

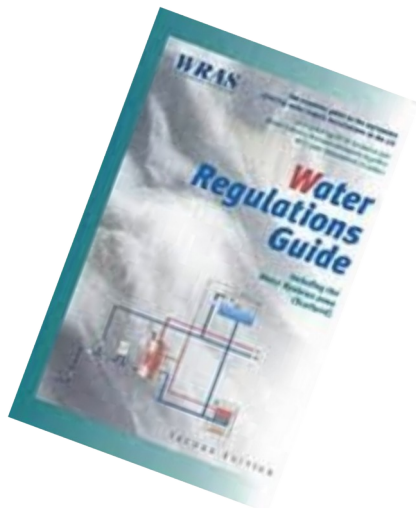
Unit 205: Cold water systems

Outcome 1

Requirements for water distribution to domestic dwellings

Cold water distribution

- The Water Regulations (1999)
- The Water Regulation Guide (WRAS)
- WRAS – Water Regulation Advisory Scheme
- BS6700 – Design, installation, testing and
- Maintenance
- Manufacturers' instructions



Cold water distribution

Directory of fittings (WRAS approved)

WRAS **approved** fittings comply with the Water Regulations are a **legal requirement** in the UK.

They are also quality products, **corrosion resistant** within their environment, and are made of materials that do not cause contamination.



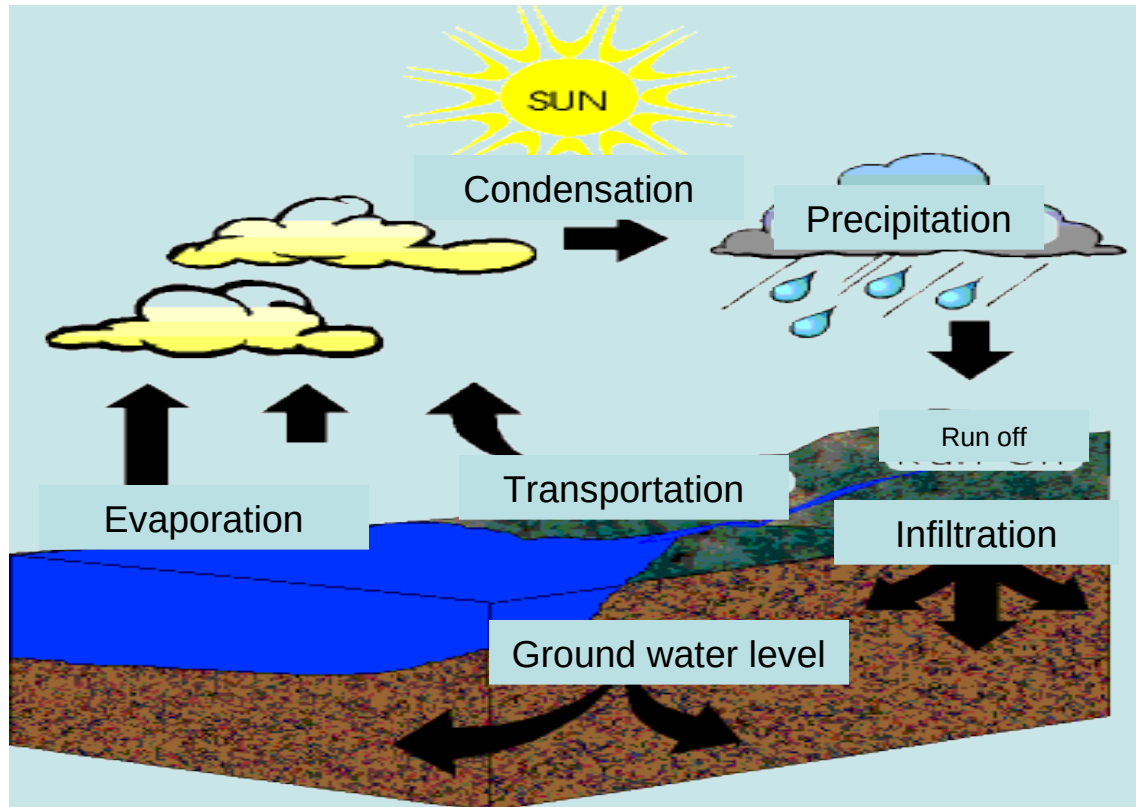
Cold water distribution

The Water Regulations replaced the individual Byelaws to give a national law for England and Wales:

- Waste
- Undue consumption
- Misuse
- Contamination
- Erroneous measurement of water

Cold water distribution

Rainwater cycle

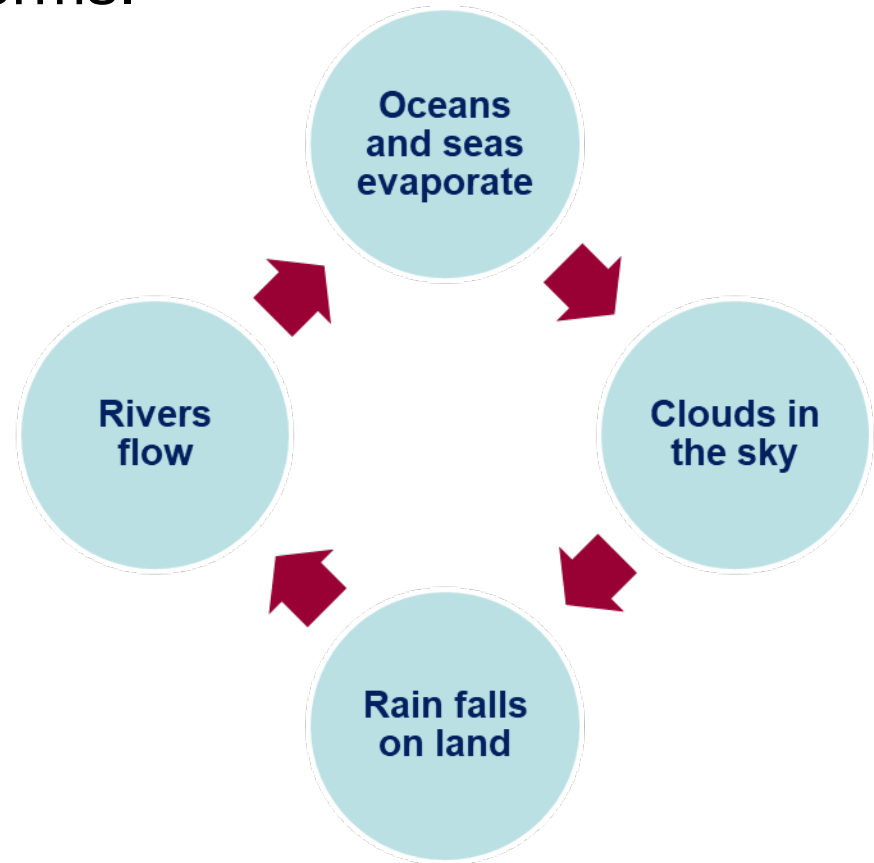


Cold water distribution

Rainwater cycle in simple terms.

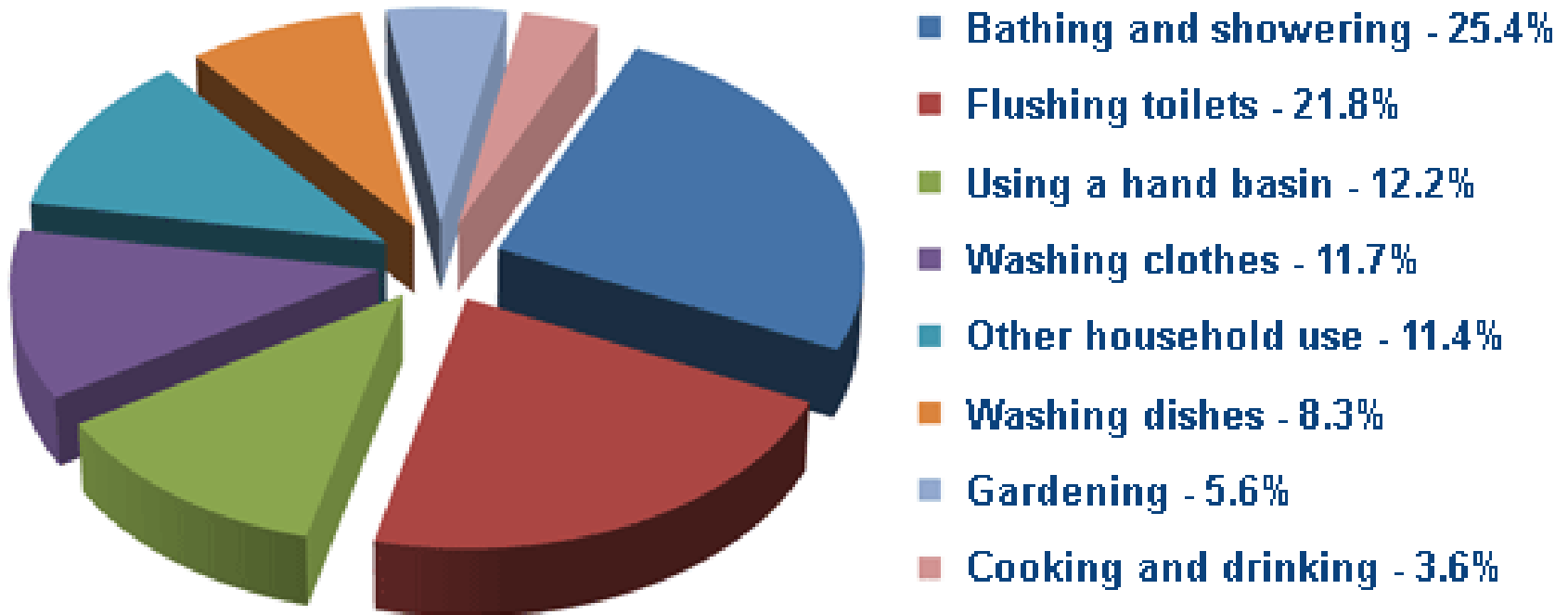
Evaporation: water molecules move apart.

Precipitation: water molecules condense and fall as rain.



Cold water distribution

Plumbers have a responsibility to **design**, **install**, **test** and **maintain** cold water systems correctly. We also need to advise customers on good usage.



Cold water distribution

1. Surface water

Lakes



Reservoirs



Rivers



Streams



Cold water distribution

Lakes and reservoirs

After a report in 1963 on the expanding population of North East Essex, Ardleigh Reservoir was developed.

Raw water is taken in from the River Colne, via a pumping station. Most of the pumping takes place in winter and constant monitoring ensures that levels do not harm the river environment.

Cold water distribution

At full rate, the intake can transfer 36 million litres of water per day. The normal rate is around 18 million litres.

At the intake station, the water is screened to prevent fish and other unwanted matter getting into the system. It is then pumped 5km to the reservoir.

Prior to entering the reservoir, ferric sulphate is added to reduce the phosphate levels (high phosphate levels encourage the growth of algae).

Cold water distribution

The reservoir itself covers some 57 hectares and, when full, contains 2,200 million litres.

A draw-off tower is sited at the deepest point and draws water from three different levels to ensure the most suitable water is selected.

Within the reservoir there are air pumps which turn the water over. This stops layers of different quality and temperature forming.

Cold water distribution

The reservoir itself is the initial treatment of raw water, allowing larger particles to settle. The draw off point is a 1,100mm steel main, in a reinforced concrete tunnel.

Once in the treatment plant, the sludge is drawn off and the **clarified** water is **disinfected** with **ozone** gas before filtration.

The filtration stage consists of granular activated carbon and sand filters. These filters trap any fine suspended matter and organic matter, including pesticides.

Cold water distribution

Every so often these filters need cleaning, which is carried out by an air and water flush, with the debris taken to a sludge lagoon.

The water then travels to a stage where the final pH adjustment takes place and chlorine is added. The water is then stored for long enough for the chlorine to kill off any remaining bacteria (sometimes UV treated).

Cold water distribution

Sulphur dioxide is added to reduce the chlorine levels so the water can then be distributed to the customer.

A 9 million litre tank stores the water, which has two variable speed pumps discharging through 600mm diameter mains.

Ardleigh Reservoir services about 150,000 homes. Samples are taken regularly throughout the day and have to comply with 50 standards.

Cold water distribution

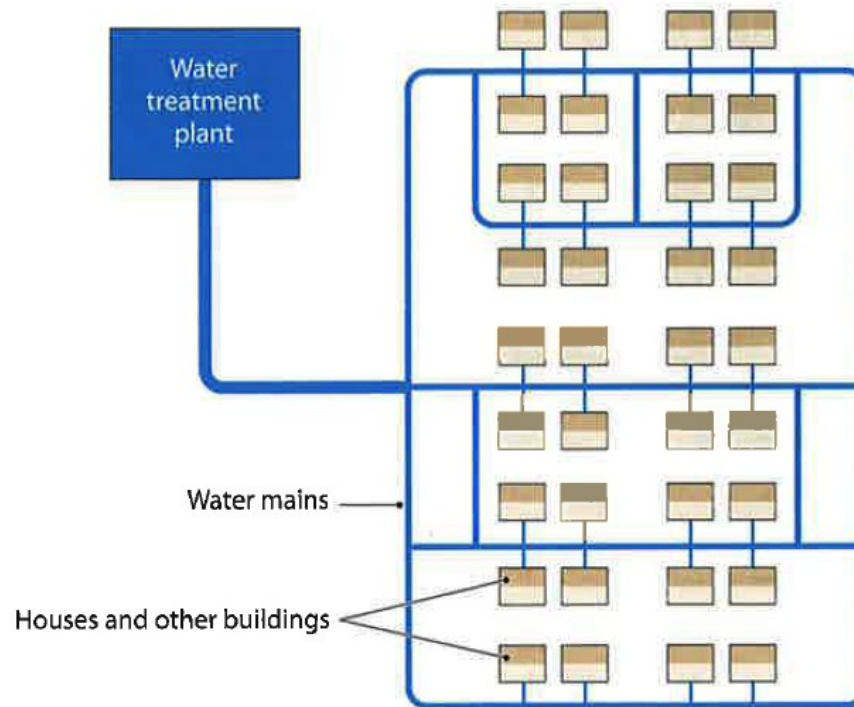
The 600mm main is then divided into smaller pipes until eventually into a 100, 63, 50, 32 or 25mm pipe serving a particular area.

The pipes used to be made of cast iron but have recently been replaced with MDPE pipe (medium density polyethylene).



Cold water distribution

A typical mains distribution system



Cold water distribution

This now means a road could be served by a 25mm pipe with an individual 20mm MDPE pipe serving each house. MDPE pipe is generally fusion welded with some compression fittings.

With cast iron and MDPE pipes, a screw-down ferrule connector or service union is installed, allowing the valve to be opened or closed with a ferrule key.



Cold water distribution



Cold water distribution



Cold water distribution

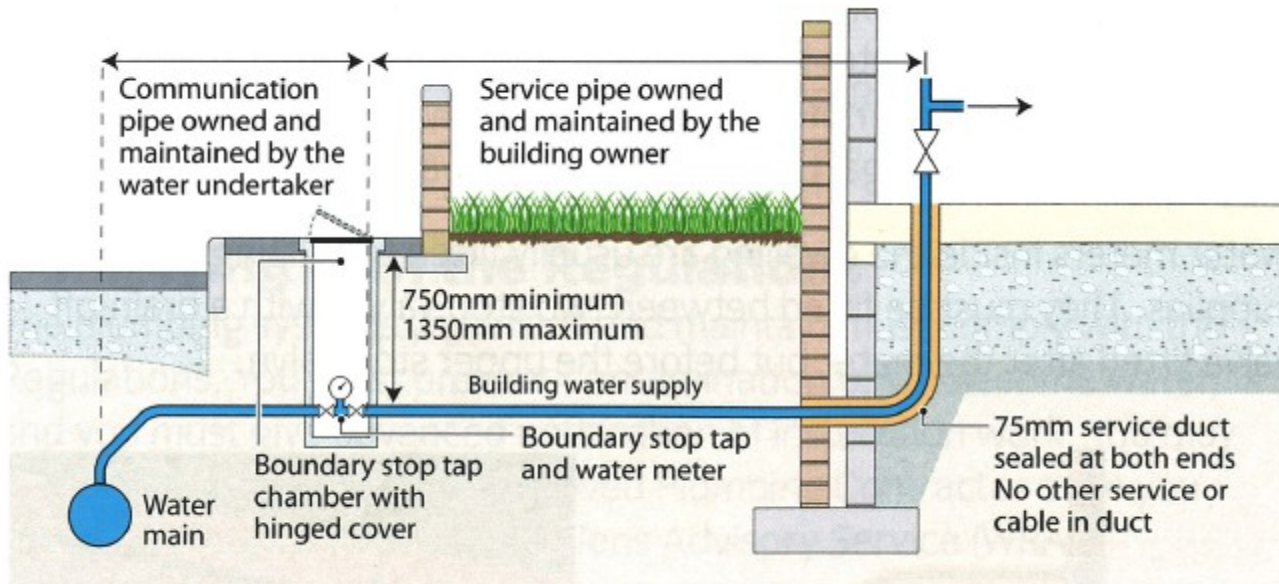


Cold water distribution

Supply pipework to domestic buildings

Communication pipe: owned and maintained by water undertaker.

Service pipe: owned and maintained by homeowner.



Cold water distribution

2. Underground sources

Wells, boreholes and springs

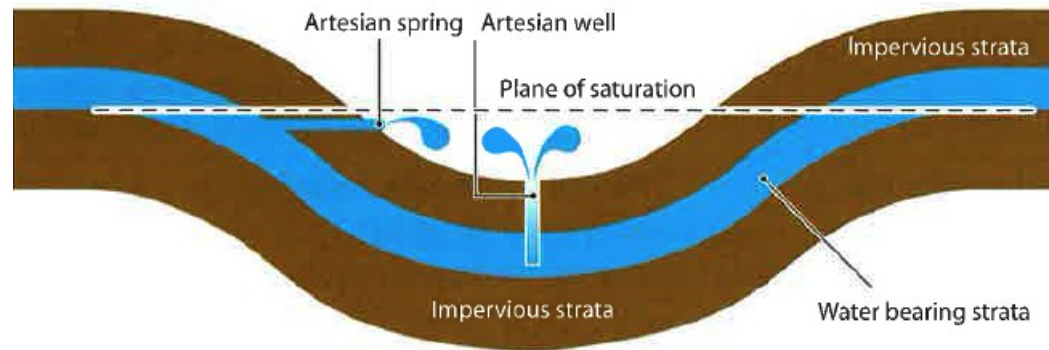
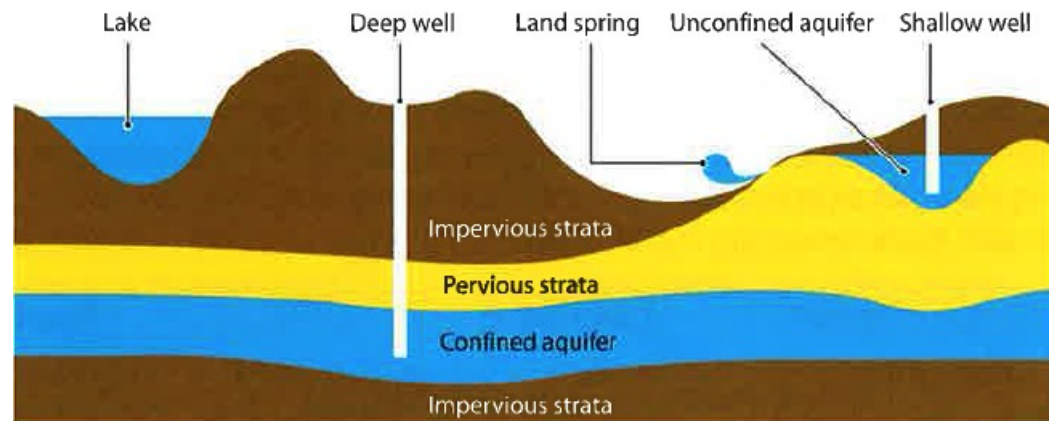


Cold water distribution

2. Underground sources

These are quite often **private supplies** and not provided by a water undertaker, and are not covered by the Water Regulations.

Wells: deep, shallow and Artesian wells.



Cold water distribution

2. Underground sources

Boreholes:

These are modern equivalents to wells, but are smaller, less intrusive and easier to maintain. A small, drilled hole is made in the ground and water is pumped to the surface.

Springs:

Naturally occurring sources of water that force water to the surface and sometimes cause the start of a stream.

Cold water distribution

Types of water

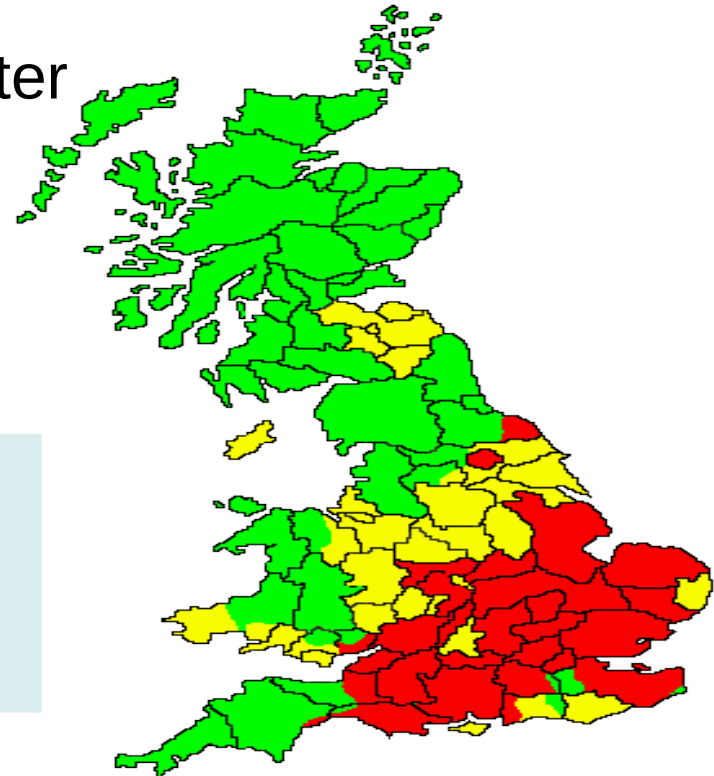
The type of ground that water falls onto and filters through, effects the type of water that is available to consumers. The two main types of water are **hard** and **soft**.

- 70% of the earth's surface is water
- 97% of that is salt water
- 2% is ice
- 1% is fresh

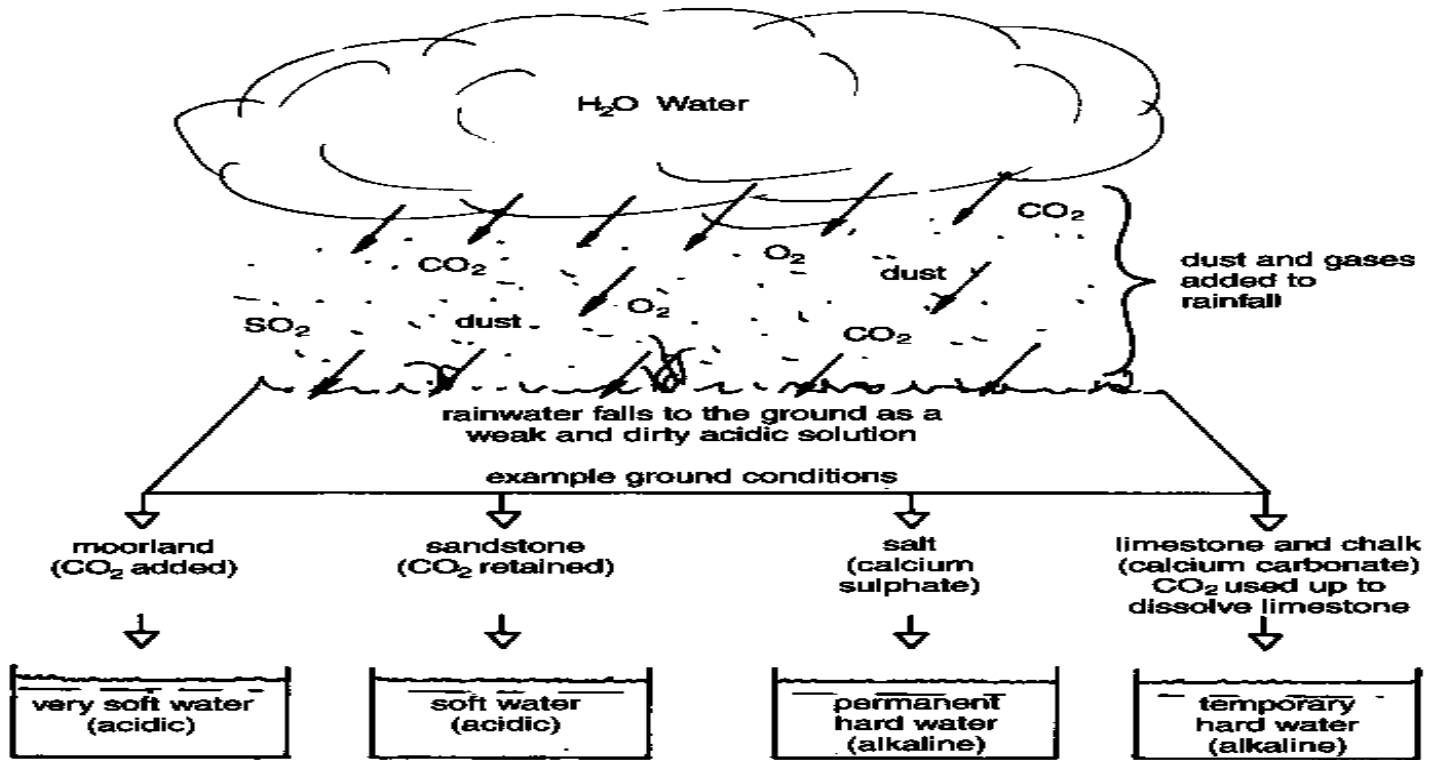
Green = soft water

Yellow = semi hard water

Red = hard water



Cold water distribution



The ability of water to absorb minerals is called **plumbosolvency**.

Cold water distribution

Permanent hard water

This contains **calcium sulphates** (or limestone). The hardness of this water cannot be **removed by boiling**.

Rain has fallen to the ground and filtered through **limestone** **and** dissolved the sulphates of calcium.

This type of hardness does not cause much scaling in **boilers** **and** **kettles**.

Temporary hard water

This contains **calcium carbonates**. The hardness is removed when **heated to 65°C**. When heated, CO_2 is removed, as the calcium carbonate form **scale** (**blockages and efficiency**).

Cold water distribution

Soft water

This is water that is free from **calcium carbonates** and **sulphates**. It is easy to get a lather with soap. It is either naturally soft, having fallen on peaty ground (being mildly acidic), or **can be produced by a water softener**.

The acidic nature of this water also causes problems to plumbing systems through **electrolytic corrosion**.

Cold water distribution

Normally accepted classifications for water are as follows:

	Degrees Clark	PPM CaCO_3
Soft	0-3.5	0 - 50
Moderately soft	3.5-7.0	50 -100
Slightly hard	7.0-10.5	100 - 150
Moderately hard	10.5-14.0	150 -200
Hard	14.0-21.0	200- 300
Very hard	over-21.0	over 300

It is generally accepted that any water with more than 200ppm needs some treatment.

Use a test kit to gauge the water hardness in your area.

Cold water distribution

The pH scale											
1	2	3	4	5	6	7	8	9	10	11	12
Acidic					Neutral		Alkaline				

The **pH scale indicates** whether the water is acidic or alkaline (potential of hydrogen).

If the pH value is below 7, the water will be **acidic** and aggressive towards pipework.

In the worst cases, people drawing directly from a well could be changing their DHW cylinder every eight months unless the pH can be corrected.

Cold water distribution

Plumbers must be aware of the **type and quality of water supplied to any property**, as this could have an effect on the appliances within the property.

Under the Water Regulations, plumbers also have a responsibility to **maintain the quality of water** supplied by the water undertaker **avoiding contamination**.