

Disinfectant Selection

There is no one-size-fits-all approach for adding supplemental disinfectant to building potable water systems to reduce the risks associated with Legionella and other waterborne pathogens. Building-specific characteristics such as pipe material, age, and condition, water usage rates and water age, and water quality parameters all impact the effectiveness of a particular technology. Municipal water supply treatment processes and water quality issues will also impact selection. Some states and localities limit disinfectant selection, and require licensing to add treatment to potable water systems. Building owners should consult regulatory authorities to ensure compliance. The table below gives an overview of common supplemental disinfection technologies for potable water systems.

Technology	Chlorine	Electrolytic Chlorine	Monochloramine	Chlorine Dioxide	Copper Silver	Point-of-Use Filtration
Disinfectant	Cl ₂	Cl ₂	NH ₂ Cl	ClO ₂	Cu - Ag	Physical Barrier
Description	Concentrated sodium hypochlorite (bleach) added from drum	Dilute sodium hypochlorite solution generated onsite using salt	Dilute mono-chloramine solution generated onsite using precursors	Dilute chlorine dioxide solution generated using precursors	Copper and silver ions released using metal electrode and electricity	Min 0.2 µm absolute membrane filter installed on faucets and showers
Typical Treatment Levels	>0.5 mg/l Free Chlorine POE Detectable distal taps	>0.5 mg/l Free Chlorine POE Detectable distal taps	1.0 - 2.0 mg/l Total Chlorine	0.25-0.5 mg/l ClO ₂ POE 0.1-0.5 mg/l ClO ₂ Tap	0.2 - 0.8 mg/l Cu 0.01 - 0.08 mg/l Ag	30 – 180 day filter installed on potable water fixtures
Maximum Treatment Levels	Max 4.0 mg/l Total Chlorine	Max 4.0 mg/l Total Chlorine	Max 4.0 mg/l Total Chlorine	Max 0.8 mg/l ClO ₂ Max 1.0 mg/l Chlorite	Max 1.3 mg/l Cu Max 0.10 mg/l Ag	Max rated days in service
Typical Application	Short and long term disinfection of cold and hot systems	Long term disinfection of cold and hot systems	Long term disinfection of cold and hot systems	Long term disinfection of cold systems	Short and long term control of hot systems	Short and long term control on faucets, showers, ice machines
Disinfection Efficacy	Powerful non-selective disinfectant	Powerful non-selective disinfectant	Weak non-selective disinfectant	Powerful selective disinfectant	Not categorized as a disinfectant	Absolute barrier
Legionella Control	Effective with limitations	Effective with limitations	Effective with limitations	Effective with limitations	Effective with limitations	Effective with limitations
Biofilm Control	Consumed by biofilms	Consumed by biofilms	Some biofilm penetration	Dissolved gas penetrates biofilm	Disrupts biofilm formation	N/A
Safety	Concentrated corrosive oxidizer	Dilute non-corrosive oxidizer	Hazardous precursors	Hazardous precursors	No hazardous chemicals	No hazardous chemicals
Limitations	Poor storage stability. Corrosive if overfed. Taste-odor	Corrosive if overfed. Taste-odor	Corrosive if overfed. Selective enrichment pathogenic bacteria	Corrosive if overfed	Avoid High pH (> 8.3). Galvanic corrosion on steel	May not last full 30-180 days
Site Testing	Daily Free/Total Chlorine analysis	Daily Free/Total Chlorine analysis	Daily Total Chlorine analysis	Daily Chlorine Dioxide and Chlorite analysis	Monthly Copper and Silver analysis	Time in service and flow rate
Equipment Cost	Very Low (Drum)	Low (Generator)	High (Generator)	High (Generator) Low (Tablets/Liquid)	High (Ionizer)	None
Operating Cost	Low (Bleach)	Low (Salt)	Moderate (Precursors)	Moderate (Precursors) High (Tablets/Liquid)	Low (Electrode Replacement)	Significant (Labor & Filter Replacement)
Feed & Control Equipment Cost	Moderate	Moderate	Moderate	High	Low	None

A site specific Water Management Plan should be in place to define the Legionella risk management protocols including any supplemental disinfection additions. Good design and operational practices to avoid dead legs, minimize stagnation, and optimize thermal control of hot and cold water systems should be followed in all cases.