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Aqua SCIENCE

"Quality Water at your tap is our Commitment"

National Primary Drinking Water Standards Primary (Health Related) Inorganic Contaminants

Contaminants	MCLG	MCL	WQA Recommended Treatment Methods	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Antimony	0.006 mg/L	0.006 mg/L	-Coagulation/Filtration -Submicron Filtration -Reverse Osmosis -Ultrafiltration -Distillation	-Cancer	-Fire retardants -Ceramics -Electronics -Fireworks -Solder
Arsenic (+3)	0.05 mg/L	0.05 mg/L (Interim Standard)	-Chemical Oxidation/ Disinfection -Reverse Osmosis -Distillation	-Skin Damage -Nervous system toxicity	-Natural deposits -Smelters -Glass -Electronic wastes -Orchards
Arsenic (+5)			-Coagulation/ Fiiltration -Submicron Filtration -Anion Exchange -Activated Alumina -Reverse Osmosis -Distillation -Electrodialysis		
Arsenic (organic complexed)			-Activated Carbon		
Asbestos (fibers > 10 µm)	7 MFL	7 MFP (million fibers per liter, >10 µm)	-Coagulation/Filtration -Submicron Filtration -Reverse Osmosis -Ultrafiltration -Distillation	-Cancer -Nervous system toxicity	-Natural deposits -Asbestos cement in water systems
Barium	2.0 mg/L	2.0 mg/L	-Cation Exchange -Reverse Osmosis -Distillation -Electrodialysis	-Circulatory system effects -Nervous system toxicity	-Natural deposits -Pigments -Epoxy sealants -Spent coal
Beryllium	0.004 mg/L	0.004 mg/L	-Coagulation/Filtration -Submicron Filtration -Activated Carbon -Activated Alumina -Cation Exchange -Reverse Osmosis -Distillation -Electrodialysis	-Bone damage -Lung Damage	-Electrical aerospace, defense industries




Cadmium	0.005 mg/L	0.005 mg/L	-Coagulation/Filtration -Submicron Filtration -Cation Exchange -Distillation	-Kidney Effects	-Galvanized pipe corrosion -Natural deposits -Batteries -Paints
Choromium (+3)	0.1 mg/L	0.1 mg/L (total chromium)	-Coagulation/Filtration -Cation Exchange -Reverse Osmosis -Distillation -Electrodialysis	-Liver Disorders -Kidney Disorders -Circulatory disorders	-Natural deposits -Mining -Electroplating -Pigments
Chromium (+6)	Same As above		-Anion Exchange -Reverse Osmosis -Distillation -Electrodialysis		
Chromium (organic complexes)	Same As above		-Activated Carbon		
Copper	1.3 mg/L	1.3 mg/L (action level)	-Cation Exchange (20%-90%) -Reverse Osmosis -Distillation -Electrodialysis	-Gastrointestinal irritation	-Natural/ industrial deposits -Wood preservatives -Plumbing
Cyanide	0.2 mg/L	0.2 mg/L	-Chemical Oxidation/ Disinfection -Anion Exchange (20%-90%) -Reverse Osmosis -Distillation -Electrodialysis	-Thyroid Damage -Nervous system damage	-Electroplating -Steel -Plastics -Mining -Fertilizer
Fluoride	4.0 mg/L	4.0 mg/L	-Activated Alumina -Bone Char -Reverse Osmosis -Distillation -Electrodialysis	-Skeletal & dental florosis	-Natural deposits -Fertilizer -Aluminum industries -Water additive
Lead	zero	0.015 mg/L (action level)	-Cation Exchange (20%-90%) -Coagulation/Filtration -Submicron Filtration/ Activated Carbon -Reverse Osmosis -Distillation -Electrodialysis	-Kidney damage -Nervous system damage	-Natural/ industrial deposits -Plumbing -Solder -Brass alloy faucets
Mercury (+2)	0.002 mg/L	0.002 mg/L (total mercury)	-Cation Exchange (20%-90%) -Coagulation/Filtration -Submicron Filtration/ Activated Carbon -Reverse Osmosis -Distillation -Electrodialysis	-Kidney disorders -Nervous system damage	-Crop runoff -Natural deposits -Batteries -Electrical switches
Mercury (HgCl3)			-Anion Exchange (20%-90%) -Reverse Osmosis -Distillation -Electrodialysis		

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Mercury (organic complexes)			-Activated Carbon		
Nickel	0.1 mg/L	0.1 mg/L	-Cation Exchange (20%-90%) -Reverse Osmosis -Distillation -Electrodialysis	-Heart damage -Liver damage	-Metal alloys -Electroplating -Batteries -Chemical production
Nitrate (as nitrogen)	10 mg/L	10 mg/L	-Anion Exchange -Reverse Osmosis (sensitive to pressure) -Distillation -Electrodialysis	-Methemolglobulinemia	-Animal waste -Fertilizer -Natural deposits -Septic tanks -Sewage
Nitrite (as nitrogen)	1 mg/L	1 mg/L	-Chemical Oxidation -Anion Exchange -Reverse Osmosis -Distillation -Electrodialysis	-Methemolglobulinemia	Same as Nitrate; rapidly converted to Nitrate
Selenium (+4)	0.05 mg/L	0.05 mg/L (total selenium)	-Coagulation/Filtration -Submicron Filtration/ Activated Carbon -Anion Exchange -Activated Alumina -Reverse Osmosis -Distillation -Electrodialysis	-Liver damage	-Natural deposits -Mining -Smelting -Coal/Oil combustion
Selenium (+6)			-Anion Exchange -Activated Alumina -Reverse Osmosis -Distillation -Electrodialysis		
Sulfate	500 mg/L (proposed standard)	500 mg/L (proposed standard)	-Anion Exchange -Activated Alumina -Reverse Osmosis -Distillation -Electrodialysis	-Diarrhea	-Natural deposits
Thallium	0.0005 mg/L (proposed standard)	0.002 mg/L (proposed standard)	-Cation Exchange -Activated Alumina -Distillation	-Kidney, liver, brain, intestinal damage	-Electronics -Drugs -Alloys -Glass

National Primary Drinking Water Standards Primary (Health Related) Organic Contaminants

Contaminants	MCLG, mg/L	MCL, mg/L	Treatment Methods
Acrylamide	zero	0.0005 (action level)	Control of water treatment chemicals and surfaces in contact with water
Adipates (diethylhexyl)	0.4	0.4	Activated Carbon Aeration

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Alachlor	zero	0.002	Activated Carbon
Aldicarb	0.007(P)*	0.007(P)*	Activated Carbon
Aldicarb sulfone	0.007 (P)*	0.007 (P)*	Activated Carbon
Aldicarb sulfoxide	0.007(P)*	0.007(P)*	Activated Carbon
Altrazine	0.003	0.003	Activated Carbon
Benz(a)anthracene (PAH)	zero (P)*	0.0001 (P)*	Activated Carbon
Benzene	zero	0.005	Activated Carbon Aeration
Benzo(a)pyrene (PAH)	zero	0.0002	Activated Carbon
Benzo(b)fluroanthene	zero (P)*	0.0002 (P)*	Activated Carbon
Benzo(k)fluoranthene (PAH)	zero (P)*	0.0002 (P)*	Activated Carbon
Butyl benzyl phthalate (PAE)	zero (P)*	0.1 (P)*	Activated Carbon
Carbofuran	0.04	0.04	Activated Carbon
Carbon tetrachloride	zero	0.005	Activated Carbon Aeration
Chlordane	zero	0.002	Activated Carbon
Chrysene (PAH)	zero (P)*	0.0002 (P)*	Activated Carbon
2,4-D	0.07	0.07	Activated Carbon
Dalapon	0.2	0.2	Activated Carbon
Di[2-ethylhexyl]adipate	0.4	0.4	Activated Carbon
Dibenza(a,h)anthracene (PAH)	zero (P)*	0.0003 (P)*	Activated Carbon
Dibromochloropropane (DBCP)	zero	0.0002	Activated Carbon Aeration
Dichlorobenzene (ortho-)	0.6	0.6	Activated Carbon Aeration
Dichlorobenzene (meta-)	0.6	0.6	Activated Carbon Aeration
Dichlorobenzene (para-)	0.075	0.075	Activated Carbon Aeration
Dichloroethane (1,2-)	zero	0.005	Activated Carbon Aeration
Dichloroethylene (1,1-)	0.007	0.007	Activated Carbon Aeration
Dichloroethylene (cis-1,2-)	0.07	0.07	Activated Carbon Aeration
Dichloroethylene (trans-1,2-)	0.1	0.1	Activated Carbon Aeration
Dichloromethane (methylene chloride)	zero	0.005	Aeration
Dichloropropane (1,2-)	zero	0.005	Activated Carbon Aeration
Diethylhexyl phthalate (PAE)	zero	0.006	Activated Carbon
Dinoseb	zero	0.006	Activated Carbon
Diquat	0.02	0.02	Activated Carbon
Endothall	0.1	0.1	Activated Carbon
Endrin	0.002	0.002	Activated Carbon
Epichlorohydrin	zero	0.002 (action level)	Control of water treatment chemicals and surfaces in contact with water

Ethylbenzene	0.7	0.7	Activated Carbon Aeration
Ethylene Dibromide (EDB)	zero	0.00005	Activated Carbon Aeration
Glyphosphate	0.7	0.7	Activated Carbon
Heptachlor	zero	0.0004	Activated Carbon
Heptachlor epoxide	zero	0.0002	Activated Carbon
Hexachlorocyclopentadiene	0.05	0.05	Activated Carbon Aeration
Indenol (1,2,3-c,d)pyrene (PAH)	zero (P)*	0.0004 (P)*	Activated Carbon
Lindane	0.0002	0.0002	Activated Carbon
Methoxychlor	0.04	0.04	Activated Carbon
Monochlorobenzene	0.1	0.1	Activated Carbon Aeration
Oxamyl (vydate)	0.2	0.2	Activated Carbon
Pentachlorophenol	zero	0.001	Activated Carbon
Picloram	0.5	0.5	Activated Carbon
Picloram	0.5	0.5	Activated Carbon
Polychlorinated byphenyls (PCBs)	zero	0.0005	Activated Carbon
Simarzine	0.004	0.004	Activated Carbon
Styrene	0.1	0.1	Activated Carbon Aeration
2,3,7,8-TCDD (dioxin)	zero	$3X10^{-8}$	Activated Carbon
Tetrachloroethylene	zero	0.005	Activated Carbon Aeration
Toluene	1.	1.	Activated Carbon Aeration
Toxaphene	zero	0.003	Activated Carbon
2,4,5-TP (silvex)	0.05	0.05	Activated Carbon
Trichlorobenzene (1,2,4)	0.07	0.07	Activated Carbon Aeration
Trichloroethane (1,1,1-)	0.2	0.2	Activated Carbon Aeration
Trichloroethane (1,1,2-)	0.003	0.005	Activated Carbon Aeration
Trichloroethylene	zero	0.005	Activated Carbon Aeration
Trihalomethanes (THMs) • Chloroform • Bromodichloromethane • Dibromochloromethane • Bromoform	zero	0.100	Activated Carbon Aeration Ultrafiltration (20%-90%) Reverse Osmosis (20%-90%)
Vinyl chloride	zero	0.002	Aeration
Xylenes (total)	10.	10.	Activated Carbon Aeration

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(P)* = Proposed Standard
MCLG = Maximum Contaminant Level Goal established at the level at which no known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety; expressed in milligrams per liter unless otherwise specified.
MCL = Maximum Contaminant Level established as close to the MCLG as feasible taking into consideration costs and treatment techniques applicable at public water systems; expressed in milligrams per liter unless otherwise specified.

National Secondary Drinking Water Regulations

Recognized Treatment Techniques
for meeting the National Secondary Drinking Water Regulations
with the Application of Point-Of-Use Systems

"The National Secondary Drinking Water regulations control contaminants in drinking water that primarily affect the aesthetic qualities relating to the public acceptance of drinking water. The regulations are not federally enforceable but are intended as guidelines for the states" (40 CFR Section 143.3)

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For simplicity, WQA uses the term Point-Of-Use (POU) when referring to both treatment at the tap and for whole house treatment.

Except for instances of contamination through inhalation or dermal adsorption, the WQA notes that in-home treatment of drinking and cooking water only is often the most economical and preferred method of choice for reducing these drinking water aesthetic contaminants. Of course, the particular contaminant found in the water will determine the appropriate treatment technique.

The recognized treatment methods listed here reflect the fact that point-of-use systems on the market today may differ widely in their effectiveness to treat any specific contaminant. Anyone contemplating use of such point-of-use equipment for a specific application or purpose should make their selection only after careful investigation of the performance capabilities. As part of the installation procedure, the performance of the system should be verified through an appropriate water analysis. In addition, the product water should be monitored periodically to verify performance.

It is the general consensus of the manufacturers and sellers of the point-of-use systems employing the listed techniques that, if these systems are defect free, properly applied and installed, and maintained strictly according to the manufacturers' installation and maintenance instructions, they may be considered for use in meeting the requirements of the National Secondary Drinking Water Regulations (SDWR).

Contaminant	SMCL, mg/L	Treatment Methods
Aluminum (AL^{+3})	0.05 to 0.2 depending on case-by-case circumstances	Cation Exchange Reverse Osmosis Distillation Electrodialysis

Chloride (C1 $^{-1}$)	250	Reverse Osmosis Distillation Anion Exchange Electrodialysis
Color	15 color units	Anion Exchange Activated Carbon Filtration Chlorination Reverse Osmosis Distillation Ozonation Activated Alumina
Copper (Cu $^{+2}$)	1.0	Reverse Osmosis Distillation Cation Exchange (20%-90%) Electrodialysis
Corrosivity	Non-corrosive	Calcite or Calcite/Magnesium Oxide (Magnesia) (5 to 1) Filter to raise pH Soda Ash Chemical Feed Polyphosphate Feed Sodium Silicate Feed Reduce TDS via Reverse Osmosis (partial, split stream treatment) Coatings Insulating Unions
Fluoride (Fl $^{-1}$)	2.0	Activated Alumina Bone Char Reverse Osmosis Distillation Electrodialysis
Foaming agents (MBAS) (methylene blue active substances)	0.5	Chlorination Activated Carbon Ozonation Reverse Osmosis Distillation
Iron (Fe $^{+2}$) (ferric iron)	0.3	Filtration(oxidizing filters) Cation Exchange Reverse Osmosis* Pressure Areation/Filtration Chlorination - Precipitation/ Filtration Distillation Electrodialysis
Iron (Fe $^{+3}$)	0.05	Filtration

*Ferrous Iron (clear water iron) is readily converted to ferric iron (red water iron) in the presence of any air or oxidizing material; precipitating ferric iron must be prevented to avoid fouling and interference with effective reverse osmosis membrane rejection.

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Manganese (Mn $^{+2}$) (ferric iron)	0.5	Filtration(oxidizing filters) Cation Exchange Reverse Osmosis* Distillation Pressure Areation/Filtration Chlorination - Precipitation/Filtration Electrodialysis
Manganese (Mn $^{+4}$)		Filtration

*manganese must be maintained in the soluble manganous (Mn $^{+2}$) to avoid fouling and interference with effective reverse osmosis membrane rejection.

Odor	3 threshold odor number	Activated Carbon Aeration Oxidation

Note: Chlorine and hydrogen sulfide are examples of odors that may e reduced by the treatment methods suggested.

pH	6.5-8.5	pH may be increased by alkalies and may be decreased by acids Ion Exchange Neutralizing Filter (Calcite, Magnesia)
Silver (Ag $^{+1}$)	0.1	Coagulation/Filtration Submicron Filtration/Activated Carbon Ion Exchange (Anion or Cation depending on complexed Ion Species)
Sulfate (SO_4^{-2})	250	Reverse Osmosis Distillation Anion Exchange Electrodialysis
Total dissolved solids (TDS)	500	Reverse Osmosis Distillation Deionzation by Ion Exchange (Cation/Anion in two bed or mixed bed) Electrodialysis
Zinc (Zn $^{+2}$)	5	Reverse Osmosis Distillation Cation Exchange Electrodialysis

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