**Water Balance**

Water Balance aka water chemistry is the most important part of pool maintenance to keep a safe, clear and all of your pool equipment in working order. Homeowners should regularly test and control the pH, total alkalinity and hardness in order to maintain balanced water.

Includes all of the following:

1. Sanitizer (chlorine, salt system ionizer)
2. pH
3. Total Alkalinity
4. Total Hardness
5. Total Dissolved Solids (TDS)
6. Stabilizer

**Sanitation**

Most used chemical for this is Chlorine or a salt system which produces chlorine. An Ionizer is becoming popular but must be used in conjunction with chlorine.

This chemical kills pathogens making the water safe for swimming.

Chlorination both sanitizes and cleans the water by oxidizing organic impurities. A free chlorine residual of 1.0-3.0 ppm (pounds per million) is preferred. Combined Chlorine should not exceed 0.5 ppm and could be destroyed with too much chlorination.

Check the capacity of your salt system more is not always better. It creates corrosive sodium hydroxide as well as chlorine, which will make the pH go out of balance.

**pH**

The most fragile and arguably the most important component of water balance is pH, a reading that indicates how acidic or basic the pool water is.

The pH of the water has a definite effect on the efficiency of chlorine as well as on the corrosive properties of water.

Free Chlorine is most efficient at 7.2 – 7.4, combined chlorine is useful but not in high amounts and is what causes the chlorine smell.

Ionized pools pH ideal range is 6.9-7.1 to keep water balanced.

Water that is not balanced – too acidic (lower numbers 6.9 or basic higher numbers 7.6) – can cause swimmer discomfort, cloudy the water and cause damage to the pool or pool equipment.

Properly balanced water or saturated water prevents damage to the pool and equipment.

Unsaturated water (acidic) corrodes fiberglass walls, fixtures, plumbing, etc. This also causes metal staining.

An oversaturated water (basic) deposit scales (calcium) or becomes cloudy.

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| **High pH Indications** | **Low pH Indications** |
| Poor Sanitation of water  Cloudy water  Shorter filter runs  Calcium scale formation  Skin and Eye irritation | Poor sanitizer efficiency  Etched or stained walls  Corroded metals/equipment  Skin and Eye irritation  Destruction of Total Alkalinity |

In addition to the effects of pH on chlorination process, it also affects the total alkalinity of water. This plays a major role in the degree of calcium carbonate saturation (hardness of water).

**Total Alkalinity**

Is a measure of the pH-buffering capacity, or the water’s resistance to a change in pH. This ability to resist change in pH is due primarily to the presence of the family of carbonate ions, but certain other compounds also provide buffering.

Alkalinity is a pH “stabilizer”. It keeps the pH within the proper levels so that the chlorine can work effectively. The Level should be between 80-140 ppm for pools and 80-120 ppm.

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| **High Total Alkalinity** | **Low Total Alkalinity** |
| Hard to change pH  Scale Formation  Cloudy Water  Skin and Eye Irritation  Poor sanitizer efficiency | Rapid changes in pH or “pH Bounce”  Stained, etched or break down of gel coat  Corroded metals/equipment  Skin and Eye Irritation |

The relevance to pH is that the amount of alkali (hardness) in the water will determine how easy it is for changes in pH to occur.

If the alkalinity is too low (below 80ppm) there can be rapid fluctuations in pH – for example there is insufficient ‘buffer’ to the pH. High alkalinity (above 200 ppm) will result in the water being too ‘buffered’ – it will make it difficult to adjust or correct the pH.

The carbonite ions have a special role in water saturation. The operator must control both the amount of carbonate alkalinity and the pH to provide enough calcium carbonate to saturate the water without having so much that scale forms.

Total alkalinity and pH are related to water balance because, at low-pH (acidic) conditions, all the carbonate ions are converted to bicarbonates. There is no calcium carbonate formed and water becomes aggressive to the pool walls and equipment. At high-pH (basic) conditions, too much carbonate is formed and even the smallest amount of calcium ion present precipitates, causing cloudy water or scale to form. At normal pH conditions (7.2-7.4) most of the carbonate ions are in the bicarbonate to provide buffering.

**Water Hardness**

Water hardness is a concentration of the calcium and magnesium in the pool and spa water. This is dependent on your water source.

Calcium hardness is the amount of dissolved calcium (plus other minerals, magnesium) in the water. If you see calcium scaling up the pipework or surface of the pool IT IS NO LONGER DISSOLVED and there for you have too much calcium. Too little could lead to the water satisfying its appetite for calcium **by taking it from your grouting.**

Like pH and alkalinity, calcium hardness affects the tendency of water to be corrosive or scale forming. The calcium carbonate will precipitate (drop out) of the water and adhere to pool walls.

The acceptable max calcium hardness depends on the amount of total alkalinity needed for pH buffering. If a particular pool tends to change pH rapidly, high total alkalinity (over 100ppm) is needed. Calcium hardness should not exceed 400-600ppm, depending on the pH and temperature of water.

Some pools pH does not drift and calcium hardness becomes less a factor.

Controlling Calcium Hardness

Increase – calcium salt – 10 pounds per 10,000 gallons of water to raise to 80ppm

Decrease – remove water and add fresh water

**Total Dissolved Solids (TDS)**

This means absolutely everything dissolved in the pool and spa water, from metals to chlorine to alkalinity to sulfates and salts. Acceptable range is between 1000-2000ppm.

High TDS – at 1500 ppm water-supply level – can reduce chlorine efficiency by as much as 50%. Evaporation can lead to high TDS, adding fresh water will help.

**Stabilizer**

This chemical forms a protective bond around chlorine, making it more resistant to being burned off by the sun. Pools should be stabilized whenever large amounts of fresh water are added. The level should be 35ppm and is adjusted by adding cyanuric acid.

It is recommended that cyanuric acid level be 30-50ppm.

**Good water chemistry can only be achieved when all four of the chemical levels are kept constant. Good Alkalinity helps keep the pH in the right range so that chlorine can do its job properly. Stabilizer keeps more of the chlorine in the water instead of it being wasted = crystal clear pool.**

**Regular testing (analyzing) of pool water is a critical part of any maintenance routine.**

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|  | **Unit** | **Minimum** | **Ideal** | **Maximum** |
| **Free Chlorine** | ppm | 1.0 | 1.0-3.0 | 3.0 |
| **Combined Chlorine** | ppm | None | None | 0.2 |
| **pH** |  | 7.1 | 7.2-7.4 | 7.6 |
| **Total Alkalinity** | ppm | 60 | 80-100 | 120 |
| **TDS** | ppm | 300 | 1000-2000 | 3000 |
| **Calcium Hardness** | ppm | 150 | 200-400 | 500 – 1000+ |
| **Cyanuric Acid** | pmm | 10 | 30-50 | 150 |

**Five Errors Commonly Made**

One – Not running filter long enough for it to do its job and filter maintenance – clean it or back wash it.

Two – keeping pH within ideal limits

Three – Support products such as boride, enzymes and sequestering agents to help maintain the pool water

Four – Leaves and acorns can cause havoc on water balance

Five – Using well water without balancing water chemistry or using sequestering agents