

## HARDNESS

Water samples with a high concentration of minerals dissolved in them are known as HARD. While water samples with low concentrations of these minerals dissolved in them are SOFT.

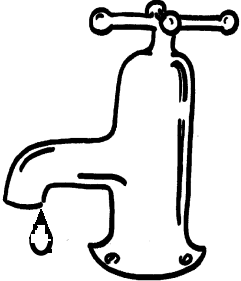
Everyday indicators of hard water include:

1. 'Fur' or 'calc' on kettles (caused by the precipitation of Calcium Carbonate on boiling) and in water pipes.
2. Scum forming when an attempt is made to lather soap.

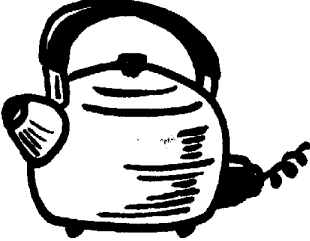
In soft water areas kettles and pipes remain clean and soap lathers easily.

Water which drains through chalk tends to be hard. Water draining off granite and peat moorlands tends to be soft.

Diagram 5: Types of Hardness



General Hardness (GH) or Total Hardness is caused by the sum total of all ions present.



Boiling removes:

- Carbonate Hardness (KH) which is largely calcium carbonate also known as
- Temporary Hardness (the “fur” or “calc” found in kettles)

Permanent Hardness- remains in solution

$$\text{GH} = \text{KH} + \text{Permanent Hardness}$$

## Measurement of Hardness

### Test Kits

A wide range of chemicals cause hardness. Generally, for simplicity all of these chemicals are measured and the results most commonl expressed in:

- mg/l - ppm Calcium Carbonate
- °dH - a German measurement. Each °dH is equivalent to 17.9mg/l Calcium carbonate

Diagram can be used to convert from one scale to the other.

Other less commonly used measurements are:

- °hardness equivalent to 1mg/l Ca CO<sub>3</sub>
- °Clark equivalent to 14.3mg/l Ca CO<sub>3</sub>
- °FH equivalent to 20mg/l Ca CO<sub>3</sub>

### Conductivity Meter

The more salts dissolved the more readily water will conduct electricity i.e. become more conductive.

**Table 3: Water hardness descriptions**

Mg/litre CaCO <sub>3</sub>	Considered as
0-50	Soft
50-100	Moderately soft
100-200	Slightly hard
200-300	Moderately hard
300-450	Hard
Over 450	Very hard