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Section A

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Assighment No 02

Subject

Waste water enngineering

Q:- Briefly describe the following terms.

1) Soil pipes and anti-syphon pipes

2) Sanitary fixtures and traps;

3) Cross connection and back syphonage control.

1) SOIL PIPES AND ANTI-SYPHON PIPES

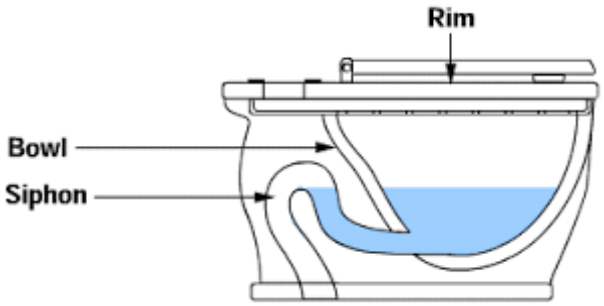
SOIL PIPES

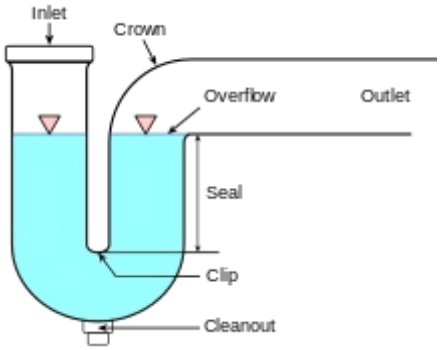
As already mentioned, a soil pipe is for soiled water. This type of pipe will carry water and solids into the sewer. While any pipe could physically perform the task, the soil pipe, also known as a soil vent pipe, as installed in most homes has a specific quality. First, it is of a dimension to allow solid waste to pass. Second, it is vented in a very specific way to maintain a safe environment and reduce odours. Soil pipes are vented high at the top or near to the top of a building, thanks to soil pipe stacks, to allow gases produced by waste to vent safely into the

atmosphere. Such gases can be harmful to health so venting them high keeps them out of the way. This is a vital feature of soil pipes and it forms part of building regulations too.

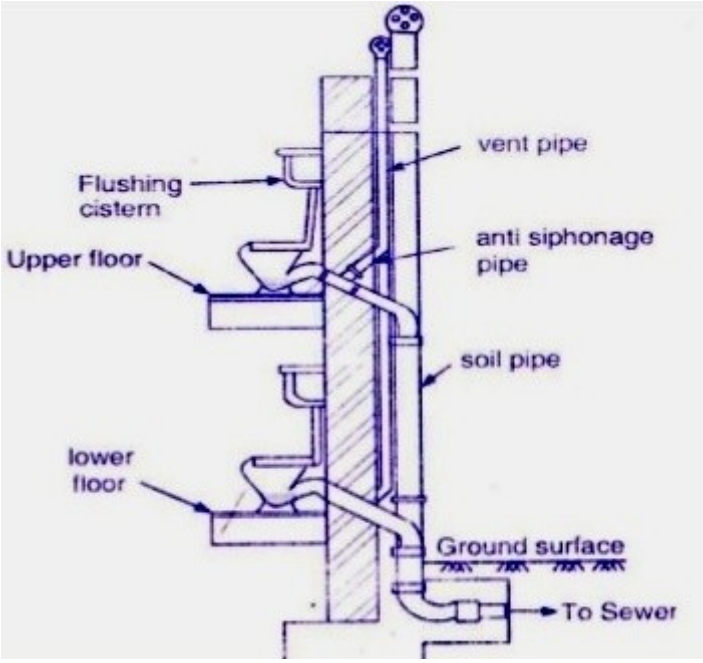
ANTI-SYPHON PIPES

- An extra pipe connected to the outlets of toilet seats of all the floors, the other end of which is exposed to atmosphere is called anti-syphonage pipe. These are provided to maintain water seal so that foul gases of the sewer line do not find entry in to the toilet/ bathrooms.
- If we look into a toilet seat we find some water at the bottom, which remains there even after flushing. The seats are designed with a trap so that the water remains in the seat. The water is maintained to prevent entry of foul gases from the toilet pipe/ soil pipe/ sewer lines into the toilet room. This is called water seal.

1. 

2. 

When one of the toilets in the upper floors is flushed, a lot of water gushes down the toilet line in the form of a water column with accelerating speed due to gravity. This fast moving water column causes a low air pressure just above it. The water seal of the toilet has normal air pressure on the toilet side and a lower air pressure on the toilet pipe side. This difference of air pressure causes the water seal in the toilet seat to get sucked out into the pipe. Thus the water seal is broken and foul gases can enter into the toilet room.

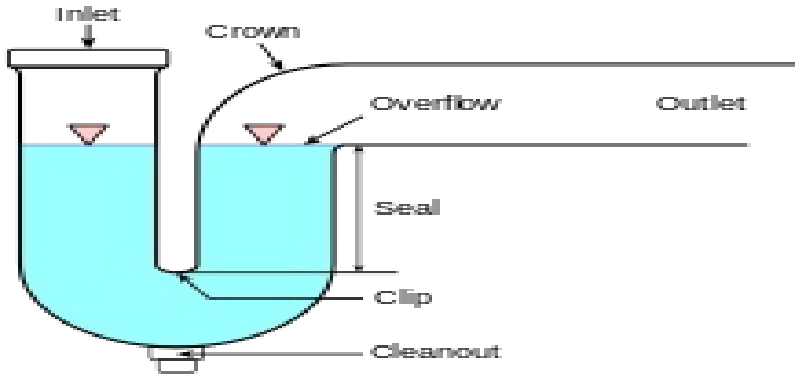


To maintain water seal, it is necessary to maintain equal air pressure on both the toilet room and soil/toilet pipe sides. Therefore an additional pipe called anti syphonage pipe is connected close to the toilet seat outlet the other end of which is open to atmosphere. As soon as the air pressure above the fast moving flush water column reduces, the anti-syphonage pipe allows atmospheric air to enter the low pressure zone and equalize the air pressure. This prevents the sucking out of the water seal from the flushed toilet seat as well as all the toilet seats connected at lower floors.

All kitchen and bathroom fittings also have water seal to prevent entry of foul gases. Bathroom floor traps, wash basins, Kitchen sinks etc are normally not connected to toilet/soil pipes and separate pipes are provided for them. The water flowing out of kitchen sinks, wash basins, bath rooms etc is not as much as that from a flushing toilet seat. It does not make a pipe full of water column rushing down leaving a low air pressure behind. Therefore anti-syphonage pipes are not essential for kitchen/ bathroom fittings.

These days single stack system of plumbing is being adopted where toilet, bathroom and kitchen sinks etc are also connected to the same toilet pipe. There the problem of breaking of water seal arises leading to foul smelling toilets, bathrooms, wash basins and kitchens. To prevent this all toilet, bathroom and kitchen fittings must be fitted with deep-seal traps. A deep seal trap has a minimum of 40 mm of water seal. 40 mm of water seal can normally resist air pressure differences generated in toilet pipes due to the flushing of toilet seats in upper floors. The upper most end of the toilet pipe remains open to atmosphere (by using a cowl) to allow entry of air to make up for any reduction of air pressure. Thus neither an anti-syphonage

pipe is required nor two separate vertical pipes for toilets and for kitchen/ bathroom water are required. A single vertical stack works for all.



2) SANITARY FIXTURES AND TRAPS

SANITARY FIXTURES

A receptacle for industrial and fecal sewage that is installed in homes and public and industrial bu ildings. Sanitary fixtures are attached to the inter ior systems of water pipes and sewerage system s and constitute the main elements of a building' s sanitary engineering equipment.

Sanitary fixtures are installed in different areas. Bathtubs, washstands, shower sumps, traps, an d bidets are installed in bathrooms, washrooms,

and shower rooms. Toilet bowls, lavatory pans, and urinals of various types, whether equipped with flush tanks or taps, are installed in lavatorie s. Washers, sinks and drains are installed in kitc hens.

Special sanitary fixtures are used in medical insti tutions, laboratories, bathhouses, barber shops, and beauty salons and on transportation facilitie s. These fixtures are made from cast iron, ceram ics (faience, semiporcelain), sheet steel, nonferr ous metals and alloys, or plastics. Cast-iron and steel fixtures are covered with a white or colored vitreous enamel. Ceramic fixtures are covered w ith glaze, and nonferrous-metal fixtures are elect roplated. Sanitary fixtures are equipped with hyd rants or faucets that deliver both hot and cold wa ter. They are also equipped with siphons that ha ve water seals to prevent polluted air from enteri ng a room from sewerage pipes.

TRAPS

In plumbing, a **trap** is a device shaped with a bending pipe path to retain fluid to prevent sewer gases from entering buildings while allowing waste materials to pass through. In oil refineries, traps are used to prevent

hydrocarbons and other dangerous gases and chemical fumes from escaping through drains.

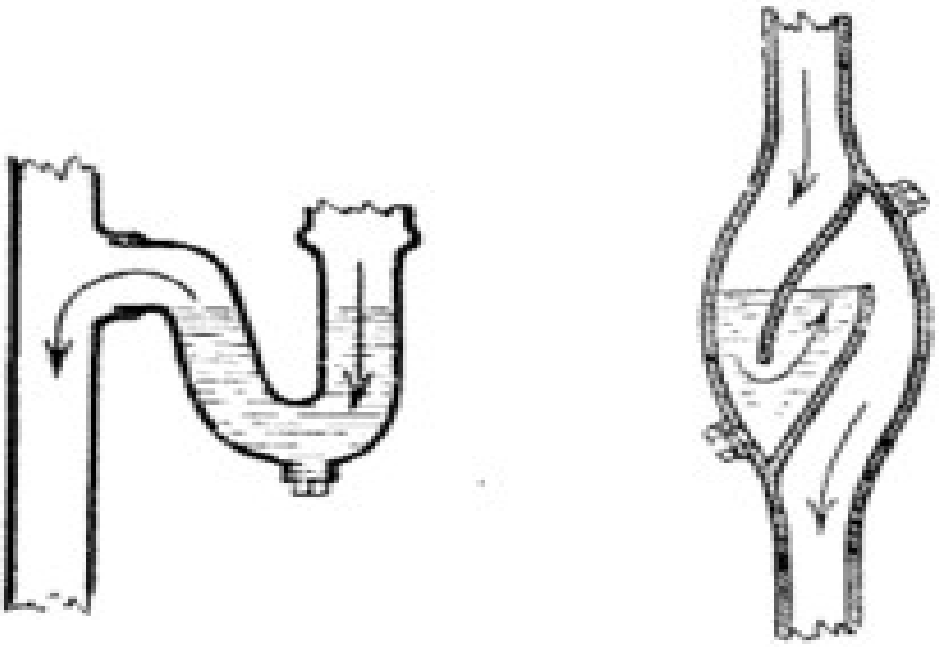
In domestic applications, traps are typically U, S, Q, or J-shaped pipe located below or within a plumbing fixture. An S-shaped trap is also known as an **S-bend**. It was invented by Alexander cumming in 1775 but became known as the **U-bend** following the introduction of the U-shaped trap by thomas crapper in 1880. The U-bend could not jam, so, unlike the S-bend, it did not need an overflow. The most common of these traps is referred to as a P-trap. It is the addition of a 90 degree fitting on the outlet side of a U-bend, thereby creating a P-like shape (oriented horizontally). It is also referred to as a sink trap because it is installed under most sinks.

Because of its shape, the trap retains some water after the fixture's use. This water creates an air seal that prevents sewer gas from passing from the drain pipes back into the building. Essentially all plumbing fixtures including sinks, bathubs and shower must be equipped with either an internal or external trap.Toilets almost always have an internal trap.

Because it is a localized low-point in the plumbing, sink traps also tend to capture small and heavy objects (such as jewelry or coins) accidentally dropped down the sink.

Traps also tend to collect hair, sand, food waste and other debris and limit the size of objects that enter the plumbing system, thereby catching oversized objects. For all of these reasons, most traps may be disassembled for cleaning or provide a cleanout feature.

Where a volume of water may be rapidly discharged through the trap, a vertical vented pipe called a **standpipe** may be attached to the trap to prevent the disruption of the seal in other nearby traps.The most common use of standpipes in houses is for clothes washing machines, which rapidly dispense a large volume of wastewater while draining the wash and rinse cycles.



3) CROSS CONNECTION AND BACK SYPHONAGE CONTROL

CROSS CONNECTION

A cross-connection is any temporary or permanent connection between a public water system or consumer's potable (i.e., drinking) water system and a source or system containing non-potable water or other substances. An

example is the piping between a public water system or consumer's potable water system and an auxiliary water system, cooling system or irrigation system.

BACK SYPHONAGE CONTROL.

It is used to protect potable water supplies from contamination or pollution due to back flow.

In water distribution system water is normally maintained at a significant pressure to enable water to flow from the tap, shower, or other fixture. Water pressure may fail or be reduced when a water main bursts, pipes freeze, or there is unexpectedly high demand on the water system (for example, when several fire hydrant are opened). Reduced pressure in the pipe may allow contaminated water from soil from storage, or from other sources to be drawn up into the system.

Backflow means the undesirable reversal of flow of a liquid, gas, or suspended solid into the potable water supply; a **backflow preventer** is designed to keep this from happening. Points at which a potable water system connects with a

non-potable water system are called **cross connections**. Such connections occur naturally in appliances such as clothes washers and dishwashers , but they must be carefully designed and installed to prevent backflow. Another common location for a backflow preventer is the connection of a fire sprinkler system to a water main, to prevent pressurized water from flowing from the fire suppression system into the public water supply.

Back-siphonage occurs when higher pressure fluids, gases, or suspended solids move to an area of lower pressure fluids. For example, when a drinking straw is used to consume a beverage, suction reduces the pressure of fluid inside the straw, causing liquid to move from the cup to inside the straw and then into the drinker's mouth. A significant drop of pressure in a water delivery system creates a similar suction, *pulling* possibly undesirable material into the system. This is an example of an **indirect cross-connection**.