

***blue  
devil***™



**POOL & SPA DELUXE TEST KIT  
INFORMATION BOOKLET**

BLUE DEVIL INDUSTRIES, INC.

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## INTRODUCTION

We highly recommend reading this entire booklet **before** you use the kit to test your water.

A test kit is one of the most important tools for the proper care of your pool or spa. It will aid you maintaining the hygienic conditions of the water, and help prevent water problems which can damage your pool or spa and related equipment. This booklet is designed

to provide information for the understanding of basic chemical management and the reason for testing. Your pool supply store can provide information on anything you do not understand - so also - it is the best source of advice on the variety of chemicals available, and their proper use in your type pool or spa.

Your test kit will serve you faithfully for many years if you will:

1. Store it in a cool, dark place when not in use
2. Always use fresh test solutions when starting your season of use. Refill solutions are relatively inexpensive, and should be available at your pool supply store.

A word of caution must be stated - the solutions in this test kit each have a label which warns of hazard for careless or improper use. In all cases handle the solutions with care and keep test solutions out of reach of children.

## DETERMINING POOL OR SPA TOTAL WATER CAPACITY

It is important to know the water capacity of your pool or spa so you can determine the proper amount of chemicals you will need to add to the water.

**Circular Shape** - diameter x diameter x average depth x 5.9\* = \_\_\_\_\_ Total Gallons

**Oval Shape** - length x width x average depth x 5.9\* = \_\_\_\_\_ Total Gallons

**Rectangular or Square Shape** - length x width x average depth x 7.5\* = \_\_\_\_\_ Total Gallons

**Free Form Shape** - if possible, use combinations of the above shapes to compute total gallons. Or - calculate, as close as possible, the square footage of the surface area x average depth x 7.5\* to determine total gallons \_\_\_\_\_ Total Gallons

If the sides are sloping, multiply the total gallons you have determined above x 0.85 = \_\_\_\_\_ Total Gallons

**Total Gallons in Pool** \_\_\_\_\_ **Total Gallons in Spa** \_\_\_\_\_

\*For metric conversion (using meters for dimensions) substitution 831 for 5.9 and 1.000 for 7.5 to obtain total liters.

## TEST RELATED DEFINITIONS

The brief definitions which follow will be expanded, for the most part, in the test which follows these definitions. The terms will be more meaningful as they directly apply to each subject category.

**Acid/pH decriaser** - a chemical additive which is used to lower the pH (acidity-alkalinity balance) of the water.

**Acid/Base Demand** - a test result which indicates how much acid or soda ash/pH increaser (if any) should be added to the water to provide a balanced proportion of acid to alkaline materials.

**Algae** - plant-like organisms which grow in water. These organisms are particularly active in growth during warm weather, warm water conditions, and where the disinfectant level is too low to destroy them. Algae may be green, brown or black in color.

**Alkalinity** - a combination of natural minerals in the water. The opposite of acidity on a measurement of pH.

**Bacteria** - undesirable organisms with the potential to cause disease if not controlled by disinfectant additives.

**Bromine** - a chemical disinfectant, similar to chlorine which is used to control bacteria and algae.

**Chlorine** - a chemical disinfectant, which is used to control bacteria and algae.

**Chlorine Demand** - the amount of chlorine (if any) that should be added to the water to provide proper bacteria and algae control.

**Chlorine Residual** - the amount of chlorine left over, after the "demand" has been met.

**Combined Chlorine** - weak chlorine which is combined with the contaminants in the water.

**Free Chlorine** - active chlorine in the water with the potency to destroy contaminants.

**pH** - the measure of acid to alkaline proportions in the pool or spa water.

**Hardness** - dissolved minerals, generally Calcium and Magnesium present in pool or spa water.

**ppm** - parts per million. Some test kit numerical readings (Chlorine and Total Alkalinity) indicating the parts per chemical type in a million parts of water.

**Scale** - a visible mineral buildup on pool or spa surfaces as a result of pH being too high.

**Shock Treatment** - the removal by means of oxidation of those materials that have a chlorine or bromine demand.

**Soda Ash** - and additive which is used to raise the pH of the water.

**Sodium Bicarbonate** - and additive which is used to increase the Total Alkalinity or pH of the water.

**Superchlorination** - and extra large amount of chlorine added to the water.

**Total Alkalinity** - the indicator of how stable the pH will be over period of time.

## DISINFECTANTS

**Chlorine and Bromine** are effective disinfectants for use against bacteria and algae problems in your pool or spa water. These contaminants arrive in your pool or spa in a number of ways, and become more of a problem as temperatures rise. Chlorine and bromine are available in a number of forms. Each form has its own particular application. The best source of information on the proper disinfectant for your specific need is your pool supply store.

**Chlorine demand or bromine demand** refers to the quantity of chlorine and bromine consumed in the process of destroying bacteria, algae and other oxidizable material in pool or spa water. The demand will change as a result of pool or spa usage, weather conditions, and by the pH of the water. For proper dosages of disinfectants you must know the water capacity of your pool or spa. Instructions on page 2 will help you determine total water capacity.

**Chlorine residual or bromine residual** is the term used for the amount of disinfectant in your pool or spa at the time it is tested. Chlorine residual is made up of free Chlorine and combined chlorine. The following explanations may be helpful in understanding this.

- **Free bromine** is immediately available as a disinfectant and sanitizer; no difference is noted between free and combined bromine. Chlorine however exists in two types; free and combined as explained below.
- **Free chlorine** is the fully potent amount of chemical which is immediately available in the water to actively attack and destroy incoming bacteria and algae. If the water contains no "free chlorine, then the only chlorine in the water is combined chlorine.

**Combined chlorine** is a weak, ineffective form that develops as chlorine combines with certain

contaminants in the water. This combined chlorine (sometimes called chloramines) is only 1/15th the strength of free chlorine and has little disinfection or algaecidal action.

Your test kit will indicate both free and combined chlorine. The free chlorine reading is indicated in the first part of the test, and total chlorine (free and combined) in the second part. Subtract the free chlorine reading from the total chlorine reading to obtain the combined chlorine reading. The card accompanying your test kit provides step-by-step instructions for the chlorine test. A free chlorine reading between 1.0 and 1.5 indicates the ideal content of the pool water and 3.0 to 5.0 for spas. If the test indicates a higher reading, your family and friends may experience discomfort - the pool or spa should not be used above these readings. If the test indicates a reading below 1.0 for pools, or 3.0 for spas you should add chlorine in the proper dosage to bring the water into the ideal range.



**NOTE:** For Bromine use, the recommended levels are: pools 2.5-4.5 and spas 3.5-6.8.

The best time to add a disinfectant is in the evening. It will work overnight without being dissipated by the sun. Additionally, chlorine is most effective when the pH is in balance.

## **SUPERCHLORINATION/ SHOCK TREATMENT**

From time to time you should superchlorinate or shock treat your pool or spa water. This is accomplished by adding an extra large dose of chlorine, or a non-chlorine shock treatment compound to the water. Superchlorination or shock treatment is used to destroy the organic contaminants in the water. Superchlorination will prohibit the use of your pool or spa for a period of time, while the shock treatment will not.

There are two basic reasons for superchlorinating. One - if algae gets out of control, you need a heavy concentration of free chlorine to bring it under control. Two - when it is desirable to break the contaminants out of the combined chlorine. You should discuss the proper application of chemicals for your particular pool or spa with your pool supply store.

**Oxidizers** are also used to break contaminants out of combined chlorine without raising the concentration of chlorine. Their use should be discussed with your pool supply store.

**Stabilizers/Conditioners** are terms given to a compound which, when added to water, acts as a sort of sun shield. The sun hastens the dissipation of chlorine. Stabilizers/conditioners slow down this dissipation. Chlorine is then present in the water for a longer period of time. Discuss their use with your pool supply store.

## pH

pH is the proportion of acid to alkaline content in the water of your pool or spa pH can change by reason of rainfall, dust, refill water and by the additives you use. The proportions of acid to alkaline content of your water can be determined by test measurements. As a result of testing, you can adjust the proportions by chemical additives. It is essential, before using additives, that you know the total water capacity of your pool or spa. The information on page 2 will be helpful in determining this. Be sure to follow the chemical manufacturer's recommendations for dosage as applied to the total water capacity of you pool or spa. When acid/alkaline proportions are adjusted for pool or spa use, pH is "in balance."

Water can be either alkaline or acidic, the degree of concentration of alkaline materials will vary by geographical location. A heavy concentration of alkaline material (high pH) in the water will result in.

- Scale or hard deposit buildup on pool or spa surfaces, coils of heating systems, and blocking of the filtration system.
- Inability of disinfectant to destroy bacteria and algae.

Adding acid to the water reduces its alkaline content in a proportional manner. Acid must be added in a controlled amount. If too much acid is added to the water, or the pH is too low for any reason, it can result in.

- Eye and nose irritation.
- Etching (eating into) plaster or lining surfaces of the pool or spa.
- Corrosion of metal such as ladders, recirculation and filtration equipment.
- Rapid dissipation of disinfectant.

Use acid additives to counteract a high pH condition, and soda ash or sodium bicarbonate to counteract a two pH condition. Consult your pool supply store



the proper chemicals and the proper form of the chemical which is best suited for use in your pool or spa.

The measurement of pH is in numerical terms. Strongly acid = 0, while strongly alkaline = 14, pH "in balance" for pools and spas should be between 7.2 and a 7.8 reading. Your test kit numerical readings cover 6.8 to 8.2 with associated color matching strips. Corrective instructions are shown with the numerical values.

pH related chemicals should not be added to pool or spa water at the same time as disinfectant related chemicals. pH related chemicals are best added in the morning - disinfectants in the evening. You will find a guide to pH adjustment dosages on the last pages of this booklet.

### **TOTAL ALKALINITY**

This test indicates the pool water's ability to resist abrupt changes in the pH. The ideal range is 80-120 ppm

for plaster finished pools, or 120-150 ppm for painted or fiberglass pools. If it is high, the pH will "bounce" up quickly. If it is too low, the pH can drop to a corrosive state easily.

If the total alkalinity is too high, acid should be added whenever the pH allows. To raise alkalinity add sodium bicarbonate (baking soda.)

### **HARDNESS**

(Dissolved Calcium and Magnesium in pool water)

Your water source will have a certain amount of natural hardness and through evaporation the hardness will build-up in the pool water. A high level of hardness in the presence of high alkalinity can cause scale to form on pool walls and in heater pipes. Insufficient levels of hardness may promote corrosion. The recommended level is 200-400 ppm.

To reduce the hardness, drain a portion of your pool

water and refill. If your hardness level is too low, consult your pool supply dealer for advise.

## TESTING GUIDELINES

1. **Test on a regular basis.** Pools, and particularly spas, should be tested daily. It is especially important to run test after heavy use, substantial rainfall, strong winds and any nearby fertilizing activity.

2. **Test during daylight hours.** Natural lighting provides the most accurate environment for color matching. Make your color comparisons in a shaded (not dark) area. The white side of the plastic card which slides into your test cell in an excellent background for your color comparison.

3. **Care of you test cell unit.** When not in use, always keep test cell in the test kit container. This

will help insure the integrity of the color indicators and protect the unit from being damaged. Again, keep your test kit in a cool, dark place when not in use. The test cell unit should be rinsed before and after use in your pool or spa water. Any other method of cleaning may result in inaccurate test results. **Do not discard test chemicals in your pool or spa.**

Test solutions lose strength and therefore should be replaced yearly.

4. **Test instructions.** Step-by-step instructions for each test are provided on an accompanying card.

**BASE DEMAND/pH INCREASER CHART**  
**OPTIONAL TEST NOT INCLUDED IN ALL DELUXE KITS**

To increase pH using the Base Demand procedure, add the additional amounts of pH increaser/Soda Ash (Sodium Carbonat e) or Baking Soda (Sodium Bicarbonate) as shown in the table below.

VOLUME IN GALLONS	NUMBER OF DROPS OF BASE DEMAND SOLUTION # 6										VOLUME IN LITERS
	1	2	3	4	5	6	7	8	9	10	
2,500	1.25 oz.	2.5 oz.	3.75 oz.	5.0 oz.	6.25 oz.	7.5 oz.	8.75 oz.	10.0 oz.	11.25 oz.	12.5 oz.	10,000
5,000	2.5 oz.	5.0 oz.	7.5 oz.	10.0 oz.	12.5 oz.	15.0 oz.	1.1 lb.	1.25 lb.	1.4 lb.	1.6 lb.	20,000
10,000	5.0 oz.	10.0 oz.	15.0 oz.	1.25 lb.	1.6 lb.	2.0 lb.	2.25 lb.	2.5 lb.	2.8 lb.	3.2 lb.	40,000
15,000	7.5 oz.	15.0 oz.	1.4 lb.	1.8 lb.	2.3 lb.	2.8 lb.	3.3 lb.	3.8 lb.	4.2 lb.	4.8 lb.	60,000
20,000	10.0 oz.	1.25 lb.	1.8 lb.	2.5 lb.	3.2 lb.	4.0 lb.	4.5 lb.	5.0 lb.	5.6 lb.	6.4 lb.	75,000
30,000	15.0 oz.	1.9 lb.	3.0 lb.	3.75 lb.	4.8 lb.	6.0 lb.	6.75 lb.	7.5 lb.	8.4 lb.	9.6 lb.	115,000
50,000	1.6 lb.	3.2 lb.	4.8 lb.	6.25 lb.	8.0 lb.	10.0 lb.	11.5 lb.	13.0 lb.	14.5 lb.	16.0 lb.	190,000
100,000	3.2 lb.	6.4 lb.	10.0 lb.	13.0 lb.	16.0 lb.	20.0 lb.	23.0 lb.	26.0 lb.	29.0 lb.	32.0 lb.	380,000
<b>SPAS</b>											
250	0.1 oz.	0.25 oz.	0.35 oz.	0.5 oz.	0.6 oz.	0.75 oz.	0.8 oz.	1.0 oz.	1.1 oz.	1.25 oz.	1,000
500	0.25 oz.	0.5 oz.	0.75 oz.	1.0 oz.	1.25 oz.	1.5 oz.	1.75 oz.	2.0 oz.	2.25 oz.	2.5 oz.	2,000

1 Heaping Tablespoon = 1 oz. - 1 Heaping Teaspoon = 1/4 oz.

## ACID DEMAND CHART LIQUID ACID/pH DECREASER REQUIREMENT

Pool Capacity in Gallons	oz = Ounce - C = Cup - P = Pint - Q = Quart - G = Gallon - 2 Cups = 1 Pint - 2 Pints = 1 Quart - 4 Quarts = 1 Gallon															Pool Capacity in Liters	
	NUMBER OF DROPS OF SOLUTION # 3																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
250	1/5 oz	2/5 oz	3/5 oz	4/5 oz	1 oz	1 1/5 oz	1 2/5 oz	1 3/5 oz	1 4/5 oz	2 oz							1,000
500	2/5 oz	4/5 oz	1 1/5 oz	1 3/5 oz	2 oz	2 2/5 oz	2 4/5 oz	3 1/5 oz	3 3/5 oz	4 oz							2,000
1,000	4/5 oz	1 3/5 oz	2 2/5 oz	3 1/5 oz	4 oz	4 4/5 oz	5 3/5 oz	6 2/5 oz	7 1/5 oz	8 oz							4,000
2,500	1/4 C	1/2 C	3/4 C	1 C	1 1/4 C	1 1/2 C	1 3/4 C	2 C	2 1/4 C	2 1/2 C	2 3/4 C	3 C	3 1/4 C	3 1/2 C	3 3/4 C	10,000	
5,000	1/2 C	1 C	1 1/2 C	1 P	2 1/2 C	3 C	3 1/2 C	2 P	2 1/4 P	2 1/2 P	2 3/4 P	3 P	3 1/4 P	3 1/2 P	2 Q	20,000	
10,000	1 C	1 P	1 1/2 P	1 Q	2 1/2 P	3 P	3 1/2 P	2 Q	1 1/2 Q	2 1/2 Q	5 1/2 P	3 Q	3 1/4 Q	3 1/2 Q	1 G	40,000	
15,000	1 1/2 C	1 1/2 P	2 1/4 P	3 P	2 Q	2 1/4 Q	2 1/2 Q	3 Q	3 1/2 Q	1 G	1 G	4 1/2 Q	1 1/4 G	1 1/4 G	1 1/2 G	60,000	
20,000	1 P	1 Q	3 P	2 Q	2 1/2 Q	3 Q	3 1/2 Q	1 G	4 1/2 Q	1 1/4 G	5 1/2 Q	1 1/2 G	1 1/2 G	1 3/4 G	2 G	75,000	
25,000	1 1/4 P	2 1/2 P	2 Q	2 1/2 Q	3 Q	1 G	4 1/2 Q	1 1/4 G	1 1/2 G	1 1/2 G	1 3/4 G	2 G	2 G	2 1/4 G	2 1/4 G	95,000	
30,000	1 1/2 P	3 P	2 1/4 Q	3 Q	1 G	4 1/2 Q	1 1/4 G	1 1/2 G	1 3/4 G	2 G	2 G	2 1/4 G	2 1/2 G	2 3/4 G	2 3/4 G	115,000	
35,000	1 3/4 P	3 1/2 P	2 3/4 Q	3 1/2 Q	4 1/2 Q	1 1/4 G	1 1/2 G	1 3/4 G	2 G	2 1/4 G	2 1/2 G	2 3/4 G	2 3/4 G	3 G	3 1/4 G	135,000	
40,000	1 Q	2 Q	3 Q	1 G	1 1/4 G	1 1/2 G	1 3/4 G	2 G	2 1/4 G	2 1/2 G	2 3/4 G	3 G	3 1/4 G	3 1/2 G	3 3/4 G	150,000	
50,000	1 1/4 Q	2 1/2 Q	1 G	1 1/4 G	1 1/2 G	2 G	2 1/4 G	2 1/2 G	2 3/4 G	3 G	3 1/2 G	3 3/4 G	4 G	4 1/2 G	5 G	190,000	

**Dry Acid/pH Decreaser Equivalents**    4/5 oz Liquid Acid = 1 oz Dry Acid - 1 oz Liquid Acid = 1 1/4 oz Dry Acid  
 1 Cup Liquid Acid = 10 oz Dry Acid - 1 Pint Liquid Acid = 20 oz Dry Acid - 1 Quart Liquid Acid = 40 oz Dry Acid

**Metric Conversion**    Liquids    1 U.S. Gallon (128oz) = 3.785 Liters - 1 U.S. Quart (32oz) = 946 Milliliters - 1 U.S. Pint (16oz) = 473 Milliliters  
 1 Cup (8oz) = 236 Milliliters - 1 U.S. Fluid oz = 30 Milliliters - 1 Liter = 33.3 fluid oz - 1 Liter = 4.2 Cups  
 1 Liter = 2.1 U.S. Pints - 1 Liter = 1.04 U.S. Quarts - 1 Liter = 26 U.S. Gallons

**B 1025.1**    Dry Weights    1 U.S. Pound (16oz) = 454 Grams - 1 U.S. Ounce = 28.3 Grams - 1 Kilogram = 2.2 Pounds - 1 Gram = .035 U.S. Ounces

# INSTRUCTIONS FOR PROFESSIONAL TEST KIT

1. Rinse test tubes before and after each test.
2. Obtain water sample from 18" below pool or spa surface and away from any water return outlet.
3. Spill water from tube until level with test line mark on tube.
4. Hold dropper bottle vertically over tube and add one drop at a time and swirl after each drop to mix.
5. Perform test in shaded area, viewing test results against a lighted background.
6. Store test kit in a cool, dark place.
7. Replace test solutions at the start of each season.

**CHLORINE TEST**

1. Fill CL tube to mark with pool or spa water.
2. Add 5 drops of solution #1.
3. Cap tube and invert several times to mix.
4. **Free Chlorine:** Immediately compare color with adjacent color standard. The result is in parts per million (ppm).
5. **Combined Chlorine:** The color continues development for two minutes. Compare tube color for (ppm) test reading. **Shock Treatment:** A difference greater than .3 between free and combined chlorine indicates a need to superchlorinate/shock treatment.

**TOTAL ACTIVE BROMINE**

1. Fill CL tube to mark with pool or spa water.
2. Add 5 drops of solution #1.
3. Cap tube and invert several times to mix.
4. Compare color in vial with standards to determine Total Active Bromine.

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**DO NOT PERFORM FOLLOWING TESTS IF TOTAL AVAILABLE CHLORINE EXCEEDS 3.0 PPM OR IF TOTAL ACTIVE BROMINE EXCEEDS 6.0 PPM**

**pH TEST (degree of acidity or alkalinity)**

1. Fill large tube to pH mark with pool or spa water.
2. Add 1 drop of solution #4, swirl to mix.
3. Add 5 drops of solution #2, swirl to mix.
4. Compare the tube color with adjacent color standard to determine pH reading.

NOTE: If the pH reading is above 7.6, save the test sample and proceed to the Acid Demand test. If the pH is below 7.4, save the test sample and proceed to the Base Demand test.

**ACID DEMAND TEST**

1. Using water sample from pH test, add solution #3, one drop at a time, swirling between drops.
2. Count drops needed to change color to nearly match pH color standard. Do not count drops which give a 7.2 reading or below.
3. Remember the number of drops added and refer to the Acid Demand Chart in the test kit booklet to determine quantity of acid (liquid or dry) required.

NOTE:

- A. Add no more than 1 pint (or 1/2 liter) of liquid acid or dry equivalent to each 10,000 gallons (or 40,000 liters) of water capacity in any one day.
- B. Never add acid and chlorine at the same time.
- C. Always add acid while filter is running.
- D. Add acid in area away from skimmer and metal fixtures.

**BASE DEMAND TEST**

1. Using water sample from pH test, add solution #6, one drop at a time, swirling between drops.
2. Count drops needed to change color to nearly match pH color standard. Do not count drops which give a 7.8 reading or above.
3. Remember the number of drops added and refer to the Base Demand Chart in the test kit booklet to determine quantity of pH increaser (soda ash or sodium carbonate) required.

NOTE:

- A. Add pH increaser (soda ash or sodium carbonate) only when the filter is running.
- B. Add pH increaser (soda ash or sodium carbonate) in area away from skimmer and metal fixtures.
- C. Always follow chemical instructions!

**TOTAL ALKALINITY TEST**

1. Fill large tube to total alkalinity test line with pool or spa water.
2. Add 1 drop of solution #4 and swirl to mix.
3. Add 2 drops of solution #5 and swirl to mix.
4. Add solution #3 one drop at a time, swirl between drops.
5. Count drops needed to change color from blue to clear or slightly yellow.
6. Multiply the number of drops X 10 to obtain ppm (parts per million) reading.

EXAMPLE: 8 drops X 10 = 80 ppm. Ideal total alkalinity is 80-120 ppm for plaster finished pools or 120-150 ppm for vinyl, painted or fiberglass pools. If your reading is less than desired - add sodium bicarbonate. If more than desired, acid is usually needed. Perform the Acid Demand Test.

**CALCIUM HARDNESS TABLET TEST**

1. Fill large tube to the 450 ppm calcium hardness line.
2. Add one Calcium Hardness tablet. Allow to dissolve, observe color.
3. If color is pink, the Calcium Hardness is above 450 ppm.
4. If color is purple, the Calcium Hardness is under 450 ppm. For exact level slowly add pool water to purple solution. Swirl to mix. When color changes from purple to pink, read ppm of the Calcium Hardness.

Excessive calcium in the water can cause scale buildup on all types of surfaces. Insufficient calcium can promote corrosion. Recommend calcium level is 200-400 ppm.

If your water tests over or under this range, consult your Pool Chemical Dealer for advice.

**STABILIZER/CONDITIONER TEST**

Cyanuric Acid is often called stabilizer or conditioner because it reduces the loss of chlorine due to sunlight exposure.

1. Fill large tube to line "A" with pool water.
2. Take the Cyanuric Acid test solution and fill to line "B". Place cap on tube and shake for 30 seconds.
3. After waiting 2-5 minutes take the mixed solution and pour slowly into the C.A. view tube. As you are pouring, view down through the C.A. tube, you will see a black dot on the bottom of the tube. Continue to pour until the black dot is no longer visible. Stop pouring at that point.
4. Read the level of the mixture to the closest number on C.A. tube scale. This is your approximate ppm (parts per million) of Cyanuric Acid in you pool water. The recommended level of Cyanuric Acid is 30-70 ppm.