shelter.

– It must be 50′ to 150′ (15m to 45 m) away from the water supply

– The vault should be supplied with ventilation

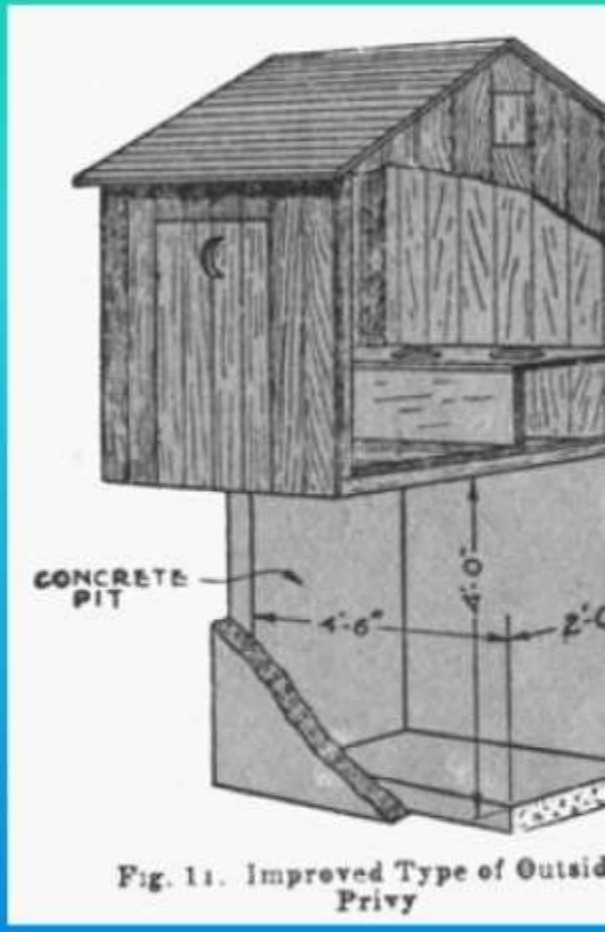


Fig. 11. Improved Type of Outsid
Privy

Septic Tank and Seepage Pit

– In this type of sewage disposal, the cycle is completed below ground and within the property. Liquid wastes are purified due to the action of anaerobic bacteria through precipitation in the digestion chamber and effluent is discharged in the leaching chamber by natural percolation.

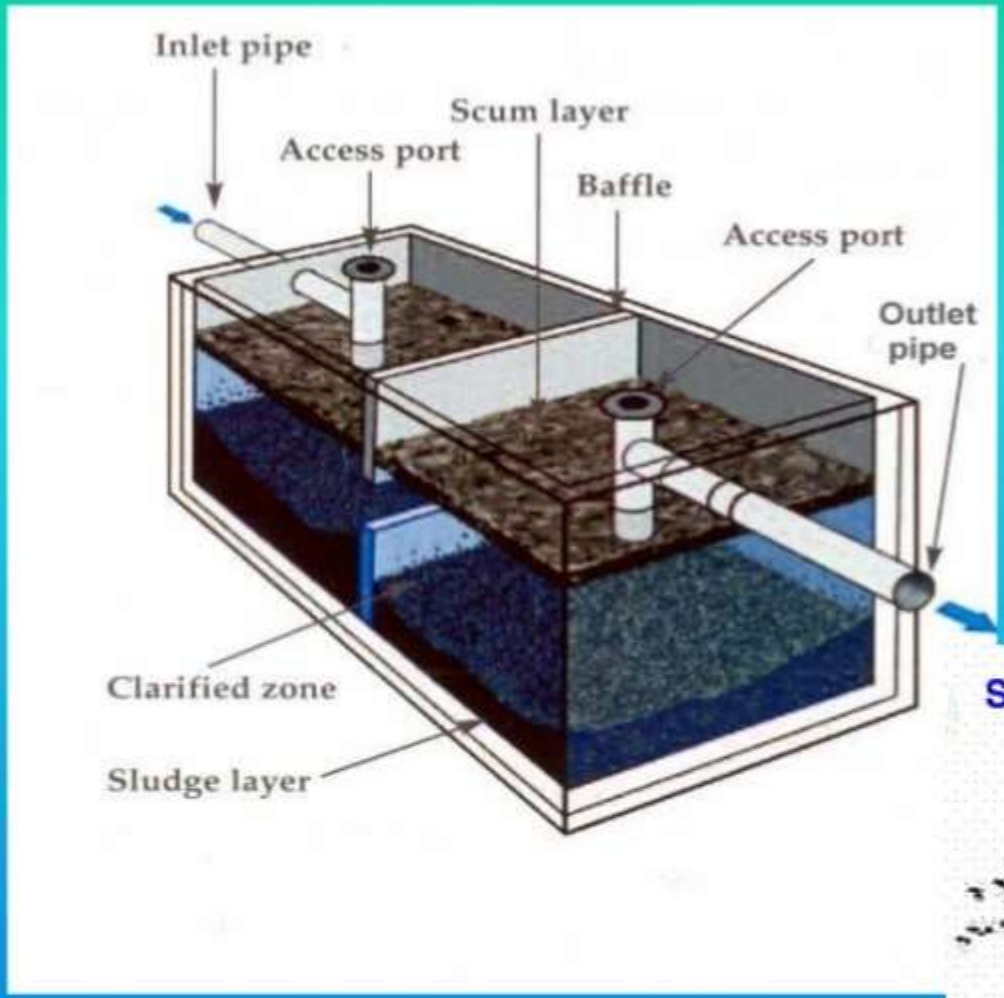
- Effluent –liquid discharge
- Scum- non-soluble organic matter that floats on the surface of the sewag
- Sludge- organic matter that settles at the base of the septic tank

- Size of tank:

Residence

- 6 persons min capacity of 50 cu ft, and for larger household 5-6 cu. ft/person

Commercial, industrial and institutional


Inlet pipe
Scum layer
Access port
Baffle
Access port
Outlet pipe
Clarified zone
Sludge layer


SeptClean 250FE

Parts of a Sanitary Drainage System

SPECIAL DEVICES:

- Interceptors
- Sumps and Ejectors
- Backwater Valves
- Roof and Floor Drains

ESSENTIAL COMPONENTS:

- House Sewer
- House Drain
- House Trap

House Sewer

– It extends from the public sewer to the pri
sewage-disposal tank to the wall of the structure and is entirely outside the building

- Glazed vitrified clay – min. 6" –36 " Ø, 2'-3' long
- Cast-iron min. 4" Ø, 5' to10' long
- Copper – 12' to 20' long
- Plastic pipe –10' to 20' long

– 12" deep with concrete pavement
– 18" deep without concrete covering
– Slope at 1/8" or ¼" to the foot

House Drain

– The horizontal main into which the vertical soil and waste stacks discharge. It connects directly to the house sewer.

– Sanitary drain

– Leader drain

- Copper
- Plastic
- Extra heavy cast-iron

– Slope at 1/8" or ¼" per foot

– A cleanout at the cellar/basement wall is recommended to clear obstructions

Fresh-air inlet

– It is intended to admit fresh ai the drainage system so that ther will be a free circulation without compression

throughout the house drain and stacks discharging above the roo

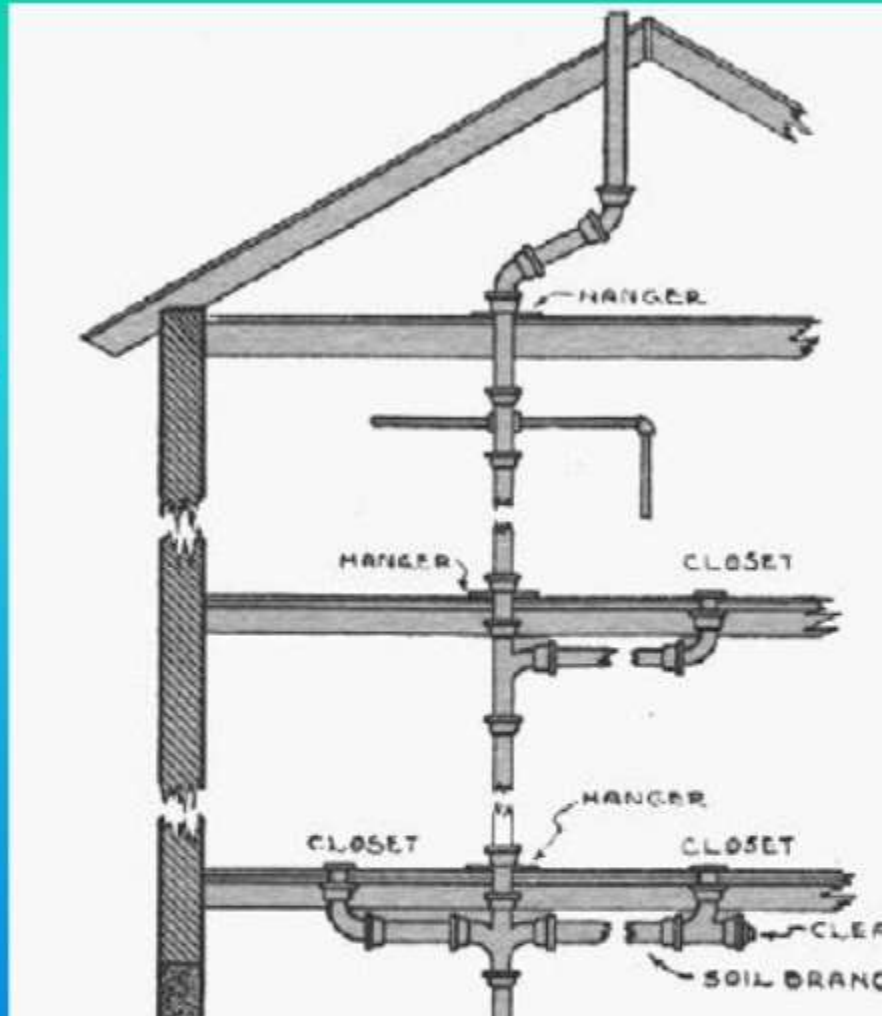
– A necessary adjunct to the hou trap

Soil and Waste Stacks

– The soil and waste stacks collect the sewage from the fixtures through their branches.

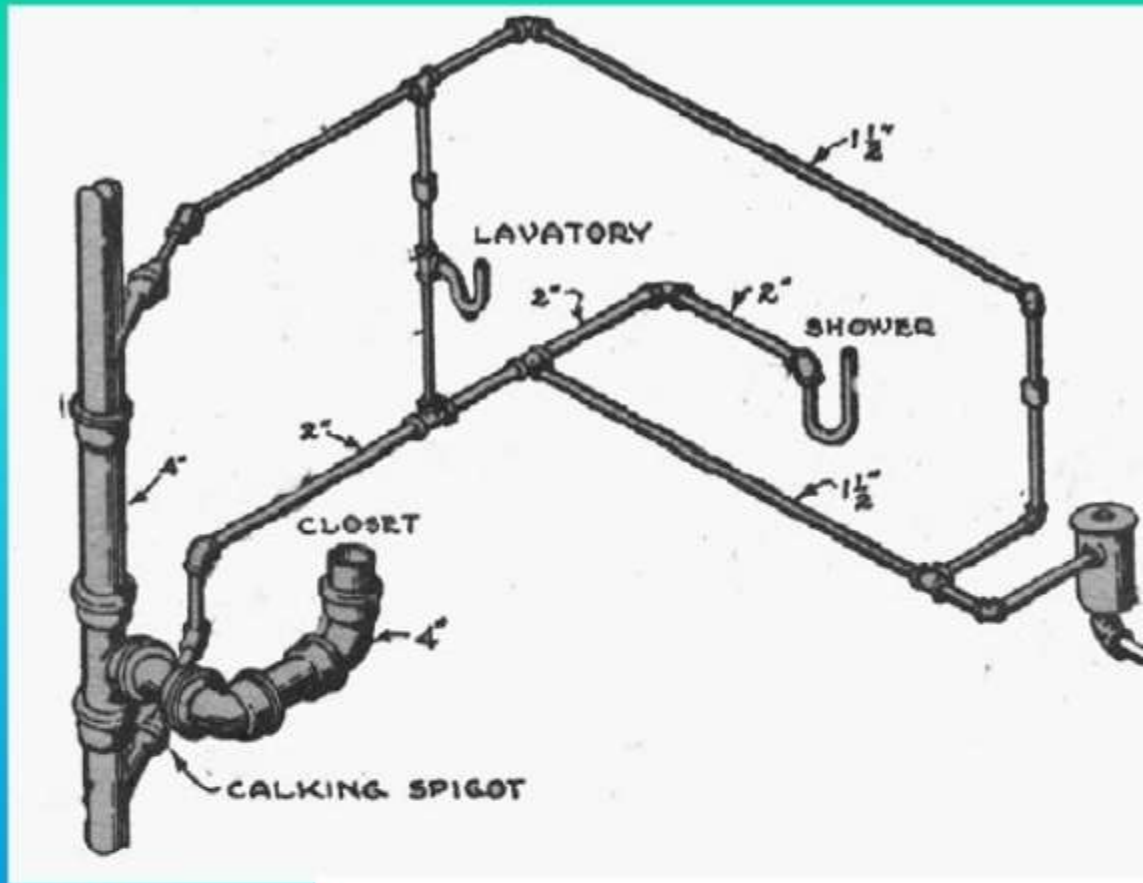
- Should rest solidly at the bottom on masonry piers or heavy posts
- The upper ends should extend through the roof for ventilation
- Made of heavy cast-iron, copper, plastic

- Supported at intervals of 10’ with stout wall hangers or brackets or on beams

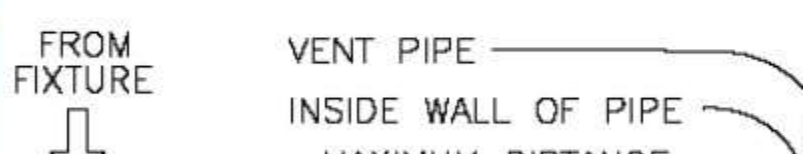


Fixture Branches

– Connect the fixtures with the stacks
– Waste or soil branches are connected to the trap of each fixture



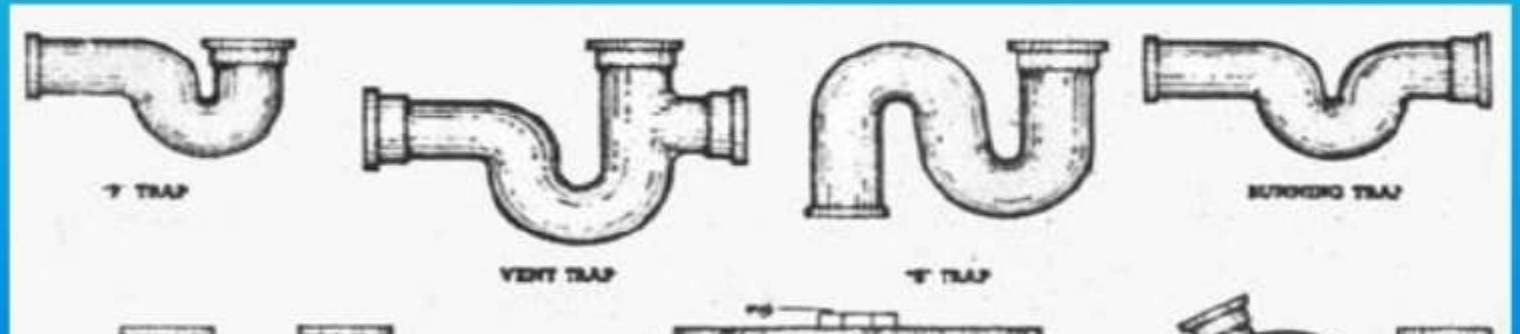
– 1/8" – ½" per foot
– Horizontal branch should not be more than 5' (from the vertical inlet of



Traps

– Traps catches water after each discharge from a fixture so as not to allow unpleasant ad obnoxious gases in a sanitary drainage system to escape through the fixture

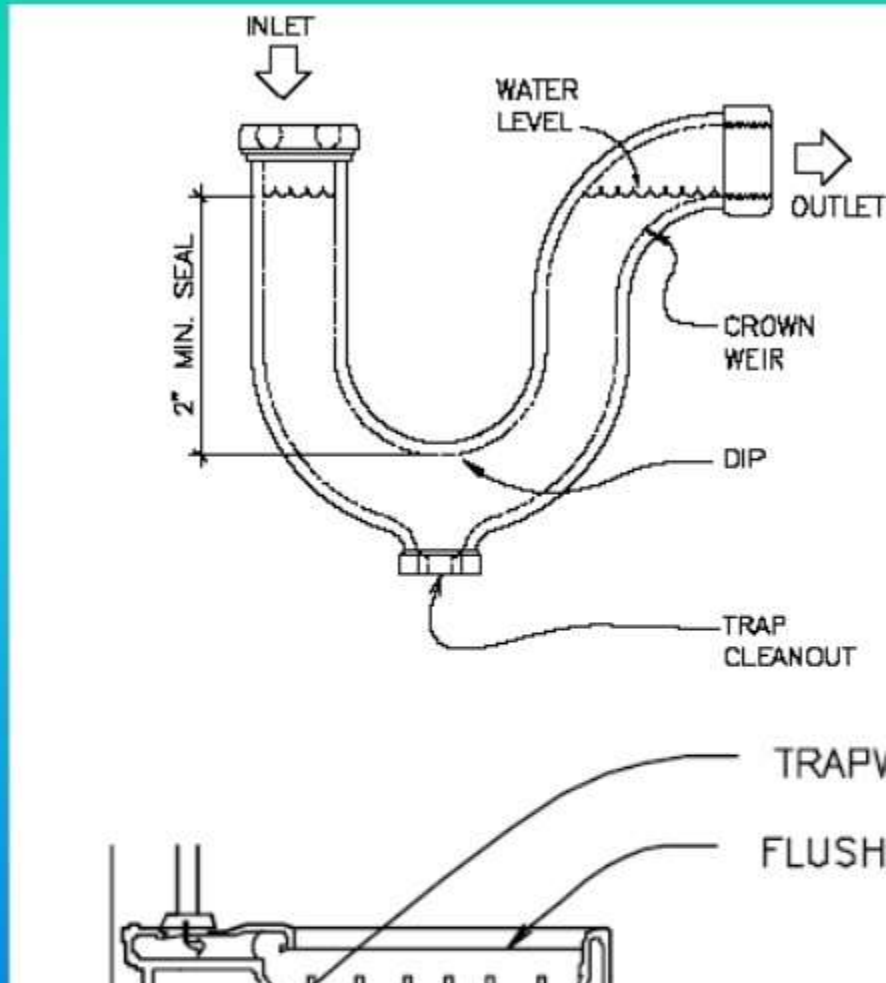
– All fixtures are to be provided with its own trap except for three laundry and kitchen sinks connected to a single trap



– Trap seal must have a min depth of 2″ and max of 4″ depth

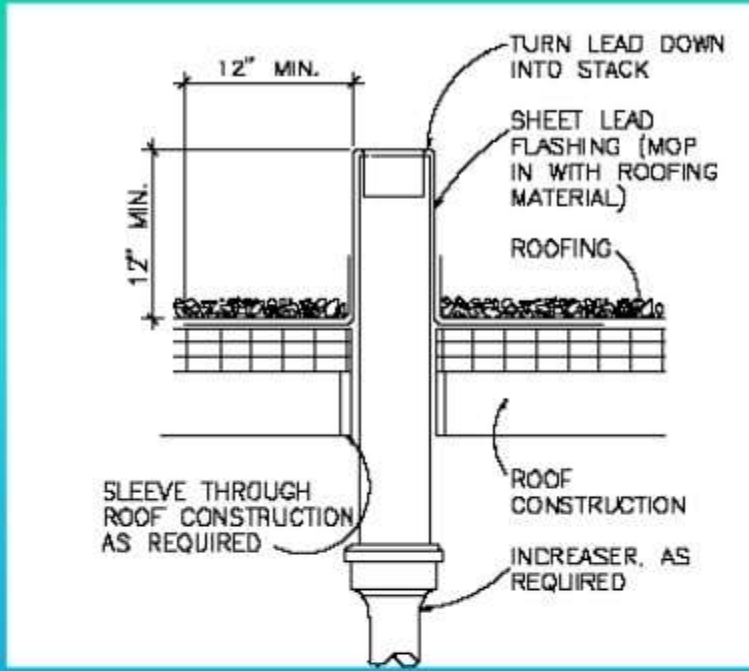
– Placed within 2’ of the fixture accessible for cleaning through its bottom with a plug

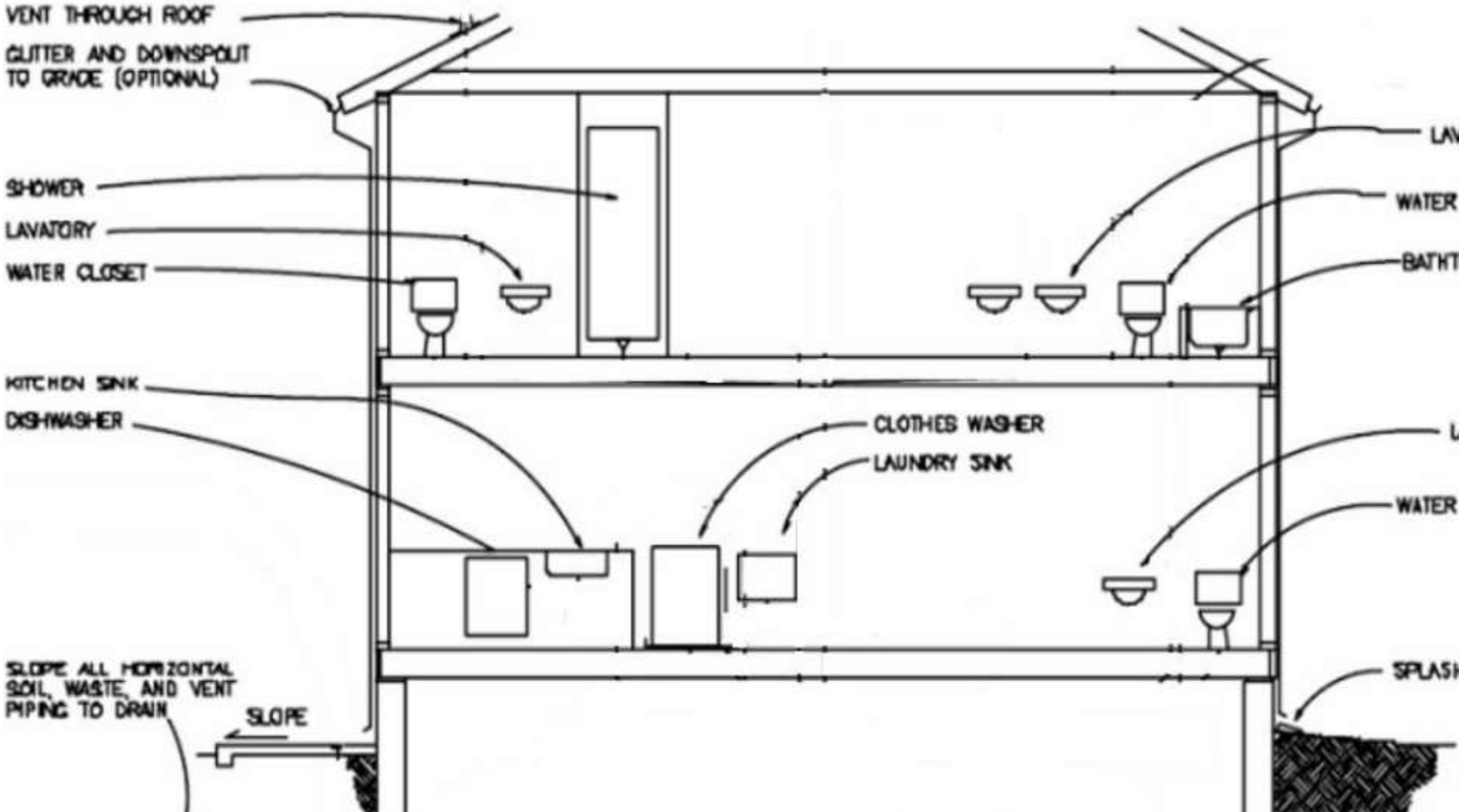
– Made of steel, cast-iron, copper, plastic and brass except those in urinals and water closets which are made of vitreous china cast integrally with the fixture

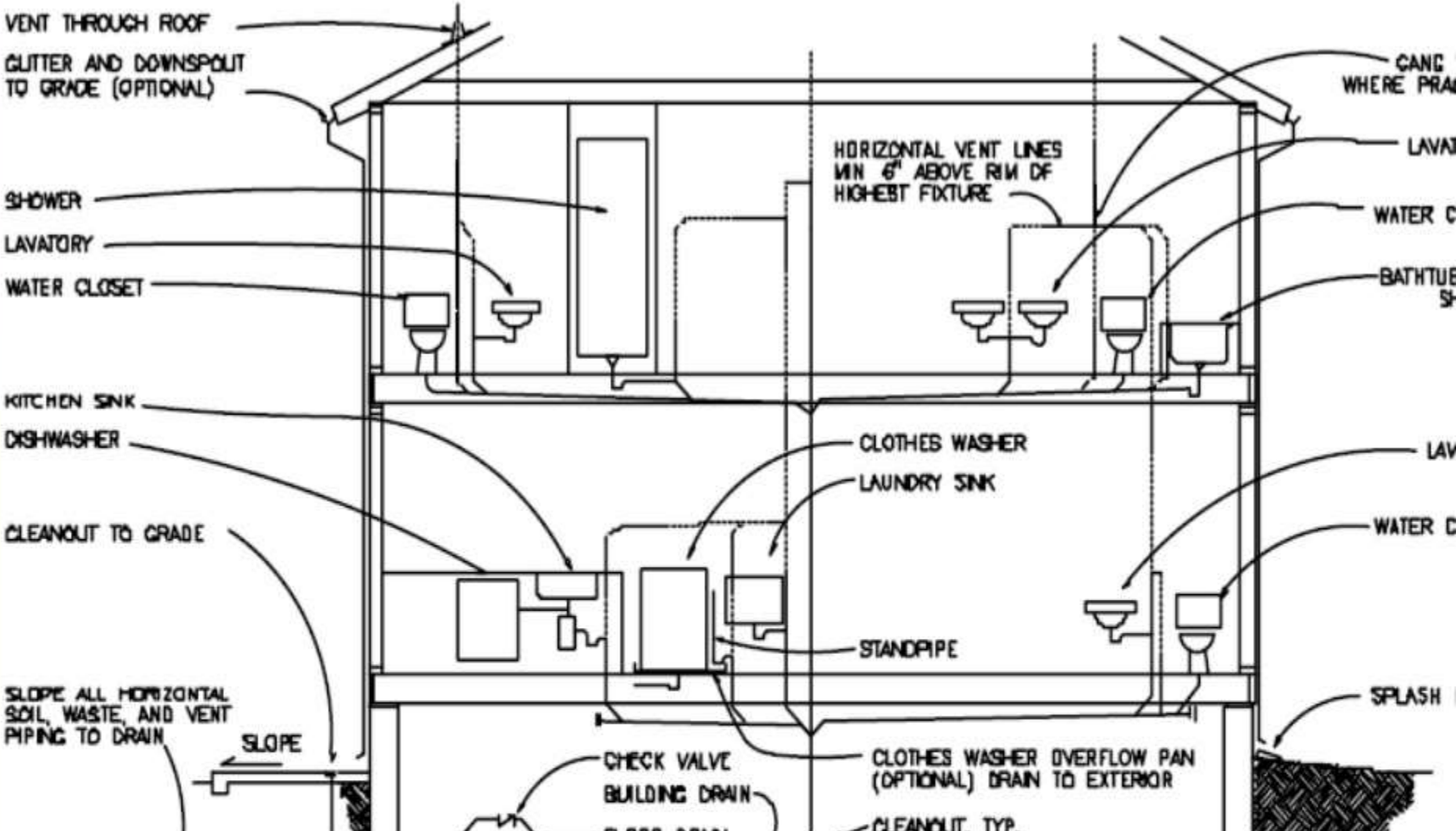


Vents

– Vents are the extension of soil and waste stacks through the roof and a system of pipes largely paralleling the drainage system for the admission of air and discharging of gases.

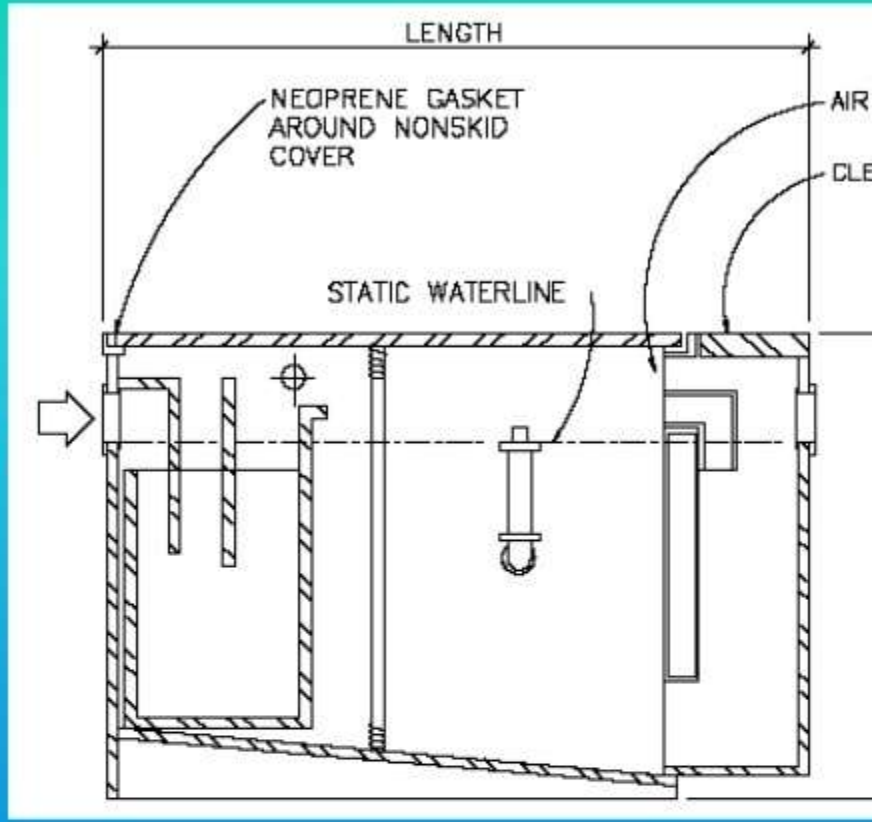



VENT THROUGH ROOF
GUTTER AND DOWNSPOUT TO GRADE (OPTIONAL)
SHOWER
LAVATORY
WATER CLOSET
KITCHEN SINK
DISHWASHER
CLOTHES WASHER
LAUNDRY SINK
SLOPE ALL HORIZONTAL SOIL, WASTE, AND VENT PIPING TO DRAIN
SLOPE


VENT THROUGH ROOF
GUTTER AND DOWNSPOUT TO GRADE (OPTIONAL)
SHOWER
LAVATORY
WATER CLOSET
KITCHEN SINK
DISHWASHER
CLEANOUT TO GRADE
SLOPE ALL HORIZONTAL SOIL, WASTE, AND VENT PIPING TO DRAIN
SLOPE
HORIZONTAL VENT LINES MIN 6" ABOVE RIM OF HIGHEST FIXTURE
CLOTHES WASHER
LAUNDRY SINK
STANDPIPE
CHECK VALVE
BUILDING DRAIN
CLOTHES WASHER OVERFLOW PAN (OPTIONAL) DRAIN TO EXTERIOR
CLEANOUT TYP
SPLASH

Interceptors

– device designed and installed so as to separate and retain deleterious, hazardous, or undesirable matter from normal waste and permit normal sewage or liquid waste to discharge into the disposal terminal by gravity

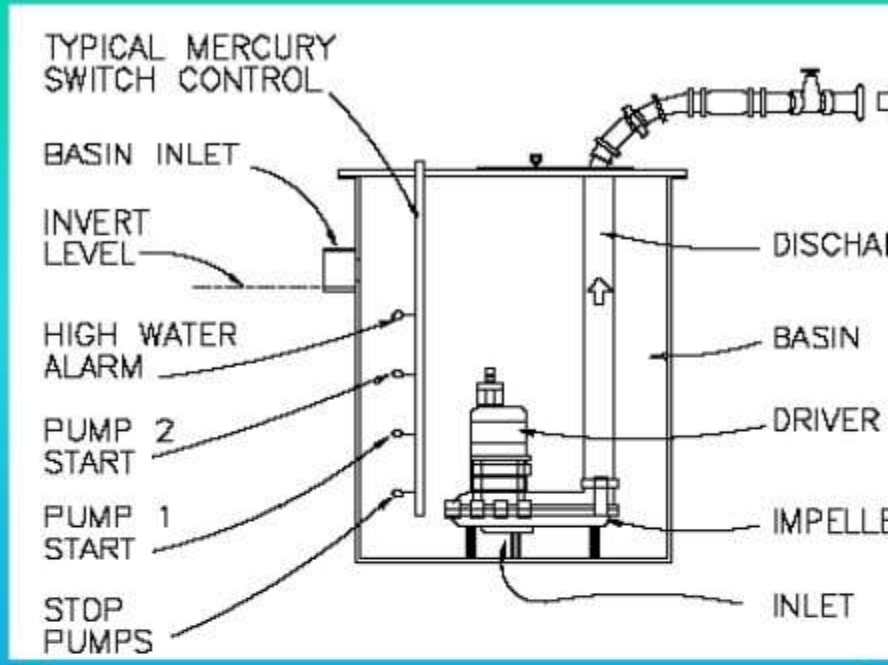


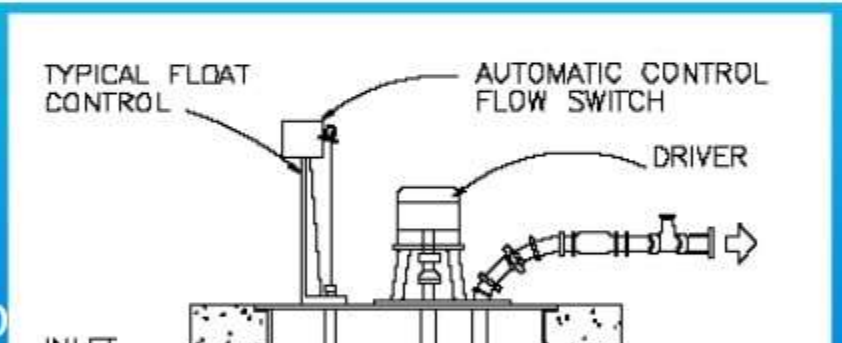
Sump and Ejectors

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

– Sewage ejectors may be motor-driven centrifugal pumps or they may be operated by compressed air.

Ejector pump for submersible system
Ejector for Vertical lift submerge pump



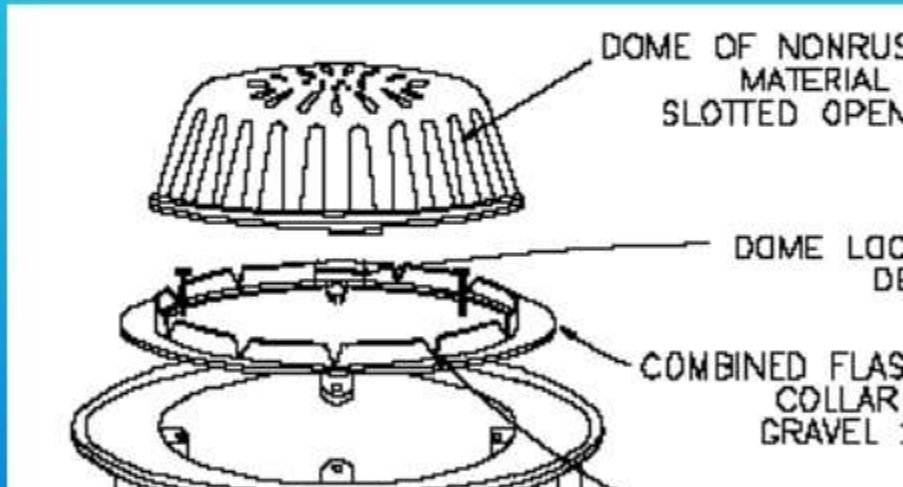


Backwater valves/check valve

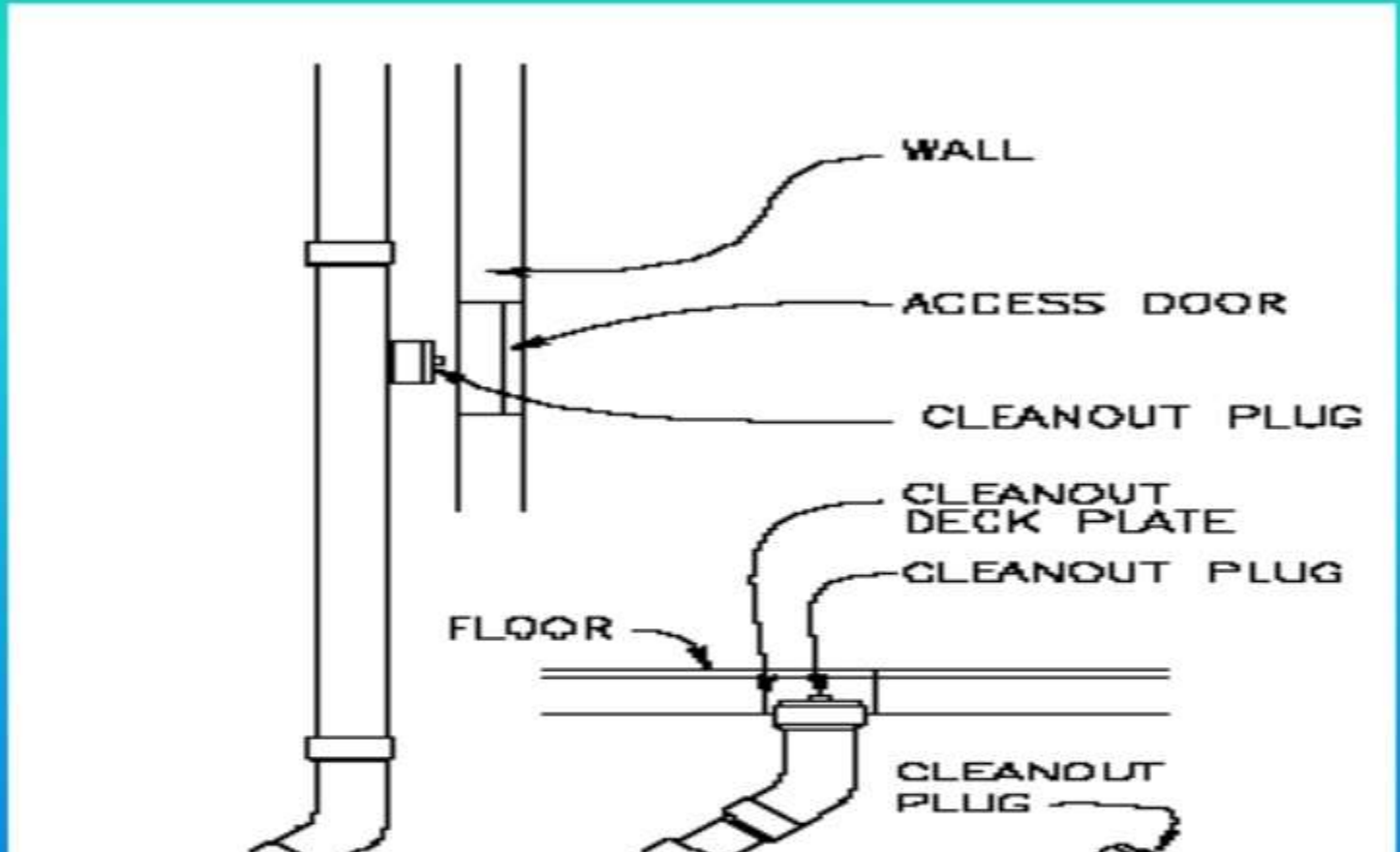
– A backwater valve closes to prevent reverse flow from a sewer to low facilities when there is a heavy drainage load for short periods that can cause building up and over flow of wastes.

Roof Drain

– Is a receptacle designed to collect surface or rain water from an open area and discharge to a catch basin



Floor Drain


WALL
ACCESS DOOR
CLEANOUT PLUG
CLEANOUT
DECK PLATE
CLEANOUT PLUG
FLOOR
CLEANOUT
PLUG

Is that portion of the drainage installation designed to maintain atmospheric pressure within it

- and prevent at least three major difficulties:
  - Retardation of flow
  - Material deterioration
  - Trap seal loss

Retardation of flow.

- The result of improper atmospheric conditions, because of insufficient ventilation or incorrect installation of fittings.
- Increased pressure causes retarded flow in the vertical stack and also affects the discharge capacity of its branches

– **Material deterioration.**

- Wastes create chemical compounds of an acid nature which

- Five ways in which trap seal is lost:
  - Siphonage (direct or indirect)
  - Back Pressure
  - Capillary Attraction
  - Evaporation
  - Wind Effect

Siphonage is the result of a minus pressure in the drainage system

- **Direct siphonage/selfsiphonage** is common in unventilated traps

Siphonage

- **Indirect siphonage** or **siphonage by momentum** is the result of a minus pressure in the waste piping caused by discharge of water from a fixture

Back-pressure is caused by a plus pressure in large plumbing installations

– The fixtures in which it occurs are usually located at the base of a soil stack or where soil pipe changes its direction.

– Ventilate the base of the soil pipe to correct this condition

Capillary attraction, **trap seal is caused by suspension of foreign object (rag, string, lint, hair) into the trap seal extending over the outlet arm of the trap.**

– The object serves as an absorbing siphon.

Evaporation of the trap seal is a phenomenon of nature.

– The atmosphere absorbs moisture and varies inversely with temperature

– It requires weeks to evaporate trap seal

– Deep seal traps are recommended when air is not saturated with moisture

Wind effects

– Wind of high velocity passing over the top of the soil pipe roof terminal affects trap seal.

– Downdrafts tends to ripple the liquid content of the trap and spill quantity of it over its outlet leg into the system.

– Soil vent terminals should be away from valleys, gables, abrupt projections

Main Soil and Waste Vent

– Is that portion of the soil pipe stack above the highest installed fixture branch extending through the roof .

– The same diameter as the water-carrying portion of the soil or waste pipe

• (2″-4″ Ø)

Main Vent

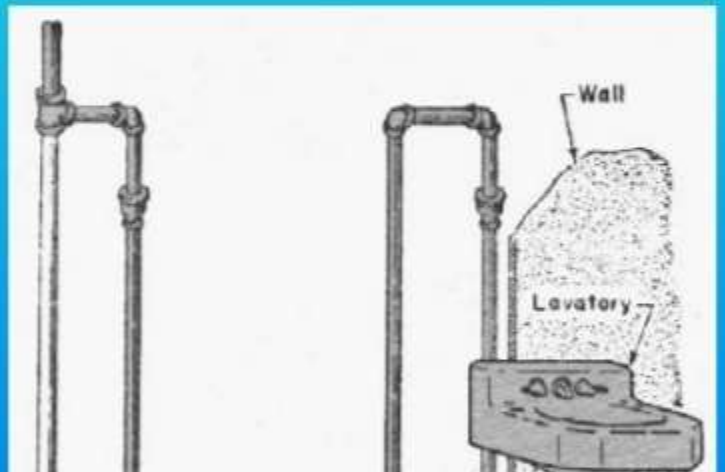
– Is that portion of the vent pipe system which serves as a terminal for the smaller, tributary forms of individual and group fixture trap ventilation (collecting vent line)

– It begins at the base of the soil-pipe stack to relieve it from back pressure and terminates in the soil –pipe stack 3’ above the highest

Wet Vent

– a wet vent is a method of ventilation used rather extensively for small groups of bathroom fixtures

– A portion of the vent system through which liquid wastes flow



Looped Vent

– used on fixtures which are located in the room away from partitions tha might be utilized to conceal the was and vent

– A bleeder or drip connection must be made between the waste pipe ar the lowest point of the vent line to avoid accumulation of water in the loop vent

Local Vent

– a vent without connection with the plumbing system

– It terminates at the roof and connected to the fixture at point below the seat

Utility vent

– Used for underground public restrooms

Ventilation System

- A system of pipes, fittings and other devices installed for the purpose of providing circulation of air and creating balanced atmospheric condition within the system thereby preventing siphonage and backpressure.

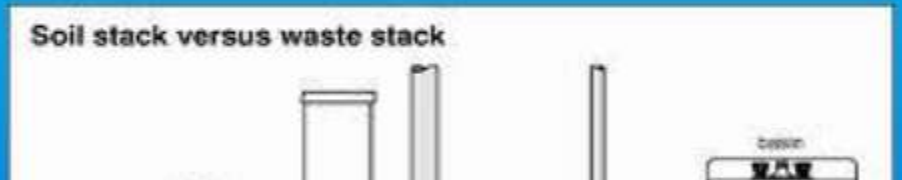
Soil Pipe

- A pipe that conveys the discharge of water closets or similar fixtures containing fecal matter, with or without the discharge of other fixtures to the building drain or building sewer.

Waste Pipe

- A pipe that conveys only liquid waste free of fecal matter.

  A waste pipe is generally smaller than a soil pipe because of the nature of matter being discharged into the system. A waste pipe may be connected directly or indirectly depending on the type of fixture.



Plumbing System Components

- Water Supply and Distribution System
  - Cold Water Supply System
  - Hot Water Supply System
- Sanitary Piping System
- Soil Piping System
- Waste Piping System
  - Direct Waste Piping System
  - Indirect Waste Piping System
- Ventilation System
- House Drain
  - House Sewer
  - Drainage Cleanout

THANK YOU