

# Part 2

## Hot and Cold Water Supplies

## Classification of Water

Water is a compound of hydrogen and oxygen. When we burn natural gas (a hydrocarbon,  $\text{CH}_4$ ) dihydrogen monoxide ( $\text{H}_2\text{O}$ , i.e. water) and carbon dioxide ( $\text{CO}_2$ ) are obtained as combustion products.

Pure water is a transparent, tasteless liquid which can be found in three physical states: solid (ice), liquid (water) or gas (steam or vapour). At atmospheric pressure, between 0 to  $100^\circ\text{C}$ , water is a liquid. At  $0^\circ\text{C}$ , water changes to ice with an immediate expansion in volume of 10%. At  $100^\circ\text{C}$ , it changes to steam, its volume expanding some 1600 times.

To convert water back to its constituent elements, an electric current needs to be passed through the liquid.

Rain water is usually contaminated with gases or chemicals which it absorbed as it fell. When rainwater reaches the ground it dissolves any soluble salts. Depending on which salts the water contains it may be classified as hard or soft.

### Soft water

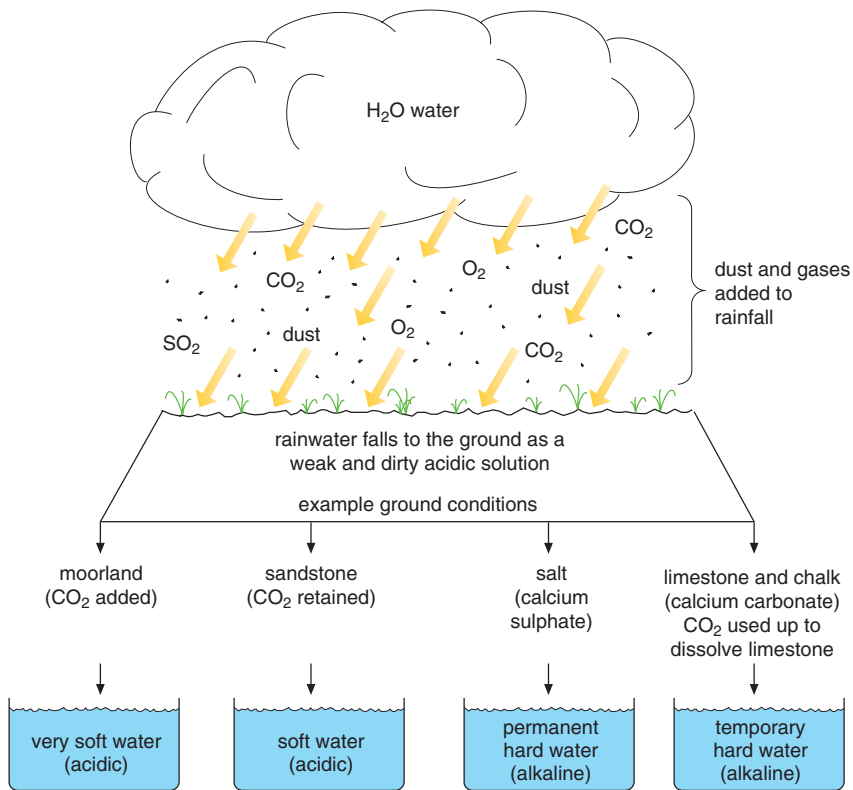
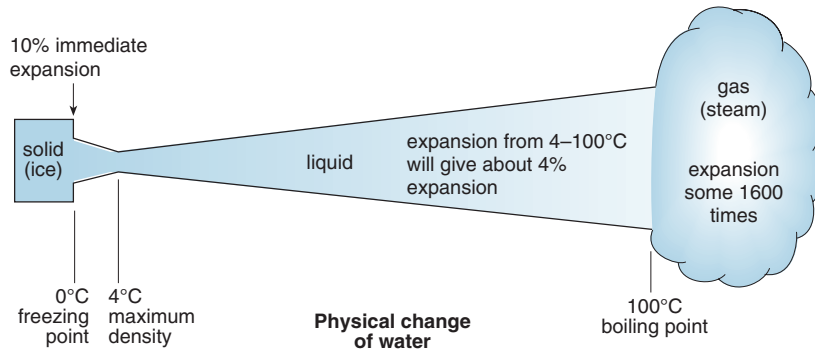
This is water which is free from dissolved calcium salts. Naturally occurring soft water is slightly acidic due to absorbed gases such as  $\text{CO}_2$ . Soft water tends to be more pleasant for washing in but has the major disadvantage of corroding pipe-work, lead pipes in particular.

### Hard water

This is water which has fallen on, and filtered through chalk or limestone from which it dissolves small amounts of calcium and magnesium salts. The water may be either permanently or temporarily hard.

**Permanent hardness** This is the result of water containing calcium or magnesium sulphates. Boiling has no effect on permanent hardness.

**Temporary hardness** This is the result of the water containing calcium or magnesium hydrogen carbonates. The  $\text{CO}_2$  dissolved in rainwater can attack limestone or chalk and convert the calcium carbonate and magnesium carbonate in the rock to soluble hydrogen carbonates. This temporary hardness can be removed by boiling the water; as a result  $\text{CO}_2$  escapes into the air and calcium carbonate is precipitated as scale.



Section of pipe with evidence of limescale

**Classification of water**