



Physical Filtration – Cartridge Filters

Physical filters are designed to remove solid particulate material from the water. This could be general debris such as leaves or sediment, or chemical precipitates that have been encouraged to form in the water (for example by oxidation) to enable their removal.

Pre-formed cartridge filters of all sizes are one of the simplest and most commonly-found means of removing particulate material from private water supplies. They benefit from being relatively cheap, compact and requiring minimal maintenance other than changing the cartridge. These may be constructed in a number of different ways and from various materials, including the following:

- Pleated paper or fibre;
- Plastics such as polypropylene or nylon;
- Cellulose;
- Membrane;
- Fibreglass;
- Ceramics.

Cartridge filters will be rated by the maximum size of particle they will allow through. A “nominal” rating means that a stated percentage of pores in the filter are smaller than a specified size. An “absolute” rating states the maximum pore size that may be found anywhere on the filter. Filters are often installed in series in descending order of pore size to maximise removal efficiency and protect downstream filters or other treatment processes.

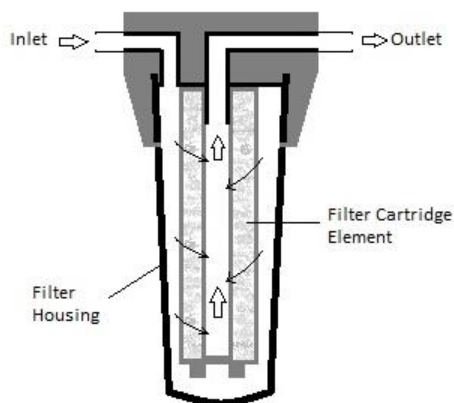


Diagram of typical cartridge, showing direction of flow

Example of a wound fibre cartridge filter in newly replaced condition in its housing.

Cartridge filters are convenient because they are easy, clean and quick to change even by non-experts. The range of sizes means that Point of Use installation is a viable option, although it should be remembered that this will provide effective treatment only at that particular tap.

Because they are not usually backwashed, they are replaced once flow through the cartridge filter reduces to a certain level as pores become clogged with deposits. Fine sediment, such as clay particles disturbed following

ploughing near the water source can quickly clog filters. This aspect also rather limits their suitability for metals removal, although they are sometimes used in circumstances where small concentrations of iron or manganese are present in oxidised (insoluble) form. In such cases a 5 micron filter would typically be used, although some trial and error may be needed. An upper limit of 300 microgrammes per litre of iron is often quoted as the upper cut-off above which cartridge filtration may not be effective and a fully back-washable media filter is required. The same is true where iron or manganese is in dissolved or colloidal form.

Cartridge filters which contain some form of chemically adsorptive media may also be available, and these may be useful for removing low concentrations of problem substances such as colour or metals, even at point of use. Once again, the inability to backwash these filters and relatively low contact times limits the scope for these filters to be used in this application. Careful monitoring is required in order to identify when contaminant breakthrough is imminent and a filter requires changing.



Sequential cartridge filters at 100 micrometre and 5 micrometre, removing particulate matter prior to disinfection with sodium hypochlorite.

Installation Considerations

Careful thought should be given to the siting and installation of cartridge filters to minimise problems and ensure they perform effectively. Some points to consider:

- Many UV units specify that a filter of 5 micron or less should be installed prior to the unit;
- Some filters have clear housings; these should be sited out of direct sunlight to avoid the growth of algae;
- Filters should be sited accessibly so that regular maintenance is possible;
- Spare stocks of filters should be kept on-site so that they are available at short notice should blockages occur.



Cartridge Filters - What You Need to Know - FAQ



What is physical filtration and what does a cartridge filter look like?

Physical filtration is the removal of solid material from the water using a water filter. Cartridge filters are simple, modular filters that are inserted into a housing and can be used to remove particles, or sometime chemicals, from the water. Cartridge filters can be composed of a number for materials. Some may be made from wound strands of a material such as polypropylene. Examples of filters and housings are shown in the pictures.

How do these filters work?

Solid material suspended in the water gets trapped on the cartridge filter. The filter will be rated to remove particles of a certain size – for many supplies, several filters in descending order of particle removal size will be needed. A typical choice would be a 20 micron filter followed by a 5 and / or 1 micron filter, but the exact choice depends on the quality of the supply and the substance(s) that need to be removed. The filter should be clearly marked with its size rating.

What can these filters remove?

As long as they are installed and used correctly, cartridge filters can remove sediment, metals and some microorganisms from the water. It is necessary to make sure that the filters are correctly sized for the flow of water you require, otherwise they may block. Cartridge filters work best in situations where there is not much solid material in the water supply and little iron or manganese (less than about 300 microgrammes per litre) of iron. Filters containing loose media may need to be used where there is a significant quantity of sediment in the water or higher concentrations of iron and manganese. In order to remove Clostridium with certainty, a filter rated at 0.5 micron will be needed. For Cryptosporidium this should be 1 micron. Some filters are impregnated with carbon to remove low concentrations of the organic compounds that cause colour in water.



How should I install a cartridge filter?

The correct installation depends on individual circumstances and it may be best to consult a specialist contractor, otherwise you risk the filters not being effective, or blocking. Try to choose filters that are approved by the WRAS or NSF organisations. You should install the largest graded filter first, with filters getting progressively finer. Filters should be fitted upstream of any disinfection process such as UV.

How easy are these filters to look after?

As cartridge filters are not backwashed, they are simply replaced once they become dirty or block. The frequency of changing depends on the quality of the water passing through the filter, and should be determined for each supply. It's best to keep stocks of spare cartridge filters in case they are needed. Changing a cartridge should simply be a matter of turning the supply off, unscrewing the housing, emptying any water inside the housing and carefully replacing the filter, taking care to achieve a good seal. Take care not to contaminate the new filter and dispose of the old one carefully.

Further advice on the safe treatment of private water supplies and the Private Water Supply Grant Scheme may be obtained from the Environmental Health Department of your local authority.