Insta-TEST® 5

Pool and Spa Owner's Handbook

LaMotte

Insta-Test 5 Pool and Spa Owner's Handbook

Congratulations on selecting the easiest way to obtain reliable water test results. The Insta-Test 5 test strips were developed specifically for use in pool and spa water by the first company in the United States to produce field test kits for pH. Since 1919, the LaMotte Company of Chestertown, Maryland has played a key role in developing simplified methods to help professional analysts monitor water quality. The Insta-Test strips are simple and convenient for anyone to use, with the best available analytical chemistry.

To learn more about our company's professional products you can visit our website at www.lamotte.com or learn more about our test strips at www.lamotte.com/insta. Please note that the information in this manual is also on our website. If you ever misplace this valuable reference just look on the Insta-Test 5 strip label to find our website address.

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Chapter 1

WHY YOU SHOULD TEST THE WATER

The two most important reasons to test the water:

#1 To protect the bather

The goal of every pool and spa owner is to have sparkling, clean water. Unfortunately, a variety of undesirable substances will often enter a pool or spa. Such items can make the water unhealthy. There are bacteria on every person's body that can get into water; some forms can cause infections or rashes. Bather perspiration and urine break down to undesirable nitrogen compounds and "Mother Nature" can also contribute: rain, algae spores, leaves and other organic materials. All of these necessitate the use of a sanitizer, such as chlorine. The Insta-Test 5 color chart shows the ideal range for free chlorine and total chlorine in swimming pools. Spa owners should keep in mind that the ideal free chlorine range in spas (hot tubs) is between 2 and 4 ppm.

#2 To protect the pool or spa

Everything that the water contacts is affected by the chemistry of the water itself. The surfaces of the pool or spa, the heater, the filter, the steps, and the pump can be damaged if the water is either corrosive or scale forming. The goal of the water analyst is to keep the water "in balance" so it does not damage the pool and its equipment. By maintaining each test factor of pH, alkalinity, and hardness within the "Ideal Range" [shown on the test strip color chart] the water will not harm the pool or spa surfaces and components.

Additional reasons to routinely test your water:

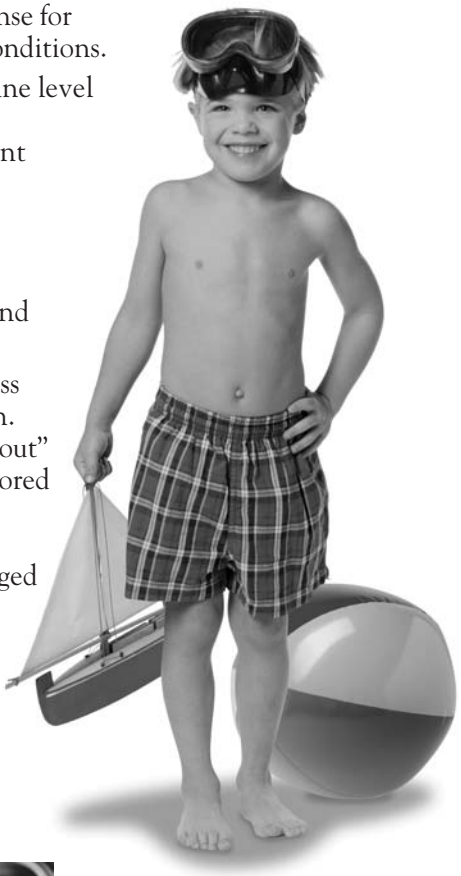
In addition to the obvious goal of determining what treatment chemicals are needed to protect the bather and the pool there are many other good reasons to test the water.

How much treatment chemical to add - By testing the water and using the treatment tables found in the back of this book (or on the chemical product label), the analyst can closely predict how much treatment chemicals are needed. This testing avoids a costly overdose of chemicals that can create larger problems than the original one.

Total Alkalinity - To avoid undesirable changes in the pH level the alkalinity must be maintained in the ideal range (near 100 ppm). Total alkalinity helps to stabilize the pH of the water so that chemical treatments or environmental conditions will not rapidly raise or lower the pH to a damaging level. Such changes can also occur after adding large doses of chlorine, since one form of chlorine may have a very low pH while another a very high pH. If the pH of your source water is high or low, consult with a pool professional to select a type of chlorine or sanitizer that makes sense for your water and the environmental conditions.

Total Chlorine - If the total chlorine level ever exceeds the free chlorine level, a superchlorination or shock treatment is needed. High total chlorine levels indicate that undesirable ammonia or nitrogen compounds have "combined" with the free chlorine to make the sanitizer much less active and create odor and swimmer irritation.

Total Hardness - When a hardness level is too low, it can cause corrosion. If it is too high, it can settle or "drop out" of solution as chalky white or tan colored deposits on component surfaces. These deposits, often referred to as "scale," could eventually lead to clogged pipes, or damaged motors, heaters, and filters.



Chapter 2

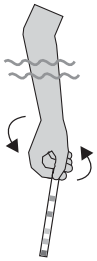
USING THE 5-WAY TEST STRIP

It is important to carefully read the instructions on the test strip bottle for proper use. In order to consistently obtain accurate results, there are several tips that help the user. For example, the reason the instruction says to read the strip starting with chlorine (Cl) at the top is because the pH and hardness pads need a few extra seconds to fully develop (about 10 to 15). By the time the strip is removed from the water and the initial three test factors are carefully read, the colors for pH and hardness are ready for evaluation.

Note: a color that appears on the strip may be between two color chart values. If this happens, record the result as a number in between the values shown.

Note: the magenta (hot pink) values represent the bromine test results, and are found just below the free chlorine values printed in black. Below are explanations as to why some of the instructions and tips are important to follow.

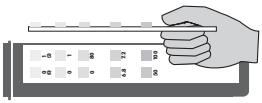
Instruction:



1. Immerse strip. **SWIRL 3 TIMES** or **DIP** according to directions on bottle.

Why? Exposes each pad to the correct amount of pool/spa water.

2. Remove with pads face up.



Why? Hold strip level to avoid reactant from one pad running into another pad.

3. DO NOT SHAKE OFF EXCESS WATER. Read immediately Cl->TCl-> etc.

Why? This could shake off the colored reaction. Read the pads reactions in sequence to allow the proper reaction time for each pad.

Tips

Keep wet fingers out of the bottle.	Strip pads will react if they get wet so shake out a strip and pick it up with dry fingers.
Close vial tightly after removing strip.	To keep moisture out of bottle press down the center of the cap to seal it quickly after removing a strip.
Immerse strip to a depth of 12"-18".	In pools, this assures a representative sample of the pool water and not just the surface where evaporation takes place. In spas, swirl with the jets not running.
Read in natural daylight.	Sodium vapor light bulbs can make color matching difficult.
Store in a cool, dry place.	Indoor is best, since extreme heat and moisture could reduce the shelf-life of the strips.

The PopTop Vial

The unique PopTop vial comes with a molded desiccant sleeve insert. This eliminates the need for a desiccant pillow and provides more protection for strips from moisture intrusion. Do not remove the sleeve. A properly closed vial is 100% leak proof and airtight.

Simple Do's and Don'ts

In addition to the important tips on the bottle here are some key DO's and DON'Ts to remember.

DO's

1. Use the test strip "on-site" and swirl in a one-foot circle.
2. Always read the result promptly after swirling and lifting it level from the water.
3. Always remove sunglasses since they can make color matching more difficult.

Don'ts

1. Never dip the strip next to a make-up water inlet, return line or a chemical feeder.
2. Never test the water prior to one complete filter cycle after a large amount of chemical has been added.
3. Never swirl a strip in spa water with the air jets running.

Chapter 3

THE ROLE OF EACH PRIMARY TEST FACTOR

Sanitizers - Protecting the Bather

A sanitizer must work quickly and efficiently to keep the water environment just as healthy for 2 bathers as for 200 bathers. There are many sanitizing systems available. The most common pool sanitizer is chlorine and the most common spa sanitizer is bromine. Both sanitizers are excellent oxidizers, which means they destroy or "burn out" contaminants in the water. There are "alternative" sanitizers available which use small amounts of chlorine or bromine to support their system and some that do not use chlorine or bromine at all. For the pool professionals that recommend small amounts of chlorine or bromine be present, just maintain a test result on the free chlorine pad with a very faint pink color. If the pad shows a light yellow color, the result is zero and more sanitizer is needed.

CHLORINE

When chlorine enters the water, it is in a form that is an active sanitizer and an oxidizer called "free chlorine". It will react with any number of contaminants in the water. When it reacts with ammonia compounds in the water, which come from bathers' perspiration and urine, it becomes "combined chlorine". In this form, chlorine is a much slower sanitizer. This form also causes chlorine odor and eye irritation. When using the 5-way strip, the difference between the free chlorine reading (pad 1) and the total chlorine reading (pad 2) is the combined chlorine reading.

When the total chlorine reading is higher than the free chlorine reading, it is time to oxidize or destroy the combined chlorine. The simplest way is to increase the chlorine level in the pool to 10 ppm. This higher level of chlorine will oxidize or eliminate the combined chlorine and is called superchlorination or shock treating. Use the chlorine treatment table found in the back of this book to determine how much chlorine should be added based on the volume of water in your pool or spa.

There are also non-chlorine shocks available, such as potassium monopersulfate and sodium dipersulfate. These will eliminate combined chlorine. Keep in mind that these non-chlorine shocks are oxidizers only, not sanitizers. Chlorine or bromine must be added to maintain an adequate level of sanitizer.

Stabilizing your Free Chlorine

In an outdoor swimming pool, the use of a chlorine stabilizer (cyanuric acid) is usually recommended to reduce the degradation of free chlorine by sunlight. Cyanuric acid acts like a shield for chlorine from ultraviolet light. It can be added by itself, usually at an initial dose of 30-40 ppm, or cyanuric acid can be added as part of a chlorine compound. Two forms of chlorine that contain cyanuric acid are known as Sodium Dichloro-s-triazinetrione Dihydrate (dichlor) and Trichloro-s-triazinetrione (trichlor). When these are added to water, they form free chlorine and cyanuric acid. Since trichlor has more active stabilizer and chlorine it usually costs more.

There are three common unstabilized forms of chlorine. They are sodium hypochlorite (liquid bleach), calcium hypochlorite(cal-hypo) and lithium hypochlorite. These are normally used for indoor pools, superchlorination treatments or when cyanuric acid levels are too high.

Chlorine Demand

The National Spa and Pool Institute defines chlorine demand as "the amount of chlorine that will be consumed by readily oxidizable impurities in water". In simpler terms, if a 3 ppm dosage of chlorine is added and is promptly tested to find only 2 ppm is on hand, the water had a 1 ppm demand. Many things contribute to chlorine demand such as bacteria, organics (like dirt and leaves), fertilizers (including nitrate and phosphate), and bather wastes. When opening a pool in the spring or after a heavy storm, expect higher than usual chlorine demands. Once the demand is met, the remaining free chlorine residual is there to take care of the additional demand.

The ideal free chlorine range for pools is 1-3 ppm and for spas is 2-4 ppm.

Chlorine Treatment Compounds

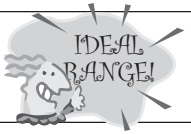
Trade Name(Proper Name)	% Available	
	Chlorine	pH
Liquid Chlorine (Sodium Hypochlorite)	12%	13.0
Litho (Lithium Hypochlorite)	35%	10.7
Cal Hypo (Calcium Hypochlorite)	65%	11.8
Dichlor (Sodium Dichloro-s-triazinetrione Dihydrate)	56%	6.0
Dichlor (Sodium Dichloro-s-triazinetrione Anhydrous)	62%	6.0
Trichlor (Trichloro-s-triazinetrione)	90%	3.0

BROMINE

There are two types of bromine systems. One type is a solid tablet form that is added to a skimmer and feeds sanitizer into the passing water as it slowly dissolves. It contains both bromine and chlorine. The function of the chlorine is to make more bromine when none remains. The second type uses a bromide salt which requires the addition of a separate oxidizer such as chlorine, ozone or non-chlorine shock.

When bromine is added to water, it forms free bromine. Like chlorine, free bromine can also combine with ammonia compounds, but the combined bromine reacts as quickly as free bromine. Thus, there is no need to distinguish between free and combined bromine. A bromine system should be shocked with 10 ppm of chlorine periodically. Spa owners may need to do this frequently. Check with your local chemical supplier for advice.

Determine bromine readings by using pad 1 on the test strip. Note: the magenta (hot pink) values represent the bromine test results, and are found just below the free chlorine values printed in black.



The ideal range for bromine in pools and spas is 3-6 ppm.

pH

Water Balance - Protecting the Pool or Spa

pH is the measure of the acidity of the water. The pH scale extends from 0 to 14 with 7 being neutral. As the pH moves lower than 7.0, the water becomes more acidic and tends to be corrosive; as pH moves up higher than 7.0, the water becomes less acidic (or more basic) and could lead to a scale forming condition.

Since most water has the tendency to either corrode or leave small, crusty "scale" deposits, it is important to properly balance the factors of pH, total alkalinity and hardness. Depending on where you live, the water can contain a variety of minerals. These minerals directly affect whether the water will corrode, scale or be in balance. In addition to pH, total alkalinity and calcium hardness, temperature plays a role in water balance and must be considered when determining ideal levels in pools or spas. The reason is because in warmer water a substance called calcium carbonate tends to fall out of solution more rapidly, thus leaving behind scale deposits. For example, in 60°F (16°C) pool water, a good practice would be to keep the pH level closer to 7.6 if the alkalinity and hardness are in the ideal range. In 80°F (27°C) pool water, a pH of 7.3 would be best. A professional pool and spa retailer can provide a "saturation index" calculation to target your ideal pH level.

Note: a high pH level (above 7.8), will inhibit the ability of free chlorine to sanitize water efficiently. If your water source has a high pH, the form of chlorine selected can actually help to lower the pH. (For example: If your water source is a pH of 8.2 you may wish to use Trichlor since it has a pH of 3.0). For several reasons, including bather comfort, the ideal pH of pool or spa water is 7.2 - 7.6.

When using the 5-way strip, read pad 4 to determine pH. Keep your results in the orange, ideal range, colors. If the color turns yellow, add pH increaser as shown in the charts at the end of this book. If the pH is not up to the ideal range within 24 hours, add more pH increaser or consult a local pool professional (the pH could be far below pH 6.8 and in need of serious attention). If the pad turns red, add pH decreaser to bring the pH down into the ideal range. The same process should be followed if the pH remains high after you have added pH decreaser, continue to add more or consult a professional. Note: if the pH test pad ever turns purple it means the chlorine or bromine level is well above 10 ppm. Bathers should not enter the water until the chlorine or bromine level is below 10 ppm.

If pH Is Too LOW (Acidic)

- corrosion of pool equipment/staining
- swimmer eye irritation
- etching plaster pool surfaces
- chlorine dissipates quickly

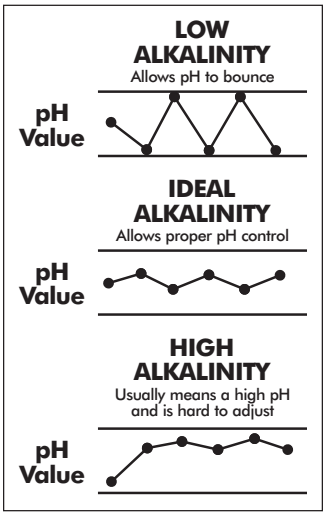
If pH Is Too HIGH (Basic)

- scale accumulates on pool equipment
- cloudy, turbid water
- sanitizing power of chlorine is weakened
- swimmer eye irritation

The ideal pH range for pools and spas is 7.2 - 7.6.

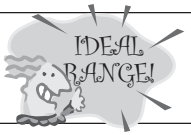
TOTAL ALKALINITY

Total alkalinity refers to the buffering capacity of the water or how well the water can resist changes in pH. If the alkalinity is too low, the pH could potentially change daily. This is known as "pH bounce" and leaves the pool and spa water vulnerable to pH problems from chlorine treatments, environmental conditions and even from fresh make-up water. Low alkalinity water will tend to be corrosive, thus eroding pool surfaces and equipment.



If the alkalinity level is too high, the pH may also drift to a very high level. Then, it is very difficult to reduce the pH and the water may be cloudy and prone to scaling.

When using the 5-way strip, use pad 3 to determine the total alkalinity reading. Try to keep results in the blue-green color range and treat the water promptly if it falls outside the ideal range. Note: when raising or lowering the alkalinity level, the pH of the water will also be affected respectively. Be sure to check the pH level carefully within 24 hours after any significant alkalinity treatment.



The ideal alkalinity range for pools and spas is 80 -120 ppm (100-150 if using cyanuric acid).

TOTAL HARDNESS

Total hardness refers to the level of dissolved calcium and magnesium in the water. The most common contributor of hardness is from the source water used to fill or top off the pool or spa. Other sources include forms of chlorine, such as calcium hypochlorite, and the intentional addition of calcium chloride. Owners of plaster pools should make concerted efforts to avoid low hardness levels especially when opening a new pool. Water is naturally, a "universal solvent" and if the hardness level is too low, the plaster can be rapidly dissolved from the pool walls. In other types of pools or spas it is important to keep hardness levels within adequate ranges in order to prevent etching or dissolving other hardware components, such as heaters and plumbing.

If the hardness level is too high, the water can become cloudy and scale may form on pool surfaces and equipment. Scale will appear as small white deposits at the water level on walls, ladders, and numerous other places that the owner may not see. If left uncorrected, scale can clog pipes and filters, as well as damage heaters.

Fortunately, there is a point where water is not corrosive or scale forming. By keeping the hardness, alkalinity and pH factors within their ideal ranges, the water is balanced and the pool or spa will provide many years of trouble-free use.

When using the 5-way strip, read pad 5 (near the handle) to determine the total hardness level. Note: this pad is the last to be viewed so allow 10-15 seconds after dipping before reading the result. If hardness is too high, the best option is to dilute it with fresh water that is low in hardness. If the hardness level is too low, add calcium chloride to the pool or spa as recommended in the treatment tables in the back of this book. Carefully read the precautions for use since mixing calcium chloride and water in a bucket can generate a very warm solution.

The ideal total hardness range for pools is 250-500 ppm and spas is 200-350 ppm.

Chapter 4

THE IMPORTANCE OF OTHER WATER TEST FACTORS

The following test factors may occasionally be a factor in your water management program. Learning about them will make it easier to understand why a pool professional may be asking you to take action to protect your pool or spa from an undesirable water condition. Except for temperature, most of these tests are done solely by pool pros either in a retail store or on-site. This chapter will also help the pool or spa owner identify what symptoms may lead to future problems. See also, the Trouble-Shooting Water Problems guide in chapter 5.

CYANURIC ACID

Cyanuric acid is used to protect chlorine from UV degradation by sunlight. In sun-belt regions, higher levels of cyanuric acid are common due to the user's eagerness to protect their chlorine and because cyanuric acid does not dissipate by itself. The only way to reduce cyanuric acid levels is by adding fresh water. Since health agencies feel high levels of cyanuric acid may inhibit the reactivity of free chlorine, most pool owners are directed to stay below 150 ppm. Cyanuric acid levels should be tested monthly, especially if free chlorine is rapidly lost or the pool has been on dichlor or trichlor (chlorines that contain cyanuric acid) for a year or more.

The ideal range for cyanuric acid in pools is 30 -100 ppm - regional needs vary.

TEMPERATURE

While water temperature is an important comfort factor for bathers, it can also play a small role in accelerating corrosion or scale formations. In warmer water, calcium carbonate is more likely to precipitate out of solution and contribute to a scale forming condition. At colder temperatures, water is more prone to corrosion if it does not have adequate calcium carbonate. When visiting a pool store to get a comprehensive water analysis, be sure to read your thermometer when taking the pool sample since the temperature of the water is factored into what is calculated as the saturation index. The saturation index is a numerical assessment of the potential for the water to cause corrosion or deposit scale.

The ideal temperature range for pools is 75-85° and spas is 95-104°.

TOTAL DISSOLVED SOLIDS (TDS)

A total dissolved solids reading indicates the amount of dissolved substances or minerals in the water. These come from the original water supply and from treatment chemicals. As water evaporates, the dissolved solids remain and over time continue to increase. A high dissolved solids level can lead to corrosion. If the water exceeds 2,000 ppm, investigate ways to replace a portion of the water supply. Most pool stores have a dissolved solids meter designed to measure TDS in seconds.

The ideal TDS range for pools and spas is less than 2,000 ppm (for salt water pools consult a pool professional).

METALS (copper, iron, manganese)

The levels of metals in water are monitored to avoid colored water and stains on pool or spa surfaces. Since stains from dissolved metals are troublesome to remove, most pool professionals like to test for at least copper and iron in the spring or several times a year as a precaution. Copper will tend to stain surfaces (including hair) blue-green and can cause water to become a tint of aquamarine after a high chlorine dosage. Iron can leave stains of a brown or rusty color and can turn water green or brown following a chlorine dose.

Manganese is much more rare than copper or iron, but can leave behind blackish specks on the walls and components. Pool professionals normally recommend metal sequestering agents to remove unwanted metals before problems start. Note: some sanitation systems use copper treatment compounds to inhibit algae growth. When those forms of copper are properly maintained or chelated (bound in a form that cannot fall out and cause problems), copper can provide a useful service. Most pool stores have ways to test for metals, but remember that the analysis may take several minutes.

The ideal level of metals for pools and spas is less than 0.3 ppm for each.

NITRATE AND PHOSPHATE

The combination of nitrate and phosphate is the building block for algae. Fortunately, if one is eliminated the other cannot produce algae on its own. Large amounts of nitrates can cause other problems, such as increases in chlorine demand. For example, an enormous amount of chlorine is added in the morning, and is gone by the afternoon. This occurrence is more common in seasonal pools that have just been reopened because nitrates can enter the water from leaves or debris that were recently removed. Other sources of nitrate intrusion come from well water supplies and localized spraying of garden or crop fertilizers.

Since nitrates can only be removed by draining the water, some manufacturers have focused on removing the other algae nutrient, phosphate. A variety of phosphate removal systems have been introduced to eliminate the potential for algae. Phosphates can enter the water from municipal water supplies (where they are used for corrosion and metal control) and from some forms of metal sequestering agents (as the organic phosphate called phosphonate breaks down to ortho-phosphate). By maintaining a constant level of 1.0 ppm or higher of free chlorine in the pool or spa, algae should normally not be a problem. If algae develops, promptly see a pool professional.

The ideal range for pools and spas is less than 10 ppm nitrate and less than 100 ppb phosphate.

Chapter 5

TROUBLE-SHOOTING WATER PROBLEMS

ALGAE

Algae is probably the most annoying water problem in outdoor pools, since it is so unsightly and difficult to destroy quickly. In many cases, several treatments and daily brushing may be required to successfully eliminate an algae problem. Algae multiplies rapidly, and by the time the human eye notices it, there are already billions of algae cells in the pool.

Most pool professionals will agree that the two most frequent complaints received about pools are related to algae and cloudy water. Green algae can make a pool especially cloudy. Algae will clog filter systems and make pool surfaces slippery. The three most common colors of algae are green, black and mustard (yellow). The best way to avoid an algae problem is to keep at least 1.0 ppm of free available chlorine circulating throughout the pool water at all times. For persistent algae problems, an algicide may be used.

(See Algae chart on next page.)

ALGAE (continued)

COLOR	GREEN ALGAE	BLACK ALGAE	MUSTARD ALGAE
APPEARANCE	Pea green color. Sometimes colors entire body of water. Also attaches to pool surfaces.	Better known as "black spots" on pool walls & surfaces.	A yellow film usually found on steps or walls.
CAUSES	Insufficient or inactive levels of sanitizer. Inadequate water circulation. High nitrate and phosphate levels.		
TREATMENT	1. Check pH & adjust if necessary.	1. Brush affected areas thoroughly.	1. Brush affected areas thoroughly.
	2. Shock treat pool water.	2. Spot treat affected areas with sanitizer.	2. Spot treat affected areas with sanitizer.
	3. Brush surfaces if necessary.	3. Shock treat pool water & later add algicide.	3. Shock treat pool water or use a specialized mustard algae treatment.
	4. Retest pH & repeat treatments if necessary.	4. Brush & vacuum as necessary.	4. Retest pH & repeat treatments if necessary.

Notes:

1. Always consult a pool professional first if any treatment procedures are unfamiliar.
2. Regular algicide treatments are recommended for outdoor pools that experience persistent algae problems.

CLOUDY WATER

Cloudy pool water is an unfortunate, but common problem in swimming pools. The usual causes of poor water clarity are improper filtration, and/or improperly balanced water. An algae condition, or severe chloramine condition can cause cloudy pool water.

If the water is cloudy, the operator should first check the filter system. If backwashing does not decrease pressure to the normal operational level, the filter may need cleaning. Clean the cartridge and DE filters according to the manufacturer's instructions. Inspect the sand in the sand filter for clumps or air pockets. Consult your local professional if you are not familiar with filter maintenance. (Note: never release pool water to any environmentally sensitive areas.)

After a thorough evaluation of the filter system, the water balance should be checked. Look for signs of high calcium hardness, pH, TDS, and alkalinity levels.

CAUSES	POOR FILTRATION	ALGAE GROWTH	UNBALANCED WATER HIGH	UNBALANCED WATER HIGH
CONFIRMATION	Slow filter turnover rates.	Hazy pool water with slight green appearance.	1. Calcium Hardness.	1. pH.
			2. TDS.	2. Alkalinity.
TREATMENT	1. Backwash & clean filter. Determine if filter media needs replacement.	1. Super-chlorinate & brush pool surfaces.	1. Replace a portion of the pool water with fresh water of lower hardness and TDS.	1. Add dry acid or liquid acid to reduce pH to 7.2 - 7.6 & alkalinity to 80-120.
	2. Run filter for 24 hours.			

Notes:

Consult a pool professional if a cloudy condition persists. The pool professional may recommend repeated treatments or the use of a clarifier.

COLORED WATER

Colorless pool water is everyone's goal, but there are those instances when it is difficult to achieve. Colored water is an ugly nuisance and can result in stained pool surfaces. The two main reasons for colored pool water are oxidized metals and algae. A turbid green pool water condition is usually attributed to algae. To gain a better understanding of algae treatment see the section on algae.

Water color resulting from oxidized metals can come in an assortment of colors, and is mostly translucent in its early stages. Green, red, brown, and black are some of the more common colors produced by dissolved metals. Green color is usually produced by either copper or iron. Red and brown colors are generated by iron. Black/brown pool water is usually caused by manganese.

Often these colored water conditions appear after a pool is initially filled or after a shock treatment. If the fill water contains metals, it should be treated with a sequestering agent and/or clarifier prior to chlorine additions. A shock treatment can cause metals to oxidize, which allows them to fall out of solution and become more visually apparent.

COLOR	GREEN	GREEN	RED/ BROWN	BLACK
CAUSES	Algae, if cloudy.	Iron or copper corrosion or in water supply.	Iron corrosion or in water supply.	Manganese in water supply.
TREATMENT	1. Brush.	1. Adjust pH & alkalinity to recommended ranges.		
	2. Shock treat & brush.	2. Add sequestering agent & run filter.		
	3. Vacuum.	3. Two days later, shock treat the water.		
		4. Retest pH & alkalinity. Also test hardness levels and if necessary, raise to 200 ppm minimum.		

Notes:

Take a pool sample to a pool professional for dissolved metals testing immediately after treatment and at least once a month.

STAINS

When stains appear on swimming pool surfaces, immediate action should be taken to avoid costly and annoying repairs. Brushing can often remove fresh stains if recognized early enough. Neglected stains in plaster pools may ultimately require draining and an acid wash. Like colored water, stains are the result of metal ions in pool water. Stains indicate that either the source water contains metals, such as copper, iron, or manganese, or that a corrosive pool water condition is dissolving metal pool components.

The first step after noticing a pool stain is to determine what caused the stain. This is done by having your local dealer or service professional test the pool water for metals. If the stain is caused by metals, the dealer may recommend either a sequestering agent or clarifier to treat the problem. If metals are present due to improper pH levels, the pH should be adjusted to be within the range of pH 7.2-7.6. If the problem persists, add a sequestering agent or a clarifier that will chemically bind the metals so that they can be filtered out before they cause more staining problems.

COLOR	BLUE/GREEN	RED/BROWN	BLACK
CAUSES	Copper or iron corrosion or from water supply.	Iron or manganese corrosion or from water supply.	Manganese in water supply.
TREATMENT	1. Adjust pH & alkalinity to recommended ranges.		
	2. Vigorously brush the stained areas.		
	3. Add sequestering agent & run filter.		
	4. Two days later, shock treat the water.		
	5. Retest pH & alkalinity. Also test hardness levels and if necessary, raise to 200 ppm.		

Notes:

Take a pool sample to a pool professional for dissolved metals testing 24-48 hours after treatment and at least once a month.

SCALE FORMATIONS

Crusty, white deposits on pool surfaces signal a severely high level of one or more of the water balance factors. Scale deposits not only make pool surfaces rough, but also reduce water circulation as scale builds up within the filter and plumbing system.

If scale deposits are readily noticeable on pool surfaces the pH, calcium hardness, and total alkalinity must be tested and adjusted immediately. Most likely one factor, if not all three, is much too high and needs to be reduced. The first step is to reduce the pH and alkalinity, since reducing the calcium hardness level is more difficult.

If high hardness is the cause of the scale, it is best to drain a portion of the pool water (or all of the water in a spa) and replace with fresh make-up water that is low in hardness and total dissolved solids.

CONFIRMATION	Crusty deposits on pool surfaces.
CAUSES	1. High calcium hardness.
	2. High pH & alkalinity.
TREATMENT	1. Adjust pH and alkalinity to ideal ranges (7.2 - 7.6 & 80 - 120 respectively).
	2. Replace a volume of pool water with water low in hardness. Consult a pool professional to determine the replacement amount.
	3. Use a sequestering agent to prevent scale buildup if high hardness levels are a continuing problem.

EYE & SKIN IRRITATIONS

Eye and skin irritations are another common problem for swimming pool bathers. In addition to such irritations within the water, nasal irritations can also be noticed in indoor pool areas with poor ventilation and excessive levels of combined chlorine, also known as chloramines.

There are two basic causes of eye and skin irritations: improper pH and high chloramines. The human eye is most comfortable in water with a pH of about 7.5. Therefore a low pH, below 7.2, or a high pH, above 8.0 can become quite irritating.

A chloramine problem is caused when combined chlorine levels exceed 0.2 ppm. Though many people incorrectly blame high chlorine for stinging eye irritations, it is actually the presence of chloramines.

CAUSES	High or low pH.	Combined Chlorine.
TREATMENT	Adjust pH to recommended range & retest.	Shock treat or superchlorinate.

FILTRATION

If your water is cloudy, but is in balance, you may want to check your filter. Filters are an integral part of having clean, clear water. As the filter collects materials, the pressure will build. To eliminate the material that has collected, one must backwash the filter. Follow manufacturer's instructions for when and how this is done to assure long filter life.

If you suspect a filter problem, the remedy may be as simple as using a filter cleaner. Beyond this, the remedy may be more involved.

Sand Filters - check the sand for gaps or hard spots and/or replace the sand. Generally, sand should be replaced every 4-5 years.

DE Filters - Soak the "fingers" in a filter cleaner. If the filter is a grid type filter, hose the grids off and inspect them for damage.

Cartridge Filter - Replace dirty cartridges with clean ones and clean the dirty ones for the next replacement.

You may wish to contact your local dealer for advice before investigating a suspected filter problem.

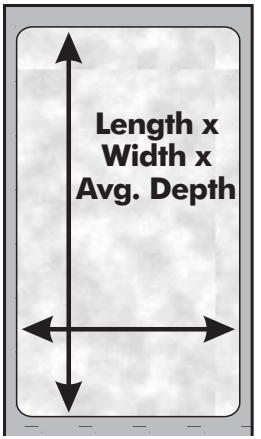
Chapter 6

WATER TREATMENT TABLES

VOLUME CALCULATIONS

Chemical adjustments are vital to proper sanitation and water balance. Since adjustments are based on the volume of water in the pool or spa, it is important to calculate the volume correctly. The following formulas may be used:

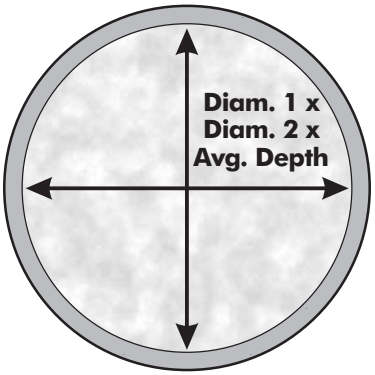
1. Rectangular or square shaped pool



Example 1 (U.S. Customary Units):
length = 40 feet
width = 20 feet
avg. depth = 4.5 feet
volume = (length x width x average depth x 7.5)
40 x 20 x 4.5 x 7.5 = 27,000 gallons

Example 2 (Metric Units):
length = 12m
width = 6m
avg. depth = 1.5m
volume = (length x width x average depth x 1,000)
12 x 6 x 1.5 x 1,000 = 108,000 liters

2. Any circular shaped pool



Example 3 (U.S. Customary Units):
diameter 1 = 20 feet
diameter 2 = 20 feet
avg. depth = 4 feet
volume = (length x width x avg. depth x 5.9) 20 x 20 x 4 x 5.9 = 9,440 gallons

Example 4 (Metric Units):
diameter 1 = 6m
diameter 2 = 6m
avg. depth = 1m
volume = (length x width x avg. depth x 785) 6 x 6 x 1 x 785 = 28,260 liters

3. Circular Spa

Example 5 (U.S. Customary Units):
diameter 1 = 4 feet
diameter 2 = 4 feet
avg. depth = 3 feet
volume = (length x width x average depth x 283)
4 x 4 x 3 x 5.9 = 283 gallons

Example 6 (Metric Units):
diameter 1 = 1.5m
diameter 2 = 1.5m
avg. depth = 1m
volume = (length x width x average depth x 785)
1.5 x 1.5 x 1 x 785 = 1,766 liters

Conversions:

1 ounce (dry) = 28.35 grams
1 ounce (liquid) = 29.57 milliliters
1 teaspoon (dry) = 5 grams
1 teaspoon (liquid) = 5 milliliters
1 pint = 0.4732 liter
1 gallon = 3.785 liters
1 pound = 453.6 grams
1 foot = 0.3048 meter

ADJUSTING pH

It is recommended that dry chemicals first be mixed into a generous amount of water in increments of about two pounds (1 kg), and the predissolved mixture be distributed evenly around the pool unless directed otherwise.

Precautions

- Never add water to chemicals; always add chemicals to water.
- Always follow manufacturer's recommendations and warnings on product labeling.
- Never mix two chemicals together since their pH might vary and could cause an explosion or fire.

A pH range of 7.2 - 7.8 is ideal for pools and spas. Since 7.5 is the midpoint of this range, we have provided the tables below to help in adjusting up or down to this pH. After testing the pH, find the pH in the left hand column and match this with the volume of water in your pool or spa, listed at the top of the table. Since the recommendations are approximate, you may wish to initially add slightly less and wait 4-8 hours to retest the water. Keep in mind that pH adjustments will affect alkalinity.

⇩ Lowering pH to 7.5 with Muriatic Acid*

U.S. Customary Units:

Starting from	100 Gallons		1,000 Gallons		5,000 Gallons		10,000 Gallons		20,000 Gallons		50,000 Gallons	
pH	**—**	**Tsp**	**Pt**	**Oz**	**Pt**	**Oz**	**Pt**	**Oz**	**Pt**	**Oz**	**Pt**	**Oz**
7.6 - 7.8	—	0.75	0	1.3	0	6.4	0	12.8	1	9.6	4	0
7.8 - 8.0	—	1	0	1.9	0	9.6	1	3.2	2	6.4	6	0
8.0 - 8.4	—	1.5	0	2.6	0	12.8	1	9.6	3	3.2	8	0
>8.4	—	2	0	3.2	1	0	2	0	4	0	10	0

Metric Units:

Starting from	400 Liters		4000 Liters		20000 Liters		40000 Liters		80000 Liters		200000 Liters	
pH	**liters**	**mL**	**liters**	**mL**	**liters**	**mL**	**liters**	**mL**	**liters**	**mL**	**liters**	**mL**
7.6 - 7.8	—	4	0	41	0	200	0	400	0	800	2	0
7.8 - 8.0	—	6	0	59	0	300	0	600	1	200	3	0
8.0 - 8.4	—	8	0	81	0	400	0	800	1	600	4	0
>8.4	—	10	0	100	0	500	1	0	2	0	5	0

⇩ Lowering pH to 7.5 with Dry Acid* (Sodium Bisulfate)

U.S. Customary Units:

Starting from	100 Gallons		1,000 Gallons		5,000 Gallons		10,000 Gallons		20,000 Gallons		50,000 Gallons	
pH	**—**	**Tsp**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**
7.6 - 7.8	—	1	0	1.6	0	8	0	16	1	12	5	0
7.8 - 8.0	—	1.5	0	2.4	0	12	1	4	3	8	8	0
8.0 - 8.4	—	2	0	3.2	0	16	1	12	4	4	10	0
>8.4	—	2.5	0	4	1	0	3	0	5	0	13	0

Mectric Units:

Starting from	400 Liters		4000 Liters		20000 Liters		40000 Liters		80000 Liters		200000 Liters	
pH	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**
7.6 - 7.8	0	5	0	48	0	240	0	480	0	840	2	400
7.8 - 8.0	0	7	0	72	0	360	0	600	1	980	3	840
8.0 - 8.4	0	10	0	96	0	480	0	840	2	40	4	800
>8.4	0	10	0	120	0	480	1	440	2	400	6	240

Notes:

*Treatment recommendations are affected by total alkalinity. At low alkalinity levels less acid may be required and at higher alkalinity levels more acid may be required.

⇧ Raising pH to 7.5 with Soda Ash*

U.S. Customary Units:

Starting from	100 Gallons		1,000 Gallons		5,000 Gallons		10,000 Gallons		20,000 Gallons		50,000 Gallons	
pH	**—**	**Tsp**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**
7.2 - 7.4	—	0.4	0	0.6	0	3.2	0	6.4	0	12.8	2	0
7.0 - 7.2	—	0.6	0	1	0	4.8	0	9.6	1	3.2	3	0
6.8 - 7.0	—	0.8	0	1.3	0	6.4	0	12.8	1	9.6	4	0
<6.7	—	1	0	1.6	0	8	1	0	2	0	5	0

Metric Units:

Starting from	400 Liters		4000 Liters		20000 Liters		40000 Liters		80000 Liters		200000 Liters	
pH	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**
7.2 - 7.4	0	2	0	18	0	96	0	192	0	384	0	960
7.0 - 7.2	0	3	0	30	0	144	0	288	0	576	1	440
6.8 - 7.0	0	4	0	39	0	192	0	384	0	768	1	920
<6.7	0	5	0	48	0	240	0	480	0	960	2	400

Notes:

*Treatments in low alkalinity waters require less soda ash while treatments in high alkalinity waters may require more soda ash.

ADJUSTING CHLORINE

It is recommended that dry chemicals first be mixed into a generous amount of pool water in increments of about two pounds (1 kg), and the predissolved mixture be distributed evenly around the pool unless directed otherwise.

Precautions

- Never add water to chemicals; always add chemicals to water.
- Always follow manufacturer's recommendations and warnings on product labeling.
- Never mix two chemicals together since their pH might vary and could cause an explosion or fire.

Best results are obtained by predissolving granular chlorine products, especially if you have a vinyl pool. Trichlor is erosion fed through skimmers or floating passive feeders. Simply add one Trichlor stick or puck. Do not try to break pucks, since these can burn skin.

⇧ Raising Chlorine 1 ppm

U.S. Customary Units:

	100 Gallons	1,000 Gallons	5,000 Gallons	10,000 Gallons	20,000 Gallons	50,000 Gallons
	Tsp	Oz	Oz	Oz	Oz	Oz
Sodhypo*	1	1 oz	7	13	1.5 pt	2 qt
Lithium	¼	0.4	2	4	8	19
Calhypo	1/10	0.2	1	2	4	10
Dichlor†	1/10	0.2	1	2	5	12
Dichlor‡	1/10	0.2	1	2	4	11
Trichlor	—	0.1	1	1.5	3	7

Metric Units:

	400 Liters	4000 Liters	20000 Liters	40000 Liters	80000 Liters	200000 Liters
	grams	grams	grams	grams	grams	grams
Gas	0.4	5	20	40	80	200
Lithium	1	10	55	115	230	570
Calhypo	1	5	30	60	125	310
Dichlor†	1	5	35	70	145	355
Dichlor‡	1	5	30	65	130	325
Trichlor	0.4	5	20	45	90	220
Sodhypo*	3	35	165	335	665	1665

*This is a liquid and the calculation assumes 1 liq. oz. (10%) = 1 dry oz.
† dihydrate form (56%)
‡ anhydrous form (see product label)(62%)

ADJUSTING ALKALINITY

It is recommended that dry chemicals first be mixed into a generous amount of pool water in increments of about two pounds (1 kg), and the predissolved mixture be distributed evenly around the pool unless directed otherwise.

Precautions

- Never add water to chemicals; always add chemicals to water.
- Always follow manufacturer's recommendations and warnings on product labeling.
- Never mix two chemicals together since their pH might vary and could cause an explosion or fire.

Alkalinity should be 80-120 ppm. Once you determine the alkalinity, calculate how much you wish to raise or lower it and find this number in the left-hand column. Match this with the volume of water in your pool or spa, listed at the top of the table. Add the recommended amount to the water in small increments. Since alkalinity adjustments affect pH, you should test the alkalinity and pH 4-8 hours after the chemicals are added.

⇩ Lowering Alkalinity with Dry Acid

U.S. Customary Units:

	100 Gallons		1,000 Gallons		5,000 Gallons		10,000 Gallons		20,000 Gallons		50,000 Gallons	
ppm	**Tsp**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**
10	1.8	—	0	3	1	0	2	0	4	0	10	0
20	3.5	—	0	6	2	0	4	0	8	0	20	0
30	—	1.0	0	10	3	0	6	0	12	0	30	0
40	—	1.3	0	13	4	0	8	0	16	0	40	0
50	—	1.6	1	0	5	0	10	0	20	0	50	0
60	—	2	1	3	6	0	12	0	24	0	60	0
70	—	2.2	1	6	7	0	14	0	28	0	70	0
80	—	2.6	1	10	8	0	16	0	32	0	80	0
90	—	3	1	13	9	0	18	0	36	0	90	0
100	—	3.2	2	0	10	0	20	0	40	0	100	0

Metric Units:

	400 Liters		4000 Liters		20000 Liters		40000 Liters		80000 Liters		200000 Liters	
ppm	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**
10	0	10	0	100	0	480	0	960	1	920	4	800
20	0	20	0	190	0	960	1	920	3	840	9	610
30	0	30	0	290	1	440	2	880	5	760	14	410
40	0	40	0	380	1	920	3	840	7	690	19	210
50	0	50	0	480	2	400	4	800	9	610	24	20
60	0	60	0	580	2	880	5	760	11	530	28	820
70	0	70	0	670	3	360	6	720	13	450	33	620
80	0	80	0	770	3	840	7	690	15	370	38	430
90	0	90	0	860	4	320	8	650	17	290	43	230
100	0	100	0	960	4	800	9	610	19	210	48	30

Notes:

Be sure to note chemical precautions. Always follow manufacturer's recommendations.

⇩ Lowering Alkalinity with Muriatic Acid

U.S. Customary Units:

	100 Gallons		1,000 Gallons		5,000 Gallons		10,000 Gallons		20,000 Gallons		50,000 Gallons	
ppm	**Tsp**	**Oz**	**Pt**	**Oz**	**Pt**	**Oz**	**Pt**	**Oz**	**Pt**	**Oz**	**Pt**	**Oz**
10	1.5	—	0	2.5	0	13	1	10	3	4	8	2.5
20	3	—	0	5	1	10	3	4	6	8.5	16	0
30	5	—	0	8	2	7	4	14	9	12.5	24	0
40	—	1	0	10.5	3	4	6	8.5	13	0.5	32	0
50	—	1.3	0	13	4	1	8	2.5	16	0	40	0
60	—	1.6	0	15.5	4	14	9	12.5	19	0	48	0
70	—	1.8	1	2	5	11	11	6.5	22	0	57	0
80	—	2	1	5	6	8.5	13	0.5	26	0	65	0
90	—	2.4	1	7.5	7	5.5	14	10.5	29	0	73	0
100	—	2.7	1	10	8	2.5	16	4.5	32	0	81	0

Metric Units:

Starting from	400 Liters		4000 Liters		20000 Liters		40000 Liters		80000 Liters		200000 Liters	
ppm	**liters**	**mL**	**liters**	**mL**	**liters**	**mL**	**liters**	**mL**	**liters**	**mL**	**liters**	**mL**
10	0	10	0	80	0	410	0	810	1	630	4	70
20	0	20	0	160	0	810	1	630	3	260	8	140
30	0	20	0	240	1	220	2	440	4	890	12	220
40	0	30	0	330	1	630	3	260	6	520	16	290
50	0	40	0	410	2	40	4	70	8	140	20	360
60	0	50	0	490	2	440	4	890	9	770	24	430
70	0	60	0	570	2	850	5	700	11	400	28	500
80	0	70	0	650	3	260	6	520	13	30	32	580
90	0	70	0	730	3	660	7	330	14	660	36	650
100	0	80	0	810	4	70	8	140	16	290	40	720

Notes:

Be sure to note chemical precautions. Always follow manufacturer's recommendations.

⇧ Raising Alkalinity with Sodium Bicarbonate

U.S. Customary Units:

	100 Gallons		1,000 Gallons		5,000 Gallons		10,000 Gallons		20,000 Gallons		50,000 Gallons	
To Raise ppm	**Tsp**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**
10	1	—	0	2	0	11	1	7	2	13	7	1
20	2	—	0	5	1	7	2	13	5	10	14	1
30	4	—	0	7	2	2	4	4	8	7	21	2
40	5	—	0	9	2	13	5	10	11	4	28	2
50	6.5	—	0	11	3	8	7	1	14	1	35	3
60	—	1.4	0	14	4	4	8	7	16	14	42	3
70	—	1.6	0	16	4	15	9	14	19	11	49	4
80	—	1.8	1	2	5	10	11	4	22	8	56	4
90	—	2	1	4	6	5	12	11	25	5	63	5
100	—	2.3	1	7	7	1	14	1	28	2	70	5

Metric Units:

	400 Liters		4000 Liters		20000 Liters		40000 Liters		80000 Liters		200000 Liters	
ppm	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**
10	0	10	0	70	0	340	0	670	1	340	3	360
20	0	10	0	130	0	670	1	340	2	690	6	720
30	0	20	0	200	1	10	2	20	4	30	10	80
40	0	30	0	270	1	340	2	690	5	380	13	440
50	0	30	0	340	1	680	3	360	6	720	16	800
60	0	40	0	400	2	20	4	30	8	60	20	160
70	0	50	0	470	2	350	4	700	9	410	23	520
80	0	50	0	540	2	690	5	380	10	750	26	880
90	0	60	0	600	3	20	6	50	12	100	30	240
100	0	70	0	670	3	360	6	720	13	440	33	600

Notes:

Be sure to note chemical precautions. Always follow manufacturer's recommendations.

ADJUSTING HARDNESS

It is recommended that dry chemicals first be mixed into a generous amount of pool water in increments of about two pounds (1 kg), and the predissolved mixture be distributed evenly around the pool unless directed otherwise.

Precautions

- Never add water to chemicals; always add chemicals to water.
- Never add calcium chloride to skimmer since it produces heat upon mixing with water.
- Always follow manufacturer's recommendations and warnings on product labeling.
- Never mix two chemicals together since their pH might vary and could cause an explosion or fire.

In most areas of the country a minimum of 150 ppm and an ideal range of 200-400 ppm of hardness is recommended. The only practical way to lower hardness is to drain some water from the pool or spa and refill with water that is lower in hardness.

Once you determine the hardness concentration, calculate how much you wish to add and find this number in the left-hand column. Match this with the volume of water in the pool or spa, listed at the top of the table. Be careful when mixing calcium chloride with water since this can generate a significant amount of heat. Allow the water to circulate 4-8 hours after the chemical is added and then check the hardness.

⇧ Raising Hardness with Calcium Chloride

U.S. Customary Units:

	100 Gallons		1,000 Gallons		5,000 Gallons		10,000 Gallons		20,000 Gallons		50,000 Gallons	
To Raise ppm	**Tsp**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**
10	1	—	0	2	0	10	1	4	2	7	6	2
20	2.5	—	0	4	1	4	2	7	4	15	12	4
30	3.5	—	0	6	1	13	3	11	7	6	18	7
40	5	—	0	8	2	7	4	15	9	13	24	9
50	6	—	0	10	3	1	6	2	12	4	30	11
60	—	1.2	0	12	3	11	7	6	14	12	36	13
70	—	1.4	0	14	4	5	8	10	17	3	42	16
80	—	1.6	1	0	4	15	9	13	19	10	49	2
90	—	1.8	1	2	5	8	11	1	22	2	55	4
100	—	2	1	4	6	2	12	4	24	9	61	6

Metric Units:

	400 Liters		4000 Liters		20000 Liters		40000 Liters		80000 Liters		200000 Liters	
ppm	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**
10	0	10	0	60	0	290	0	590	1	180	2	940
20	0	10	0	120	0	590	1	180	2	350	5	880
30	0	20	0	180	0	880	1	760	3	530	8	820
40	0	20	0	240	1	180	2	350	4	700	11	600
50	0	30	0	290	1	470	2	940	5	880	14	700
60	0	40	0	350	1	760	3	530	7	60	17	640
70	0	40	0	410	2	60	4	120	8	230	20	580
80	0	50	0	470	2	350	4	700	9	410	23	520
90	0	50	0	530	2	650	5	290	10	590	26	460
100	0	60	0	590	2	940	5	880	11	760	29	400

Notes:

Be sure to note chemical precautions. Always follow manufacturer's recommendations.

ADJUSTING CYANURIC ACID

It is recommended that dry chemicals first be mixed into a generous amount of water in increments of about two pounds (1 kg), and the predissolved mixture be distributed evenly around the pool unless, directed otherwise.

Precautions

- Never add water to chemicals; always add chemicals to water.
- Always follow manufacturer's recommendations and warnings on product labeling.
- Never mix two chemicals together since their pH might vary and could cause an explosion or fire.

Usually a 30 - 50 ppm concentration of cyanuric acid will produce good chlorine stabilization. However, your service professional may have a different recommendation. Usually cyanuric acid is added to a skimmer and travels to the filter where it may take 24-48 hours to completely dissolve. Determine how much cyanuric acid you wish to add and find this number on the left-hand side of the table. Match this with the pool or spa water volume listed at the top of the table. Keep in mind that dichlor and trichlor products will add cyanuric acid as well.

⇧ Raising Cyanuric Acid

U.S. Customary Units:

	100 Gallons		1,000 Gallons		5,000 Gallons		10,000 Gallons		20,000 Gallons		50,000 Gallons	
To Raise ppm	**—**	**Tsp**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**	**Lb**	**Oz**
10	—	0.75	0	1	0	7	0	13	1	11	4	3
20	—	1.5	0	3	0	13	1	11	3	5	8	6
30	—	2.25	0	4	1	4	2	8	5	0	12	8
40	—	3	0	5	1	11	3	5	6	11	16	11
50	—	3.5	0	7	2	1	4	3	8	6	20	14

Metric Units:

	400 Liters		4000 Liters		20000 Liters		40000 Liters		80000 Liters		200000 Liters	
To Raise ppm	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**	**Kg**	**g**
10	0	4	0	40	0	200	0	400	0	800	2	0
20	0	8	0	80	0	400	0	800	1	600	4	0
30	0	12	0	120	0	600	1	200	2	400	6	0
40	0	16	0	160	0	800	1	600	3	200	8	0
50	0	20	0	200	1	0	2	0	4	0	10	0

Notes:

Cyanuric acid may require 24-48 hours to completely dissolve.

Recording Your Test Results

Date	Test Results									
	Free Chlorine or Bromine	Total Chlorine	Total Alkalinity	pH	Total Hardness	Sanitizer Name	Shock/Superchlorination Date	Backwash Date	Treatment

Insta-TEST® 5

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