Contents

9 Plumbing

9.1 Description

9.1.1 Service Supply Piping

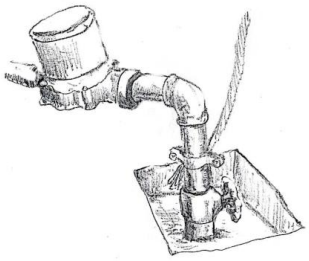
This is the entry point of the main water supply line to the house form a municipal service or a private source such as a well. The following describes typical materials in use.

Lead: Widely used up until the 1940's this material is being replaced due to health concerns. It can be identified by its dull gray colour and 'bulbous' connection. It can also be easily notched due to the soft ductile nature of lead.

Fig. 9.1

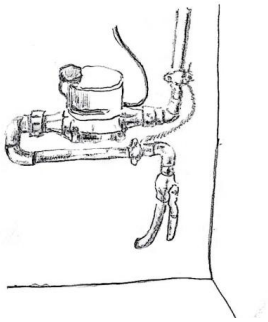
Galvanized steel: Widely used up until the 1950's this material is often replaced. It can be identified by its dull gray colour and 'thicker' look. It is often corroded where it is contact with the ground.

Fig. 9.2



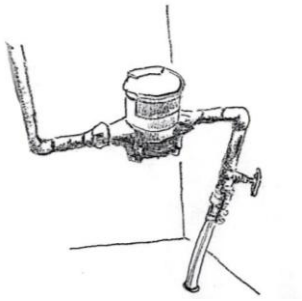
Copper: The most common type of material in use. This material has proven reliable and can be identified by its orange brownish colour. Green surface corrosion is natural.

Fig. 9.3



Plastic: More common in recent years due to improvements in plastic technology. Note that there is no electrical ground since plastic cannot be used for this purpose.

Fig. 9.4



9.1.2 Main Shut off Valve Location

This is typically located at the front of the house in the basement (if any). It is important for the home owner to observe the location of the main shut-off valve in order to turn it off quickly during an emergency i.e. if a leak is suddenly discovered or suspected.
an onsite (private) source such as a well.

The *main shut off valve* controls the access point at which the water to the house is supplied. The supply can be from the municipality (public) service or from

9.1.3 Water Flow (Pressure)

Good water pressure is an important factor for the proper function of a home. Since this can be subjective it will typically be determined based on experience and/or the average for the neighbourhood.

9.1.4 Supply Piping

This refers to the water supply distribution within the house.

Copper: The most common type of material in use are described below and often observed on the labeling on the exterior of the pipe.

Types of Copper:
K : thickest walled and used for heating and underground
L: used in residential and commercial water supply
M: thin walled and for general use like residential distribution
DWV: thinnest wall used for Drain, Waste, Vent piping

Galvanized steel: Widely used up until the 1950's this material is usually replaced. It can be identified by its dull grey colour.

Plastic:
More common in recent years due to improvements in plastic technology.

Types of Plastic:
PEX (cross-linked polyethylene)
Polybutylene
CPVC (chlorinated polyvinyl chloride, used for both hot and cold water)
PVC (polyvinyl chloride, used for cold water only)

9.1.5 Supply Pumps

The house might be equipped with a mechanical pump to distribute the water. Usually this will provide better water pressure or required for larger homes due to the greater distances the water must travel (water pressure will diminish over length traveled).

A Domestic Hot Water tank might also be equipped with a pump in order to provide hot water quicker to the faucets.

9.1.6 Waste Piping

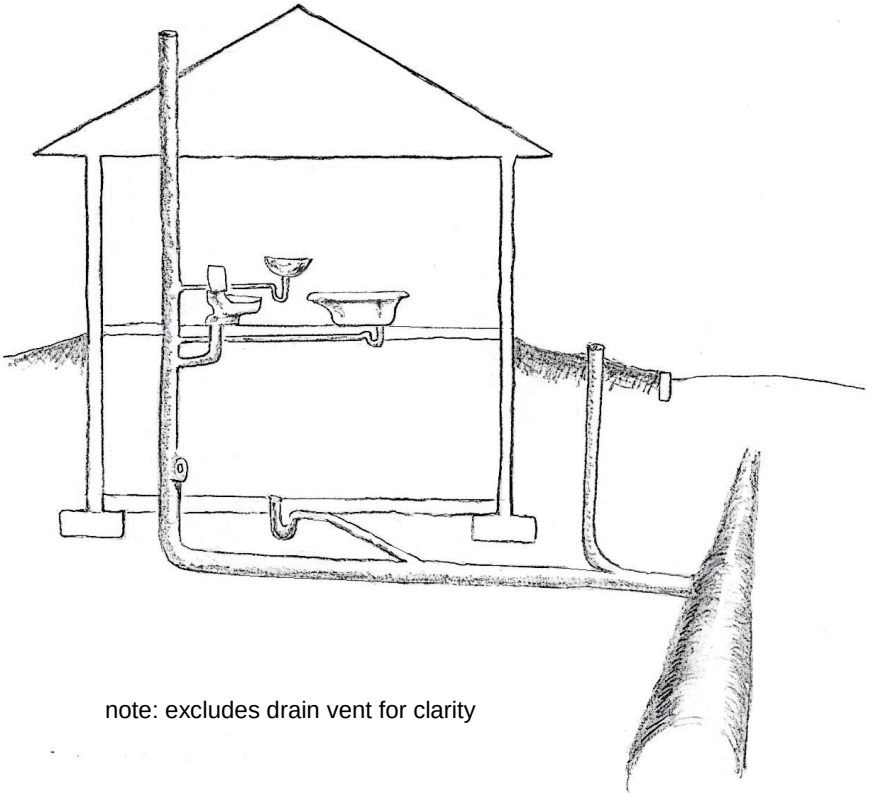
The safe and proper removal of waste is what allows a city to exist. It is perhaps the single most important part of a cities infrastructure. Essentially the waste is removed through pipes that are vertical and/or sloped downward and therefore use gravity.

Over the years the design of waste systems have not changed much except for the materials used. In older homes cast iron, galvanised steel, lead, copper and clay were mostly used.

Since the development of plastics such as ABS (Acrylonitrile Butadiene Styrene) and PVC (Polyvinyl Chloride) these have become predominate for modern homes. They are light weight and generally inexpensive as well as easier to install. Finally these materials are expected to last indefinitely if installed properly.

A basic diagram of a house waste system is illustrated in the figure below.

Fig. 9.5

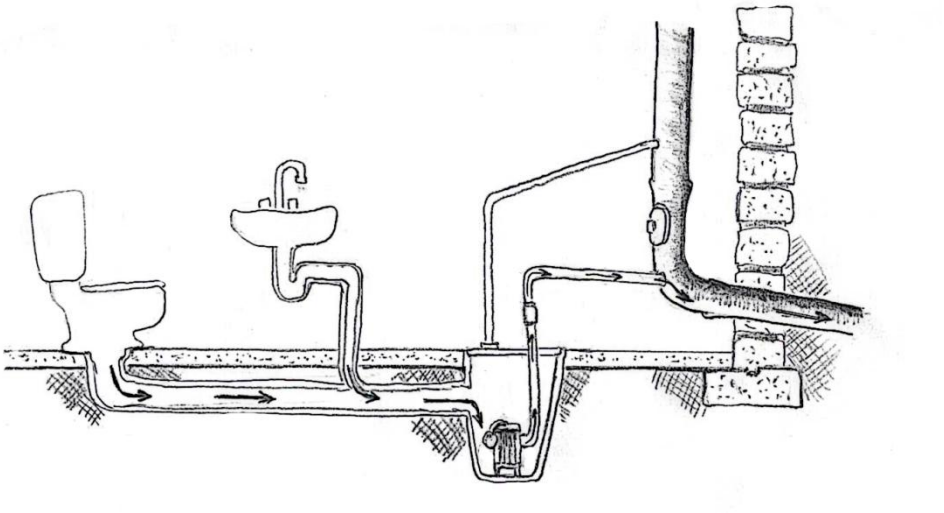


note: excludes drain vent for clarity

9.1.7 Waste Pumps

Solid Waste Pump: When gravity cannot be utilized to remove house waste we must resort to mechanical means. Discharge from a washroom is directed to a sump pit where it is **pumped up** to the main waste drain.

Fig. 9.6



Laundry Tub Pump: This pump is used to remove waste water from a clothes washer that discharges into a laundry tub.

9.1.8 Domestic Water Heater

Domestic hot water refers to the water used for general purposes such as bathing and laundry.

Fuel Types include:

- Oil
- Natural gas
- Electricity
- Propane
- Solar

The *capacity* of the hot water heater typically depends on the size of the house and is measured in gallons and/or liters. Occasionally two or more units are in use especially in larger homes or in a multi unit house.

The temperature of the hot water leaving the tank should not be above $120^{O}F$ to minimize risk of scalding.

The typical life expectancy of a hot water heater is 15 to 20 years.

The following illustrates the various types of hot water heaters.

Conventional: Older type of water heater that uses a natural draft metal exhaust vent. The vent can be connected to an existing masonry chimney that should have a metal liner. Alternatively the metal liner can simply extend vertically through the house and above the roof line.

Fig. 9.7

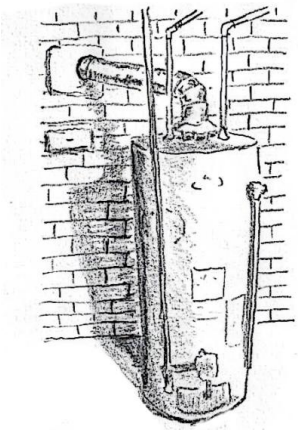
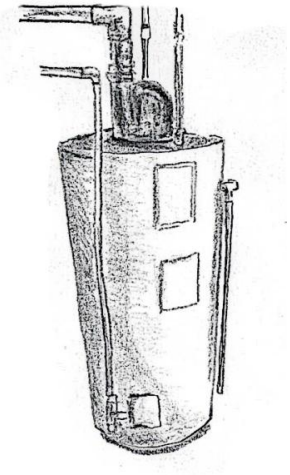


Fig. 9.8

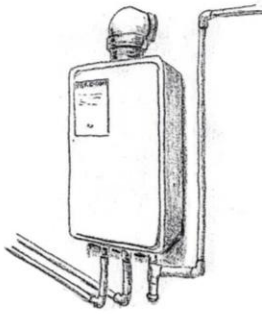


Induced Draft: Modern water heaters can be vented with plastic exhaust pipes directly through an exterior wall. They can be identified by the electrically powered fan located on top of the water tank.

Electric: In some areas electricity is used to heat the water. No exhaust vents are required.

Fig. 9.9

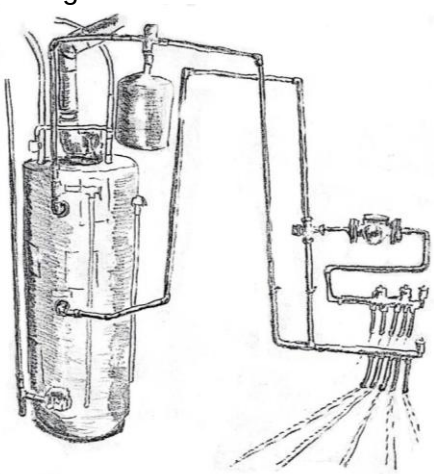
Fig. 9.10



Tank-less (On Demand): This type of water heater provides hot water when required and are usually labeled high efficiency since no energy is expended when not in use.

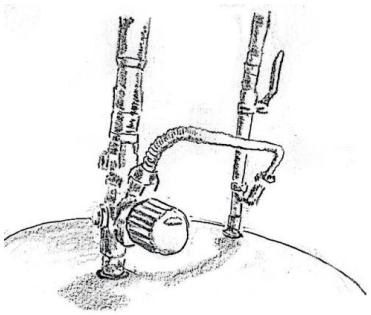
Combination System: As the name implies this type of unit provides hot water for domestic use and hot water for radiant systems that heat the house. They can also provide hot water for a heat exchanger in a forced air system. This system is also described under the Heating section.

Fig. 9.11



Tempering Valve: Recently a special valve has become mandatory for water heaters. This valve provides some cool water to the hot water leaving the tank in order to ensure it is not too hot which may cause scalding. It is typically set at 120^{O}F. It is also called a missing valve.

Fig. 9.12



9.1.9 Water Supply Wells

When municipal systems are not available a house must depend on an independent well system for water. Since this is a system that requires a specialist inspection it is often beyond the scope of a regular inspection.

9.1.10 Septic Systems

When municipal systems are not available a house must depend on an independent system for proper removal and treatment of effluent. Since this is a system that requires a specialist inspection it is often beyond the scope of a regular inspection.

9.2 Limitations

Typically valves are not tested (i.e. opened or closed) since this may affect the proper function of a system or worse may start to leak which is not unusual especially if older. Valves should be tested or inspected by a technician who is properly equipped to make repairs if required. These valves include:

- Isolating Valves
- Relief Valves
- Main Shut-off Valves

Since a Home Inspection is a visual inspection concealed plumbing is cannot be inspected.

Bathtub and sink overflows are not tested. Older bathtub overflows are prone to leaking since the rubber gasket seal may become brittle and crack.

Kitchen and Laundry appliances might be inspected this is not part of a regular Home Inspection. Since appliances will have many setting options the inspection is overall general.

Water treatment equipment is not inspected unless the Inspector is qualified.

Valves that are shut off will limit the inspection. The Inspector is not required nor is it advised that valves be adjusted (unless given permission) since this may cause problems or be a safety concern.

9.3 Recommendations/Observations

9.3.1 Water Supply

Main Shut Off Valve: This valve should be readily accessible and in good working order since it may require use in an emergency situation i.e. a leaking supply pipe has been discovered.

Lead: Widely used up until the 1940's for the watermain. This pipe should be replaced due to potential health concerns . Lead testing of the water is also recommended.

Galvanized steel: Widely used up until the 1950's galvanized steel corrodes over time and prone to leaking. Build up of corrosion inside the pipe will also inhibit proper water flow thus lowering pressure. Replacement is often required for house insurance purposes.

Plastic Piping: There have been problems with some plastic products. One example is Kitec (also under the brand names of Zurn and Aquapex) supply plumbing of which a class action lawsuit resulted in a settlement. The problem is the low quality brass connection that is prone to failure and therefore leaking. Replacement is recommended.

Since many other brands use brass connections these should be monitored.

Isolating Valves: These valves are used to isolate water in a local area or system and required by most building codes. Some uses include:

- exterior faucets
- hot water tank
- sinks
- toilets

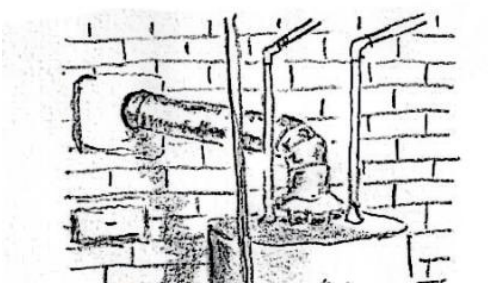
Water Supply Well: When a municipal system is not available the house will require a supply of water from a well.

9.3.2 Water Heater

Exhaust flue: This is what safely removes the combustion products. The flue must be sealed properly to contain the exhaust products and must slope upward.

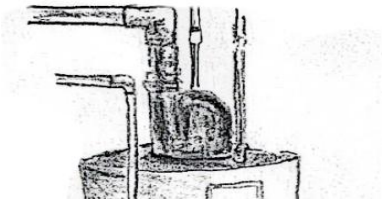
Metal exhaust flues are used for natural draft water heaters. The metal flue can rise through the house and above the roof line. It can also run through an existing masonry chimney.

Fig. 9.13



Plastic exhaust flues are used for wall vented water heaters. All high efficiency water units use plastic vents and have an electric **draft fan** to remove the exhaust products.

Fig. 9.14

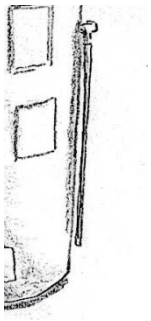


Older water heaters used plastic vents marked DWV (drain waste vent) which are also used for drain plumbing. These were found to be insufficient and soon replaced with plastic exhaust vents rated for combustion products.

Temperature and Pressure Relief Valve: A relief valve is required for any water heater. This device is designed to release the water automatically should the water pressure in the tank be too high. It is also called a safety valve. It is typically designed to relieve at a pressure of 150 psi (pounds per square inch) and temperature at 210^{O}F.

The relief valve requires a **tube** (usually white plastic) that directs the discharged water to the floor in a safe manner.

Fig. 9.15



Circulating pump: Sometimes a water heater is equipped with a circulating pump for better pressure and quicker distribution of hot water through the house.

Combustion air: Since fire requires air it is important to provide combustion air to the room where the water heater is located. This can be a grill located on the inside wall of the room or a pipe located on the exterior wall.

Electric Water Heater: These units do not require exhaust flues since they use electric coils to heat the water.

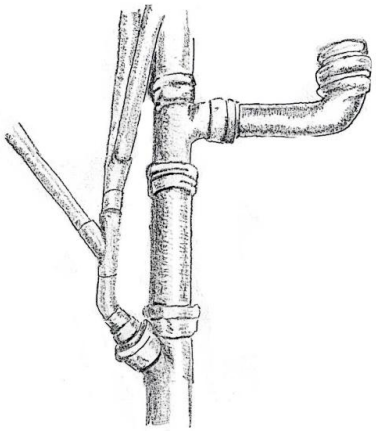
9.3.3 Waste Piping

Stack: Older homes will usually have a cast iron stack. Over time this material will corrode, crack and leak. Since the stack is mostly hidden behind walls it is difficult to access its condition. Generally replacement should be anticipated and sometimes required for house insurance purposes.

Plastic and copper stacks last indefinitely and replacement is usually not required unless modifications required during renovations.

Piping: Older piping such as cast iron, galvanized steel and lead is usually replaced during renovations or if defective.

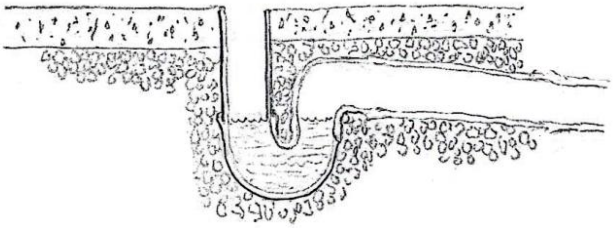
Fig. 9.16

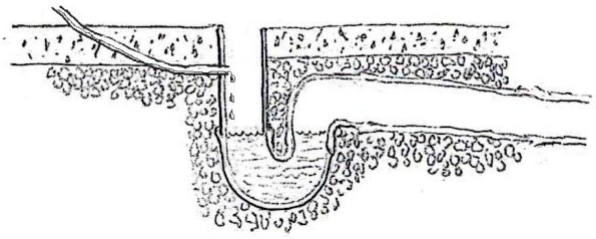


Floor drain/trap: Every basement requires a floor drain in case of leaking from an appliance or leaking from the exterior. It should be located in the lowest area of the basement floor.

The drain requires a trap which holds some water and prevents sewer odours from entering the house through the drain.

Fig. 9.17





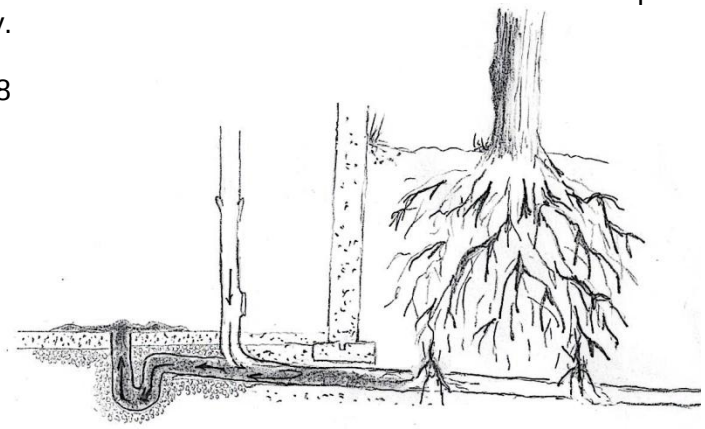
In newer homes a small pipe is installed to add water to the trap and prevent evaporation. This is called a primer. The primer is connected to a faucet (usually from the laundry tub) so that some water is directed to the trap every time the faucet is turned on.

The best locations for basement floor drains are in the utility room (where the water heater and/or boiler are located) and/or the laundry room where the clothes washer is located. If these appliances leak a nearby drain will remove the water and minimize damage.

Laundry rooms located in the upper levels of a house should have a floor drain.

Clay floor drains (basement floor) are older and often require replacement since the material will deteriorate over time (50+ years). Clay is also more prone to damage caused by tree roots. A clay floor drain may also indicate the main waste drain to the municipal or private waste service is older. This usually requires further evaluation with a video scan to determine its condition especially if large trees are present in or around the property.

Fig. 9.18



Backflow Valve: In newer homes the main waste drain is equipped with a back flow valve (also called a check valve) to stop back up sewage. In older homes they are installed during drain repairs or if experiencing sewage back-up.

Fig. 9.19

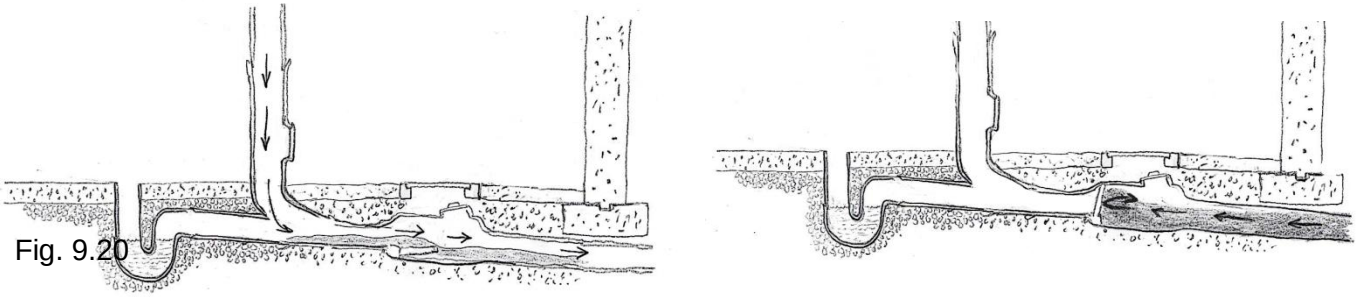
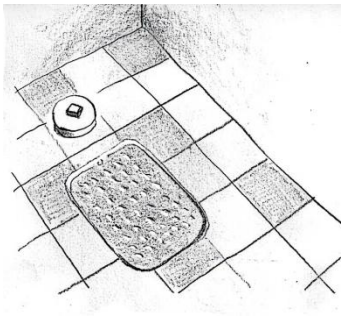
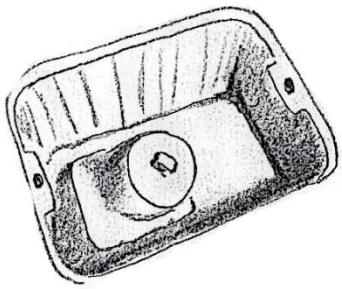


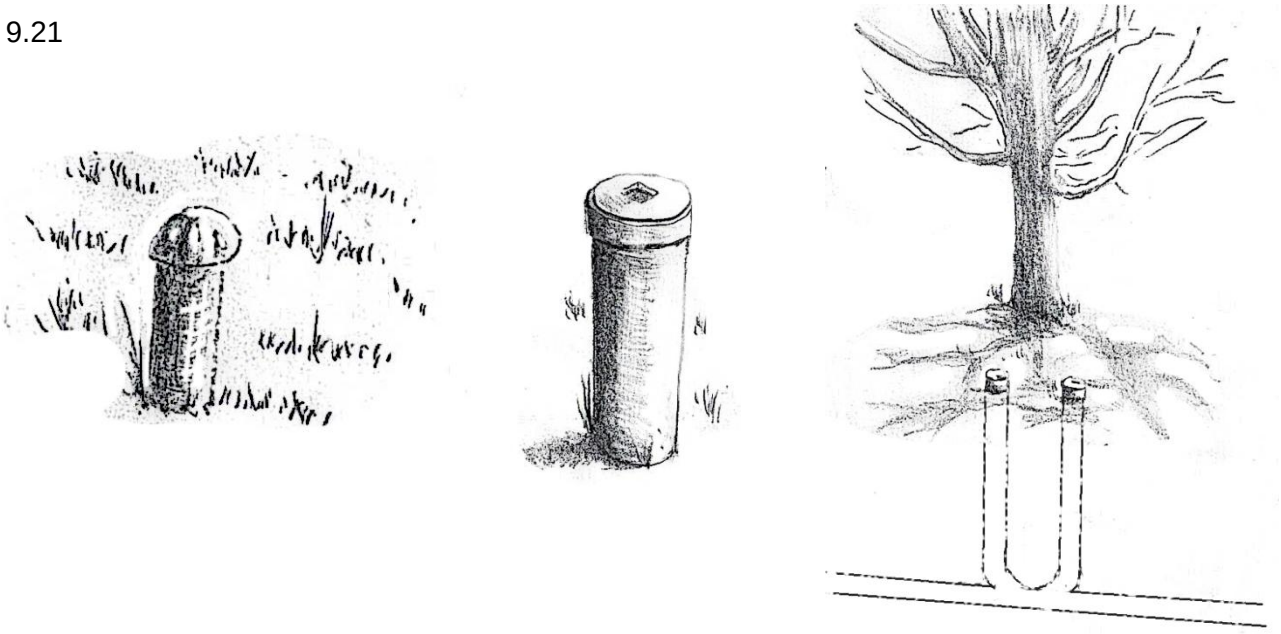
Fig. 9.20





Drain Clean-Out: On the exterior of the front lawn a pipe might be visible protruding about 1 foot from the ground. This is the access pipe to the waste drain system. It is installed for inspection and servicing. Originally the pipe also acted as breather to vent sewer odours which can be identified by its cast metal 'mushroom' shape. This is now been replaced by a white plastic pipe that is capped. Sometimes there are two clean-out pipes.

Fig. 9.21



Drain Venting: When waste water is discharged though a drain it displaces air. The air which is under atmospheric pressure will somewhat resist or inhibit the proper flow of the waste water. We therefore attach a vent pipe from the drain to the main vent stack which allows the air to be displaced easily. This equalizes the pressure in the drain thus allowing for proper flow.

Fig. 9.22

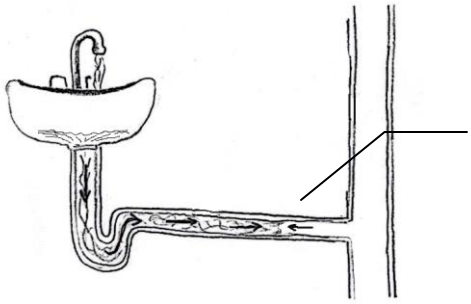


Fig. 9.23

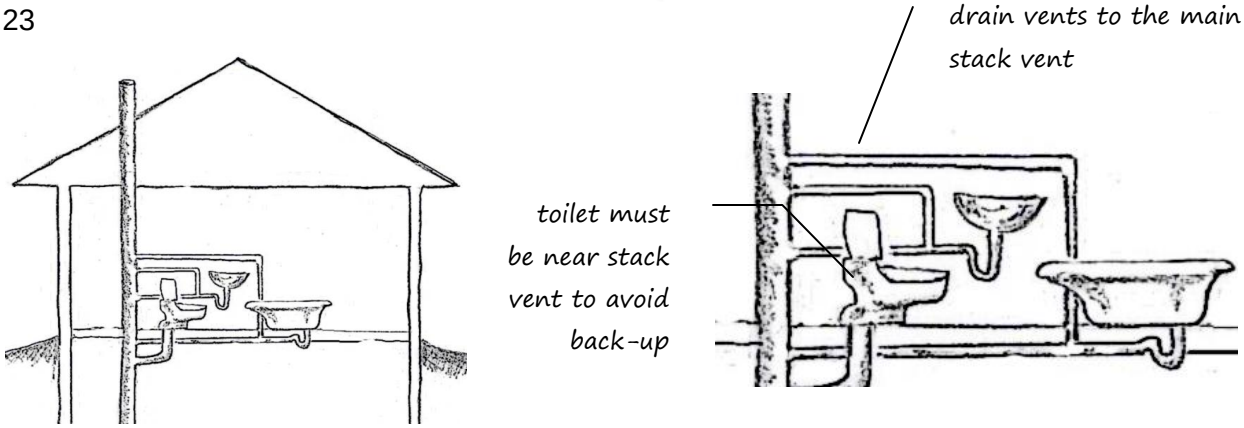
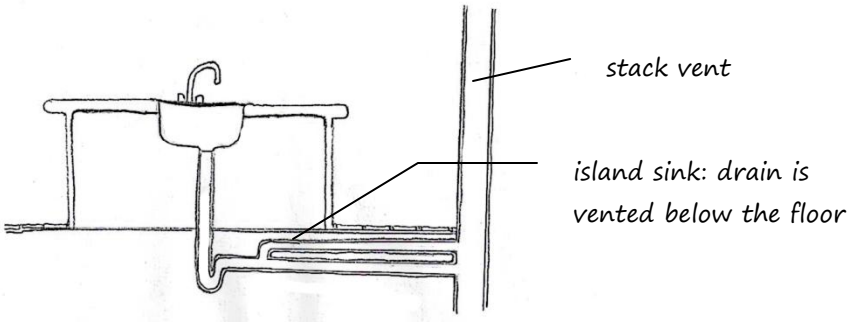


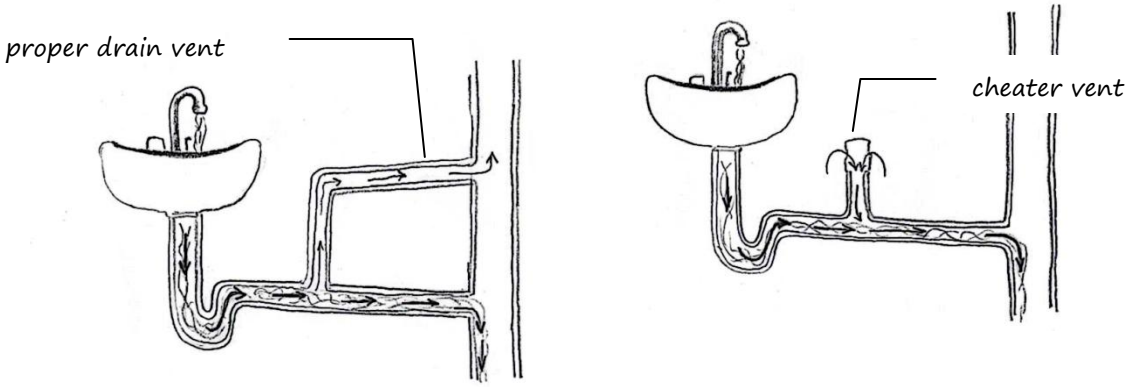
Fig. 9.23 continued



Auto-vent: When a vent pipe cannot be easily attached to the vent stack we employ an auto vent. This device is typically installed as a cheap alternative to properly venting a drain pipe. This is commonly known as a **'cheater vent'** and often not allowed due to municipal plumbing codes.

When in use an auto-vent should be located in an open space and not concealed inside of a wall. Auto vents can fail and/or discharge sewer odours in the living spaces when not working properly.

Fig. 9.24



Solid Waste Pump: Failure of this pump can result in an unhealthy situation and/or environment. Annual maintenance of the pump is recommended. The sump pit must have a properly sealed lid and requires a vent pipe that is connected to the plumbing vent stack.

Laundry Tub Pump: Annual maintenance of the pump is recommended.

9.3.4 Washrooms

The following briefly describes common plumbing problems.

Faucets: The most common defects include

- leaking
- loose
- hot-cold reverse
- missing isolation valves

Bathtub/Enclosure: The most common defects include

- leaking
- loose and/or damaged tile
- cracked/deteriorated grout/caulking
- rusting/chipped tub
- slow drain

Sink: The most common defects include

- leaking
- cracked
- rusting
- missing overflow
- drain missing trap
- slow drain

Toilet: The most common defects include

- leaking
- cracked
- missing isolating valve
- slow flush

Shower Stall: The most common defects include

- leaking
- loose and/or damaged tile
- cracked/deteriorated grout/caulking
- slow drain
- faucet diverter defective

Whirlpool bath: The most common defects include

- leaking
- pump missing GFCI (ground fault circuit interrupter)
- timer switch too close to tub

Bidet: The most common defects include

- leaking
- cracked
- slow drain
- low water supply pressure
- missing isolation valve

9.3.5 Kitchens

The following briefly describes common plumbing problems.

Sink/Faucet: The most common defects include

- leaking
- rusting
- drain missing trap
- slow drain