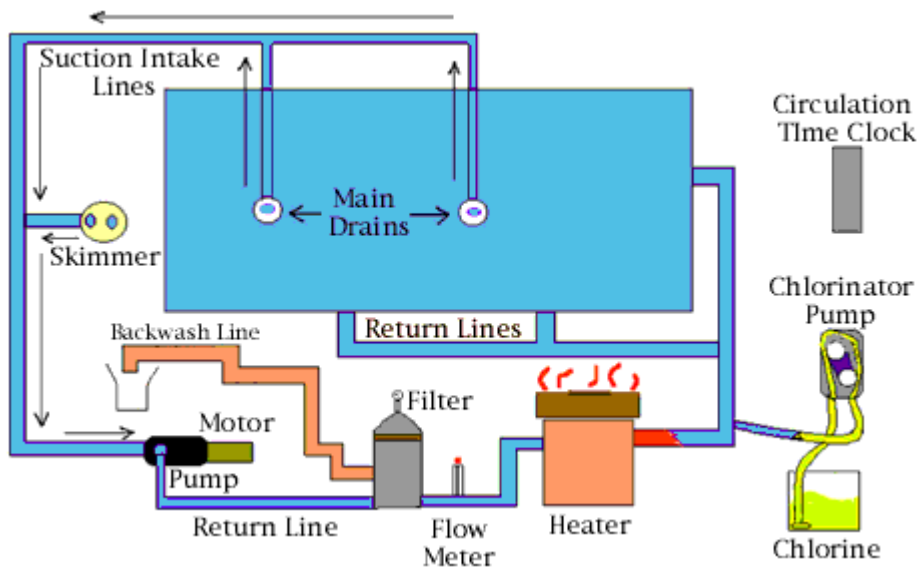


Pool Diagram



BASIC EXPLANATION OF POOL CIRCULATION SYSTEM

This is a basic design of a pool system. The water in the pipes is being pulled from the main drains, and skimmer to the pump. Once the water is pulled into the pump it is then pushed through to the Filter. The filter then filters out the debris in the water. The clean filtered water passes through the flow meter. The flow meter gauges the gallons per minute the pool pump is circulating. The water is then pushed through the heater where the water is heated depending if the heater is turned on. The heated water is then chemically treated by the automatic chlorinator before it returns back into the pool system, which are known as the return lines in the pool. This process continues itself throughout the day. The health department requires that all commercial pools circulate during the hours the pool is available for use. The pool system is also required to have a turn-over rate of 6 hours. Which means the pool must circulate the entire water volume in the pool at least every 6 hours.

Spas- Spas systems run exactly the way a pool system runs. The same system, but just add the booster pumps, and motors for the jets. The turn-over rate for commercial spas is once every 30 minutes. The booster motors operates by pulling in water exactly how the pool pump does and pushes the water back out through the jet return lines. The booster pumps do not go through the circulation system. They simply pull water in, and push it back out. The air from the jets comes from an air intake line that is plumbed into the return line going back into the spa. With the force of the water being pushed through the return line it creates a venturi which pulls air into the return line, which gives the jets the air bubble action.

Waders- Waders run exactly how a pool system runs. It's basically just a smaller version of a pool, with the same set up. Waders turn- over rates are once every 1 hour.

All commercial pools, spas and waders run independently of each other. They each have their own time clock, heater, filter etc. As were many residential pools and spas will share the same equipment.

BACKWASH RATE

The rate of flow, in gallons per minute per square foot of filter surface area, required for efficient filter cleaning.

CHLORINE

A heavy, green, highly poisonous gas compressed in liquid form and stored in heavy steel tanks. Used in swimming pools as a bactericide and algaecide. Extreme caution must be used in handling.

FLOW METER

A device that measures pressure differential across a calibrated orifice and indicates the rate of flow at that point. Usually in gpm.

POOL FILTER

May filter dirt from the water at the cartridge surface or allow penetration of smaller suspended particles into internal interstices.

SKIMMER

A device other than an overflow trough for continuous removal of surface water and floating debris from a pool. Usually returns water so removed to the filter system.

TERMS:

ACID

A chemical compound that releases hydrogen ions in water solution.

ALGAE

Microscopic forms of plant life that enter the pool by rain, wind and dust storms. There are numerous varieties - some are free floating; others grow on walls and surfaces and come in different colors. Some are more resistant to chemical treatment than others.

ALGICIDES

Chemicals that prevent and control algae. Some prevent algae growth; others are designed to kill specific types of visible algae growth.

ALGISTAT

A chemical that inhibits the growth of algae.

ALKALINE

The property of a compound that allows it to neutralize an acid.

ALKALINITY

The amount of bicarbonate, carbonate and hydroxide compounds present in water solution. A measure of the pH buffering capacity of water.

ALUM

Any one of several aluminum compounds used in pools to form a gelatinous floe on sand filters or to coagulate and precipitate suspended particles in water. Most commonly refers to aluminum sulfate. aluminum sulfate See above.

AMMONIUM HYDROXIDE

An ammonia and water mixture used for detecting chlorine leaks.

AMMONIA

A chemical compound of hydrogen and nitrogen that combines with free chlorine in pools to form chloramines, or combined chlorine. ammonia nitrogen Brought into pools by swimmers: perspiration, urine or waste. Reacts with chlorine to form chloramines. Causes eye irritation.

AMMONIUM ALUM

Ammonium aluminum sulfate. No longer used as a flocculent or coagulant in pools due to chloramine formation.
anthracite Hard coal.

ANTRHAFILT

Trade name for anthracite specifically ground into particles of the proper size to be used in a swimming pool filter.

ATOM

The smallest particle into which matter can be broken by ordinary means. Combines with other atoms to form molecules of chemical compounds.

AUTOMATIC FEEDERS

Electronic equipment that senses water variables (primarily chlorine and pH) and controls feed systems to maintain desired levels.

AVAILABLE CHLORINE

Chlorine, both free and combined, that is active to some degree against bacteria in pool water.

AVERAGE HEAD

The resistance to flow of water in a pool recirculation system obtained by averaging the maximum and minimum resistance encountered in the course of a filter run.

BACKWASH

The process of cleaning a swimming pool filter by reversing the flow of water through it.

BACKWASH RATE

The rate of flow, in gallons per minute per square foot of filter surface area, required for efficient filter cleaning.

BACTERIA

Microorganisms present in all water supplies. Some are necessary to life; others cause disease. bactericide Any chemical that kills bacteria.

BALANCED WATER

The correct ratio of mineral content and pH level that prevents pool water from being corrosive or scale forming.

BASE OR BASIC

A chemical that neutralizes acids. Usually by furnishing hydroxyl ions.

BLUESTONE

Common name for copper sulfate, an effective algicide that is declining in popularity as a swimming pool algicide because of its toxicity and incompatibility with some pool chemicals.

BODY COAT

Diatomaceous earth that builds up on a filter element during the course of a filter run to help maintain filter porosity.

BODY FEED

Diatomaceous earth fed constantly or intermittently during a filter run to produce a body coat.

BOURDEN TUBE

A tube, closed at one end, that measures pressure against air trapped in the tube. It is used as the basic element in many pressure gauges and flow meters in swimming pool instrumentation.

BREAKPOINT

The point in a rising chlorine residual at which the concentration of available chlorine becomes great enough to oxidize all organic matter and ammonia compounds in a pool completely. Chlorine added thereafter will be in an uncombined, or free, state. Breakpoint is characterized by a sudden drop in total residual available chlorine. The magnitude of the drop depends upon the amount of combined chlorine present and other factors.

BRIDGING

Buildup of a body coat on diatomaceous earth filter elements to the point where the body coats of two adjacent elements touch.

BROMIDE

A chemical compound containing bromine, sodium or potassium bromide in solution; will produce free bromine if an oxidizer is introduced.

BROMTHYMOL BLUE

A chemical dye sensitive to changes in pH. Used to test pH over a range of 6.0 to 7.6. Turns from yellow to blue as pH increases.

CALCIFICATION

Formation of calcium carbonate on the walls of pools or pipes, or in a filter, due to the precipitation of calcium carbonate. Also refers to incrustation caused by magnesium hydroxide.

CALCIUM HARDNESS

The calcium portion of the total hardness. About 65-75% of total hardness. Concentrations of calcium determine whether water is "soft" (too little) or "hard" (too much). Higher hardness levels can cause cloudy water and scale. Lower levels can harm the pool and its equipment.

CALCIUM HYPOCHLORITE

A compound of chlorine and calcium used in white granular or tablet form as a bactericide in pools. In water solution, it provides 65% available chlorine. Must be handled with care.

CARTRIDGE FILTER

A pool water filter that uses paper or fabric like cartridges as its filtering medium.

CENTRIFUGAL FORCE

The outward force exhibited by anything in circular motion. The principle by which water is propelled through a circulation system by a pump impeller that imparts circular motion to the water in a pump.

CHEMICAL FEEDER

Any of several types of devices that dispense chemicals into pool water at a predictable rate. Types include diaphragm, piston, erosion, peristaltic, dry and vacuum.

CHLORAMINES

Compounds formed when chlorine combines with nitrogen from urine, perspiration, etc. Chloramines cause eye and skin irritation, as well as unpleasant odors.

CHLORINATOR

Any chemical feeder used to dispense any form of chlorine, often used conversationally to refer specifically to gas chlorinators.

CHLORINE

A heavy, green, highly poisonous gas compressed in liquid form and stored in heavy steel tanks. Used in swimming pools as a bactericide and algicide. Extreme caution must be used in handling.

CHLORINE DEMAND

The amount of chlorine necessary to oxidize all organic matter present in pool water, chloramines, bacteria and algae.

CHLORINE RESIDUAL

The amount of available chlorine remaining in pool water after the chlorine demand has been satisfied.

CLARITY

The degree of transparency of pool water. Characterized by the ease with which an object can be seen through a given depth of water.

COAGULANT

A chemical, usually alum, used in pools for the purpose of gathering and precipitating suspended matter.

COLIFORM ORGANISMS

Bacteria found in the intestines of warm blooded animals. Their presence in pool water indicates the possibility of the presence of disease causing bacteria.

COMBINED CHLORINE

Chlorine that has combined with a nitrogen compound, usually ammonia, forming compounds known as chloramines. Although combined chlorine does have some bactericidal powers, it is far less effective than free chlorine.

CONTAMINATED

Impure. Can refer to presence of harmful bacteria in water or to the presence of any unwanted substance in any other substance.

COPPER SULFATE

An effective algicide, declining in popularity for pool use because of its toxicity and incompatibility with some other compounds found in pools.

CORROSION

Caused by unbalanced and aggressive water. Metal parts are eaten away, usually due to acidity or very soft water conditions.

CROSS CONNECTION

An unprotected connection between a domestic water supply and a pool or other non potable water where a contamination of the domestic system could occur. Protective devices must be used to eliminate possible contamination.

CYANURIC ACID

The chemical 2,4,6, trihydroxytriazine, also known as stabilizer or conditioner. It stops sunlight from dissipating chlorine strength.

DESIGN RATE OF FLOW

The average rate of flow used for design calculations in a system. Usually refers to gallons per minute per square foot of filter surface area.

DIAPHRAGM PUMP

A chemical feeder of the positive displacement type in which an electrically operated flexing diaphragm in conjunction with one way suction and discharge check valves makes possible constant, repeatable and adjustable feed rate regardless of varying injection pressures, flow rates and liquid levels.

DIATOMACEOUS EARTH

White powder composed of fossilized skeletons of one celled organisms called diatoms. Porous, containing microscopic spaces. Used as a filter medium for swimming pools.

DIATOMACEOUS EARTH FILTER

A filter designed to use diatomaceous earth or volcanic ash as a filter medium. May be either pressure or vacuum type. Commonly called a D.E. filter.

DICHLORAMINES

(NHCl₂) A poor disinfectant that gives off disagreeable odor and irritates the eyes.

DISSOCIATION FACTOR

Percent of HOCl at varying temperatures and pH values.

DISINFECTANT

A chemical that will destroy infection causing organisms.

DOWNWASH

A process of filtering water to waste after backwashing to insure that all pipes in the system are free of debris before beginning a filter run.

DPD

The preferred reagent used in test kits to measure and indicate free available chlorine. The presence of chlorine turns the indicator pink.

DRY ACID

The granular chemical (sodium bi sulfate) that slowly lowers pH and total alkalinity. Safer to handle than liquid (muriatic acid).

DRY FEEDER

A chemical or D.E. feed device consist ing of a small, electrically operated, slowly revolving auger in the bottom of a hopper.

EFFLUENT

The outflow of water from a filter, a pump or a pool.

ELECTRODE

A sensor placed in a sample for measurement and control of water variables through automation.

EMISSIVITY

Thermodynamics, the relative ability of a surface to emit radiant energy compared to an ideal, black body at the same temperature and with the same area.

ELECTROLYSIS

Flow of electrical current through a liquid solution by means of electrically charged ions. Usually produces corrosion of metals in the liquid.

EROSION FEEDER

A chemical feed device in which powder, tablet or sticks are placed in a closed container through which a regulated stream of pool water is allowed to flow, gradually eroding the chemical. Feed rate varies with flow velocity.

EQUALIZER LINE

A line from below the pool surface to the body of a skimmer, designed to prevent air being drawn into the filter when the water level drops below the skimmer inlet. Operates automatically.

FACE PIPING

The piping, with all valves and fittings, that is used to connect the filter system together as a unit. This includes all valves and piping necessary for the filter plant to perform the functions of filtering or backwashing, either by the plant as a whole or any unit operating singly.

FEET OF HEAD

A basic measurement of pressure or resistance in a hydraulic system that is equivalent to the height of a column of water that would cause the same resistance. The DYNAMIC HEAD is the sum of all the resistance in a complete system when in operation. The principle factors of "head" are vertical distances and resistance due to friction of the flow against the walls of the pipe or vessel. FRICTION HEAD is the head due to friction only.

FERRIC IRON

Compounds of iron that are insoluble in water and will precipitate.

FERROUS IRON

Compounds of iron that are soluble in water and will impart a clear green color. filter A mechanical device for straining suspended

PARTICLES FROM POOL WATER

Refers to the complete mechanism including all component parts.

FILTER AID

Usually refers to powder like substance such as diatomaceous earth or volcanic ash used to coat a septum type filter. Can also be used to refer to alum as an aid to sand filtration.

FILTER CARTRIDGE

A disposable element, usually of fibrous material, used as a filter septum in some.

POOL FILTERS

May filter dirt from the water at the cartridge surface or allow penetration of smaller suspended particles into internal interstices.

FILTER CYCLE (FILTER RUN)

The time of filter operation between backwash procedures.

FILTER ELEMENT

A filter cartridge, or that part of a D.E. filter on which the filter aid is deposited. filter media Any fine grain material, carefully graded as to size, that entraps suspended particles as water passes through.

FILTER RATE

The rate of flow of water through a filter during the filtering cycle expressed in gallons per minute per square foot of effective filter area.

FILTER ROCK

Graded, rounded rock or gravel used to support filter media. filter sand A type of filter media composed of hard, sharp silica, quartz or similar particles with proper grading for size and uniformity.

FILTER SEPTUM

That part of a filter on which diatomaceous earth or similar filter media is deposited. Usually consists of cloth, wire screen or other fine mesh material.

FLOCCULENT

A compound usually used with sand type filters to form a thin layer of gelatinous substance on the top of the sand. Aids in trapping fine suspended particles that might pass through the sand.

FLOE (See flocculent)

A gelatinous substance resulting from the use of a flocculent.

FLOW METER

(See rate of flow indicator).

FOOT BATH

A shallow water area between bath house showers and pool deck through which pool patrons must walk. Originally designed to contain a disinfectant solution for control of athlete's foot. Because it was proved to be ineffective, the foot bath has either been eliminated or modified to contain a continuous flow of clean water.

FOOT SPRAY

A device for spraying bathers' feet with water or a disinfectant. Usually a shower head at knee height to rinse sand and grass from feet before entry into the pool. free chlorine Also called available, usable chlorine. It is the most active form of chlorine that is free to kill bacteria and algae.

GALVANIC ACTION

Creation of electrical current by electro chemical action.

GALVANIC CORROSION

Corrosion of metals that occurs when two or more dissimilar metals are immersed in an electrolyte. gutter Overflow trough at edge of pool.

HARDNESS (WATER)

Refers to the quantity of dissolved minerals, chiefly calcium and magnesium compounds, that may be deposited as scale in pipes, pools and heaters.

HEAD

(See feet of head).

HYDROCHLORIC ACID

Also called MURIATIC ACID when diluted. A very strong acid used in pools for pH control and for certain specific cleaning needs. A byproduct of the addition of chlorine gas to water. Use extreme care in handling.

HYDROGEN

The lightest chemical element. A component of water and a frequent product of many chemical reactions. In its ionic form it is used as a measure of acidity and pH.

HYDROGEN ION

The positively charged nucleus of a hydrogen atom. Its presence in water solution is used as a measure of acidity of the solution.

HYDROXYL ION

A negatively charged particle composed of one hydrogen atom and one oxygen atom.

HYPOCHLORINATOR

A chemical feeder through which liquid solutions of chlorine bearing chemicals are fed into the pool water at a controllable rate.

HYPOCHLORITE

Refers to any compound containing a metal and the (OC1) radical. Most commonly refers to calcium, sodium or lithium hypochlorite in pool usage.

HYPOCHLOROUS ACID (HOCl)

An unstable acid with excellent bactericidal and algacidal properties. The active agent by which chlorine serves as a disinfectant. Formed by dissolving chlorine gas, any hypochlorite or other chlorinating agent in water. impeller The rotating vanes of a centrifugal pump.

INFLUENT

Water flowing into a pool, a pump, a filter, a chemical feeder or other space.

IODIDE

A chemical compound containing iodine. Potassium or sodium iodide, when used with a suitable oxidizing agent such as chlorine, will release iodine in pool water.

IODINE

A blue black crystalline chemical element of the same chemical family as chlorine and bromine. An excellent bactericide in pool water solution. Not effective as an algacide.

LIFELINE

A rope line across a pool to designate a change in slope in the pool bottom or the beginning of deep water. Usually supported by regularly spaced floats.

LINE STRAINER

A device mounted in the pump influent line to screen out lint and other debris that might cause damage to the pump.

LIQUID ACID

Chemicals used to reduce pH and total alkalinity in pool water. Most common types are muriatic and sulfuric. They are extremely corrosive and dangerous chemicals to handle.

LOGARITHM

A mathematical term. The number that represents the power to which a given number must be raised to obtain another number. In pool usage, the power to which 10 must be raised to equal the reciprocal of the hydrogen ion concentration of the pool water. It is represented by the term pH.

MAKE UP WATER

Fresh water used to fill or refill the pool.

MANOMETER

An instrument that measures pressure differential across an orifice by means of a column of liquid, usually mercury. In pools, usually calibrated to show rate of flow of water in gallons per minute.

MICRON

A unit of measure representing one millionth of a meter, or one thousandth of a millimeter. microorganism A microscopic plant or animal.

MOLECULE

The smallest particle to which a chemical compound can be reduced without destroying its chemical composition.

MULTIPLE FILTER CONTROL VALVE

A special switching valve with a separate position for each of various filter operations. Combines in one unit the functions of several direct flow valves.

MURIATIC ACID

A dilute solution of hydrochloric acid.

NITROGEN

An element introduced into the pool via perspiration, hair spray, cosmetics, etc. Reduces the effectiveness of chlorine; stimulates algae growth. Forms eye irritating chloramines (See chloramines).

N.S.P.I.

National Spa and Pool Institute. A trade organization of people and institutions in the swimming pool and spa industry.

N.S.P.F.

National Swimming Pool Foundation. A research, education and safety organization representing both the pool industry and the general public.

ORIFICE

An opening, usually carefully calibrated in size, through which water flows.

ORIFICE PLATE

A disc with a sharp edged, circular orifice in the center. When placed in a water flow line, it creates a pressure differential to operate a rate of flow indicator, chemical feeder or other hydraulic mechanism.

ORGANIC WASTES

The perspiration, urine, saliva and suntan oil that swimmers introduce into a pool. When these wastes accumulate, they must be chemically oxidized because most won't filter out.

ORGANISMS

Plant or animal life. Usually refers to algae or bacteria like growth in pool water.

ORTHOTOLIDINE

An organic test reagent (also called OTO) that turns yellow green in the presence of chlorine, bromine or iodine.

OVERFLOW TROUGH

Trough around the top perimeter of a pool. Used to skim the surface of the water to waste or to filters. Also called scum gutter.

OXALIC ACID

A mild organic acid, usually purchased as a solid white granular substance. Used specifically to dissolve rust stains on pool walls and floors or to clean rust from filter septa. Poisonous; use with care.

PATHOGEN

A microorganism that causes disease in man.

pH

The negative logarithm of the hydrogen ion concentration of a water solution. A measure of the degree of acidity or alkalinity of a solution. A pH below 7.0 is considered acid. A pH above 7.0 is considered alkaline. Above 7.8, the water is too alkaline and could cause cloudiness and scale formation. Below 7.2, the water is too acidic and could cause corrosion and plaster etching. Im proper pH also affects chlorine's germ killing power and causes swimmer discomfort.

PHENOL RED

An organic dye that is yellow at a pH of 6.8 and turns progressively deeper red in color as the pH increases to 8.4. The most commonly used test reagent for pH in pools.

POLYMER

A flocculating agent designed to clear cloudy or colored water. Rapidly collects, settles and allows for easy removal of dead algae, insoluble minerals and suspended iron, copper or manganese.

POTABLE

Water that is safe and suitable for drinking.

POTASSIUM ALUM

Potassium aluminum sulfate. Sometimes used as a flocculent in sand filter operation.

POTASSIUM PEROXYMONOSULFATE

A non chlorine oxidizer used to shock treat pool and spa water and to activate bromide ions to produce hypobromous acid.

PPM PARTS PER MILLION

Calculated in weight units. In dilute water solution, the weight volume relationship of milligrams per liter may be substituted. Equals 1/1,000 of 1%.

PSI

Pounds per square inch. Commonly, a unit of pressure or head.

PRECIPITATE

An insoluble compound, such as calcium carbonate, that may appear in a solution as the result of chemical action. For example, addition of chlorine to a pool containing dissolved iron will cause a reddish precipitate of insoluble iron compounds.

PRECOAT

The layer of diatomaceous earth deposited on the filter septa at the start of a filter run with D.E. filters.

PRECOAT FEEDER

A chemical feeder designed to inject diatomaceous earth into a filter in sufficient quantity to coat the filter septa at the start of a filter run.

PRESSURE DIFFERENTIAL

The difference in pressure between two points in a hydraulic system. As the difference in pressure between the influent and the effluent points of a filter, a pump, a venturi tube or an orifice plate.

PUMP CURVE

A graph of performance characteristics of a given pump under varying power, flow and resistance factors. Used in checking and choosing a pump.

PUMP STRAINER

A device containing a removable strainer basket designed to protect a pump from debris in the water flow when installed in the pump suction line. Also called lint strainer or hair and lint catcher.

QUATERNARY AMMONIUM COMPOUNDS

A family of compounds (also known as "quats") used in various mixtures and concentrations to combat algae growth in pools. May cause foam on the surface of the water due to their ability to decrease the surface tension.

RATE OF FLOW INDICATOR, FLOW METER

A device that measures pressure differential across a calibrated orifice and indicates the rate of flow at that point. Usually in gpm.

RECIRCULATING SYSTEM

The entire system of pipes and pumps and filters that allows water to be taken from the pool, filtered, treated and returned to the pool.

RESIDUAL

(See chlorine residual).

REVERSE CIRCULATION

The name given to a pool water circulation system in which water is taken from the surface of the pool and returned through inlets at the bottom of the pool.

RINGBUOY

A ring shaped floating buoy capable of supporting a drowning person. Usually attached to 50 to 60 feet of light line and kept at poolside for rescue use.

SAND FILTER

A pool filter using sand, or sand and gravel as a filter medium.

SATURATION INDEX

A mathematical calculation, based on the interrelation of temperature, calcium hardness, total alkalinity and pH, that predicts if the pool water is corrosive, scale forming or neutral.

SCALE

Calcium carbonate deposits that can be found deposited in the filter, heater or on pool wall. Generally caused by high mineral content combined with high pH.

SEQUESTERING AGENT

A chemical that when added to pool water keeps dissolved metals and minerals in clear solution.

SERVICE FACTOR

The degree to which an electric motor can be operated above its rated horsepower without danger of overload failure.

SKIMMER

A device other than an overflow trough for continuous removal of surface water and floating debris from a pool. Usually returns water so removed to the filter system.

SKIMMER WEIR

Part of a skimmer that adjusts automatically to small changes in water level to assure a continuous flow of water to the skimmer.

SLURRY FEED

Body feed for a D.E. filter introduced as a liquid slurry.

SLURRY FEEDER

A chemical feeder designed to handle a gritty slurry without clogging.

SODA ASH

Sodium carbonate (Na_2CO_3) used to raise pH and increase total alkalinity in pool water. Also to react with alum to produce floc on sand filters and to neutralize hydrochloric acid resulting from use of chlorine gas for chlorination.

SODIUM BICARBONATE

A chemical (NaHCO_3) used to raise total alkalinity content of a pool with little change in pH.

SODIUM BISULFATE

A dry white powder (NaHSO_4) that produces an acid solution when dissolved in water. Used in pools to lower pH. Safer to handle than hydrochloric acid.

SODIUM HYPOCHLORITE

(NaOCl) A liquid that provides 12% to 15% available chlorine. One of the most commonly used products for chlorination of pools. Produces hypochlorous acid when added to pool water. Use care when handling.

SODIUM THIOSULFATE

Chemical solution used to remove all chlorine from a test sample to avoid false pH test readings or false bacteria test results. It is also used in larger quantities to dechlorinate swimming pools.

SOFT WATER SCALE

A particularly rough, coarse form of scale. Formed when the calcium hardness of water is 100 ppm or less.

STABILIZER

(See cyanuric acid).

STERILIZE

To kill all microorganisms by heat or chemical action.

SUPERCHLORINATION (shock treatment)

The practice of adding 8 to 10 times the normal chlorine dose to destroy algae or reach breakpoint for the reduction of chloramines.

SWIMMER LOAD

The number of persons in the pool area at any given moment, or during a stated period of time.

TOTAL ALKALINITY

The total amount of carbonates, bicarbonates and hydroxides in the pool. Total alkalinity affects and controls pH. If total alkalinity is too high, pH will be hard to adjust. If it's too low, pH will be unstable, difficult to maintain within the desired range. The total alkalinity level should be 80 to 150 ppm, depending on sanitizer.

TURBIDITY

Degree to which suspended particles in pool water obscure visibility.

TURNOVER RATE

The number of times a quantity of water equal to the total capacity of the pool passes through the filters in a stated time. Usually in turnovers per 24 hours.

UNDERDRAIN

The distribution at the bottom of a sand filter to collect the filtered water during a filter run and to distribute the backwash water during backwash.

UNDERWATER LIGHT

A lighting fixture designed to illuminate a pool from beneath the water surface. May be "wet niche" located in the pool water, or "dry niche" located in the pool sidewall behind a waterproof window and serviced from outside the pool.

VACUUM CLEANER

One of several types of suction devices designed to collect dirt from the bottom of the pool. Some discharge dirt and water into the filters, some discharge to waste, and some collect debris in a porous container, allowing water to return to the pool. Some are self propelled; others must be pushed or pulled across the pool.

VACUUM FILTER

A filter, usually of the D.E. type, through which water is pulled by a pump mounted on the effluent side of the filter.

VELOCITY

The rate of movement of water in feet per second.

VENTURI TUBE

A tube mounted in a water line so as to cause restriction of flow. The constriction causes a change in velocity of water through the tube, resulting in a pressure differential that is proportional to the flow rate. The pressure differential can be used to measure flow or operate hydraulic chemical feeders.

VOIDS

Spaces in or between particles or fibers of a filtering medium. These spaces determine the permeability and the dirt holding capacity of the filter.

VOLCANIC ASH

A fine white porous powder similar to diatomaceous earth but lighter in weight. Used as a filter medium or filter aid in D.E. type filters.

ENERGY MANAGEMENT

FORMULA FOR NATURAL GAS COSTS TO HEAT A POOL TO 80 DEGREES YEAR ROUND

Pool Length x Width x 8* Therm x .62** cents = Cost Per Year

*Requires 8 therm per square feet of surface area to heat to 80 degrees.

** .62 cents is average cost for Southern California.

Example: 75 x 45 x 8 x .62 = \$16,740.00

HOW TO REDUCE NATURAL GAS COSTS

Have Pool Maintenance Company perform preventative maintenance on heaters, check heat exchanger tubes for calcification or corrosion. If necessary de-lime and de-soot heat exchangers. 2. Verify proper heater size for pool (BTU rating).

FACTORS AFFECTING HEAT LOSS

1. Temperature difference between air and water
2. Pool surface area - evaporation (depth is not a factor)
3. Humidity
4. Winds around pool area - windbreaks such as landscaping or fencing can reduce
5. Geographic location

ENERGY LOSS (AS REPORTED BY THE U.S. DEPARTMENT OF ENERGY)

Outdoor Pools

70% Evaporation

20% Radiation

10% Ground

HOW LONG WILL IT TAKE TO HEAT THE POOL?

For Commercial Pool Heaters:

EXAMPLE :

- Determine the number of BTUs (British Thermal Units) needed to raise 165,000 gallons of pool water from 50 degrees F to 85 degrees F.
- Use the formula 1 BTU will raise 1 pound of water 1 degree F in 1 hour
- Multiply the volume in gallons by 8.33 (weight of 1 gallon of water) to determine the weight of the water that must be heated.
- Multiply the water weight by the desired temperature rise to determine the number of BTUs needed.
- Divide the BTUs needed by the available heater output in BTUs to find the number of hours it will take to heat the water.
- Example:
Water Volume: 165,000 gallons
Temperature Rise: 35 degrees F

Water Weight: 165,000 gallons x 8.33 = 1,374,450 lbs.

1,374,450 lbs. X 35 degrees F = 48,105,750 BTUs needed to heat

Heater output: 1,890,000 BTUs

48,105,750 BTUs needed to heat to desired temperature divided by 1,890,000 BTUs output = 25 hours

TURNOVER TIMES

Turnover time is the number of times in a 24 hour period that the total gallons of water must circulate through the filtration system.

Swimming Pools 6 hours

Wading Pools 1 hour

Spas 30 minutes

BATHER LOAD

California State Codes restrict the number of bathers to:

1 bather for each 20 square feet of water surface area (for pools)

1 bather for each 10 square feet of water surface area (for spas)

Example:

75' (length of pool) x 50' (width of pool) = 3750 square feet

3750/20 = 187.5 bathers

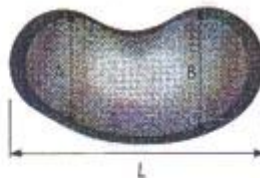
CALCULATING POOL VOLUME

Selecting pool equipment and water treatment chemicals depends upon a working knowledge of your pool's capacity in gallons. To find a pool's approximate volume, first calculate its area, which corresponds to the length times the width, then multiply the area by the average depth and a conversion factor (7.48). The trick is finding the "length and width" of a pool with an irregular shape. If you can't find a shape below that approximates your pool, divide the outline into units of simpler shapes, figure the volume of each chunk, and then add them together for the total.



Area = $A \times B \times 3.14$
Volume = area x average depth x 7.48

Area: square feet of surface
Volume: gallons of water



Area = $(A + B) \times L \times 0.45$ (approx.)
Volume = area x average depth x 7.48



Area = $R \times R \times 3.14$
Volume = area x average depth x 7.48



Area = $(L \times W) + (R \times R \times 3.14)$
Volume = area x average depth x 7.48



Area = $L \times W$
Volume = area x average depth x 7.48