Pool Water Chemistry Guide

water test

The water chemistry information in this guide will help you keep your pool water clean and clear, swimmer safe, and plaster friendly.

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the clear choice in pool care

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Introduction

The purpose of this Pool Water Chemistry Guide is to provide basic water chemistry information which will help you keep your pool water clean and clear, swimmer safe, and plaster friendly.

Water chemistry includes 2 primary categories: balanced water and sanitized water. Balanced water relates to the chemical and mineral elements of the pool water. Sanitized water relates to the cleanliness and sanitary condition of the pool water.

Detailed information on these matters, and more, are presented in the sections which follow.

crystal clear

Water Chemistry Importance

Pool water chemistry consists of 2 categories: balanced and sanitized. And the reason balanced and sanitized pool water is so important lies in its destructive effects if it is not. Unbalanced water will corrode, etch, scale, and stain pool surfaces and equipment. Unsanitary water will have ill-effects upon swimmers, water quality, and pool surface.

The 5 key chemical elements which affect water quality are pH, total alkalinity, calcium hardness, cyanuric acid, and sanitizer (e.g. chlorine). By consistently monitoring and adjusting these elements you can keep your water balanced and sanitized, and your equipment and pool surface healthy.

The most common sanitizers are: chlorine, bromine, and chlorine generators (salt systems). The purpose of these various sanitizers is to disinfect and sanitize the pool water by preventing algae and destroying bacteria.

Chlorine, the most popular sanitizer, is most effective at water temperatures of 65 to 85 degrees, whereas bromine is most effective at water temperatures of 85 to 104 degrees.

NOTE: never combine sanitizers and always follow product label instructions.

Nature of Water

Essentially, pool water has an appetite. If fed the proper chemicals, it will become balanced and plaster friendly. Conversely, if the pool water is deprived it will become aggressively destructive as it leeches from the plaster what it needs (e.g. calcium).

Pool water which is unbalanced will deteriorate a plaster finish whereas pool water which is balanced will preserve a plaster finish.

Nature of Plaster

Because plastered pools and spas are, and need to be, in constant contact with water, their surfaces are significantly affected by the water's chemistry.

Essentially, the water chemistry will have an impact on the condition and life of the plaster surface: in some cases, causing minor cosmetic changes in the plaster; however, in too many cases, causing a deteriorating and corrosive effect.

chemistry kit

spot cleaning

mottled plaster

Determining Pool Water Volume

It's important to know your pool's volume of water when it comes to balancing your pool water. Here are a few simple formulas for determining your pool's number of gallons.

Average depth formula:

- shallow-end depth + deep-end depth divided-by 2 = average depth
- example: 3.5' + 8.5' = 12' 12'/2 = 6' average depth

Water volume for a rectangular or square pool:

- length x width x average depth x 7.5 = water volume in gallons
- example: 40' x 20' = 800 800 x 6 = 4,800
  4,800 x 7.5 = 36,000 gallons

Water volume for a round or oval pool:

- length x width x average depth x 5.9 = water volume in gallons
- example: 40' x 20' = 800 800 x 6 = 4,800
  4,800 x 5.9 = 28,320 gallons

Must-Have Chemicals

Having the following products on-hand will make balancing your pool water easy and convenient:

Test kit which tests for:

- alkalinity
- pH
- calcium hardness (or total hardness)
- sanitizer (chlorine, bromine, salt or sanitizer of choice)
- cyanuric acid

Alkalinity chemicals

- alkalinity increaser (sodium bicarbonate)
- alkalinity decreaser (sodium bisulfate or pre-diluted muriatic acid)

pH chemicals

- pH plus (sodium carbonate)
- pH minus (sodium bisulfate or pre-diluted muriatic acid)

Calcium chemicals

- calcium increase (calcium chloride) or hardness increaser

Sanitizer chemicals

- chlorine (tablets or sticks), if your pool is set-up for chlorine
- bromine (tablets or sticks), if your pool is set-up for bromine
- salt, if your pool has a salt generator

Cyanuric acid

- cyanuric acid is available in a granular form

Shock chemicals

- liquid chlorine
- granular chlorine

Diatomaceous earth (D.E.)

- always replenish D.E. filters with diatomaceous earth after backwashing

Algaecides

- available by the quart

Clarifiers

- available by the quart

Stain and scale preventer

- available by the quart

Water Chemistry Basics

The first step in water chemistry is to be in the habit of testing your pool water at least 2 times a week and, on occasion, taking a sample of your pool water to a pool dealer for an in-store test. The second step is to have on-hand a fresh test kit as well as the "Must-Have Chemicals" as itemized in the previous section.

NOTE: most test kits have a shelf-life of no longer than 12 months.

#1: Alkalinity level

Test and adjust total alkalinity

- total alkalinity is a measurement of the water's ability to neutralize acids and bases
- proper alkalinity level helps stabilize pH, so, get total alkalinity in-range prior to adjusting pH
- test alkalinity and adjust to 80 to 120 ppm (parts per million) for plaster and concrete pools
- test alkalinity and adjust to 125 to 150 ppm (parts per million) for vinyl liner and/or fiberglass pools

Low alkalinity will cause volatility with your pH level

- add alkalinity rise (sodium bicarbonate) to increase alkalinity

High alkalinity (rare) will cause your pH level to be rigidly fixed and may cause scale and cloudiness

- add muriatic acid or sodium bisulfate to decrease alkalinity, or drain and replace some of pool water

NOTE: sodium bisulfate can discolor plaster where the granular rests; first, dilute granular in bucket of water (always follow product label instructions)

#2: pH level

Test and adjust pH

- pH represents the acid or basic-content of water
- pH of 7 is neutral; pH less than 7 is acidic; and, pH greater than 7 is basic
- test pH and adjust level to 7.2 to 7.6

Low pH means that your water is too acidic and will cause damage to plaster and especially equipment

- add pH plus (sodium carbonate) to increase pH level

High pH means that your water needs acid

- add pH decreaser (sodium bisulfate) or pre-diluted muriatic acid (Hydrochloric acid) to decrease pH

NOTE: sodium bisulfate can discolor plaster where the granular rests; first, dilute granular in bucket of water (always follow product label instructions)

#3: Calcium hardness (total hardness)

Test and adjust calcium hardness:

- the calcium hardness level affects the plaster surface
- test calcium hardness and adjust to 200 to 400 ppm (parts per million)

#3: Calcium hardness (total hardness) cont.

Low calcium water will pull calcium from the plaster and cause etching and roughness

- add calcium chloride to increase calcium hardness

High calcium (rare) water may cause scale formation and cloudy water

- drain and replace some of the pool water to decrease calcium hardness

#4: Chlorine level

Test and adjust chlorine:

- chlorine sanitizes and disinfects water by preventing algae and destroying bacteria, it also oxidizes dissolved matter
- add chlorine to a achieve an ideal level of 1.5 to 2.0 ppm (parts per million)

NOTE: granular chlorine can discolor plaster where the granular rests; first, dilute granular in bucket of water (always follow product label instructions)

#5: Cyanuric acid level

Test and adjust cyanuric acid:

- cyanuric acid is a chlorine stabilizer and protects it from being destroyed by the sunlight
- ideally, should be 30ppm to 50ppm

Low cyanuric acid will cause the chlorine to be consumed by the sun's ultraviolet rays

- add cyanuric acid to increase cyanuric acid level; cyanuric acid to be added slowly only at the skimmer(s)

High cyanuric acid can bind the chlorine and render it ineffective

- drain and replace some of the pool water to decrease cyanuric acid level

#6: Shock (super-chlorination)

Swimmers bring elements – perspiration, deodorant, saliva, urine, mucous, suntan lotion, hair products, etc. – into the pool water which combine with chlorine to form chloramines. These chloramines reduce the efficiency of the chlorine and, subsequently, can cause swimmer irritation.

Shocking a pool with liquid chlorine or granular shock will remove the chloramines and also destroy accumulation of algae and bacteria. Weekly shocking is universally recommended but left to the discretion of the pool owner.

#7: Algaecides

While there are many different types of algae, they all are microscopic plants which are introduced to the pool by swimmers, rain, wind, etc. Sunlight and nitrogenous materials stimulate their growth so that algae can take-over a pool quickly and, thereafter, be expensive and burdensome to treat, e.g. green algae, yellow (aka mustard) algae, pink algae, and black algae.

It's important to understand that algae and bacteria feed each other naturally. Algae takes-in carbon dioxide and gives-off oxygen, and bacteria takes-in oxygen and gives-off carbon dioxide. The key is to prevent it in the first-place by adding algaecides on a regular basis in addition to proper chlorination and weekly shocking.

#8: Clarifiers

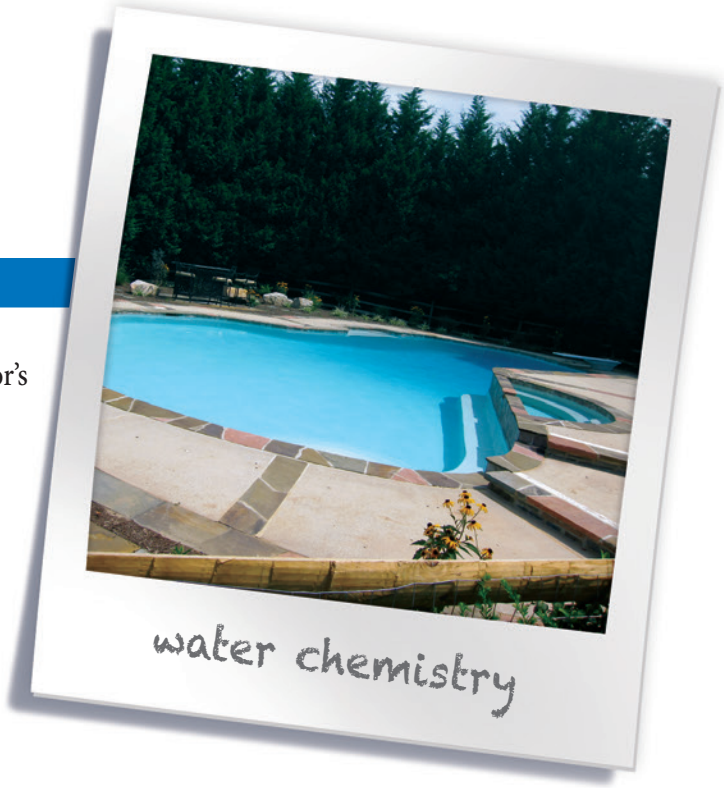
Water clarity has an impact on the appearance of the water, prevention of disease, and swimmer welfare. Because cloudy water can harbor bacteria and viruses which in-turn can cause human symptoms such as earaches, pinkeye, rashes, etc., cloudy or discolored water is a condition which makes swimming less desirable as well as unhealthy.

Water clarity is achieved through the filtration system which removes large particulate matter like dirt, skin flakes, algae spores, bacteria, fertilizers, and other debris. However, the smaller particulate matter, such as oils and lotions, will pass-through the filter and return to the pool. Clarifiers essentially coagulate these oils, lotions and smaller particulate matter into a larger mass which the filter then effectively removes. Adding a clarifier on regular basis will help ensure clear and clean pool water.

#9: Stain and scale preventer

Surface stains are typically caused by metals in the pool water and other metallic impurities introduced to the pool by groundwater (via garden-hose), rainwater, toys, swimmers and the like. Iron, copper, and manganese are the most common metals found in municipal water, well water and rainwater.

The other source for metallic impurities is corroded pool equipment such as heaters, ladders, and pool lights. Low pH or total alkalinity can cause corrosion of these metal-based components and in-turn produce copper and iron metal particulates. Adding a stain and scale preventer on a regular basis will help prevent metallic stains as well as scale.



#10: Phosphate remover

Mostly a concern for chlorine generator pools (employing salt), high levels of phosphate can retard or stop the generator's production of chlorine. Phosphates can be introduced to the pool water via swimmer, dirt, fertilizers, hair products, and even pool chemicals (containing tri-sodium phosphate or polyphosphates). Signs of high phosphate include cloudy water and lack of chlorine residual.

Measured in ppb (parts per billion), the ideal phosphate ppb range should be 200 to 500 ppb. For chlorine generator pools, monitoring the phosphate level on a regular basis is recommended as is adding a phosphate remover as needed.

Additional Informative Guides

Please reference additional guides at www.aquathority.com

- Pool Renovation Guide
- Warranty Policy Guide
- Pool Repair Guide
- Safety Cover Guide
- New Plaster Guide

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