

POOL OPERATOR TRAINING

What you need to know to keep bathers safe and healthy

ALL POOLS AND SPAS OPEN TO THE PUBLIC, GUESTS, OR CLUB MEMBERS MUST HAVE

- ✓ A **permit** to operate from the Health Department
- ✓ **Barriers** to keep out un-supervised children or un-approved users
- ✓ **Automatic disinfection** feed and **pH adjusting** equipment
- ✓ **Clear, clean water** that that contains correct levels of an approved pool disinfectant and the correct pH (continued on next slide)

ALL POOLS AND SPAS OPEN TO THE PUBLIC, GUESTS, OR CLUB MEMBERS MUST HAVE

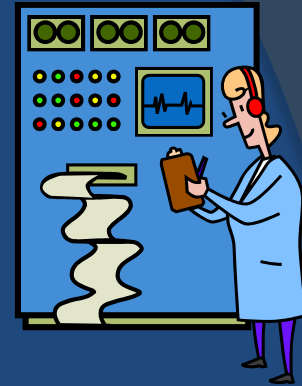
- ✓ **Pumps** sufficient to **circulate the water** according to requirements
- ✓ **Drain covers** for all outlets that meet Virginia Graham Baker Law requirements and **suction entrapment prevention**
- ✓ **Facilities maintained** to provide sanitary toilet use, showering, trip free decks, safe stairs and ladders, and lighting and depth marking

It is the LAW

The Goal of all requirements is
to **prevent illness, injury, and
death** from use of pools and
spas

I work at a pool. What does my pool need?

A competent operator!



Every pool licensed by the Health Department needs an operator who:

- ✓ Understands the **function and purpose** of the pool equipment
- ✓ **Inspects the pool features and equipment** every day to assure their proper functioning
- ✓ **Can maintain** the equipment in the event of a failure or knows who to call

Pool Operators are Responsible for Pool Safety!!!

Operators must

- Keep pool users **safe and healthy**
- Maintain **water quality** in the pool
- Maintain **daily inspection records**
- Understand **WHEN to CLOSE**

What are the possible outcomes of poor pool management?

**Bather Illness, Injury,
or Death**

Let's review the basics of safe pool or spa operation

Remember:

It is up to you to **know your facility**.

If you don't, **get an expert** to help.

If you don't understand the requirements, **call the Health Department**.

The Basics

General Use vs. Limited Use

- ⦿ Limited Use Pool: a water feature at a residential facility – a condominium, hotel, apartment complex, etc. limiting users to residents or invited guests.

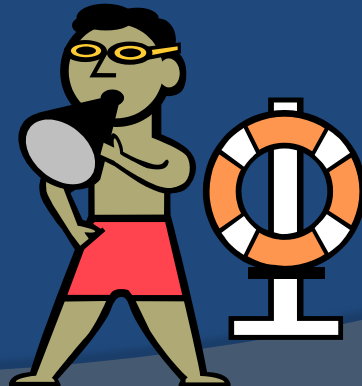


- ⦿ General Use Pool: a water feature open to the general public



The main difference in requirements for General vs. Limited Use pools is in the need for **Life Guards**.

General Use Pools **ALWAYS** need guards or a guard equivalent swim coach



WATER CLARITY

A safe pool must have **clear, clean water**.

The pool or spa **drains should be easily visible** from the pool deck.

If you can see a **quarter fall to the bottom** you should have good clarity.

Every day look at the pool or spa



Can you see the
drain?



Can you see the
drain?

What do you do with this pool??



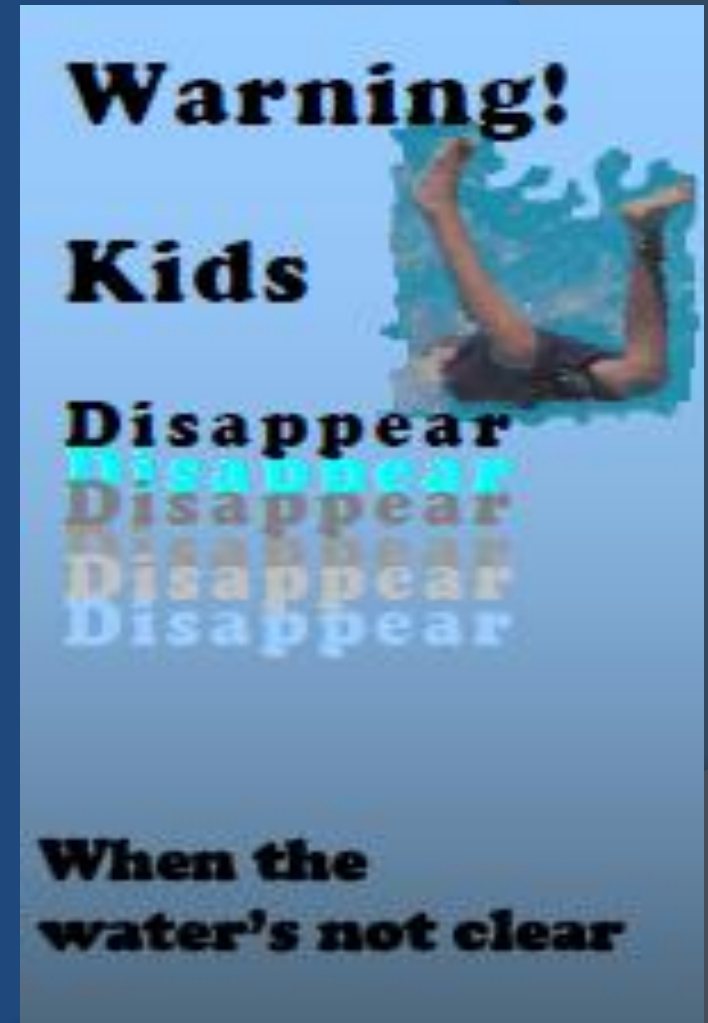
Close it!!

A cloudy pool is a threat to bathers

Immediately **close** the pool to bathers until the water is clean and clear

To **correct a cloudy pool** you need to check that you have

- A **functioning pump**
- **Filters** that are operating correctly
- Proper pool **chemistry**
- **Control** of algae growth



A cloudy pool is a threat to bathers

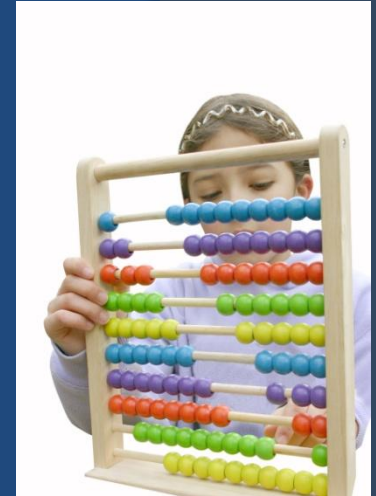
- ⦿ A pool professional should be contacted if you need help maintaining clarity in your water

Circulation

A key to maintaining water clarity and quality in a pool or spa is circulating the water through the filters and treatment system.

- ⦿ All of the water in the pool must be circulated at least **every 6 hours**
- ⦿ All of the water in a spa must be circulated at least **every 30 minutes**, more often depending on bather load

Calculating Pool Volume



You need to know the volume of water in your pool or spa:

- To determine if the **flow rate is adequate** to meet the turnover requirements
- To figure out **the quantity of a chemical** to add to remedy an imbalance (continued)

Calculating Pool Volume (continued)

- To determine **bather load***
- To determine proper **size of equipment** like filters and heaters

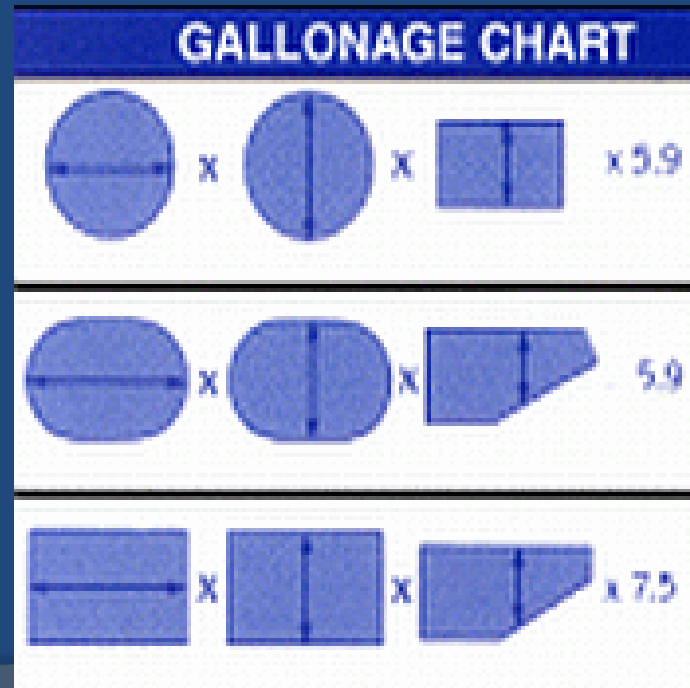
*Remember that the number and frequency of bathers affects water quality!!

For square or rectangular pool:

Length x Width x
Avg. Depth x 7.5 =
Number of Gallons

For round or oval pool:

Length x Width x
Avg. Depth x 5.9 =
Number of Gallons



*All dimensions must be measured in feet for these calculations

Average Depth = Shallowest Depth +
Maximum Depth divided by 2.

Irregularly shaped pools are more
complicated – ask a pool professional
for guidance.

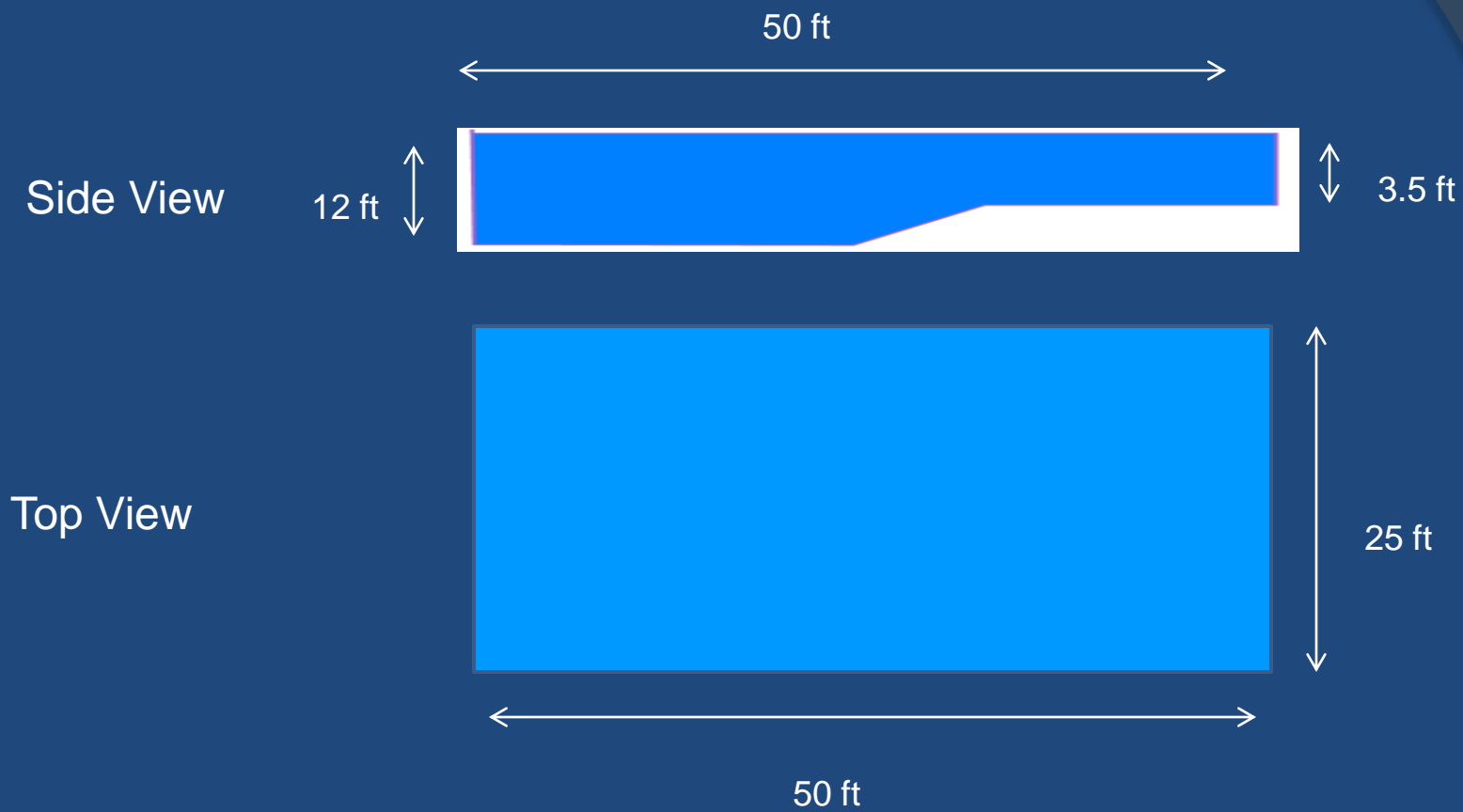


Figure out an approximate volume of the pool shown above

Answer:

Length x Width x Avg Depth x 7.5 = Volume

Length = 50 feet

Width = 25 feet

Average Depth = $\frac{12 + 3.5}{2} = 7.75$ feet

Use constant to convert cubic feet to gallons = 7.5 g/ft³

Volume = 50 x 25 x 7.75 x 7.5 = 72,656 gallons

Use your **pool volume** to **calculate the flow rate** that you need to achieve your **required turnover**

Flow rate on a typical flow meter is measured in gallons per minute



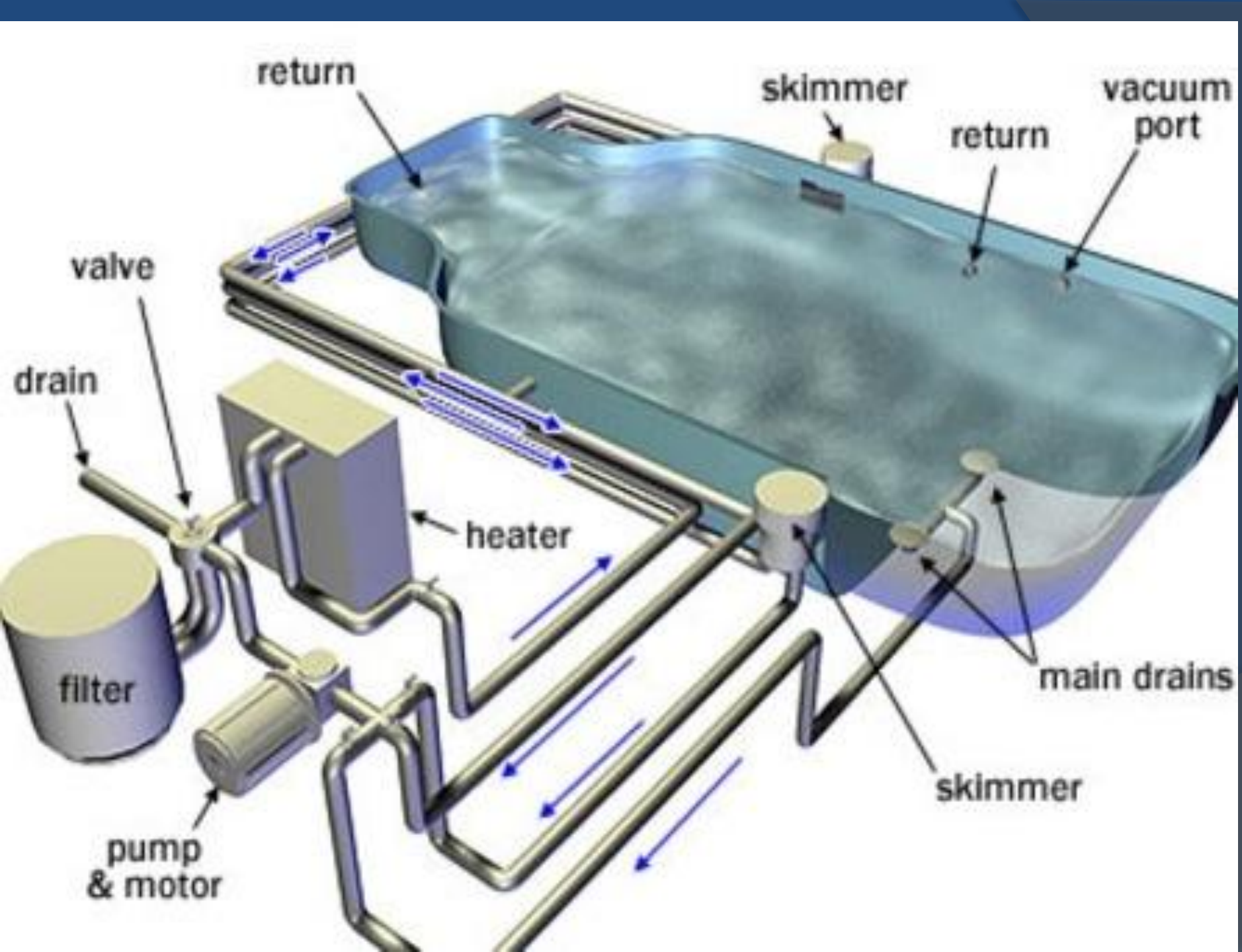
For the swimming pool with **volume of 72,600 gallons**, to achieve a complete turnover every **6 hours** (360 minutes) you will need a total flow rate of

$$72,600 \text{ gallons} / 360 \text{ minutes} = 200 \text{ gpm}$$

You can achieve your total flow rate by recirculating water through the drains and recirculating water through the skimmer system.

Drains pull water from the deepest part of the pool.

Skimmers pull water off of the surface of the pool.



Understand the flow of water through your pool or spa system!

The **pump(s)** need to supply **adequate flow** for turnover requirements.

Automatic vacuum relief protection must be installed if your drains do not meet the spacing or size requirements of the VGBA.

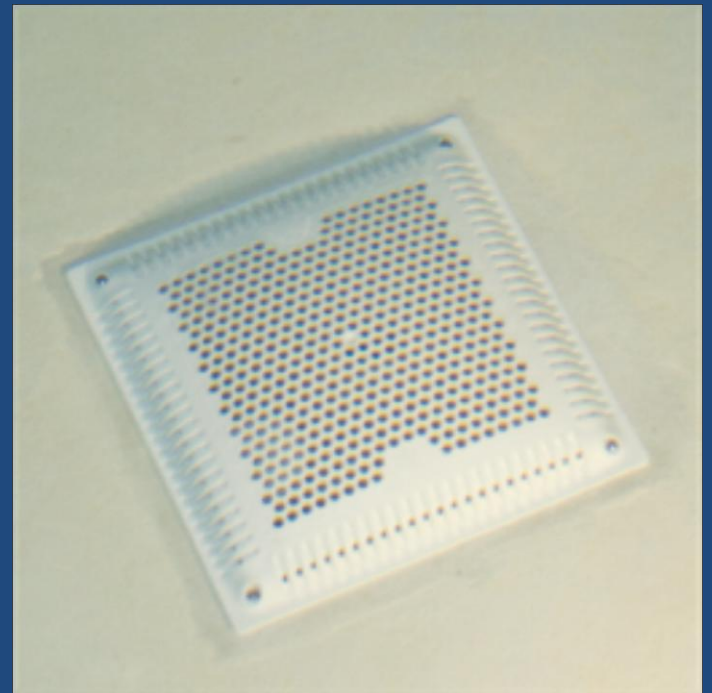
You must be able to **maintain the mechanical systems** for your pool/spa (or be able to call on someone who can maintain these systems).

What is VGBA?

- ⦿ The Virginia Graham Baker Act
- ⦿ Passed by the US Congress to **prevent drowning from entrapment** in pools and spas
- ⦿ Enforced by the **Federal Consumer Product Safety Commission**
- ⦿ Requires all pool and spa **outlet covers** and skimmer **equalizer lines** to meet anti-entrapment safety standards
- ⦿ Requires **protection from suction entrapment** hazards either through drain number, size, and spacing or through automatic vacuum relief systems

More on VGBA

- Check drain covers regularly for damage
- Replace if loose, cracked or missing
- Follow manufacturers recommendations for installation and replacement



Physical Treatment of Water



Filters remove gross particle contamination from the water

Different types of filters can remove particles of different sizes

How big is it?

- Human hair – 70 microns
- **Rapid-rate sand filter** – 50 microns
- Limit of human visibility – 40 microns
- **High-rate sand filter** – 25 microns
- **Cartridge filters** – 15 microns
- Red blood cell - 8 microns
- **D.E. filter** – 4 microns
- Bacteria – 1 micron



Filters need to be correctly maintained

Filters will become blocked or develop channeling over time if not maintained.

Follow manufacturer's recommendations for maintenance.



Monitor the pressure gauge.

When the pressure has increased 10 psi above **clean** filter pressure it is probably time to backwash, clean, or replace your filter depending on filter type

Pool Disinfection and other Chemical Parameters

POOL CHEMISTRY & DISINFECTION

Filters are necessary to remove larger particles from the pool to maintain clarity **but they do not remove bacteria and viruses.**

Filters clean the water enough to allow the chemical disinfectant to be effective.

Automatic disinfectant feeders are required on pools and spas!



Rainbow automatic chlorine or bromine feeder



Polaris automatic feeder

POOL CHEMISTRY & DISINFECTION

Chlorine or Bromine are disinfectants used to kill germs in public pools and spas

A constant minimum level of disinfectant needs to be present in the pool water in order to kill disease causing microorganisms

Sunlight, dirt, skin, and fecal matter reduce the effectiveness of disinfectants.

3.5		Argon
fur	Chlorine	18
6	17	A
5	Cl	39.
.07	35.45	
2.5	3.0	
		Kr

35
Br
BROMINE
79.9

POOL CHEMISTRY & DISINFECTION

Required Disinfectant
Levels:

Free chlorine ≥ 1.5 ppm
(3 ppm for spas)

Bromine ≥ 2.5 ppm
(4 ppm for spas)

Maximum Disinfectant
Level allowed (free or
total) ≤ 10 ppm



Photos by Fidalgo Pool

POOL CHEMISTRY & DISINFECTION

More on Chlorine....

- ⦿ **Free Chlorine** is the fraction of chlorine available for disinfection.
- ⦿ **Combined Chlorine** measures disinfection by-products, including chloramines. Combined chlorine has the following issues:
 - The active disinfecting chlorine ion is bound by nitrogen and organic compounds
 - It is not an effective disinfectant
 - It can be irritating to eyes and mucous membranes
 - It can contribute to cloudy water
 - It causes un-pleasant odors and poor air quality in the pool or spa area and can have long term health impacts
- ⦿ **Total Chlorine** is the sum total of free chlorine and combined chlorine

*Bromine is an active disinfectant whether it is free or combined

- ① If you use chlorine as a disinfectant **measure and record both Free and Total Chlorine.**
- ① **Free chlorine** tells you your active disinfectant level and must meet the minimum requirements.
- ① **Total chlorine** will tell you if you are below the maximum allowed (10.0ppm) and let you calculate your combined chlorine.

remember – total chlorine should never be more than 1.5 x free

A variety of methods can be used to **control combined chlorine** levels. These can include:

- ① **Shocking** the pool or spa with super chlorination or a commercial shocking agent to break down combined chlorine
- ② Providing **secondary treatment** with ozone or UV light to break down combined chlorine
- ③ Maintaining your **filters**, having adequate **circulation** and **replacement of pool water** to reduce the load of organic material in the pool



Test Kits

- ⦿ You must have test kits or test instruments to accurately measure all of the following:
 - Disinfectant (Chlorine or Bromine)
 - pH
 - Alkalinity
 - Cyanuric Acid (if used)
- ⦿ Replace the chemicals in your test kit every year

To measure free chlorine or bromine you must be able to detect the minimum and below the maximum. Or you need to **CLOSE** the pool or spa!

You cannot keep a pool or spa open to bathers unless you have at least the minimum disinfection level required.

*Minimum = 1.5 ppm for pools
3.0 ppm for spas*



If you do not detect the minimum level with your test kit, re-test once to confirm and then **close the pool or spa until you have resolved the situation.**

Resolving the situation means that you have **fixed** the cause of the low disinfectant levels and have **measured and recorded** at least the minimum level required to be open.

If you measure disinfectant level with a color indicator and your result reads at the most intense color on the scale

YOU DO NOT KNOW HOW MUCH DISINFECTANT YOU HAVE

If your scale maxes out at 5 ppm, you could actually have 5, 10, or >20ppm.

You need to **DILUTE** your sample to get an accurate reading

Because you cannot exceed the **maximum allowed of 10ppm**



To dilute your sample to accurately measure free or total chlorine or bromine

Keep a bottle of **distilled** water on hand

Dilute a new sample of pool water by filling the sample vessel with $\frac{1}{2}$ pool water and $\frac{1}{2}$ distilled water

OR for more dilution

$\frac{1}{4}$ pool water and $\frac{3}{4}$ distilled water

UNTIL the resulting color reads in the middle portion of the color scale

Multiply the concentration value by 2 (first example) or 4 (second example) to obtain your accurate ppm of disinfectant level in the pool or spa.



POOL CHEMISTRY & DISINFECTION

pH

Why does it matter?

pH must be measured and recorded at least daily for pools and spas

Keeping pH

between 7.2 and 8

balances the disinfectant's germ killing power while minimizing skin and eye irritation

Water Quality	pH
Poor Chlorine Disinfection Eye Irritation Skin Irritation	> 8.0
Most Ideal for Eye Comfort and Disinfection	7.8
	7.6
	7.2
Eye Irritation Skin Irritation Pipe Corrosion	< 7.0

pH is also usually measured with a colorimetric indicator

You cannot dilute a sample to obtain a more accurate pH

If your pH reading is falling outside of the colorimetric zone

CLOSE THE POOL OR SPA

until you correct the problem and can verify by retesting and recording pH within the allowed zone of 7.2 – 8.0.

WHAT IS CLOSURE??

All of the following is required for closure:

- ✓ ALL bathers must leave the pool.
- ✓ Entrances must be locked so that guests or customers do not have access
- ✓ Signs must be posted on entrances stating the pool or spa is closed
- ✓ Staff must know that the pool or spa is closed and cannot be used by bathers

When do you NEED to CLOSE your pool or spa to bathers?

- ✓ When **disinfection** levels are outside of the allowed range
- ✓ When **pH** is outside of the allowed range
- ✓ When you cannot **see the pool bottom clearly**
- ✓ When any **equipment is malfunctioning** including pumps, filters, chemical feed equipment
- ✓ When physical structures threaten the **safety of bathers**, such as broken drain covers, broken ladders
- ✓ When a general purpose pool does not have adequate **life guard** coverage
- ✓ In the event of **a fecal incident or other infectious disease threat** to the water

*This is not a complete list



How long do I need to stay closed?

UNTIL THE PROBLEM IS FIXED!

Don't open until the pool water is safe, clear, clean and getting appropriate flow, filtration, and treatment.

Don't open until the pool is SAFE!

Disinfectant can be manually fed into a pool or spa when no bathers are present in the event of a failure of the automatic feed system. This is allowed only on an emergency basis during the repair or replacement of the feed equipment. You must be able to maintain the required levels of disinfectant in the pool or spa. Hand feeding should not occur for longer than one week.

POOL CHEMISTRY & DISINFECTION

A bit more chemistry:



Cyanuric Acid

- Cyanuric acid (CyA) has no disinfection properties
- CyA is used to stabilize chlorine in **OUTDOOR** pools
 - UV rays in sunlight can destroy about half the chlorine in a pool in less than an hour
 - There is **NO NEED** to use sun stable chlorine in **indoor pools**
- CyA does not stabilize bromine
- Too much CyA interferes with disinfection and can irritate bathers

More on.....

Cyanuric Acid

- CyA levels must not exceed **90 ppm** (ideal range is 30 to 50 ppm)
- **Dilution with freshwater** is the only way to lower CyA levels
- CyA must be measured at least **WEEKLY** in any pool using sun stable chlorine

POOL CHEMISTRY & DISINFECTION

Total alkalinity is the measure of the water's ability to resist changes in pH

- Total alkalinity should measure between **60 and 180 ppm**
- **Total alkalinity must be measured weekly**

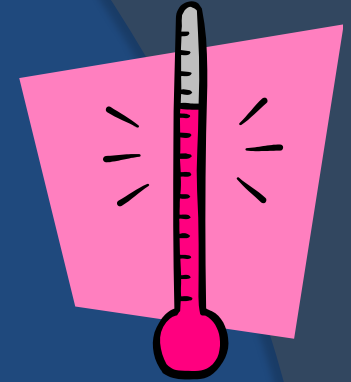


Effects of high alkalinity – cloudy pool water and algae growth



Effects of low alkalinity on left (plumbing corrosion)

Water Temperature



- ⦿ Spa or pool water temperature may not be more than 104 degrees F (40 degrees C)
- ⦿ There is no minimum temperature for pools
- ⦿ Shower temperature must be between 90 and 120 degrees F

To Summarize.....

- ⦿ Measure and record **daily** (more often with heavy use pools):
 - Chlorine or Bromine levels
 - pH
 - Water temperature in spa
- ⦿ Measure and record **weekly** or more as needed:
 - Alkalinity
 - Cyanuric Acid (if use stabilized chlorine)
- ⦿ Keep records for **3** years.



This is key!!

Heavy bather loads will cause your pool or spa chemistry to change more quickly.

Disinfection levels and pH need to be checked **MORE FREQUENTLY** during periods of heavy use.

The Pool Facility and Safety

EMERGENCY EQUIPMENT

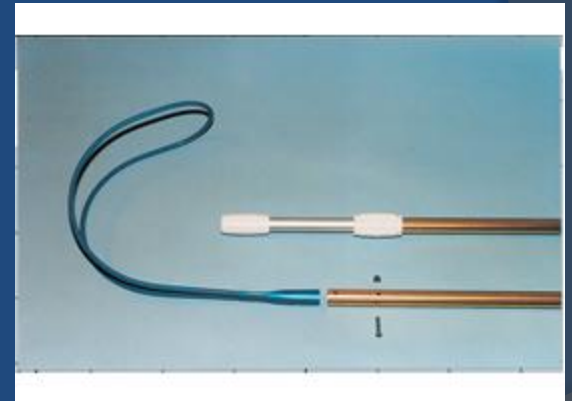
- All pools and spas must have an emergency phone within the pool/spa area or post the location of a nearby phone that is accessible.
- All pools must have rescue equipment.
- All pools must have a stocked first aid kit



*General Use Pools have additional emergency equipment requirements

RESCUE Equipment

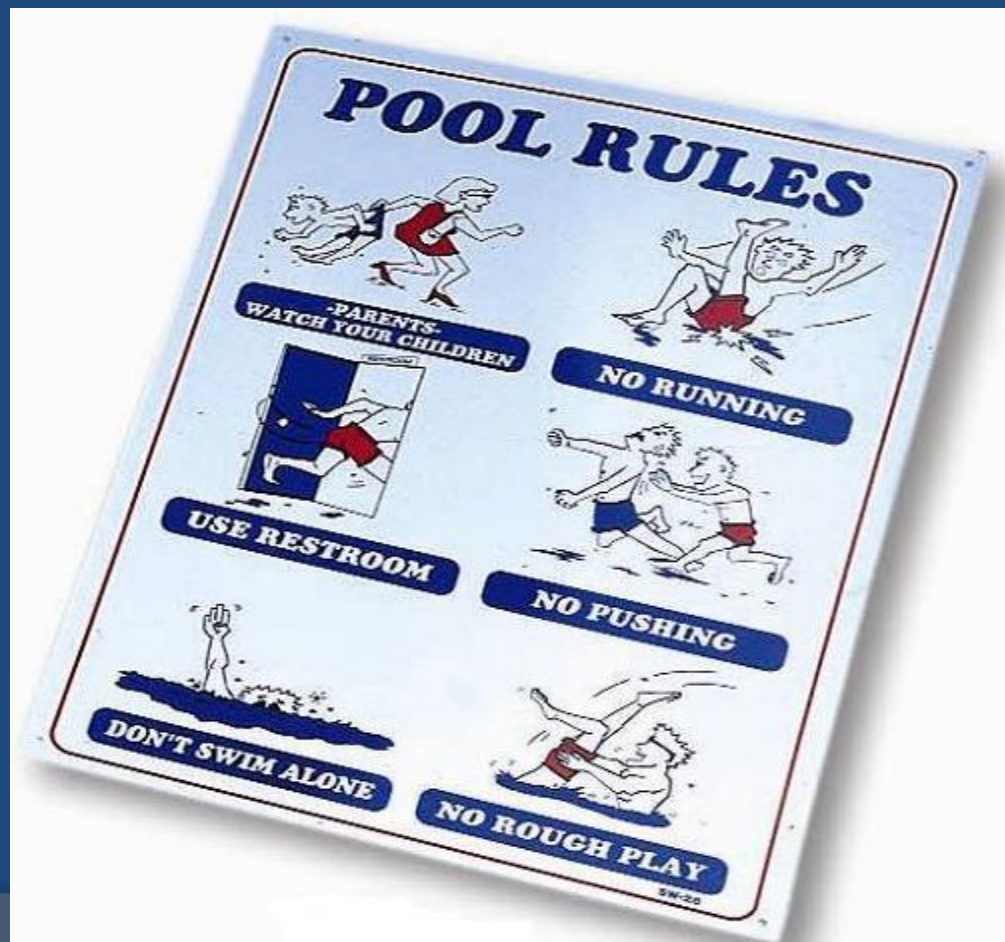
- Reaching Pole
- Heaving Line
- Ring Buoy
- Lifeguard Hook
- Rescue tube



Make sure the pole and ring can reach someone at any point in the pool

RULES! RULES! RULES!

- Rules are essential for safety
- They must be clearly posted and enforced



Sanitary Facilities

Bathers must have access to:

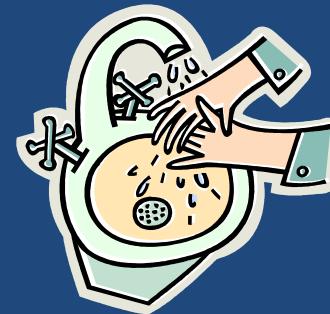
- Private Shower



- Private Toilet



- Handwashing Sink



Sinks and showers must be supplied with warm water with **temperatures of 90-120 degrees Fahrenheit.**

Barriers

No climbable structures are allowed within 5 feet of the outside of the perimeter fence

Barriers must be un-climbable and 60" high for limited use pools, 72" for general use pools

Entrances must be self-closing and self latching.



A child cannot have access to a barrier latch.

**Barriers prevent drowning by
keeping unauthorized
people out of the pool**





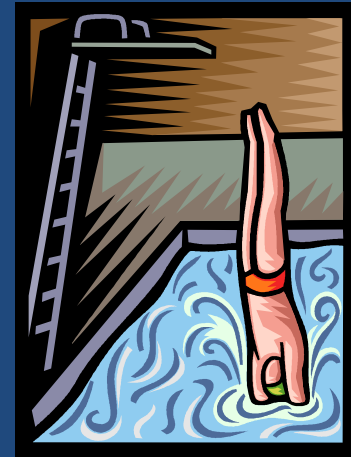
Some diseases can be easily spread in pool water.

Disease Prevention

Disease Prevention

Many agents can cause recreational water outbreaks.

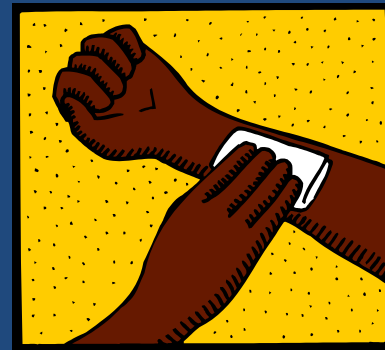
- Chemicals
 - Imbalanced chemicals
- Viruses
 - Norovirus
- Bacteria
 - Shigella, E. coli, Pseudomonas
- Parasites
 - Cryptosporidium, Giardia



Waterborne illness symptoms can vary.

The most common are:

- Stomach illness (vomiting, diarrhea, fever)
- Skin rashes, irritation, hives
- Wound or ear infections



Disease Prevention

Ill bathers bring germs into the pool.

Most illnesses are a result of inadequate disinfectant in the pool water.

Some parasites, like Cryptosporidium and Giardia are difficult to kill with chlorine.



Proper pool maintenance prevents illness spread



- *Swimmers must shower before entering pool
- *Swimmers must be healthy to use the pool
- *Fecal accidents must be swiftly contained and treated (continued)

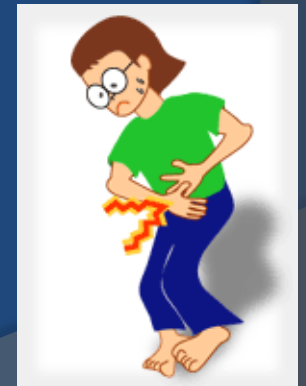
Proper pool maintenance prevents illness spread



- * Children must be supervised and toileted often
- * Pool water in balance is more soothing to the skin
- * Chlorine can kill bacteria, viruses, and parasites (with enough exposure time)

Fecal Incident Response (or Poop in the Pool)

- Diarrhea is more difficult to treat in a pool than formed stool.
- Diarrhea is more likely to contain disease organisms.
- Some microorganisms are harder to kill than others.



Fecal Incident Response

- ◉ IMMEDIATELY **CLOSE** THE POOL TO ALL SWIMMERS
- ◉ Remove as much of the fecal material as you can.
- ◉ **Raise the free chlorine** level to
 - **2 ppm** for 30 minutes if formed stool
 - **20 ppm** for 13 hours if diarrheal incident
- ◉ Maintain pH 7.5 or less
- ◉ Maintain water temperature 77°F or more
- ◉ Backwash the filter.
- ◉ **Document the incident and what was done to remedy the pool water.**
- ◉ **NOTIFY THE HEALTH DEPARTMENT!!!**

When do I need to notify the Health Department?

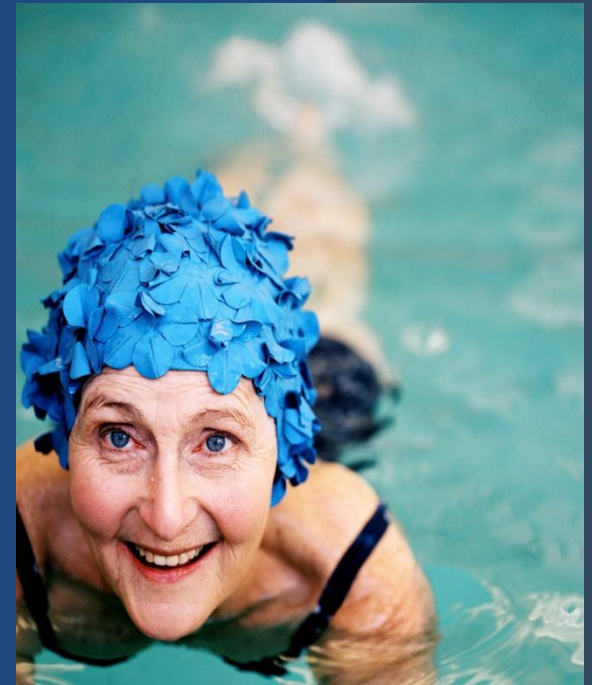
Call us at **360-336-9380** in the event of:

- Fecal or vomiting incidents
- Major injuries or drowning
- Major equipment failure
- Planned equipment changes or replacement
- New management



When in doubt - NOTIFY HEALTH

Now it is up to you!!



Questions?

- **360-336-9380**
- We are always willing to talk you through a situation.
- Better to call than to cause a threat to your bathers.
- **When in doubt, play it safe, close the pool.**