Filtration

- Filtration is a physical process that occurs when liquids, gases, dissolved or suspended matter adhere to the surface of, or in the pores of, an absorbent medium.
- Filtration of contaminants depends highly on the amount of contaminant, size of the contaminant particle, and the charge of the contaminant particle. Depending on the household's water needs, pretreatment before filtration may include the addition of coagulants and powdered activated carbon, adjustments in pH or chlorine concentration levels, and other pretreatment processes in order to protect the filter's membrane surface.

Microfiltration

- A microfiltration filter has a pore size of approximately 0.1 micron (pore size ranges vary by filter from 0.05 micron to 5 micron);
- Microfiltration has a very high effectiveness in removing protozoa (for example, Cryptosporidium, Giardia);
- Microfiltration has a moderate effectiveness in removing bacteria (for example, Campylobacter, Salmonella, Shigella, E. coli);
- Microfiltration is not effective in removing viruses (for example, Enteric, Hepatitis A, Norovirus, Rotavirus);
- Microfiltration is not effective in removing chemicals.

Ultrafiltration

- An ultrafiltration filter has a pore size of approximately 0.01 micron (pore size ranges vary by filter from 0.001 micron to 0.05 micron; Molecular Weight Cut Off (MWCO) of 13,000 to 200,000 Daltons). Ultrafiltration filters remove particles based on size, weight, and charge;
- Ultrafiltration has a very high effectiveness in removing protozoa (for example, Cryptosporidium, Giardia);
- Ultrafiltration has a very high effectiveness in removing bacteria (for example, Campylobacter, Salmonella, Shigella, E. coli);
- Ultrafiltration has a moderate effectiveness in removing viruses (for example, Enteric, Hepatitis A, Norovirus, Rotavirus);
- Ultrafiltration has a low effectiveness in removing chemicals.

Nanofiltration

- A nanofiltration filter has a pore size of approximately 0.001 micron (pore size ranges vary by filter from 0.008 micron to 0.01 micron; Molecular Weight Cut Off (MWCO) of 200 to 2000 Daltons); Nanofiltration filters remove particles based on size, weight, and charge;

- Nanofiltration has a very high effectiveness in removing protozoa (for example, Cryptosporidium, Giardia);
- Nanofiltration has a very high effectiveness in removing bacteria (for example, Campylobacter, Salmonella, Shigella, E. coli);
- Nanofiltration has a very high effectiveness in removing viruses (for example, Enteric, Hepatitis A, Norovirus, Rotavirus);
- Nanofiltration has a moderate effectiveness in removing chemicals.

Reverse Osmosis Systems

- Reverse Osmosis Systems use a process that reverses the flow of water in a natural process of osmosis so that water passes from a more concentrated solution to a more dilute solution through a semi-permeable membrane. Pre- and post-filters are often incorporated along with the reverse osmosis membrane itself.
- A reverse osmosis filter has a pore size of approximately 0.0001 micron.
- Reverse Osmosis Systems have a very high effectiveness in removing protozoa (for example, Cryptosporidium, Giardia);
- Reverse Osmosis Systems have a very high effectiveness in removing bacteria (for example, Campylobacter, Salmonella, Shigella, E. coli);
- Reverse Osmosis Systems have a very high effectiveness in removing viruses (for example, Enteric, Hepatitis A, Norovirus, Rotavirus);
- Reverse Osmosis Systems will remove common chemical contaminants (metal ions, aqueous salts), including sodium, chloride, copper, chromium, and lead; may reduce arsenic, fluoride, radium, sulfate, calcium, magnesium, potassium, nitrate, and phosphorous.

Distillation Systems

- Distillation Systems use a process of heating water to the boiling point and then collecting the water vapor as it condenses, leaving many of the contaminants behind.
- Distillation Systems have a very high effectiveness in removing protozoa (for example, Cryptosporidium, Giardia);
- Distillation Systems have a very high effectiveness in removing bacteria (for example, Campylobacter, Salmonella, Shigella, E. coli);
- Distillation Systems have a very high effectiveness in removing viruses (for example, Enteric, Hepatitis A, Norovirus, Rotavirus);
- Distillation Systems will remove common chemical contaminants, including arsenic, barium, cadmium, chromium, lead, nitrate, sodium, sulfate, and many organic chemicals.

Ultraviolet Treatment Systems (with pre-filtration)

- Ultraviolet Treatment with pre-filtration is a treatment process that uses ultraviolet light to disinfect water or reduce the amount of bacteria present.
- Ultraviolet Treatment Systems have a very high effectiveness in removing protozoa (for example, Cryptosporidium, Giardia);
- Ultraviolet Treatment Systems have a very high effectiveness in removing bacteria (for example, Campylobacter, Salmonella, Shigella, E. coli);
- Ultraviolet Treatment Systems have a high effectiveness in removing viruses (for example, Enteric, Hepatitis A, Norovirus, Rotavirus);
- Ultraviolet Treatment Systems are not effective in removing chemicals.

Water Softeners

- Water Softeners use ion exchange technology for chemical or ion removal to reduce the amount of hardness (calcium, magnesium) in the water; they can also be designed to remove iron and manganese, heavy metals, some radioactivity, nitrates, arsenic, chromium, selenium, and sulfate. They do not protect against protozoa, bacteria, and viruses.

Please remember that:

- Point of Use (POU) water treatment systems typically treat water in batches and deliver water to a single tap, such as a kitchen sink faucet or an auxiliary faucet.
- Point of Entry (POE) water treatment systems typically treat most of the water entering a residence. Point of entry systems, or whole-house systems, are usually installed after the water meter.
- The treatment technologies described can be used in conjunction with each other for greater pathogen reduction. The addition of coagulants, carbon, alum, and iron salts to filtration systems may aid in chemical removal from water.