

A CONSUMERS'  
GUIDE TO  
WATER  
SOFTENING

a



proven  
answer  
to hard  
water



BRITISH WATER

The mains water supplied by your water company is required to meet stringent quality regulations to ensure that it is safe for human use. In areas of the country with a hard water supply, consumers may wish to consider the advantages of softening their water.

This Guide has been produced to help answer your questions about water softening. Related Fact Sheets are available on the British Water website.

Water softeners have been available in this country for nearly one hundred years. Although widely used by industry throughout this period, domestic water softeners were for many years considered a luxury. They are now very affordable and their use will provide real savings and benefits.

The feeling of washing and bathing in soft, silky, scum-free water is indeed luxurious, and softened water protects the bathroom and sanitaryware from ugly stains and scale associated with hard water. Domestic water softeners play an important role in today's modern home, along with other traditional 'white goods'.

There is a wide range of domestic water softening equipment from which to choose.

## Contents

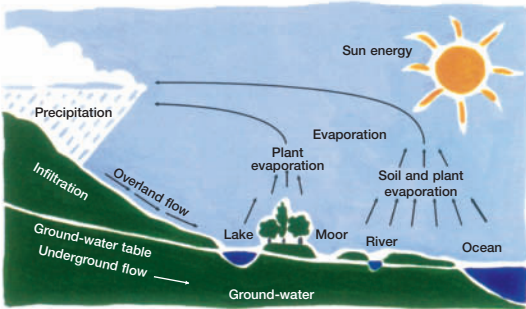
- 1 ***Water hardness***
- 3 ***What are the benefits of softened water?***
- 4 ***How is hard water softened in the home?***
- 5 ***Softened water around the home***
- 7 ***Installation of water softeners***
- 8 ***Softened water and health***

# WATER HARDNESS

## Q. Why do you get hardwater?

**A** Hard water is water that contains dissolved chalk, lime and other minerals. Rainwater is naturally soft, but as it percolates through chalk and limestone it dissolves and collects these minerals. Rainwater which falls on hard rock remains naturally soft. The hardness of the supply of mains water to your home is dependent on where you live and the source (river or ground water) of your mains water supply. (See also Fact Sheet 10)

## The water cycle



Source: International Water Association

1

## Q. What are the effects of hard water?

**A** Scale, scum and tidemarks around baths and basins. The minerals contained in the hard water settle out as an unsightly deposit of hardness scale whenever the water is heated, or when cold standing water evaporates. Examples of this are:

- Unsightly white marks, stains and scale on sinks, baths, toilet bowls and around the base of taps; blocked shower heads
- Clogging of pipework and premature failure of water heaters and white goods



Water hardness also makes it difficult to get a good lather, so more soap is required for washing. Even after washing, clothes can be left grey and dingy, and dishes and glasses dull or smeared.

## Q How can I find out if my water is hard?

**A** Generally speaking, hard water is supplied to 60% of homes in the UK: especially in central, eastern and southern areas of England. Some English cities are supplied with naturally soft water from Wales and the Lake District. Water quality information, including hardness levels, for individual supplies is available from your water supply company. The map and notes overleaf give indications of water hardness in the different regions of the UK.

# TOTAL HARDNESS OF WATER SUPPLIES

In Scotland and Northern Ireland, various levels of hardness occur.

**Scotland:** Supplies range from soft to various levels of hardness, with the majority being in the soft to moderately soft category.

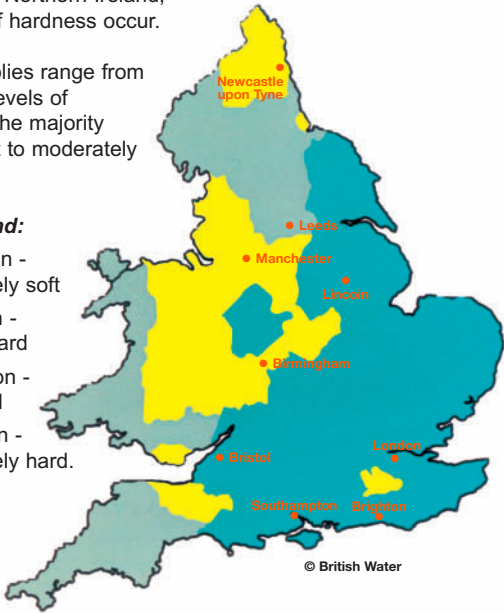
**Northern Ireland:**

Northern Division - soft to moderately soft

Eastern Division - soft to slightly hard

Southern Division - soft to very hard

Western Division - soft to moderately hard.



2



Soft to moderately soft:  
0-100mg/l as calcium carbonate equivalent



Slightly hard to moderately hard:  
100-200mg/l as calcium carbonate equivalent



Hard to very hard:  
above 200mg/l as calcium carbonate equivalent

Hardness can also be measured in parts per million (ppm).

1 mg/l = 1 ppm.

Methods of measuring hardness and some equivalent values

mg/l or ppm as calcium carbonate equivalent	mg/l of calcium	Degrees Clark or English	Degrees German	Degrees French	Grains per US Gallon	mg/l of sodium added during softening **
100	40	7	5.6	10	5.8	46
200	80	14	11.2	20	11.6	92
300	120	21	16.8	30	17.4	138
400	160	28	22.4	40	23.2	194
435	174	30.5	24.4	43.5	25.2	200*

\* Maximum sodium concentration in Water Regulations

\*\* For total sodium concentration add the amount of sodium present in the mains water supply - information that can be obtained from your water supply company.

# WHAT ARE THE BENEFITS OF SOFTENED WATER?

Featured here are just some of the benefits of softened water:

- 1 Softened water provides real cost savings in service, maintenance and replacement of water heaters, dishwashers, washing machines and showers and also extends their life
- 2 Softened water improves the efficiency of hot water and heating systems - **just 1.6mm (1/16") of scale build-up in heating systems will cause a 12% loss in heating efficiency**
- 3 Softened water can **save some 50% of washing powder and toilet soap consumption and similarly reduce the amount of shampoos, conditioners and cleaning products used**
- 4 Softened water can help certain dry skin conditions such as eczema
- 5 Softened water saves time - independent studies have confirmed that considerable cleaning time is saved with softened water
- 6 Softened water can, in time, remove existing scale deposits in hot water and heating systems as well as scale around taps and stains in baths and basins
- 7 Softened water has a clean silky feeling. It makes bathtime a luxury without the need for bath oils or bubble bath liquids
- 8 Softened water makes hair soft and easy to manage
- 9 Softened water rinses completely away without leaving scum, even after shaving
- 10 Softened water makes laundry brighter and glasses and dishes sparkle and shine
- 11 Softened water makes washing the car easier and will reduce streaking and spotting. Water softeners are installed in nearly all commercial laundries, kitchens and car washes in hard water areas



3

**Each year, in a hard water area (300mg/l as calcium carbonate equivalent) the average family home will use water containing 70kg (154lbs) of scale. Unchecked, it will cause damage and expense. It is estimated that an ion-exchange water softener could save in the region of £200 for this average 4-person household.**

# HOW IS HARD WATER SOFTENED IN THE HOME?

## Q *How is hard water softened?*

A To fully soften water the minerals (calcium and magnesium) which cause hardness must be removed. These minerals are removed by ion-exchange. Domestic ion-exchange water softeners use this process and are the only products which are specifically designed to completely remove all hardness from your mains water supply. The softened water will also gradually remove existing scale from pipework, bathroom fittings and heating elements.

## Q *How do water softeners work?*

A Hard water is passed through a cylinder containing millions of tiny beads of ion-exchange resin which attract and remove the hardness minerals from the water. The resin is automatically cleaned or “regenerated” by rinsing a small amount of brine (common salt - sodium chloride - dissolved in water) through the cylinder. The sodium from the salt is left in the resin as it is exchanged for the hardness minerals trapped by the resin. The used brine, containing the accumulated hardness, does not enter the household water system - it is automatically flushed away into a drain. Refreshed by the regeneration, the resin is again ready to remove hardness minerals, ie to soften the water. This process is known as “ion-exchange”.

4

## Q *Do I have to clean or regenerate the resin myself?*

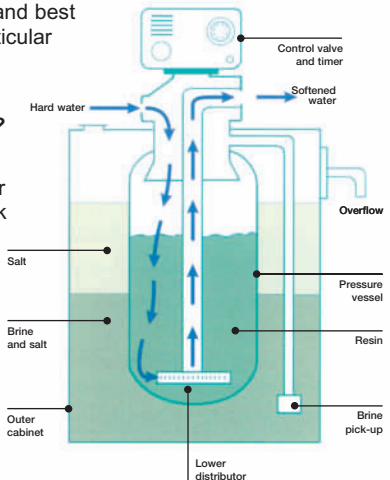
A No. All modern water softeners are programmed to regenerate automatically. All you have to do is occasionally add salt.

## Q *What kind of salt should be used?*

A Only salt recommended for water softener regeneration should be used. Your supplier will be able to provide full details of the correct type and best grade to use with your particular installation.

## Q *Where can I buy salt?*

A From your local water softener supplier - ask your installation engineer or look in Yellow Pages under Water Softeners or Water Treatment. Normally salt is available in various packs from 10 to 25kg (22 to 55lbs) bags or as blocks. It should be stored in a clean and dry environment.



## SOFTENED WATER AROUND THE HOME

**Q** *How much does a water softener cost?*

**A** The cost will vary according to the type and size. Unlike other home improvements the savings provided by a water softener can produce a payback within 2 - 4 years.



**Q** *How can I justify the investment?*

**A** Most people who have used a water softener would simply say that to wash and bathe in clear, scum-free water is sufficient justification. However, use of softened water can give significant savings which include many long-term benefits such as the protection of bathroom equipment, all water-using appliances and a reduction of water heating bills. Substantial savings can also be made on soap products, cleaning materials and especially cleaning times.



5

**Q** *What about servicing and maintenance?*

**A** A water softener is constantly in operation but because there are few moving components, its life is much longer than most other domestic appliances. Your supplier can probably offer servicing if required. The frequency of servicing or maintenance will depend on the type, age and usage of the softener.

**Q** *Can a water softener be moved and relocated?*

**A** Definitely yes. It is as easy as removing a washing machine or dishwasher and can be moved from home to home. In many cases, a water softener has been known to help sell a property as a result of its protection of the hot water system and bathroom sanitaryware.



**Q** *Why not just soften the hot water?*

**A** This is not economically viable. Although the hot water system would remain scale-free, all the benefits of fully softened water would be lost when any cold, hard water was added.

**Q Can a water softener be used with lead pipes?**

**A** When an ion-exchange water softener is installed it is recommended that, as a precaution, all lead pipework carrying softened water should be replaced. Softening the water will not in itself affect the uptake of lead from existing pipework but disturbance of lead pipework in fitting the softener may do so. Grants may be available for replacement of pipework for households with low income: further information may be obtained from your local authority. (See also *Fact Sheet 8*)

**Q Will softened water affect my central heating system?**

**A** Softened water will prevent scaling: however, if the nature of your local water supply requires it, or if you have an indirect central heating system, a corrosion inhibitor should be used.

**Q Do plants like hard or softened water?**

**A** It is worth checking with your local garden centre. The level of sodium in softened water may be harmful to some plants. Most indoor plants usually prefer rainwater to tap water. It is an unnecessary waste of softened water to use it to supply a garden hose.



**Q Can softened water be used in an aquarium?**

**A** Softened water may be acceptable. If in doubt, check with your local aquatic supplier.

**Q Can softened water be used in car batteries and steam irons?**

**A** No. Only distilled or deionised waters should be used in car batteries. Many modern steam irons can use hard and/or softened water. The guidance given in the manufacturer's instructions should be followed.

**Q Is softened water suitable for home brewing?**

**A** It varies. Naturally soft or softened water is suitable for wine, brown ale, stout and lager brewed from concentrate kits. Home brewers who "mash" may require special water treatment.

**Q Will my water bill be affected by fitting a water softener?**

**A** A small amount of water will be used to regenerate the softener, but your water bill will not be affected unless you have a water meter fitted. However, this increased water use may be offset by using less softened water for cleaning.





## INSTALLATION OF WATER SOFTENERS

**It is important that water softeners are correctly installed, used and maintained according to manufacturer's instructions.**

**Q** *Is a water softener easy to install?*

**A** Usually. Modern water softeners are small enough to fit easily into any kitchen or utility room and ideally near to the incoming mains water supply with access to a drain and electricity. (See *Fact Sheet 9*) British Water has published a Code of Practice for the installation of ion-exchange water softeners connected to the mains water supply. Installation by British Water members or plumbers affiliated to a recognised Trade Association eg The Institute of Plumbing and Heating Engineers, is recommended.



**Q** *Do I need electricity?*

**A** It depends on the type of water softener. Most softeners are fitted with a small electric system for automatic control.

This ensures that the softener regenerates at the correct intervals and at the correct time. The automatic control consumes about the same amount of electricity as a kitchen clock. Some water softeners operate hydraulically using the water flow to control regeneration and do not require electricity.

**Q** *Does a water softener need a specific water pressure?*

**A** No. Water softeners work within a wide range of pressures, but a minimum pressure of 20 psi (1.4 bar) is required - refer to the manufacturer's instructions. If your water pressure is excessively high or low, this can be corrected at installation.

**Q** *Can water softeners be used with the direct high flow rate systems now being fitted in the UK?*

**A** Yes, but seek advice from a specialist supplier to ensure a suitable high flow rate model is supplied and correctly installed.

**Q** *Will installation of a water softener conform to the Water Fittings Regulations?*

**A** Provided your supplier installs your softener in accordance with the current British Water Code of Practice for Salt Regenerated Ion-Exchange Water Softeners for Direct Connection to the Mains Water Supply, the installation will conform to the Water Supply (Water Fittings) Regulations, 1999.

**Q** *Can I install myself?*

**A** Yes. Provided you are competent and it is done in accordance with the manufacturer's instructions. However, it is important to ensure that the softener is working at maximum efficiency after installation, and complies with the Water Supply (Water Fittings) Regulations, 1999. If in doubt, contact your supplier.

**Q** *Can a water softener drain into a septic tank or package treatment plant?*

**A** Yes. Regeneration waste from a water softener will have no adverse effect on a septic tank or package treatment plant, provided both are the right size for the maximum number of people in the house. Softened water can help reduce the amount of detergent discharged into the waste system.

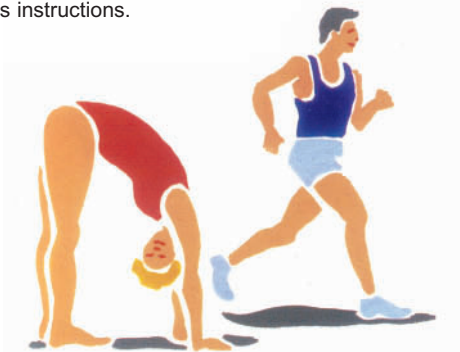
## SOFTENED WATER AND HEALTH

**Water softening removes the hardness minerals, calcium and magnesium, by exchanging these minerals for sodium in common salt.**

**Q** *Should a water softener be installed to leave a drinking tap which supplies unsoftened water?*

**A** Yes. Although there is no absolute legal requirement in the Water Supply (Water Fittings) Regulations, 1999, the British Water Code of Practice recommends that a mains water tap should be fitted, where reasonably practicable, when an ion-exchange water softener is installed.

It is particularly important that all water mixed with powdered milk for babies' feed is drawn from an unsoftened mains tap. This is because powdered milk already contains sufficient sodium, and very young babies have a limited tolerance to sodium. Anyone on a sodium-restricted diet should follow their doctor's instructions.



8

**Q** *Will those who prefer to drink softened water be deprived of minerals necessary for good health?*

**A** The beneficial minerals necessary for good health come mostly from food in a balanced diet. Neither hard drinking water nor softened water can provide a significant proportion of the daily needs for minerals - for example a glass of hard water contains only about one tenth of the calcium that is in an equal volume of milk.

**Q** *How much sodium is there in softened water?*

**A** The average daily intake of sodium from food and water for an adult is 3.6g (equivalent to 9g of salt) but the Department of Health's recommended daily allowance (RDA) is 2.4g sodium (equivalent to 6g salt). Many natural and manufactured foods and drinks contain sodium and contribute to this total intake.

	Sodium	Equivalent Salt	% RDA
1 litre of milk	0.6g	1.5g	25%
1 litre of artificially softened water in a hard water area (300mg/l as calcium carbonate equivalent)	0.14g	0.35g	6%

For additional information refer to the Food Standards Agency – [www.food.gov.uk](http://www.food.gov.uk) who define 1g of sodium equivalent to 2.5g of salt. (See also *Fact Sheet 2*)

**Q Will softened water help dry skin conditions such as eczema?**

**A** Many eczema sufferers notice benefits from the use of softened water. Due to the complexity of eczema, it is impossible to quantify why softened water helps although experience suggests the following:

- Water softeners eliminate scummy soap curd and result in a clean lather which is kind to skin, reducing dryness and itching.
- With softened water, the amount of soap used when washing clothes can be greatly reduced. Also pure soap products can be used with softened water in preference to detergents.

## ACKNOWLEDGEMENTS

The contents of this Guide were first published in 1996 when it benefited greatly from the advice and help received from the following bodies (and their predecessors):

9

Department of the Environment, Food and Rural Affairs,  
London (Defra)

Department of Health, London

National Eczema Society, London

Water UK, London

The Water Regulations Advisory Scheme, Oakdale, Gwent

## FURTHER INFORMATION

Information and Fact Sheets covering water treatment in the home are listed overleaf.

Whilst the Association does its best to ensure that any information that it may give is accurate, no liability or responsibility of any kind is accepted by the Association, its Members, its servants or its agents.

First edition 1988  
Revised 1996  
Reprinted 1998  
Revised 2001  
Revised 2005

*Publications available on the British Water website*

*A Consumers' Guide to Water Softening*

*A Consumers' Guide to Drinking Water Treatment Systems*

**Ten Fact Sheets responding to the most frequently asked questions about domestic water treatment**

**Fact Sheet 1** - Hard Water Treatment: Cost and Energy Savings

**Fact Sheet 2** - Softened Water and Health

**Fact Sheet 3** - Physical Conditioners: scale reducers

**Fact Sheet 4** - Drinking Water Treatment

**Fact Sheet 5** - Drinking Water Treatment Methods  
- comparison chart

**Fact Sheet 6** - Taste and Odour in Drinking Water

**Fact Sheet 7** - Nitrates in Drinking Water

**Fact Sheet 8** - Lead in Drinking Water

**Fact Sheet 9** - Types of Water Softener

**Fact Sheet 10** - Water Hardness: Description and Measurement

BRITISH WATER is the trade association for the UK water and wastewater industry.

Members' worldwide expertise includes: the manufacture and installation of point-of-use, commercial, industrial and municipal water and wastewater treatment processes and equipment. Where relevant, consulting, legal, financial and training services can also be provided by member companies.



## BRITISH WATER

1 Queen Anne's Gate London SW1H 9BT

Tel: +44 (0)20 7957 4554 Fax: + (0)20 7957 4565

Email: [info@britishwater.co.uk](mailto:info@britishwater.co.uk)

Website: [www.britishwater.co.uk](http://www.britishwater.co.uk)