JeffCo Aquatic Coalition
The Voice for Aquatics in Jefferson County

Pool Purification Frequently Asked Questions (FAQs)

Note: Pool purification systems are technically complex and require experts to design and manage. The below should be viewed as a layman's description.

I am allergic to chlorine. Will I be able to use the pools in the proposed YMCA?

You are one of many people who say their allergic or other reactions to chlorine prohibit them from using an indoor chlorinated pool. However, it is very likely that you are not sensitive to the chlorine, but the chloramines that are the byproduct of the chemical reaction of chlorine with the organisms they are neutralizing. The familiar "chlorine smell" is actually the odor of chloramines. Managing the chloramines is the key to having a pool accessible by you and many others. The proposed YMCA pools would use a state-of-the-art purification system that would address this.

Will the proposed YMCA pool(s) be non-chlorinated?

Washington Administrative Code (WAC) 246-260-111 specifies that Water Recreation Facilities (WRF) must use either chlorine or bromine for continuous disinfection. Bromine is primarily used for small WRF such as spas. Virtually all pool size WRFs use chlorine as a primary disinfectant. WAC 246-260-111 specifies a minimum chlorine concentration of 1.5 parts per million (ppm) and a maximum chlorine concentration of 10 ppm. So the proposed pool necessarily needs to be chlorinated.

Doesn't a saltwater purification system avoid the use of chlorine?

The chemical composition of salt is NaCl, or sodium chloride. Saltwater systems use an electrolytic process to generate chlorine from the dissolved salt and water to meet the WAC mandated chlorine concentration. There are various advantages and disadvantages to saltwater purification systems. But it is a misconception that a saltwater system is not a chlorination system.

Can Ozone or Ultraviolet (UV) treatment be used instead of chlorine to sanitize pools?

Both Ozone and UV treatment can be used to neutralize contaminants as the water circulates through the pump room. However health codes do not allow such systems to be used as the primary purification system. Either can be used as a secondary or supplemental purification system in addition to chlorine. This results in reduced levels of chlorine needed to purify the water.

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How can chloramines be reduced so I might be able to use the proposed YMCA pools?

There are several strategies to reduce the level of chloramines in a natatorium:

1. Reduce the amount of contaminants in the pool that need to be neutralized by chlorine reactions. Since the main sources of contaminants are the humans in the pool, personal hygiene is the most effective way to reduce contaminants. This strategy relies on education of pool users regarding personal hygiene. Pool users can reduce chloramine generation by taking a soap and water shower *before* entering the pool. This can also reduce the "chlorine smell" on the body after a swim. Fully rinsing your hair with clean tap water before entering the pool and wearing a swim cap is better protection than slathering on conditioner which the chlorine will attack. It goes without saying that avoiding peeing in the pool will reduce chloramine generation.
2. A secondary treatment method (Ozone or UV) applied as the water passes through the pump/filter/heater system can reduce contaminants entering the pool. Secondary treatments lessen the chlorine needed to neutralize contaminants, and therefore lessen the chloramine byproduct.
3. Properly designed ventilation systems also remove chloramines from the natatorium. An effective ventilation system will withdraw air near the water surface, and therefore remove the gaseous chloramines. The recent improvements to the Mountain View Pool ventilation system have reduced the "chlorine smell", aka the chloramines.
4. Maintain the correct concentration of chlorine.

What is the best state-of-the-art pool purification system?

Besides the goal of reducing chloramines, the choice of pool purification systems depends on installation costs, operating costs, maintenance, replacement and other factors. During field trips by JAC board members to YMCAs, they have seen both liquid chlorine and saltwater primary systems (both with a UV secondary system) that are comparable for managing chloramine levels.

When the time comes, the YMCA will engage qualified experts to specify and design its purification system using the best available state-of-the-art technology. Until then, it is premature to state what the pool purification system will be for the proposed YMCA.

Attached references

1. Pool Water Chemical Treatment Options prepared by Counsilman-Hunsaker
2. Excerpts from Washington Administrative Code 246-260-111, "Water quality standards, analysis and sample collection for Water Recreational Facilities."

Counsilman · Hunsaker
AQUATICS FOR LIFE

POOL WATER CHEMICAL TREATMENT OPTIONS

All public swimming pools require sanitizing systems to eliminate microbes in the water to provide a healthy swimming environment. There are many options available today and there are some common misconceptions regarding what systems are available and their relative merits. The purpose of this overview is to provide some basic information about these systems and their effectiveness, safety, and practical application.

There are three basic categories of water treatment systems commonly used in swimming pools: Sanitizers, Supplemental Sanitizers, and pH Buffers.

SANITIZERS

All public swimming pools must have a chemical sanitizer, as mandated by the local public health code. The function of the sanitizer is to kill micro-organisms. This is generally done by adding a chemical sanitizer to the water as it passes through the treatment system in the pool equipment room. This effectively treats the water at the point of injection, but also leaves residual sanitizer in the pool water itself to handle contamination sources in the pool. The following options are available:

1. Sodium Hypochlorite
    a. 12% free available chlorine
    b. Liquid
    c. Dilutes over time
    d. Classified as an irritant
2. Calcium Hypochlorite
    a. 65% free available chlorine
    b. Tablet
    c. Longer shelf life than sodium hypochlorite
    d. Classified as a Class 3 oxidizer and is corrosive
3. Gas Chlorine
    a. 100% free available chlorine
    b. Gas
    c. Chlorine gas is extremely corrosive and has been known to corrode all metal within an equipment room.
    d. Not allowed by most health codes due to hazardous nature.
4. Bromine
    a. Commonly used on smaller bodies of water (hot tubs) with low bather loads.
    b. Twice the bromine is required to reach the same oxidation potential of chlorine.
    c. Bromine is a much less aggressive oxidizer compared to chlorine.
    d. Bromine BCDMH is classified as a corrosive – either class one or class two oxidizer. It is not flammable in and of itself, but it may ignite combustible materials in which it comes into contact, and as such is identified as a hazard.
5. Chlorine Generation (Salt System)
    a. Non-ionized, coarse, sun-dried or pelletized salt (normally in 40 lb. bags) is initially added to the pool water to develop a concentration of 0.5% (5,000 ppm).
    b. A small amount of electricity is used by the chlorine generator during the electrolytic process.
    c. Salt systems generate pure sodium hypochlorite at a near neutral pH and therefore have less effect on pH than most other pool chlorines.
    d. 4 ppm of free chlorine is reported to be ten times more corrosive than 4,000 ppm in salinity.

A common misconception is that salt systems provide a chlorine-free pool. This is incorrect. Chlorine serves as the primary chemical sanitizer in all of the above systems except Bromine.

SUPPLEMENTAL SANITIZERS

In addition to the above chemical sanitizers, secondary water treatment systems are available to further improve the water quality. It should be noted that none of these systems are permitted by health codes to serve as a primary source of water treatment. They are only permitted as supplementary systems. This is because they do not result in providing any residual chlorine in the pool itself, where contamination is most likely to occur. Water is only treated in the equipment room.

However, the advantage of these supplemental systems is in their effectiveness at reducing Chloramines (combined chlorine). Chloramines are compounds formed when chlorine combines with other chemicals from human perspiration, body oils, and other byproducts. These chloramines have been shown to affect the air quality in the natatorium, particularly just above the surface of the water. It is the "chloramines' in the air which produce the common "chlorine smell" often experienced at indoor aquatic facilities if not treated effectively. They have been shown to cause health problems, particularly in people with respiratory problems such as asthma. These supplemental sanitizers are also effective as sanitizers, even though not permitted as a primary means. These systems include:

1. Ultraviolet Light (UV)
    a. Reduces combined chlorine (chloramines). Indoor air quality will improve.
    b. The frequency of super-chlorination of the pool is reduced with UV installed.
    c. UV is highly effective against chlorine resistant pathogens like Cryptosporidium and Giardia; as well as the vast majority of bacteria, viruses, yeast, and mold.
        i. Chloramines reduction: < 0.2ppm
        ii. Disinfection: > 99.99% for Cryptosporidium and E. coli.
    d. Medium pressure.
    e. Need to budget $1,000 per year for bulb replacement.
2. Ozone
    a. Reduces combined chlorine (chloramines). Indoor air quality will improve.
    b. The frequency of super-chlorination of the pool is reduced.
    c. Full DIN system treats 100% of flow – very expensive
    d. Sidestream Ozone system treats approximately 25% of flow – still very expensive.
    e. Ozone systems are very complicated to operate – need pool operator that has experience with Ozone.

pH BUFFERS

The sanitizers discussed in this overview have a high pH and thus raise the pH of the pool water therefore it is necessary to add pH buffers to lower the pH levels of the pool. The options available are:

1. CO2
    a. CO2 (Carbon Dioxide) is a pH balancing chemical that is effective with "soft" source water.
    b. Used when the total alkalinity is less than 70 ppm. CO2 raises the TA in the water.
    c. CO2 is injected into water to release oxygen and carbonic acid.
    d. No fire rating is required.
2. Muriatic Acid
    a. 31.5% solution of hydrochloric acid.
    b. Muriatic acid reacts with the sanitizer, thus counteracting the pH, raising effects of the sanitizer. It has a pH of approximately 3. In the pool, it will lower the pH and total alkalinity. Typically delivered in 15-gallon carboys.
    c. Muriatic acid (hydrochloric acid) is classified as a corrosive and is highly reactive.
    d. Muriatic acid is used where the total alkalinity in the source water is above 70 ppm.

Washington Administrative Code (WAC) 246-260-111

http://app.leg.wa.gov/WAC/default.aspx?cite=246-260-111

Water quality standards, analysis and sample collection for Water Recreational Facilities (WRF).

(3) **Disinfection.**

(a) Owners shall maintain continuous disinfection of WRF pool water at all times by using:

(i) Chlorine or bromine concentrations specified in Table 111.1 of Appendix A

(ii) Ozone may be used as a supplement to primary disinfection, but not a replacement.

(A) Minimum levels of primary disinfectant (chlorine or bromine) may not be less than required minimums.

(B) Ozonator units must meet the requirements of NSF standard 50 and be listed by NSF or an equivalent laboratory testing to NSF standard 50 and providing readily available listing.

(C) Maximum levels of ozone that can be produced by ozone generating device in the atmosphere above the pool water or the room where ozone is generated may not exceed 0.05 ppm.

(iii) Copper or copper silver disinfection processes may be used as a supplement to primary disinfection, but not a replacement.

(A) Minimum levels of primary disinfectant (chlorine or bromine) may not be less than required minimums.

(B) Copper or copper/silver disinfection units must meet requirements of NSF standard 50 and be listed by NSF or an equivalent laboratory testing to NSF standard 50 and providing readily available listing.

(C) Maximum levels of copper that can be produced in the pool water are 1.0 ppm copper and 0.05 ppm of silver; or

(iv) An alternative disinfectant registered with EPA and WSDA.

(b) Any primary or supplemental alternative disinfectant shall be used in conformance with guidelines established by the department and NSF standard 50.

(c) Alternative disinfectants must be evaluated using EPA document "*Guide Standard and Protocol for Testing Microbiological Water Purifiers*" by Campt and Cotruvo, EPA, April, 1986.

Excerpts from Table 111.1 Appendix A

Minimum and Maximum Levels of Disinfectant for a SWIMMING POOL

Parts per million (ppm) of chlorine is measured as free available chlorine residual

Minimum levels	Chlorine 1.5 ppm Chlorine with cyanurate compound 2.0 ppm Bromine 2.5 ppm
Maximum Levels	The maximum disinfectant level shall conform with manufacturers' recommendations and shall not exceed 10 ppm for any pool.