Cartridge Filters and Housings
Glass Filled Polypro 5 μ
Stainless Steel Sub-Micron 0.20 μ

Industrial Water Purification
1(800) CAL-WATER

There are a bewildering array of cartridge filter housings and cartridges available today. The cartridge filters shown here are the most common ones used, but are only a few of the many cartridge filters available from Cal Water. (Please see Cartridge Filter Application Notes)

The 5 micron filter cartridge is the most versatile and least expensive filter cartridge in industry. The 5 micron cartridge is used to remove particles and turbidity for applications from drinking water to pretreatment for high purity water systems.

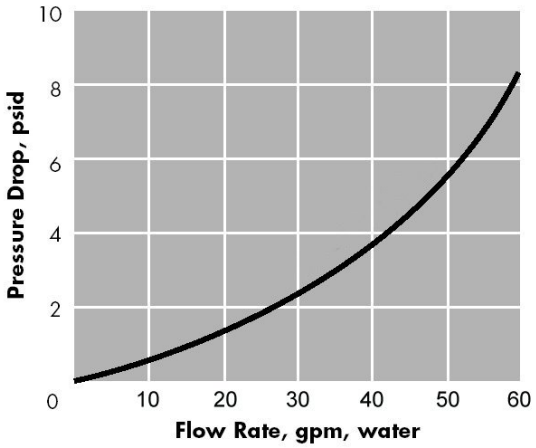
Standard Single Cartridge housings have a dark blue top and a light blue body made of glass filled poly pro. Each housing contains a single 5, 10 or 20" 5 micron filter element. (Other filter available are 0.45, 1, 20, 50 micron, and others.)

Each cartridge filter will produce a flow of up to 40 GPM with a clean element. As the 5-micron cartridges filter out particles, the flow rate begins to drop off and the pressure drop across the filters will increase. A good rule of thumb regarding the replacement of the filter cartridge is to change it when there is a ten-pound drop across it. Pressure drop is determined by subtracting inlet pressure from outlet pressure. The gauge preceding the filter represents the incoming pressure. The outlet pressure is found by reading the very next pressure gauge in the system that can be found mounted on the piping or on the inlet of the next piece of equipment.

Because the turbidity in city water is unpredictable, the pressure drop across the filters should be routinely checked. If checking pressure drop is a problem, then the cartridges should be replaced on a schedule.

"Big Blue"

"Big Blue" 20" Housing w/5 Micron Cartridge vs. Liquid Flow Rate



Filter Housings

Model:	"Big Blue"
Number of cartridges:	1
Materials of Construction:	
Housing:	Glass filled poly pro
Seal:	Knife-Edge
Specifications:	
Type:	Single Cartridge
Length:	20" (nom.)
Materials of Construction:	
Cartridge:	foam
Seals:	Knife-Edge
Specifications:	
Micron Rating:	5 micron
Length:	20" (nom.)
Diameter:	4.5" (nom.)
Flow rate:	40 GPM/Cartridge

Sub-Micron Cartridge Filters
Sub-micron cartridges are at the other end of the cartridge filter spectrum from the 5 micron. An example sub-micron filter housing would be the stainless steel top-opening container shown below. This type of filter is typically used for the physical removal of microorganisms, living or dead that passed through the UV system along with any other particulates.

The filter shown holds 12 cartridges rated at 0.2 sub-microns (Absolute). These cartridges produce a flow of 60 GPM with clean elements. As an element filters out particles, the flow rate will begin to drop off and the pressure drop will increase. A good rule of thumb for the replacement of sub-micron filter cartridges is a fifteen-pound pressure drop across them.

Cartridge Filter Housing
Multiple Cartridge – Stainless Steel

Materials of Construction:

Housing:	316 Stainless Steel
Seals:	Buna-N

Specifications:

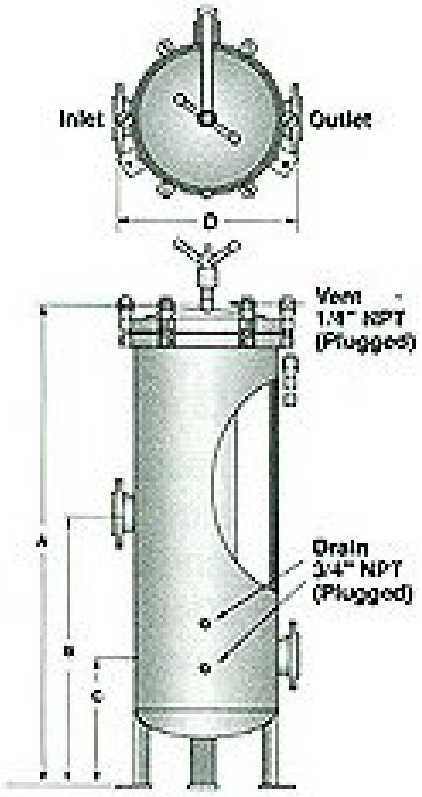
Type:	12 –30" Cartridges
Height:	54"
Diameter:	15 3/8"

Sub-Micron (0.20) Cartridge
Number Required per Change: 12

Rating:	0.20-Micron Absolute
Seals:	Knife Edge
Length:	30"
Diameter:	2 ½"

Materials of Construction:

Cartridge:	Polypro
Seals:	Teflon



Wing Nut Housing

Notes:
Cartridge filter housings materials of construction can be glass-filled poly pro, natural polypropylene, stainless steel, PVDF, Teflon and other materials.

Sub-micron filter cartridges come with a variety of top and bottom seals. It is important to get the correct cartridge for a particular housing.

Certain standard 10" and 20" sub-micron (0.45μ, 0.2μ) filter cartridges will fit in the same housing as the 5 μ filter cartridge.

To select and size a cartridge filter for a specific filtering application please call **Cal Water** to obtain the optimum cartridge filter selection.


12" Filter Cartridges

For More Information Please Call
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Cartridge Filter Application Notes

Cal Water offers a variety of sizes and configurations of filter cartridges and housings. The use of a specific filter size and type is dictated by the application.

There are four basic types of filter cartridges:

- Melt blown (Solid) Filter Cartridges
- String Wound Filter Cartridges
- Pleated Filter Cartridges
- Media Cartridges: Activated Carbon (GAC), DI resin, Calcite, Alumina, and more

(Please see: Filter Cartridge Types, below)

Cartridge Filter Micron Ratings
All cartridge filters have micron ratings that indicate the smallest sized particle they are capable of removing. (One micron (Milimicron, □□ = 0.000039 inch) Micron ratings for filter cartridges range from 50 microns (all filter cartridge types) down to 0.035 microns (Pleated membrane cartridges).

Absolute vs. Nominal Filter Ratings
The micron size ratings can be "Nominal" or "Absolute." A nominal rating indicates that the filter cartridge will remove 95% of the particles of that micron size. An absolute rating indicates that the filter will remove 99% of the particles. (Absolute ratings are available only on pleated filter cartridges.)

Applications
Cartridge filters are effective in the removal of moderate amounts of particles from liquids in the size range of 50 to 0.035 microns. When filtering large amounts of solids at high flow rates, other treatment methods such as self-cleaning multimedia filters may be required as pre-filters, followed by cartridge filtration, if needed.

The most popular micron sizes are the 5-micron general-purpose filter cartridge, and 0.2 sub-micron "Absolute" pleated filter cartridge for final filtration on high purity water systems.

Pressure Drop
The pressure drop across a cartridge filter is used to determine the condition and effectiveness of the cartridge. A high pressure drop across a cartridge filter, over the maximum recommended pressure drop, indicates that the cartridge needs attention. No pressure drop at all indicates that the filter is either breached or that the seals are not working, and again needs attention. In most cases the attention needed is cartridge replacement. With some of the pleated filter cartridges, a cleaning can restore an acceptable pressure drop.

Static Pressure
The static pressure on a system is simply the pressure shown on all pressure gauges with a system pressurized, with the outlet valves off. Typically, static pressure is simply city water pressure. Once a system is pressurized and initial pressure equilibrium is achieved, all pressure gauges will read the same (after correcting for gauge error). There will be no △P. A static pressure reading alone will not indicate the condition of a filter cartridge.

Dynamic Pressure

Dynamic pressure readings are obtained by taking the readings from the pressure gauges in a system with the water flowing. Dynamic pressure readings are the only way to determine cartridge filter condition.

Determining Pressure Drop (Filter Cartridge Condition)

Water Flowing to Other Components – If water going through a cartridge filter goes on to another component that also has a pressure drop, the difference in the dynamic pressure readings before and after the cartridge filter provide the △P of the filter cartridge, and thus, a good indication of the condition of the cartridge.

$$\triangle P = P1 - P2$$

Water Flowing to Atmosphere – If the water coming from a cartridge filter goes directly to atmosphere, a downstream pressure gauge would rarely go much above zero and so it can be eliminated. The pressure drop across a cartridge in this type of service can be determined by simply taking a dynamic reading from the inlet pressure gauge.

When to Replace a Filter Cartridge

As particles accumulate on a filter cartridge, flow through the filter becomes restricted. This restriction reduces the flow rate through the cartridge and increases backpressure. (It also increases the effectiveness of the filter, so cartridges shouldn't be changed unnecessarily.) The difference in pressure before and after a cartridge filter is the pressure drop, or △P (Delta P).

Different filter configurations and micron ratings have different △P replacement specifications. For example, pleated membrane filters normally require replacement at a △P of 15 psig, while string filters are still going strong at a △P of 25 psig. Consult the manufacturers △P recommendations for the specific filter cartridge being used.

General Filter Cartridge Replacement Procedure

- Close the inlet valve to the filter.
- With the outlet valve still on this should reduce the pressure in the system.
- Close the outlet valve.
- Loosen lid or top of the housing and allow the remaining pressure to dissipate.
- Drain or pour the water from the housing.
- Remove the old filter cartridge.
- Rinse the bowl, or swab the inside of the housing and lid or head with a sterilant: Chlorine, peroxide, etc.
- Insert the new filter cartridge.
- Replace the bowl or lid, loosely.
- Using the inlet valve, slowly fill the housing with water.
- When the water starts to overflow, close the inlet valve and complete the seal.
- Turn on the inlet valve again and repressurize the system
- Check for leaks and repeat the process as necessary. (the most frequent cause of leaking is an O'ring seal out of place.)
- Resume service by turning both inlet and outlet valves on.

Filter Cartridge Types

Melt blown (Solid) Filter Cartridges

A melt blown filter cartridge is a "depth" type filter that is good for the removal of relatively uniform sized particles throughout the body of the filter, not just on the surface. Melt blown filter cartridges are particularly effective on well waters and normal city water.

The standard 10", 5-micron, melt blown filter cartridge is the least expensive and most widely used filter cartridge on the market today. The melt blown 5-micron cartridge is used extensively for both commercial and domestic applications.

Typical applications include:

- 1 to 50 micron filters used in general purpose applications, with the 5-micron cartridge being the most popular.
- 5-micron filters installed up-stream of ion exchange resin columns to remove particles and down-stream to remove resin fines that could pass through under drains and clog a pure water system.
- 5-micron pre-filters installed ahead of a reverse osmosis system to remove particles that could clog up membranes and deteriorate performance.

String Wound Filter Cartridges

The string wound cartridge was the original cartridge filter element. A string wound cartridge is a "surface" type filter that is effective in removing diverse sized particles. It removes particles of its micron rating with excellent resistance to being "blinded" by larger particles. Because of the overlapping nature of the string windings, it has an effective surface area considerably larger than that of the melt blown filter. String wound filters are particularly applicable to surface waters from streams and rivers.

While string wound cartridges predate all the other filters, with polypropylene fiber construction, a string wound is still a good general-purpose filter and in certain applications, the best choice. Like the melt blown filter cartridge, string wound cartridges are inexpensive. In its 10", 5-micron form it is the 2nd most commonly used filter cartridge on the market and is used extensively in pre-filtration applications.

Typical applications include:

- 1 to 50 micron filters used in general purpose applications.
- 5-micron filters installed up-stream of ion exchange resin columns to remove particles and down-stream to remove resin fines that could pass through under drains and clog a pure water system.
- 5-micron pre-filters installed ahead of a reverse osmosis system to remove non-uniform sized particles.

Pleated Filter Cartridges

A pleated cartridge is a "surface" type filter cartridge that is effective in removing diverse sized particles in limited quantities. Pleated cartridges will remove particles of its micron rating with good resistance to being "blinded" by larger particles. Pleated filter cartridges are particularly effective on surface waters from streams and rivers.
Pleated filter cartridges are constructed to provide a surface area far in excess of the diameter of the filter.

The micron rating of a pleated filter is more precise than either the melt blown or string wound cartridges. Though pleated cartridges are more expensive than melt blown or string wound, they are the only choice for sub-micron filtration. (0.45 to 0.1 microns) Sub-micron pleated filter cartridges are used extensively as biological blocks in the production of high-purity and sterile water.

Typical applications include:

- 5-micron general-purpose filters used before and after ion exchange resin columns.
- 1 to 50 micron filter on the vent of a water storage tank to help prevent airborne particles from entering the tank during draw down in non-critical applications.
- 0.45 sub-micron post-filters installed after ion exchange systems act as final filters for particle sensitive applications.
- 0.2 sub-micron post-filters are installed after ion exchange and ultraviolet sterilization systems to act as final filters yielding bacterial and particle counts of near zero.
- 0.1 sub-micron hydrophobic filters are used extensively on the vents of a high-purity water storage tanks to prevent airborne dust and microorganisms from entering the tank during draw down in critical applications.
    - 0.1 to 0.2 sub-micron "Absolute" filters for both system and point-of-use filtration in critical applications.

Media Filter Cartridges

A Media Filter cartridge is not like the mechanical filters described above. A media cartridge is actually a water treatment device that effects chemical changes in the water. The flow rate through a media cartridge is substantially lower than that a similarly sized particle filter. For example a 10" 5-micron filter can flow at 5 GPM, while the same sized Carbon Media cartridge flow rate should be less than 2.5 GPM. (Depending on chlorine and organic loading.)

Replacement of media cartridges is not dictated by pressure drop. Carbon media cartridge replacement should be scheduled for every three months or more often. Deionizer (DI) cartridges should be replaced according to water quality.

Typical applications include:

- Activated Carbon for the removal of chlorine, taste and odor.
- Mixed Bed DI resin for water purification.
- Calcite media for neutralization of acidic water.
- Many other medias are available to handle a wide variety of water problems. (Cal Water engineers can assist in selecting the right media for the job.)

Cartridge Filter Accessories

Accessories include: Filter housing wrenches, Inlet and outlet pressure gauges, isolation valves and pressure relief valves.