

## **Public Swimming Pools: Understanding Water Sampling Requirements**

### **What Are Public Swimming Pools?**

Public swimming pools include those located at clubs, hotels, motels, holiday units, schools, hospitals and workplaces where the public can be admitted, whether free of charge, on payments of fee or otherwise. The operator of these pools must ensure that the water quality is maintained to prescribed standards to infections and disease.

These types of pools are more likely to be contaminated with a greater diversity of disease causing micro-organisms than a single domestic swimming pool. This is because public pools are used by unrelated people and are more likely to have higher bather loads.

### **Disinfection**

All public swimming pools must be equipped either an automatic or continuous metered disinfectant dosing system. A pool must be disinfected with either chlorine or bromine.

### **Chlorine**

Chlorination is the most commonly used swimming pool disinfectant technique and is available in many compounds.

#### ***Total Chlorine***

Total chlorine is the total amount of chlorine in the pool water – the total of combined and free chlorine.

$$CC + FC = TC$$

#### ***Combined Chlorine***

Once chlorine begins to react with contaminants in the water, such as ammonia, it becomes combined chlorine. Also called chloramines, in this state, the chlorine isn't as effective at disinfecting compared to free chlorine. Chloramines also greatly reduce the disinfection power of free chlorine, irritate mucous membranes, cause eye stinging and red eyes, and irritate respiratory systems.

The concentration of combined chlorine in the water in a chlorine disinfected pool must not exceed 1.0mg/L.

Reducing chloramines is an important factor in maintaining disinfection power of the pool water.

Chloramines must be burnt out or oxidised by adding more oxidiser such as chlorine. Another way to prevent a build-up of chloramines is to ensure that there is a large excess of free chlorine to combined chlorine to constantly burn out chloramines.

Engage a pool consultant to assist with addressing problems with chloramines.

#### ***Free Available Chlorine***

Free available chlorine is the part of the total chlorine measurement that has not yet reacted with contaminants. It is the amount of active chlorine agent available for disinfection of the pool water.

Concentrations of free available chlorine in a chlorine disinfected pool must be:

- Outdoor pool – 1.0mg/L
- Outdoor pool in which cyanuric acid is used – 3.0mg/L
- Indoor pool – 2.0mg/L
- Spa pool – 2.0mg/L

Where the pH level is greater than 7.6, the free available chlorine must be:

- Outdoor pool – 2.0mg/L
- Outdoor pool in which cyanuric acid is used – 4.0mg/L
- Indoor pool – 3.0mg/L
- Spa pool – 3.0mg/L

Free chlorine concentration should be increased when high bather loads are anticipated to ensure that concentrations are never less than the minimum.

### **Bromine**

Bromine is mainly used in heated spas as it is more stable than chlorine at higher temperatures. Bromine is less suitable for outdoor pool use because it cannot be stabilised against losses due to

UV light and is more expensive than chlorine-based disinfectants.

Concentrations of bromine in a bromine disinfected pool must be:

- Outdoor pool – 2.25mg/L
- Indoor pool – 24.5mg/L
- Spa pool – 4.5mg/L

## pH

pH is a measure of how acid or alkaline a pool is. The pH scale ranges from 0 to 14 with 7.0 being neutral.

Ideally, pH should be maintained between 7.2 – 7.6 as it allows free chlorine to work more effectively to disinfect the pool.

As the pH increases in the pool water, free chlorine disinfection power decreases. Where pH exceeds 7.6 then free chlorine must be increased to compensate for loss of disinfection power. Above pH 7.8, free chlorine has lost most of its disinfection power.

Where pH is too low, the pool become acidic which can cause corrosion to pool equipment and etching of pool surface. It can also cause discomfort to bathers.

Chemicals for raising pH:

- Soda ash
- Bicarb (sodium bicarbonate)

Chemicals for lowering pH:

- Dry acid (sodium bisulphate)
- Hydrochloric acid (muriatic acid)

Engage a pool consultant to get advice on how to adjust the pH of your pool water.

## Total Alkalinity

Total alkalinity is the measure of alkaline salts (bicarbonates, carbonates and hydroxides) present in water. Total alkalinity prevents large fluctuations in pH, known as pH bounce.

Total alkalinity should be maintained at between 80mg/L and 200mg/L.

High total alkalinity causes cloudy water, rough pool surface, clogged filters and reduced circulation.

Low total alkalinity causes etching of pool surface and staining of surface walls.

To increase total alkalinity, a buffer such as sodium bicarbonate is added to the water. To lower total alkalinity, acid is added. pH will need to be re-adjusted as a change in total alkalinity alters pH.

Engage a pool consultant to get advice on how to adjust total alkalinity of your pool water.

## Cyanuric Acid

For outdoor pools, UV light causes hypochlorous acid (active chlorine component) to convert to hydrochloric acid which has no disinfection power. Therefore, UV light from the sun gradually decreases the disinfection capacity of the pool water. More chlorine then needs to be added to maintain disinfection levels.

Cyanuric acid is a chemical that can be added to pool water to stabilize hypochlorous acid to recue losses from UV light from the sun.

However, addition of cyanuric acid also reduces the disinfection power of hydrochloric acid. Therefore, it is necessary to operate an outdoor pool at 3.0mg/L of free chlorine when using cyanuric acid.

Cyanuric acid only needs to be added occasionally, and not continuously. Maximum concentration of cyanuric acid in the pool is 50mg/L.

Cyanuric acid can only be used in outdoor chlorine disinfected pools and must not be used in a spa pool.

## Safety with Chemicals

Pool operators should seek advice and instructions from pool consultants and/or chemical suppliers on how to safely store, handle and apply chemicals. Pool chemicals can become a risk if not correctly used.

NSW WorkCover has useful information on their website about the storage and handling of chemicals.

[www.safework.nsw.gov.au/hazards-a-z/hazardous-chemical/general-requirements](http://www.safework.nsw.gov.au/hazards-a-z/hazardous-chemical/general-requirements)

## Water Testing Requirements

Pool operators are required to regularly monitor and test the pool chemistry to ensure adequate disinfection is being achieved.

Where an automatic dosing system is installed:

Parameter	Frequency
Chlorine	Prior to opening and once during the day
pH	Prior to opening and once during the day
Cyanuric acid	Once a week
Alkalinity	Once per day

Where a non-automatic continuous dosing system is installed:

Parameter	Frequency
Chlorine	Prior to opening
pH	Prior to opening
Cyanuric acid	Once a week
Alkalinity	Once per day

Water testing can be done in-house or by an external pool service agent.

### Records

Records must be kept of water testing results for a period of 6 months and be available for inspection.

### More information

More information can be found on NSW Health's website at:

[www.health.nsw.gov.au/environment/publicpools](http://www.health.nsw.gov.au/environment/publicpools)