# ELECTRICAL STORM ACTIVITY RECOMMENDATIONS
## (INDOOR AND OUTDOOR POOLS)

1. Pool Staff should always understand the daily weather forecast. Lightning's behavior is random and unpredictable

2. Monitor a radio weather channel if a storm is in the near forecast.

3. Clear patrons from swimming pool and deck at the first sound of thunder or sign of lightning.

4. Keep water and pool deck clear for at least thirty (30) minutes after last sound of thunder or sign of lightning.

5. Enforce this policy consistently and without exception.

6. Swimming pools are connected to underground piping, wiring, cables, deck grating, overhead metal building structures, fencing and lighting. **SAFETY FIRST!**

REFERENCES: NATIONAL LIGHTNING SAFETY INSTITUTE
NEWPORT NEWS AQUATICS AND BEACH SAFETY

# AQUATIC FACILITY STAFF

## CERTIFICATION AND TRAINING REQUIREMENTS

### POOL LIFEGUARD:

1. American Red Cross Lifeguard Training or equivalent certification
2. American Red Cross First Aid or equivalent certification
3. American Red Cross CPR for the Professional Rescue or equivalent certification
4. Certified Pool Operator (at least 1 on staff)
5. American Red Cross Preventing Disease Transmission or Blood borne Pathogens Training
6. Site Specific in-service training

### POOL OPERATOR

1. Certified Pool Operator
2. American Red Cross Preventing Disease Transmission or Bloodborne Pathogens Training
3. Hazardous Material Management
   *Should not be lifeguard unless certified

### POOL MANAGER OR HEAD LIFEGUARD

1. Certified Pool Operator
2. American Red Cross Preventing Disease Transmission or Blood borne Pathogens Training
3. Hazardous Material Management
4. Meet all pool lifeguard requirements
5. American Red Cross Head Lifeguard or Lifeguard Management Program
   *Should not lifeguard unless certified

### SWIM INSTRUCTOR

1. American Red Cross Water Safety Instructor (or equivalent certification)
   *Should not lifeguard unless certified

### SWIM COACH

1. American Red Cross Safety for Swim Coaches
2. American Red Cross First Aid or equivalent certification
3. American Red Cross CPR or equivalent certification
   * Should not lifeguard unless certified.

**A DESIGNATED CERTIFIED LIFEGUARD SHOULD SUPERVISE ALL PRACTICES AND PROGRAMS AT YOUR FACILITY. SURVEILLANCE SHOULD BE THEIR PRIMARY DUTY.**

# GENERAL SWIMMING POOL FACILITY RULES

## RULES SHOULD BE ENFORCED CONSISTENTLY

**CHILDREN MUST BE ACCOMPANIED BY AN ADULT (18 OR OLDER) AT ALL TIMES**

**SHOWERS REQUIRED – NO EXCEPTIONS**

**PROPER SWIMWEAR REQUIRED**

**NO ONE WITH OPEN WOUNDS OR CONTAGIOUS DISEASES ALLOWED IN POOL**

**NO RUNNING ON POOL DECK**

**NO ROUGH PLAY, SPITTING OR SPOUTING**

**DIVE IN DESIGNATED AREAS ONLY**

**APPROVED PANTS MUST BE WORN OVER DIAPERS**

**USE OF ALCOHOL PROHIBITED**

**NO SMOKING ON FACILITY GROUNDS**

**NO GLASS OBJECTS ALLOWED IN FACILITY OR LOCKER ROOMS**

**NO CHEWING GUM OR FOOD ALLOWED IN POOL**

**OBEY LIFEGUARDS AT ALL TIMES**

# Hot Tubs, Spas, Steam Rooms and Saunas

## Hot Tubs (Spas)

Hot Tubs, sometimes referred to as Spas or Whirlpools are small heated pools using multiple therapeutic water jets and air intakes. Suggested temperature range: 100 – 104° F. Most Hot Tubs are sanitized with Bromine or Chlorine and we recommend chemical automation for all Public Hot Tubs.

**Safety and Maintenance Considerations:**

1. Empty Hot Tub Water Regularly (i.e. Once a week or every other week)
2. Clean the scum line often (i.e. daily or more as required)
3. Check to change filter sand more often than swimming pools
4. Maintain higher sanitizer levels at all times
5. Use anti-foaming products if necessary
6. Water chemistry changes may occur quickly
7. Bottom suction drains should be safety checked through out the day

## Steam Rooms

Steam Rooms are enclosed heated areas usually lined with ceramic tile and most often feature multilevel benches for lounging. A team generator (located in a separate room) injects steam from an inlet near the floor at timed intervals or according to temperature need. Suggested temperature range: 100 – 125 degrees F.

**Safety and Maintenance Considerations:**

1. Safety check all interior surfaces before start up each day: Look for loose tiles or missing grout.
2. Caution: HOT METAL SURFACES
3. Tile grout will grow mold and mildew daily
4. Thorough disinfect all interior surfaces at closing and hose off using hot tub water

## Saunas

Saunas are enclosed heated rooms usually lined with redwood or cedar and often feature an interior heater topped with hot rocks. Saunas may have multi-level wooden benches for lounging. Suggested temperature range: 150 – 195 degrees F.

## Safety and Maintenance Considerations

1. Safety check all interior surfaces at start up. Look for loose nails and splintered wood.
2. Caution: HOT METAL AND GLASS SURFACES
3. Heater should be protected by metal cage.
4. Do not allow patrons to pour water over hot rocks. WATER AND ELECTRICITY DO NOT MIX.

## SUGGESTED RULES FOR HOT TUBS, STEAM ROOMS AND SAUNAS

1. Recommended time limit: 10 – 15 minutes.
2. Persons with high blood pressure or heart conditions should not use
3. Staff supervision at all times
4. Pregnant women should not use
5. Children under 13 years of age are not allowed
6. No soaps, body oils or lotions allowed.
7. No shaving allowed
8. Swim caps and street clothes not allowed
9. Glass objects not allowed
10. Proper attire required
11. Use of Alcohol Prohibited

Rules should be permanently posted at each facility within sight while using or at entrance.

| | |
|---|---|
| | 0 ppm (mg/L) indoor pools and spas |
| | 0 ppm (mg/L) spas |
| Alkalinity | 75 – 125 ppm (mg/L) |
| Calcium | 150 – 1,500 ppm (mg/L) |
| Langelier Index | 0.2 – 0.8*** |
| Ryznar Index | 6.3 – 6.7 |
| Chloramines | 5.0 ppm (mg/L) maximum**** |

These parameters cannot be viewed independently and must be maintained in balance collectively to provide proper Langelier and Ryznar Indices.

* Higher FAC levels may be necessary to maintain required ORP levels.

** Lower FAC levels may be acceptable assuming proper ORP levels are maintained in accordance with local health department standards.

*** For seawater applications, refer to StaffDavis correction factors.

**** Chloramines are a naturally occurring byproduct resulting from the oxidation of organic nitrogen with chlorine-based oxidizers. The concentration of chloramines in a given body of water will vary based on factors such as pool volume, bather load, distribution rates and accumulated demand. Since chloramines are not accountable for the odor, eye irritation, rashes, corrosion, etc., attributed to the presence of inorganic nitrogen chlorides, chloramines, in and of themselves don't warrant pool closure or corrective action when maintained within the given guideline.

**Manual Addition of Chemicals**

Manual addition of pH and disinfection chemicals will be allowed under special conditions and it is recommended that the facility be closed during such special conditions and the addition of adjusting chemicals. At least one full turnover should be allowed before reopening the facility following chemical adjustment. The facility may be returned to use when free chlorine and pH levels drop to within acceptable levels as deemed safe by local health department and/or regulatory agency recommendations. Follow all chemical and equipment manufacturers' recommendations related to their product's use and acceptable chemical concentration levels accommodating such special chemical adjustment conditions.

**Cyanuric Acid**

If cyanuric acid (stabilizer, conditioner) by itself or in any cyanuric/disinfectant combined form is added, then the cyanuric acid concentration shall be measured a minimum of once per month and records shall be kept of the results.

**Facility Recirculation System**

The recirculation system must be in operation at time of public use. To facilitate energy and natural resources conservation, it is recommended that the recirculation system be shut off 1-3 hours after the facility closes; operation must resume 1-3 hours prior to reopening for public use. The energy and natural resource conservation feature must be controlled

by automated water chemistry and filtration control devices, assuring acceptable water quality. Recirculation system operation must comply with all regulatory agencies and applicable codes.

**Facility Drains**

Facility must be closed immediately if main drain grates or covers are missing, loose or broken. All main drain covers or grates should be visually inspected daily by the facility operator.

**Test Kits**

Test kits are required at all facilities to determine free active chlorine and total chlorine using DPD method, total alkalinity, calcium hardness and pH. If cyanuric acid, sodium chloride or quaternary ammonium are being used, then the appropriate test kits should be provided.

**Keeping of Daily Records**

The keeping of a daily record regarding facility operation shall be the responsibility of the facility operator. Treatment chemical levels, flow readings, pressure, vacuum, chemical additions, and maintenance items are recommended entries. See sample form provided.

**Ozone Generator/UV Systems**

Ozone generators can be used as a supplemental oxidation system to a standard oxidation/disinfection treatment package. The concentration of ozone shall not exceed 0.1 ppm (mg/L) of the recirculation flow unless the system is equipped with an ozone destruct system. Safety equipment, ozone detectors, and self-contained breathing apparatuses shall comply with all regulatory agencies and applicable codes. Corona UV systems should be installed per manufacturer's recommendation.

**Bathing Load – Adherence**

The bathing load of the facility shall comply with all regulatory agencies and applicable codes.

**Recirculation and Treatment Equipment**

All recirculation and treatment equipment, including filters, disinfection feeders, ozone generators, circulation pumps, etc., should be listed as complying with the ANSI/NSF International Standard 50-1996 or local equivalent.

All recirculating pumps should be fitted with a properly sized hair and lint strainer, unless suction occurs after filtration. Pumps should be selected to provide the required rate of flow at the required minimum total dynamic head (TDH). Pumps that are installed above water level shall be self-priming.

All filters will be equipped with influent and effluent gauges, allowing for differential pressure indication across the filter media. Gauges shall be a minimum of 4" (10.16 cm) in diameter and shall read 0-100 psig (689 kPa).

All recirculation pumps will be equipped with vacuum/compound gauges for performance evaluation. Gauges shall be a minimum of 2" (5.08 cm) in diameter and shall read 0-30" Hg (761 mm) vacuum and 0-30" Hg (761 mm) and 0 to 60 psi (413 kPa) compound.

**Cleaning System**

A portable or plumbed-in vacuum should be provided. Pumps should be self-priming and include a hair and lint strainer. Automatic or robotic cleaners can satisfy this requirement as long as they can circulate and clean the entire pool/facility. Portable or automatic and robotic cleaners should be powered through a GFI-protected electrical circuit for maximum safety.

**Heating Devices**

Facility water heating devices should comply with nationally recognized standards. Piping with influent, effluent and proportioning valves should allow removal or isolation of the heating device from the recirculation system. Installation should not affect proper turnover rate. Monitoring thermometers should be installed on influent and effluent lines, and flow should be proportioned to supply manufacturer's suggested temperature rise per pass. Heating devices should comply with all regulatory agencies and applicable codes. Best effort shall be made to integrate a high efficiency and low emission heating system whenever possible.

**Facility Wastewater Disposal**

Facility wastewater should be disposed in accordance with regulatory agencies, applicable codes and environmental guidelines. Disposal of water from DE applications should be accomplished though DE separators with a capacity equal to filter surface area, or through settling tank.

**Disinfection and pH Feeders**

Mechanical chemical feeders should be provided for all pH and disinfection chemicals. All chemicals should be fed into the return line after the pump, filter and heating device.

**Chemical Automation**

A device that monitors and controls chemical feed devices for pH and ORP (disinfection and oxidation) is recommended for each recirculation system. These chemical control devices should be electrically interlocked with the recirculation pump power and may also be equipped with an additional flow sensing device to disable chemical feed in the event of loss of system or monitoring flow.

**Chlorine Delivery System**

The chlorinator should be capable of feeding a chlorine dosage of a minimum of one-half pound (0.2268 kg) of available chlorine per day, per thousand gallons of water (3,785 Liters), based on using a controller with time-based proportional feed.

Some applications will require higher sizing, including water slides, zero depth pools, therapy pools, etc.

**Supervision and Safety**

All owners, managers, supervisors, swimming instructors and lifeguards should be responsible for the supervision and safety of the facility.

**Safety Equipment**

All facilities shall be equipped with safety equipment as detailed by all regulatory agencies and applicable codes.

**Chemical Storage**

Chemicals should be stored in accordance with regulatory agencies and applicable codes. Chemicals shall be stored in a cool, dry and well-ventilated area that is inaccessible to unauthorized personnel.

**Pool Covers**

Floating insulated pool cover blankets are recommended for use on all heated pools that rely on non-renewable energy sources. The cover system should be equipped with ultra-violet stabilized materials and a method of deploying and removing the insulated blankets. The energy saving blankets should be deployed when the facility is closed to the public and the area made inaccessible to unauthorized persons. Local factory-trained energy saving blanket systems specialists shall be employed to assure proper blanket fit and installation and training of staff to assure maximum energy savings and performance. A U. S. Department of Energy Audit on actual energy and other resource cost savings shall be prepared and presented to facility management. Only blankets complying with all known Federal Regulation Label and Marking requirements (OSHA and ASTM-Es 13-89) shall be employed, assuring public safety.

**Wading Pools**

It is recommended that wading pool piping shall not be physically connected to any other swimming pools. Wading pools should have a maximum depth of 2 feet (0.6096 m), with a perimeter maximum depth of 12" (0.3048 m). Automatic chemistry controllers are recommended for wading pools to assure proper chemistry levels on these small bodies of water. Main drain lines should discharge into a collector tank. Wading pools should be equipped with a quick drain to waste system for rapid evacuation in the event of a fecal discharge.

**Whirlpools, Spa Pools and Hot Tubs**

Recirculation system should have a maximum turnover rate of one-half hour and should be equipped with an automatic chemical control system to assist in maintaining proper

# SWIMMING POOL DOSAGE CHART

Pool Name: _____

Pool Gallonage: _____

Calculated By: _____ Date: _____

**PH:**
To lower pH by .2 ppm, add _____ gallons of muriatic acid.
To raise pH by .4 ppm, add _____ pounds of soda ash.

**Total Alkalinity:**
To raise total alkalinity by 10 ppm, add _____ pounds of sodium bicarbonate.
(Desired range: 80 – 120 ppm.)

To lower total alkalinity by 10 ppm, add _____ gallons of muriatic acid into the deep end of the pool.

**Calcium Hardness:**
To raise calcium hardness by 10 ppm, add _____ pounds of calcium chloride.
(Desired minimum: 250 ppm.)

To lower calcium hardness, remove the same % of water as the desired % drop needed.

**Chlorine Residual:**
To raise chlorine residual 1 ppm, add _____ pounds of calcium hypochlorite or _____ gallons of sodium hypochlorite.

To lower chlorine residual 1 ppm, add _____ pounds of sodium thiosulphate.

To calculate Breakpoint Chlorination:

| | | |
|---|---|---|
| Total Chlorine | | ppm |
| Free Chloirne | - _____ | ppm |
| Combined Chlorine | | ppm |
| | x 10 | |
| Breakpoint | | ppm |

% available calcium hypochlorite needed _____ pounds
% available sodium hypochlorite needed _____ gallons

# Swimming Pool Calculations

## Swimming Pool Leakage

To determine the rate of leakage in gallons per hour:

$$\frac{\text{Inches lost X surface area X } 0.625}{\text{Number of Hours}}$$

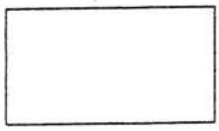
- Typically a public swimming pool will lose ½ inch of water to evaporation in the State of North Carolina.
- The greatest source of heat loss in a swimming pool/spa is from the surface.

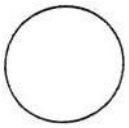
### Swimming Pool Capacity

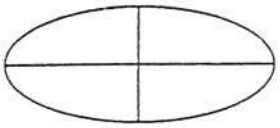
Step 1: Determine average pool depth.

Depth of Deep end_____feet + Depth of shallow end_____feet =_____feet ÷ 2 =_____feet (average pool depth)

Step 2: Determine capacity for pool – rectangular, circular, and oval shape.







Volume of Rectangular Pool (in gallons) = length (ft) X average depth (ft) X 7.5 gallons

Volume of Circular Pool (in gallons) = $r^2$ X $\pi$ X average depth(ft) X 7.5 gallons

Volume of Oval Pool (in gallons) = long diameter(ft) X short diameter(ft) X average depth(ft) X 5.9 gallons

### Rate of Turnover

$$\text{Hours per Turnover} = \frac{\text{Pool Capacity (gallons)}}{60 \text{ X Pump Capacity (g.p.m.)}}$$

### Flow Rate

$$\text{Flow Rate} = \frac{\text{Pool Volume (gallons)}}{\text{Turnover Time (hours) X } 60}$$

### Area Formulas

A = Area  L = Length  W = Width  H = Height

r = radius = ½ diameter  $\pi$ = pi = 3.14 (a constant)

$\pi r^2$ = surface area of circular pool/spa

A = L x W = surface area of a square or rectangular pool

# Swimming Pool Calculations

## Definitions

Square foot (sq. ft.) – a square 12" wide and 12" long
Cubic foot (cu. ft.) – a cube 12" by 12" long by 12" high
Cubic yard (cu.yd.) – 27 cubic feet

## Equivalents

| | |
|---|---|
| 1 cubic foot of water contains 7.5 gallons | 1 cubic foot of water weighs 62.4 lbs. |
| 1 gallon of water = 0.134 cubic feet | 1 gallon of water weighs 8.33 lbs. |
| 1 meter = 39.37 inches | 1 meter = 3.2808 feet |
| 1 meter = 1.0936 yards | 1 foot = 0.3048 meters |
| 1 yard = 0.9144 meters | 1 square foot = 0.0929 square meters |
| 1 square yard = 0.836 square meter | 1 cubic meter = 35.314 cubic feet |
| 1cubic meter = 1.308 cubic yards | 1 cubic meter = 264.2 gallons |
| 1 gallon = 3.786 liters | 1 liter = 0.2642 gallons |

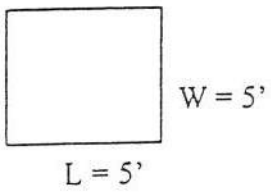
1 part per million (ppm) represents 8.3 pounds of chemical per million gallons of water

## Calculating Surface Area

Calculating a pool's area in square feet is the first step in determining data such as pool gallons and maximum bather loads, or surface area.

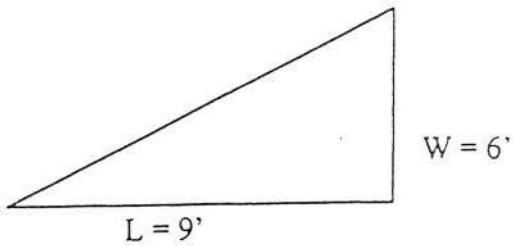
Area of a Square or Rectangle

A = L x W
A = 5' x 5'
A=25 sq. ft.



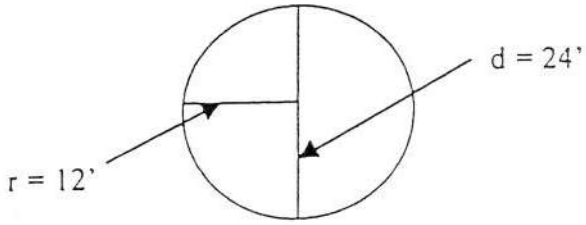

Area of a Right Triangle

A= (L x W) ÷ 2
A = (6 x 9) ÷ 2
A = 27 sq. ft.




Area of a Circle

$A = \pi r^2$
A = 3.14 x 144
A = 452.16 sq. ft.



# Types of Chlorine

| Names | Elemental Gas Chlorine | Sodium Hypochlorite | Lithium Hypochlorite | Calcium Hypochlorite | Sodium Dichloro-s-triazinetrione | Trichloro-s-triazinetrione |
|---|---|---|---|---|---|---|
| Common Name | Gas | Liquid Chlorine | Lithium | Cal-Hypo | Dichlor | Trichlor |
| Free Available Chlorine | 100% | 15% | 35% | 65% | 62% | 90% |
| Effect on pH | Lowers | Raises | Raises | Raises | No Change | Lowers |
| Disadvantages | Very Dangerous | Short shelf life, high salt content, unstable, dissipates rapidly in heat | very costly | clouds water, unstable | Quick-dissolving no residue, regular or super-chlorination | Dissolves slowly, long shelf life, protected from sun |
| Physical Appearance | Gas | Liquid | Powder | Granular & Tablets | Granular | Granular & Tablets |

## Table of Chlorine Equivalents

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 lb. Gas Chlorine | = | 1 Gal. Liquid Chloine | = | 1 lb., 8 ½ oz. Calcium Hypochlorite | = | 2 lbs., 13 ½ oz. Lithium Hypochlorite | = | 1 lb., 12 ½ oz. Sodium Dichlor | = | 1 lb., 2 oz. Trichlor |
| 1 Gal. Liquid Chlorine | = | 1 lb. Gas Chlorine | = | 1 lb., 8 ½ oz. Calcium Hypochlorite | = | 2 lbs., 13 ½ oz. Lithium Hypochlorite | = | 1 lb., 12 ½ oz. Sodium Dichlor | = | 1 lb., 2 oz. Trichlor |
| 1lb. Calcium Hypochlorite | = | 10 ½ oz. Gas Chlorine | = | 2/3 Gal. Liquid Chlorine | = | 1 lb., 13 ½ oz. Lithium Hypochlorite | = | 1 lb., 2 1.2 oz. Sodium Dichlor | = | 11 ½ oz. Trichlor |
| 1 lb. Lithium Hypochlorite | = | 5 ½ oz. Gas Chlorine | = | 1/3 Gal. Liquid Chlorine | = | 8 ½ oz. Calcium Hypochlorite | = | 10 oz. Sodium Dichlor | = | 6 oz. Trichlor |
| 1 lb. Sodium Dichlor | = | 9 oz. Gas Chlorine | = | ½ Gal. Liquid Chlorine | = | 14 oz. Calcium Hypochlorite | = | 1 lb., 9 ½ oz. Lithium Hypochlorite | = | 10 oz. Trichlor |
| 1 lb. Trichlor | = | 14 ½ oz. Gas Chlorine | = | 9/10 Gal. Liquid Chlorine | = | 1 lb., 6 oz. Calcium Hypochlorite | = | 2 lbs., 9 oz. Lithium Hypochlorite | = | 1 lb., 9 ½ oz. Sodium Dichlor |

# Cleaning Up Body Fluid Spills on Pool Surfaces

Body fluids, including blood, feces, and vomit are all considered potentially contaminated with bloodborne or other germs. Therefore, spills of these fluids on the pool deck should be cleaned up and the contaminated surfaces disinfected immediately.

**Recipe for Bleach Disinfecting Solution**

9 parts cool water
1 part household bleach Add the household bleach to the water.
Gently mix the solution.

## Appropriate Disinfectants

### Bleach

One of the most commonly used chemicals for disinfection is a homemade solution of household bleach and water. Since a solution of bleach and water loses its strength quickly, it should be mixed fresh before each clean-up to make sure it is effective.

### Other Disinfectants

A listing of other approved commercial disinfectants can be found at **http://www.epa.gov/oppad001/chemregindex.htm** and **http://www.fda.gov/cdrh/ode/germlab.html**.

These disinfectants are effective when used according to the manufacturers instructions.

### Clean-up Procedure Using Bleach Solution

1. Block off the area of the spill from patrons until clean-up and disinfection is complete.
2. Put on disposable latex gloves to prevent contamination of hands.
3. Wipe up the spill using paper towels or absorbent material and place in a plastic garbage bag.
4. Gently pour bleach solution onto all contaminated areas of the surface.
5. Let the bleach solution remain on the contaminated area for 20 minutes.
6. Wipe up the remaining bleach solution.
7. All non-disposable cleaning materials used such as mops and scrub brushes should be disinfected by saturating with bleach solution and air dried.
8. Remove gloves and place in plastic garbage bag with all soiled cleaning materials.
9. Double-bag and securely tie-up plastic garbage bags and discard.
10. Thoroughly wash hands with soap and water.

Content Source: Division of Parasitic Diseases, National Center for Zoonotic, Vector-borne, and Enteric Diseases
Page last modified: May 2, 2007
**Page Located on the Web at http://www.cdc.gov/healthyswimming/bodyfluidspill.htm**

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
SAFER • HEALTHIER • PEOPLE™

# V—FACILITY MAINTENANCE

Facility Maintenance and Safety go hand in hand. A morning Opening Inspection CheckList should include: ladders, steps, railings, storage areas, lifeguard stands, filtration equipment, skimmers, strainers, etc. All facilities should follow a preventative maintenance schedule as well as a work order repair system to help eliminate safety hazards and potential technical failures.

Facility Management should provide written instructions for the following:

1. Vacuum Operations
2. Filter Backwashing Procedures
3. Deck Cleaning
4. Bodily Fluid Spill Clean-up Plan
5. Hazardous Material Management and Spill Procedures
6. Hair Strainer Cleaning and Replacement
7. Pool Water Fill
8. Facility Inspections
9. Electrical Safety
10. Mechanical Equipment Failure Plan

We recommend that written Policies and Procedures be available to Employees at all times and that all Training is documented and filed.

**SAFETY NOTE:**

LIFEGUARDS SHOULD NOT LEAVE THE SWIMMING POOL UNATTENDED WHILE PERFORMING MAINTENANCE. A SUGGESTION MIGHT BE TO SCHEDULE 10-15 MINUTE BREAKS.

**OPERATOR'S NOTE:**

ALWAYS SCHEDULE STAFF TO REPORT TO WORK AT LEAST 1 HOUR BEFORE THE POOL OPENS TO VACUUM, BACKWASH, MAKE WATER LEVEL ADJUSTMENTS, WATER BALANCE, SAFETY INSPECTIONS, RESCUE TRAINING, CLEANING AND OTHER MAINTENANCE.

## Finishes

In most public swimming pools the structural shell is rough so a smooth surface must be applied. Marbelite plaster is a commonly used finish for pool bottoms and walls. It is slip resistant, smooth, non-porous, easily cleaned, tough, and has a relatively long life span. The color of marbelite plaster pool is usually white. Swimming pools with plaster finishes should not remain empty or dry for extended periods of tme.

Paint is a popular finish. Swimming pool paints are:

1. Water Base—gives an acceptable finish expected to last about one season.
2. Rubber Base—has an appearance and durability superior to water base. Yearly painting is usually necessary.
3. Vinyl—has a life expectancy of two years. Requires a spray application.
4. Epoxy—gives long lasting finish of high quality. Should be applied by only experienced painters.

The durability of any paint application is substantially dependent upon the surface to which it is applied. Applying swimming pool paints over a poorly prepared surface will give poor results. Follow directions and pay particular attention to requirements regarding surface preparation.

## Tile

Tile is an excellent pool finish. Because of tile's high cost, its use is usually limited to edging at the water surface and special designs. Tile is easily cleaned with tile cleaner designed for swimming pools. Never use steel wool or scouring powder to clean tile. Particles of steel wool will break off and cause rust spots over the entire swimming pool.

## Defoamers and Degreasers

These chemicals are good to have on hand. They help in cleaning. A defoamer is especially helpful on pools where soaps are detergents have contaminated the pool water.

## Pool Decks and Equipment

The surface around a swimming pool is designed to serve many purposes. Some of these are:

1. Drain water away from the pool.
2. Provide a safe walking surface that is clean.
3. Provide non-slip surface around the swimming pool rim.
4. To add attractive surrounding area that will enhance the safety and appearance of the swimming pool.

There are many decking surfaces available. Concrete with non-skid surface is probably the most common.

## Ladders

Ladders are made of stainless steel and are provided as a means of exit from the swimming pool. In time, normal use may cause ladders to loosen in their sockets. To tighten, raise the escutcheon plates at the base of the ladder where it attaches to the deck and turn the bolts clockwise. These bolts expand wedge anchors.

## Handrails

Handrails can be tightened in the same manner as ladders. Handrails provide an added measure of security at pool steps.

## Diving Boards and Pool Slides

Diving boards and pool slides can provide many hours of enjoyment, if well maintained and used safely. Certain hazards are attached to diving, whether it is from poolside, a diving board, or a platform. Safe use depends on the configuration and depth of the pool, the location of the equipment, the type, the height, and the condition of the equipment, proper supervision, posted rules and daily safety inspections.

Diving by its very nature is hazardous, and children should be closely supervised by adults. Many accidents have occurred where an overly enthusiastic and excited child has rushed out and dived off the board only to land on a previous diver. Dives should be made straight off the board and never off the sides. WHEN ADDING OR CHANGING THE DIVING BOARD, SPECIAL CARE MUST BE TAKEN TO MAKE SURE THE SWIMMING POOL CAN ACCOMMODATE THE TYPE AND SIZE OF DIVING BOARD DESIRED. Always submit changes to the local Health Department and get permission in writing. A strong suggestion is to use the same equipment/manufacturer when changing diving equipment.

## Depth Markers

Depth markers indicating the pool depth are required for public swimming pools. They should be visible to bathers both in and out of the water. Accidents have occurred where bathers who were unable to swim have jumped into the water which is above their heads, while other bathers have dived into shallow areas, hitting the bottom. Depth markers should be located on both the pool walls and deck. Depth must be indicated in feet to the nearest one-half foot.

There should be a permanent (preferable non-skid tile) strip of contrasting color incorporated in the floor and the walls of the pool to mark rapid depth changes. A lifeline needs to be in place as well (usually between shallow end and deep end of pool).

SPECIAL NOTE: SWIMMING POOLS WITH NON-ENGLISH SPEAKING PATRONS SHOULD HAVE RULES IN ENGLISH AND THE LANGUAGE(S) THAT ARE SPOKEN BY THE SWIMMING POOL PATRONS.

## Cleaning Tools

### Vacuum

The vacuum is a device that is used to clean the walls and bottom of a swimming pool of all loose debris. Included on the vacuum are:

1. Vacuum Head
2. Pole
3. Hose

In older swimming pools the connection for this vacuum is usually located in the pool wall. (When not in use the "plug" should always be replaced in its fitting). The maintenance of this system is simple. Store the vacuum hose properly, out of the sunlight and check all nuts and bolts on the vacuum head. Some swimming pools have no provision for a vacuum cleaner so a portable self-contained system must be used. (It is best if the portable system has a cartridge type filtering system attached so water can be returned to the pool).

### Pool Brushes

These devices are used to loosen stubborn dirt and sweep dirt to the main drain. They come in various sizes and shapes with different types of bristles (nylon or stainless steel).

### Leaf Skimmers

These devices are a skimming net with a long handle. They are useful for removing leaves and debris from the water surface and from the bottom.

### Automatic Swimming Pool Cleaning Equipment

Automatic pool cleaning equipment has become popular. Swimming pools interested in automatic equipment should contact several representatives of this equipment to discuss the advantages each has to offer.

The most important consideration is whether the automated cleaning equipment can be installed easily in an existing pool.

Some major advantages to using automatic cleaning equipment are as follows:

1. The pool is being cleaned continuously, without supervision.
2. Foreign matter is kept in suspension so the filter can remove it or be vacuumed by the cleaning device.
3. Generally more reliable than manual cleaning.
4. Economically appealing to the owner.

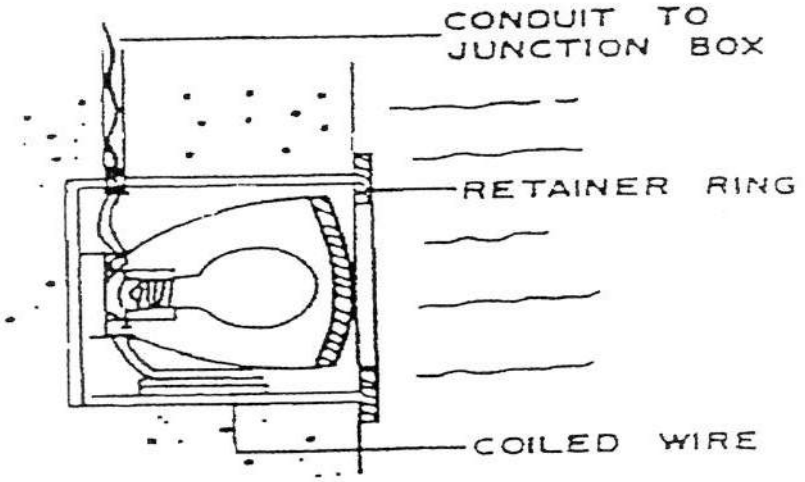
Some disadvantages:

1. The equipment may not clean some shapes of pools thoroughly.
2. Equipment requires special care. Follow manufacturer's instructions.
3. The initial cost may be high.
4. Have to budget for frequent repair costs.

This type of equipment can contribute greatly to the efficiency of an aquatic facility if it is intelligently integrated into the agencies overall program.

## Underwater Lights

Underwater lights are provided for nighttime swimming and for dramatic effect in accenting the pool. There are two types: wet niche and dry niche. The wet niche light is entirely submerged and surrounded by pool water and is the most commonly used. The water surrounding this type of light is what cools the fixture. The dry niche light is contained in a dry pit, and the light shines into the pools through a window in the pool wall. Underwater lights should be serviced only by a qualified technician.




**Wet Niche Underwater Light**

## Overhead Lights

This type of lighting can create slightly different but pleasing effects, and if properly located, they can adequately light the pool interior for safe nighttime swimming. They are less costly than the underwater variety, and are easily maintained. These lights must be carefully positioned to avoid the obvious hazards of breakage and electrical shock.

**SAFETY NOTE**

**BOTH UNDERWATER AND OVERHEAD LIGHTING ARE REQUIRED FOR NIGHT TIME OPERATION**

## Facility Lighting

1. Mandatory for indoor pool operations.
2. Reduces night time vandalism.
3. Reduces after hours trespassing.
4. Mandatory for outdoor pool night activities.
5. Should be inspected daily.

## Care for Seasonal Pools

Care for seasonal swimming pools demands specialized knowledge. Closing a swimming pool, preparing it for winter conditions, and opening it again in the spring require special techniques. Methods of seasonal care may vary, however, according to winter conditions and the experiences of closing the pool and opening. The two greater concerns are freezing and hydrostatic pressure. The first can crack a pool's walls and bottom; the second can cause it to rise out of the ground (float) damaging the circulation lines and systems.

A successful winterizing program prevents rust, moisture accumulation and general deterioration resulting from non-use. Contact a professional for opening/closing.

## Standard Pool Opening Procedures

1. Remove existing dirty water and debris.
2. Clean pool surface—pressure wash and/or muriatic acid.
3. Patch, paint or resurface if necessary.
4. Inspect filters—change sand if necessary.
5. Inspect circulation system and all electrical equipment.
6. Replace skimmer lids, baskets, strainers, equalizers, strainer lids and weirs if necessary.
7. Replace ladders, railings, furniture, poles, etc.
8. Fill swimming pool with water.
9. Start circulation.
10. Balance water and vacuum.
11. Schedule a Health Department Inspection.

## Standard Pool Closing Procedures

1. Drain or cover pool accordingly (drain filters).
   *Know your underground water table.
2. Inspect hydrostatic relief valves.
3. Place pressure plugs appropriately.
4. Use anti-freeze in all openings.

# VI—FACILITY SAFETY AND STORAGE

Facility safety and preventative maintenance go hand in hand. Constant facility surveillance and safety inspections will reduce the risk of injury or loss of life. Facility safety should be the highest priority for all pool operators.

Documentation is the basis of any risk management program. A Facility Safety Checklist Form should be completed each day at facility opening and additional safety checks should be conducted throughout the day as well. A typical Safety Checklist may include:

1. **Storage Rooms and Pump Rooms**
   - Containers properly labeled and sealed
   - Floor clean, dry, and free from slip or trip hazards
   - Products stored in proper places
   - Eyewash stations accessible and in working order
   - Fire exits clear and well marked
   - Fire extinguisher(s) accessible, well marked, and in working order
   - Mechanical equipment and plumbing systems are functional and not leaking
   - Personal protective gear is stored properly and accessible
   - No unusual odors or noises are present
   - Lighting is adequate
   - Inaccessible to general public (doors and windows closed and locked)
   - Ventilation is adequate
2. **Swimming Pool and Deck**
   - Water clarity – main drain(s) clearly visible
   - Main drain cover(s) are in place, secure, and in good condition and working order
   - Ladder and step railings are tightened properly
   - Pool deck is free of sharp objects, slip or trip hazards, etc.
   - Skimmer lids are in place and in good condition and working order
   - Diving boards and other recreational equipment are in good working order
   - Safety equipment is accessible, in good condition and working order
   - Pool bottom clean and free of foreign objects
   - Safety lines and lane ropes are in place, in good condition and working order
   - Drinking fountains and deck showers are in working order and good condition
   - Trash cans emptied and outside surfaces clean
   - Exercise and other equipment stored or set up properly
   - Facility safety signs legible and in good condition
3. **Rest Rooms and Locker Areas**
   - Urinals, toilets, sinks and showers clean and in good repair
   - Floors clean and free of trip or slip hazards
   - Air handling systems in working order
   - Fire exits clear and well marked
   - Lockers free of hazards and in good repair
   - Paper products well stocked
   - Cleaning and storage closets secure

## Fencing

All swimming pools should be enclosed by a fence with gates so access to the swimming pool can be controlled. ALL GATES SHOULD BE THE SELF-CLOSING, SELF-LATCHING TYPE. If there is a wading pool for children, this should be surrounded by a fence with a self-closing, self-latching gate. All fencing around public swimming pools should be sufficient in height to provide a protective barrier. Entrance to pool area should never open to the deep end of the pool.

## City of Newport News Ordinance 39.12--Fencing

A. It shall be unlawful for any person to construct, maintain, use, possess or control any swimming pool located outdoors unless such swimming pool is completely enclosed by a substantial fence, not less than four (4) feet in height, more than two (2) inches above the ground surface and located not closer than five (5) feet or solid board type fence or a fence of equal or greater strength shall be construed as meeting this requirement. The fence shall have at least one gate, and all gates shall be kept locked at all times when the swimming pool is not in use.

b. All fences required by this section shall conform to the city's building code and to the zoning ordinance.

B. Any person convicted of violating this section shall be punished by a fine of not more than three hundred dollars ($300.00) or by imprisonment for not more than thirty (30) days or by both such fines and imprisonment.

## Electrical Safety

It is reasonable to assume that swimming pools now being constructed will be electrically safe. The codes governing electrical wiring are complete, strict and rigidly enforced. Older swimming pools, however, may not have the degree of protection as that of a recently constructed swimming pool. The vast majority of existing swimming pools were built under earlier and less protective editions of the codes. These codes are constantly being revised, updated and improved so that the older your pool is, the less stringent the electrical code at the time it was built.

Another factor working against the older swimming pool is time itself. It has endured years of weather, wear, corrosion and possible abuse. Equipment may be severely worn. Electrical connections may have corroded or actually broken. Inadequate or improper service of the equipment over the years may have created a potential hazard.

The single most important step that you can take to upgrade an old swimming pool electrical system is to have a ground-fault circuit interrupter installed on every electrical system connected with the pool. Also, have the electrical systems of the pool thoroughly checked out yearly by a licensed electrician. A ground-fault circuit interrupter is a safety device, which limits the duration of any electrical fault current on the ground. Damaged insulation on equipment and wiring or careless handling of electrical equipment in wet surroundings are common causes of ground faults.

## WHAT MAKES MATERIALS HAZARDOUS?

The word "hazardous" means involving or exposing one to risk. Common place materials such as soap or detergent can be hazardous, as well as gasoline fumes or infectious waste. Materials not handled properly can expose one to risk of physical or health hazards.

Several things can cause materials to be considered hazardous:

**TOXIC:** Most chemicals are toxic at some level of exposure. If allowed to enter the body through the nose, mouth or skin they can make you sick.

**CORROSIVE:** Materials like strong acids can eat through other substances including clothing. Serious burns can be caused it they are splashed on the skin or eyes.

**EXPLOSIVE:** Some materials can explode when they are exposed to heat or flame. Compressed gases and flammable liquids can explode under certain conditions.

**FLAMMABLE:** Materials that catch fire easily, burn rapidly, spread quickly, and give off intense heat are flammable.

**REACTIVE:** Reactive materials can burn spontaneously. These materials are kept isolated because some of them can burn when exposed to air or water mixed with other substances.

## COMMON POOL CHEMICAL PRODUCTS (HAZARDOUS)

LIQUID CHLORINE (SODIUM HYPOCHLORITE)—TOXIC * CORROSIVE * REACTIVE

MURIATIC ACID (HYDROCHLORIC ACID)—TOXIC * CORROSIVE

CALCIUM CHLORIDE—TOXIC, OXIDIZER

SODIUM BICARBONATE—TOXIC

ALGAECIDE—TOXIC * FLAMMABLE *

SODA ASH (SODIUM CARBONATE)—TOXIC

SODIUM BISULFATE—TOXIC * CORROSIVE *

CALCIUM HYPOCHLORITE (GRANULAR CHLORINE)—TOXIC * EXPLOSIVE * OXIDIZER * FLAMMABLE * REACTIVE

BROMINE—OXIDER * TOXIC *

STABILIZER—TOXIC * FLAMMABLE * REACTIVE *

TRICHLOR (CHLORINE TABLET)—FLAMMABLE * REACTIVE * TOXIC *

CARBON DIOXIDE—DO **NOT** INHALE

CHLORINE NEUTRALIZER—TOXIC *

# MATERIALS SAFETY DATA SHEET
# (MSDS)

The MSDS provides detailed information about each hazardous material. It lists the necessary precautions for protecting yourself and co-workers from dangerous exposure. MSDSs should always be available at the work site.

The following information offers a brief explanation of the general material found on a MSDS. All MSDSs are not exactly the same so the sections may differ slightly in title.

**IDENTITY:** The first section of the MSDS tells you the name. This is also the same name that is on the container's label.

**PHYSICAL/CHEMICAL CHARACTERISTICS:** This section provides additional important information concerning the appearance and odor of the material, it's boiling point, vapor pressure and density, solubility in water, melting point, and evaporation rate.

**FIRE AND EXPLOSION HAZARDS:** This section will tell you under what conditions the material might catch fire or explode and how to handle these hazards.

**REACTIVITY:** This section tells you the stability of the material and under what conditions it might become reactive.

**HEALTH HAZARDS:** This important section tells how the hazardous material could harm you. It also tells you the signs and symptoms of exposure and what emergency First Aid procedures to follow if overexposure occurs.

**CONTROL MEASURES:** This section tells you what protective clothing or equipment to use when working with the materials. It also lists other safe working procedures involving clean up after working with the material.

**PRECAUTIONS FOR SAFE HANDLING AND USE:** This section outlines in detail the instructions for safe handling of the substance. It tells you how to store, move, and use the material. It also dictates what to do in case of a spill or leak.

**HAZARDOUS INGREDIENTS:** This section tells you the chemical names for all the substances that make up the hazardous material named in the identity section.

## MATERIAL SAFETY DATA SHEETS (MSDS) MUST BE CURRENTLY MAINTAINED FOR ALL CHEMICALS AND CLEANING PRODUCTS USED IN THE WORKPLACE AND EASILY ACCESSIBLE IN CASE OF EMERGENCY.

# AQUATIC FACILITY ACCIDENTS

**Drowning Statistics**

- 7th leading cause of injury deaths
- 2nd leading cause of injury deaths for children ages 1-19 years
- 3rd leading cause of deaths for children ages 0-4 years
- 500 drowning and 3,000 near drowning amount children under age 5 in residential swimming pools

**Drowning**

- 5,700 drowning annually
- 3,500 occur during swimming activities
- 90% occur in open water areas
- 50% - 76% are alcohol related
- 150 occur in hotel & motel swimming pools
- 100+ occur in "guarded" swimming facilities

**Child Drowning**

- Leading cause of accidental death in FL, CA, & AZ, and second leading cause of accidental death nationwide
- Improper supervision—leading contributing factor
- 10 times more children suffer brain damage than death from near-drowning incidents
- Children have little concept of dangers associated with water
- Action of children around water is unpredictable

**Contributing Factors**

- Improper supervision by adults
- No lifeline in place
- No fence or barrier around the pool
- Gates are left unlocked or unlatched
- Failure to have trained personnel available for response
- Inexperience or lack of general water safety knowledge on the part of the parent

**Public Safety Considerations**

- Less than 10% of the public have the physical skills or water safety knowledge to make them reasonably safe in, on, and around the water
- Most parents do not possess the knowledge of water safety to provide a save environment around the water

**Prevent Drowning**

- Learn to swim
- Never swim alone in unsupervised places
- Watch children constantly
- Always check water depth before entering
- Never chew gum or eat while swimming or diving
- Isolate pool form all sides with a fence & make sure gates are self-closing and self-latching
- Do not use drugs or alcohol when in, on, and around the water

**Injuries Related to head First Injuries**

- #4 cause of all spinal injuries
- 13,000 diving board-related injuries annually
- 800 spinal injuries form head first entries annually

# EMERGENCY PROCEDURES AND STAFF TRAINING

## EMERGENCY ACTION PLANS (EAP)

All public swimming pools should adopt a written emergency action plan for minor and major incidents. These incidents may include:

- Bodily Fluid Spills
- Respiratory Emergencies
- Cardiac Arrest
- Spinal Injuries
- Water Rescues
- Fractures
- Bleeding and Shock
- Sudden Illness
- Lost Children
- Violence
- Vandalism
- Chemical Spills

## EMERGENCY EQUIPMENT

Rescue equipment and first aid supplies should be properly maintained at all times and readily accessible. Rescue equipment may include:

- Rescue Tubes (Mandatory for lifeguards)
- Ring Buoys
- Spinal Injury Back Board with at least 3 straps
- Head Immobilizer
- Well stocked First Aid Kit
- CPR Mask
- First Aid Gloves
- Reaching Pole
- Life Hook or Shepherd's Crook
- Elevated Lifeguard Stands

## STAFF TRAINING

All facility staff should be thoroughly trained to use all facility specific rescue equipment, how to activate any emergency action plan. A pre-employment orientation is vital to facility operations and all staff training should be documented. WE RECOMMEND AN ONGOING TRAINING PROGRAM FOR ALL FACILITY STAFF, CERTIFICATONS MUST BE CURRENT.

## EMERGENCY TELEPHONE AND LISTINGS

There should be an available telephone for emergency use at public and residential swimming pools. This telephone should be located within the facility fence on deck or in the pool office. Emergency phone numbers should be located by the telephone. Emergency numbers may include:

- EMS (911)
- POLICE (911)
- POISON CONTROL
- ANIMAL CONTROL
- FACILITY MAINTENANCE
- FACILITY MANAGER
- CHEMICAL SUPPLIER

**SAFETY NOTE:**

**LIFEGUARDS SHOULD SAFETY CHECK ALL FACILITY TELEPHONES BEFORE OPENING EACH DAY**

Remember that cell phone batteries can loose charge (Especially in the direct sun light). Hard wired telephones are recommended for emergency use.

## INFECTION CONTROL

**Follow These Precautions:**

1. Hand washing is the most important effective way to prevent the spread of infection. Wash your hands with a liquid soap on the following occasions:

   - After gloves are removed
   - After each victim contact
   - After using the toilet, blowing or wiping the nose, or similar incidents
   - After our hands have touched a surface which may be contaminated
   - When visibly soiled
   - Before eating
   - After performing any cleaning and maintenance task

2. **Always wear Personal Protective Equipment/Clothing when necessary**.
   - During First Aid incidents
   - When cleaning bodily fluids

3. Get immunizations that are required or recommended.

4 Maintain good health with a balanced diet, regular exercise and plenty of sleep.

5. Practice good personal hygiene and maintain clean/sanitized equipment.

## MANAGEMENT'S RESPONIBILITIES

OSHA requires your employer to provide personal protective equipment and an exposure control plan to be readily available at your aquatic facility. Any employee who may come in contact with bodily fluids (blood, vomit, etc.) should have access to and receive training to use the following:

- First Aid gloves (rescue personnel only)
- CPR Mask (rescue personnel only)
- Cleaning Gloves
- Blood spill clean up kit
- Goggles
- Exposure control plan

## WHAT IS INFECITON CONTROL ?

Doing everything possible to prevent work-related illnesses.

## WHY IS INFECTION CONTROL IMPORTANT?

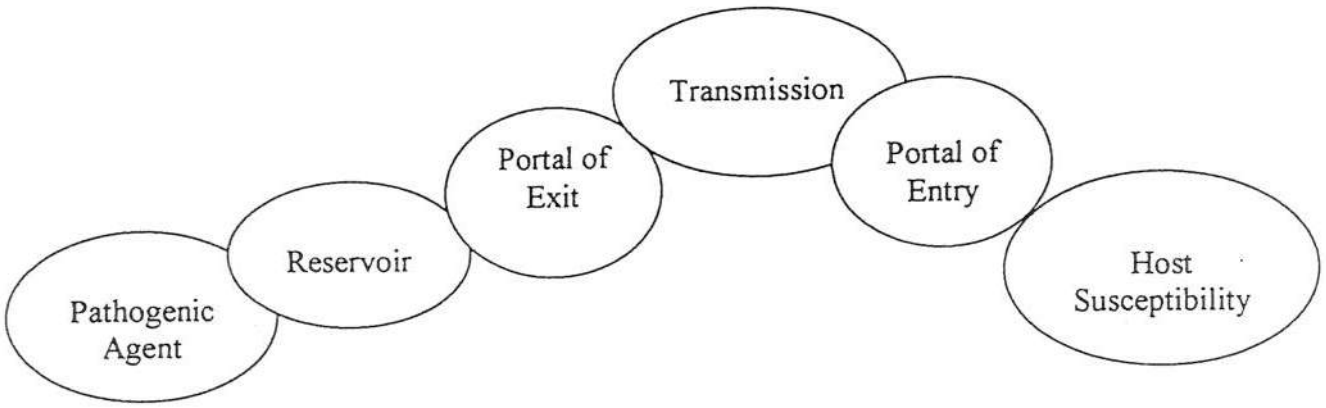
Infection Control is vital to a victim's well-being, and yours, too!

You are exposed to many germs that can make you sick and possibly spread this illness to your family and friends.

Infection Control is **everyone's** responsibility! You should know about and take special precautions to PREVENT INFECTIONS—even if your job doesn't involve direct contact with victims!

## HOW ARE INFECTIONS SPREAD?

All 6 of these LINKS IN THE INFECTION CHAIN must be present, for an infection to develop!




**Chain of Transmission**

INFECTION CONTROL PROCEDURES are aimed at breaking the infection chain by removing one of these links.

## Three Bloodborne Diseases That We Should Be Knowledgeable Of

### HIV / Human Immunodeficiency Virus

Ultimately destroys the immune system, leading to fatigue, weight loss, wasting, other symptoms of AIDS and death.

No vaccine is currently available.

The chances a professional rescuer will get this virus are extremely small, if you properly use all barrier devices.

### Hepatitis B (HBV)

The main infectious work related illness in the health care industry.

May produce no symptoms, or may cause loss of appetite, nausea and vomiting, jaundice, liver damage, cancer of the liver and death.

More than 12,000 healthcare workers get HBV each year; a portion of these will die.

This disease is vaccine preventable (the current vaccine is 85 – 97% effective at preventing the disease for 9 years or longer).

Don't risk being infected. Protect yourself with a safe and effective vaccine. (Contact Aquatic Management Staff for more information).

### Hepatitis C (HCV)

A bloodborne pathogen just recently viewed as posing a potential risk to healthcare providers.

Traditionally, HCV was most frequently seen related to contaminated blood transfusions.

Symptoms can range form none to similar to Hepatitis B infection.

There is no vaccine to prevent infection.

## Modes of Occupational Transmission of Bloodborne Pathogens

A sharp exposure (such as a needle stick, open wound, broken glass, or anything that can pierce, puncture or cut your skin).

A splash or exposure onto open cuts, abrasions, dermatitis, mucous membranes of the mouth, eyes, or nose.

An indirect route of exposure occurs when touching a contaminated object or surface and then transferring this infection material to your eyes, mouth, nose, or open skin. **Always use protective footwear during a blood spill on pool deck.**

**Methods to Reduce Exposure**

**Personal Protective Equipment:**

- Gloves, Aprons, Masks, Protective Eyewear
- CPR Masks

**Engineering Controls:**

- Puncture-resistant sharps containers
- Use of biohazard red bags

**Work Practice Controls:**

- Constant hand washing
- Proper use of protective equipment

**Housekeeping:**

- Handle contaminated waste & linen appropriately
- Disinfect or dispose of blood stained emergency supplies, equipment and exposure surfaces

Healthy Swimming

# Fecal Incident Response Recommendations for Pool Staff*

## What do you do when you find poop in the pool?

*Check for existing guidelines from your local or state regulatory agency before use.
CDC recommendations do not replace existing state or local regulations or guidelines.

- These recommendations are for responding to fecal incidents in chlorinated recreational water venues.
- Improper handling of chlorine-based disinfectants can cause injury. Follow proper occupational safety and health requirements when following these recommendations.
- **Pool Closures:** Fecal incidents are a concern and an inconvenience to both pool operators and patrons. Pool operators should carefully explain to patrons why the pool needs to be closed in response to a fecal incident. Understanding that pool closure is necessary for proper disinfection and protection of the health and safety of swimmers is likely to promote support rather than frustration. Pool closures allow chlorine to do its job — to kill germs and help prevent recreational water illnesses (RWIs).

# Important background info...

## WHAT ARE RECREATIONAL WATER ILLNESSES (RWIs)?

What is the first thing that pops into your head when you think about water safety? Drowning? Slipping? Lightning? All good answers, and all are very important. But, did you know that germs can contaminate swimming water? These germs cause RWIs that have made many people sick.

RWIs are caused by germs such as “Crypto” (KRIP-toe), short for *Cryptosporidium*, *Giardia* (gee-ARE-dee-uh), *E. coli* 0157:H7, and *Shigella* (Shi-GEL-uh).

## HOW ARE RWIs SPREAD?

RWIs are spread by swallowing pool water that has been contaminated with fecal matter. How? If someone has diarrhea, that person can easily contaminate the pool. Think about it. Pool water is shared by every swimmer. Really, it’s communal bathing water. It’s not sterile. It’s not drinking water.

The good news is that germs causing RWIs are killed by chlorine. However, chlorine doesn’t work right away. It takes time to kill germs and some germs like Crypto can live in pools for days. Even the best maintained pools can spread illness.

## SHOULD ALL FECAL INCIDENTS BE TREATED THE SAME?

No. A diarrheal fecal incident is a higher-risk event than a formed-stool incident. With most diarrheal illnesses, the number of infectious germs found in each bowel movement decreases as the diarrhea stops and the person’s bowel movements return to normal. Therefore, a formed stool is probably less of a risk than a diarrheal incident that you may not see.

A formed stool may contain no germs, a few, or many that can cause illness. You won’t know. The germs that may be present are less likely to be released into the pool because they are mostly contained within the stool. However, formed stool also protects germs inside from being exposed to the chlorine in the pool, so prompt removal is necessary.

**Germ Inactivation Time for Chlorinated Water***

| Germ | Time |
|---|---|
| *E. coli* O157:H7 Bacterium | Less than 1 minute |
| Hepatitis A Virus | About 16 minutes |
| *Giardia* Parasite | About 45 minutes |
| Crypto Parasite | About 15,300 minutes or 10.6 days† |

## SHOULD YOU TREAT A FORMED FECAL INCIDENT AS IF IT CONTAINS CRYPTO?

No. In 1999, pool staff volunteers from across the country collected almost 300 samples from fecal incidents that occurred at water parks and pools.¶ CDC then tested these samples for Crypto and *Giardia*. None of the sampled feces tested positive for Crypto, but *Giardia* was found in 4.4% of the samples collected. These results suggest that formed fecal incidents pose only a very small Crypto threat but should be treated as a risk for spreading other germs (such as *Giardia*). Remember a diarrheal fecal incident is considered to be a higher-risk event than a formed-stool fecal incident.

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* 1 parts per million (ppm) or mg/L free chlorine at pH 7.5 or less and a temperature of 77°F (25°C) or higher.

† Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008;6(3):513–20.

¶ CDC. Prevalence of Parasites in Fecal Material from Chlorinated Swimming Pools — United States, 1999. MMWR 2001;50(20):410–2.

# What do I do about...

## formed stool in the pool?

Formed stools can act as a container for germs. If the fecal matter is solid, removing the feces from the pool without breaking it apart will limit the degree of pool contamination. In addition, RWIs are more likely to be spread when someone who is ill with diarrhea has a fecal incident in the pool.

1. **For both formed-stool and diarrheal fecal incidents,** close the pool to swimmers. If you have multiple pools that use the same filtration system — all pools will have to be closed to swimmers. Do not allow anyone to enter the pool(s) until the disinfection process is completed.
2. **For both formed-stool and diarrheal fecal incidents,** remove as much of the fecal material as possible (for example, using a net or bucket) and dispose of it in a sanitary manner. Clean and disinfect the item used to remove the fecal material (for example, after cleaning, leave the net or bucket immersed in the pool during disinfection).

VACUUMING STOOL FROM THE POOL IS NOT RECOMMENDED.

3. Raise the free chlorine to 2 parts per million (ppm), if less than 2 ppm, and ensure pH 7.5 or less and a temperature of 77°F (25°C) or higher. This chlorine concentration was selected to keep the pool closure time to approximately 30 minutes. Other concentrations or closure times can be used as long as the contact time (CT) inactivation value* is achieved (see next page).
4. Maintain free chlorine concentration at 2 ppm and pH 7.5 or less for at least 25 minutes before reopening the pool. State or local regulators may require higher free chlorine levels in the presence of chlorine stabilizers,[†] which are known to slow disinfection. Ensure that the filtration system is operating while the pool reaches and maintains the proper free chlorine concentration during the disinfection process.

## diarrhea in the pool?

Those who swim when ill with diarrhea place other swimmers at significant risk for getting sick. Diarrheal incidents are much more likely than formed stool to contain germs. Therefore, it is important that all pool managers stress to patrons that swimming when ill with diarrhea is an unhealthy swimming behavior.

3. If necessary, before attempting the hyperchlorination of any pool, consult an aquatics professional to determine the feasibility, the most optimal and practical methods, and needed safety considerations.
4. Raise the free chlorine concentration to 20 ppm[¶,§] and maintain pH 7.5 or less and a temperature at 77°F (25°C) or higher. The free chlorine and pH should remain at these levels for at least 12.75 hours to achieve the CT inactivation value of 15,300.** **Crypto CT inactivation values are based on killing 99.9% of Crypto. This level of Crypto inactivation cannot be reached in the presence of 50 ppm chlorine stabilizer, even after 24 hours at 40 ppm free chlorine, pH 6.5, and a temperature of 77°F (25°C).[††] Extrapolation of these data suggest it would take approximately 30 hours to kill 99.9% of Crypto in the presence of 50 ppm or less cyanuric acid, 40 ppm free chlorine, pH 6.5, and a temperature of 77°F (25°C) or higher.**
5. Confirm that the filtration system is operating while the water reaches, and is maintained, at the proper chlorine level for disinfection.
6. Backwash the filter after reaching the CT inactivation value. Be sure the effluent is discharged directly to waste and in accordance with state or local regulations. Do not return the backwash through the filter. Where appropriate, replace the filter media.
7. Allow swimmers back into the water only after the required CT inactivation value has been achieved and the free chlorine and pH levels have been returned to the normal operating range allowed by the state or local regulatory authority.

Establish a fecal incident log. Document each fecal incident by recording date and time of the event, whether it involved formed stool or diarrhea, and the free chlorine and pH levels at the time or observation of the event. Before reopening the pool, record the free chlorine and pH levels, the procedures followed in response to the fecal incident (including the process used to increase chlorine levels if necessary), and the contact time.

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* CT inactivation value refers to concentration (C) of free chlorine in ppm (or mg/L) multiplied by time (T) in minutes at a specific pH and temperature.

[†] Chlorine stabilizers include compounds such as cyanuric acid, dichlor, and trichlor.

[¶] Many conventional test kits cannot measure free chlorine levels this high. Use chlorine test strips that can measure free chlorine in a range that includes 20–40 ppm (such as those used in the food industry) or make dilutions with chlorine-free water when using a standard DPD test kit.

[§] If pool operators want to use a different free chlorine concentration or inactivation time, they need to ensure that CT inactivation values always remain the same (see next page for examples of how to accomplish this).

** Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008;6(3):513–20.

[††] Shields JM, Arrowood MJ, Hill VR, Beach MJ. The effect of cyanuric acid on the chlorine inactivation of *Cryptosporidium parvum*. J Water Health 2008; in press.

# Pool disinfection time...

How long does it take to disinfect the pool after a fecal incident? This depends on what type of fecal incident has occurred and at which free chlorine levels you choose to disinfect the pool. If the fecal incident is formed stool, follow Figure 1, which displays the specific time and free chlorine levels needed to inactivate *Giardia*. If the fecal incident is diarrhea, follow Figure 2, which displays the specific time and free chlorine levels needed to inactivate Crypto.

**Figure 1 *Giardia* Inactivation Time for a Formed-Stool Fecal Incident**

| Free Chlorine Level (ppm) | Disinfection Time* |
|---|---|
| 1.0 | 45 minutes |
| 2.0 | 25 minutes |
| 3.0 | 19 minutes |

* These closure times are based on 99.9% inactivation of *Giardia* cysts by chlorine at pH 7.5 or less and a temperature of 77°F (25°C) or higher. The closure times were derived from the U.S. Environmental Protection Agency (EPA) Disinfection Profiling and Benchmarking Guidance Manual. These closure times do not take into account "dead spots" and other areas of poor pool water mixing.

**Figure 2 Crypto Inactivation Time for a Diarrheal Fecal Incident**

| Free Chlorine Level (ppm) | Disinfection Time*† |
|---|---|
| 10 | 1,530 minutes (25.5 hours) |
| 20 | 765 minutes (12.75 hours) |
| 40 | 383 minutes (6.5 hours) |

* Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008;6(3):513–20.

† At pH 7.5 or less and a temperature of 77°F (25°C) or higher.

The **CT inactivation value** is the concentration (C) of free chlorine in ppm multiplied by time (T) in minutes (CT inactivation value = C x T ). The CT inactivation value for *Giardia* is 45 and the CT inactivation value for Crypto is 15,300 (pH 7.5 or less and a temperature of 77°F [25°C] or higher). If you choose to use a different free chlorine concentration or inactivation time, you must ensure that the CT inactivation values remain the same.

For example, to determine the length of time needed to disinfect a pool after a diarrheal incident at 15 ppm, use the following formula: C x T = 15,300.

Solve for time: T = 15,300 ÷ 15 ppm = 1020 minutes or 17 hours. It would take 17 hours to inactivate Crypto at 15 ppm.

# FILTRATION

## General Statement

Water safety is the most important factor for all pools. Water clarity (turbidity) is important to avoid both diving and swimming accidents. The turbidity level shall be of 0.5 NTU or less, and the main drain grate should be clearly visible from the pool deck.

1. Sedimentation – the pool is free from all swimmers for a period of time, most organic matter will be fall to the pool floor and accumulate in "dead" areas. This material should be removed by vacuuming before swimmers are allowed in the pool.
2. Filtration – by continuous circulation through a mechanical straining device called a filter, small particles of dirt, hair, organic matter, etc. will be removed by "simple dilution."

## Filtration

The filtration process should not be confused with the disinfection process. Suspended particles are removed from pool by water filtration. Filtration only aids in the partial removal of microorganisms from swimming pool water.

Passing water thorough a filter media to strain suspended particles is how filtration is accomplished. Filtration efficiency depends upon several items:

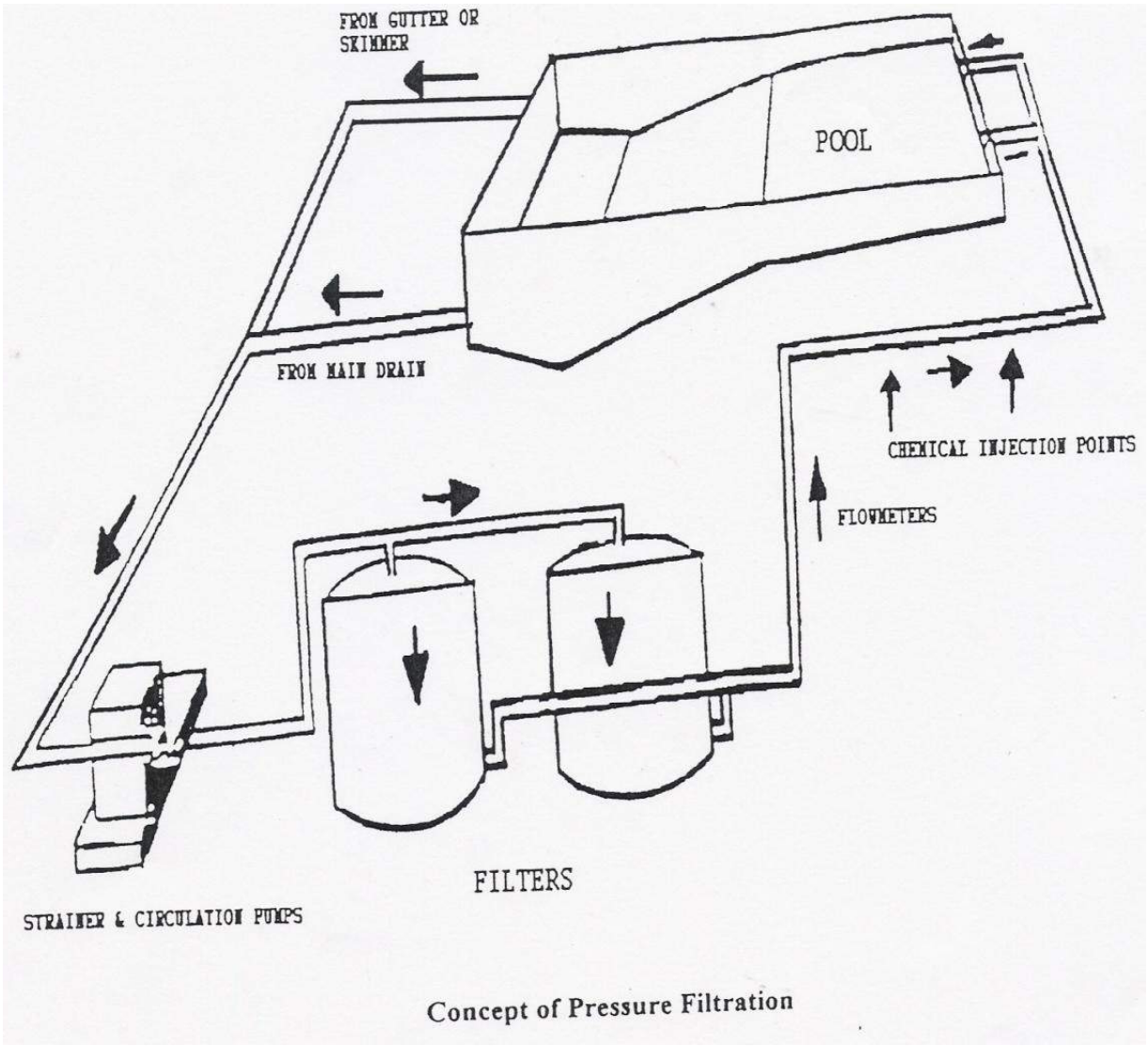
1. Type of filtration medial.
2. Size of pores in the media.
3. Number of times pool water passes through the media.

As the swimming pool water passes through the filter, the media traps suspended particles. In time, the media becomes very restrictive because of partial entrapment, thus requiring cleaning to restore it to original condition. This process is usually referred to as backwashing. Backwash from the filters must be legal acceptable method. If the backwash water is to be discharged to a sanitary sewer system, specific approval MUST be obtained from the municipality or sewer authority for such discharge. Cartridge filters are not backwashed, but are manually cleaned or replaced. There are three basic types of filtration media used in swimming pool today:

1. **Sand**
2. **Diatomaceous Earth**
3. **Cartridge**

Swimming pool water to be filtered is circulated through the filter media by two methods.

1. Pressure Filtration is accomplished by having a recirculating pump located ahead of the filter and by pushing the water through the media. The filter tank is a closed vessel.
2. Vacuum Filtration is accomplished by having the pump pull water through the filter. Water flows to an open top tank, passes through the filter media, and is pumped back to the swimming pool.

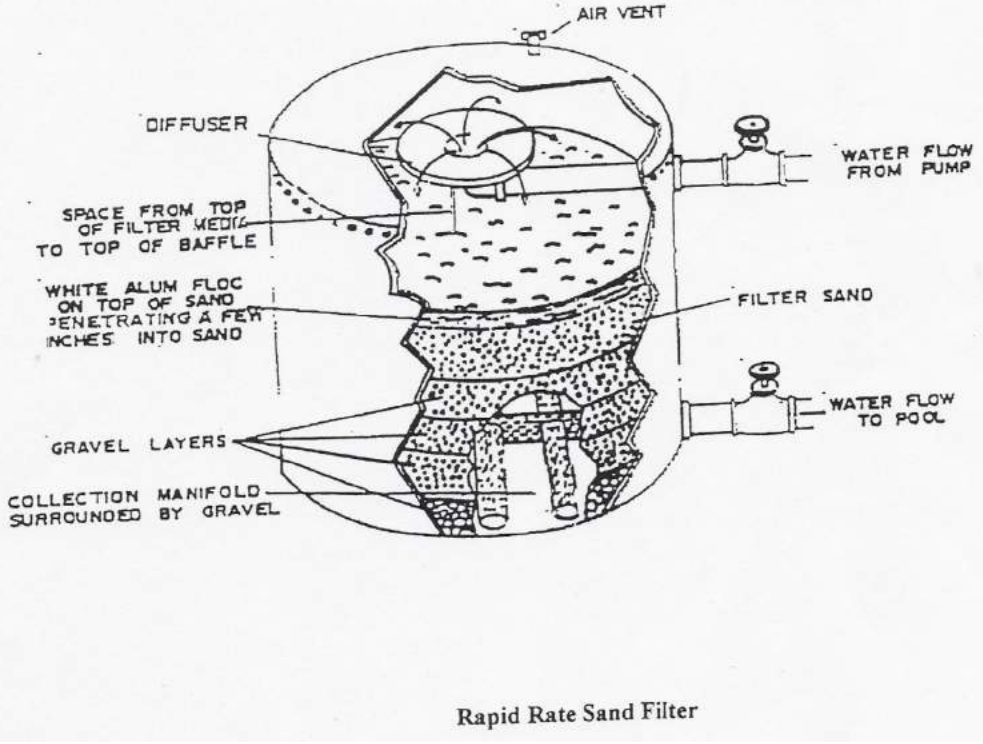



Concept of Pressure Filtration

## Types of Swimming Pool Filters

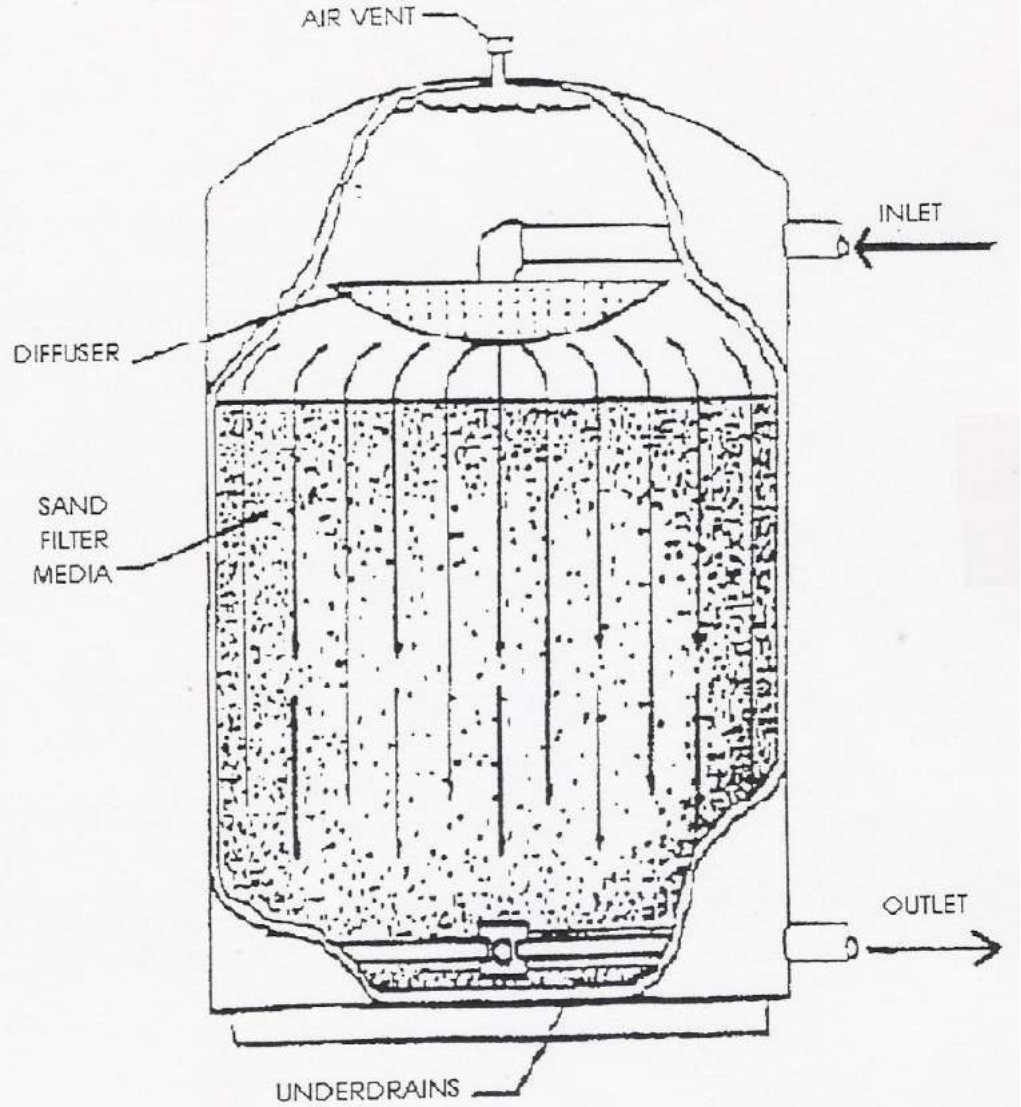
### Sand Filters

1. Rapid Rate Sand Filters – (pressure sand and gravel) this type of filter uses layers of sand and gravel in a closed pressure tank. This type of filter has been outdated due to the introduction of Hi-Rate sand filters. A flow rate of not more than 3 gallons per minute per square foot of filter bed area was recommended though requiring a lot of filter area.



Rapid Rate Sand Filter

2. Hi-Rate Sand Filter – this type of filter (No. 20 or 30) utilizes silica quartz sand as a permanent media for swimming pool water filtration. The sand is enclosed in a pressure tank. The Hi-Rate Sand Filter utilizes a greater depth of sand than Rapid Rate Sand Filters. Penetration of suspended particles is deeper into the sand bed. The filtration flow rate for Hi-Rate Sand Filters is 15 gallons per minute per square foot of sand.




**Hi-Rate Sand Filter**

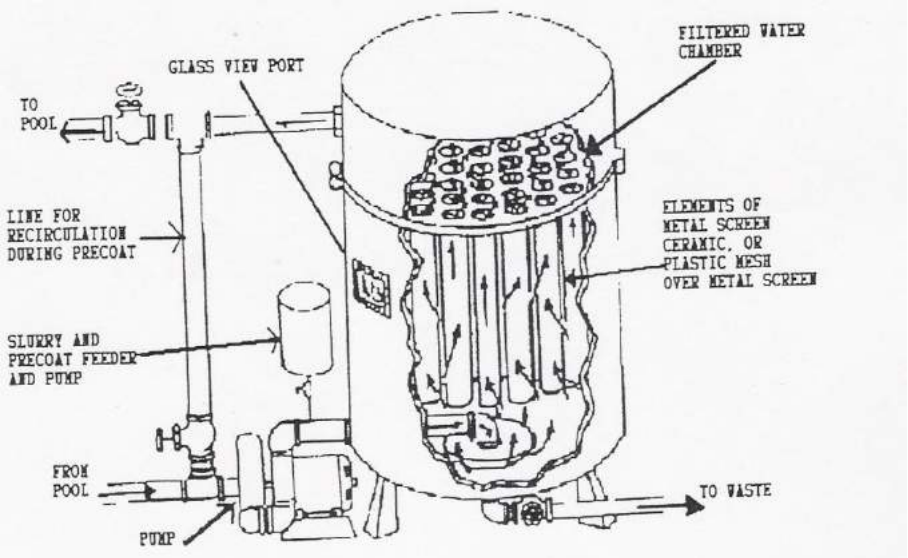
3. Vacuum Sand Filters – this type if sand filter utilizes a bed of sand in an open tank. Swimming pool water flows through the filter media and then is pumped back to the pool.

**Diatomaceous Earth**

This type of swimming pool filter uses the fossilized skeleton of an aquatic plant called a diatom. Diatomaceous earth is a white powdery substance resembling bleached flour with coats grids without reducing flow. Special care must be taken when using diatomaceous earth. It should not be breathes in and a mask should be worn when handling. The dust from the diatomaceous process is accomplished by coating the septum (a specially designed system), which is located in the filter tank, with diatomaceous earth. The swimming pool then passes though the diatomaceous earth, thus trapping the suspended particles. The filtration standard for the diatomaceous earth filters is 2 gallons per minute per square foot of filter media. There are several types of diatomaceous earth filters. Two of these are:

1. Vacuum Diatomaceous Earth Filters – in this type of swimming pool filter elements are contained in one open top tank. Cleaning is accomplished by hosing down filter elements manually.
2. Pressure Diatomaceous Earth Filters – in this type of swimming pool filter the elements are contained within a closed filter tank.

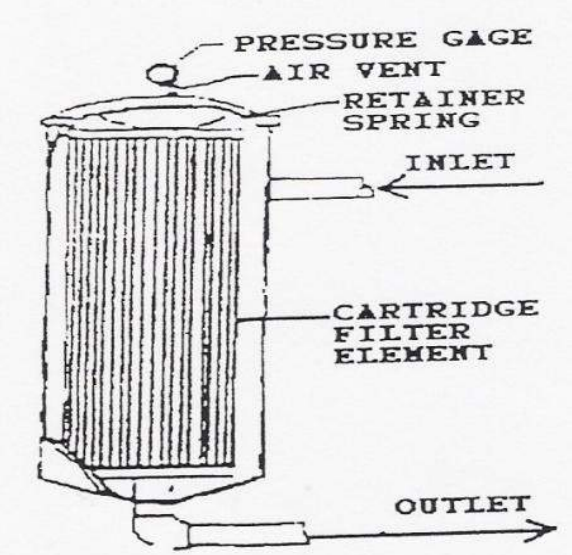
*Special Note: Diatomaceous Earth has been classified as a carcinogen by the United States Environmental Protection Agency. There are substitute products made out of fiber used as a alternative to Diatomaceous Earth.




Pressure Diatomaceous Earth Filter With Cylindrical Elements

## Cartridge Filter

In cartridge filtration, a manufactured media is used. This type of filter can either be vacuum or pressure. This filtration standard for cartridge filters is 0.375 gallons per minute per square foot of filter media. The filter media is cleaned by hosing and a hand scrubbing particles from the surface.




Cartridge Filter

## Summary

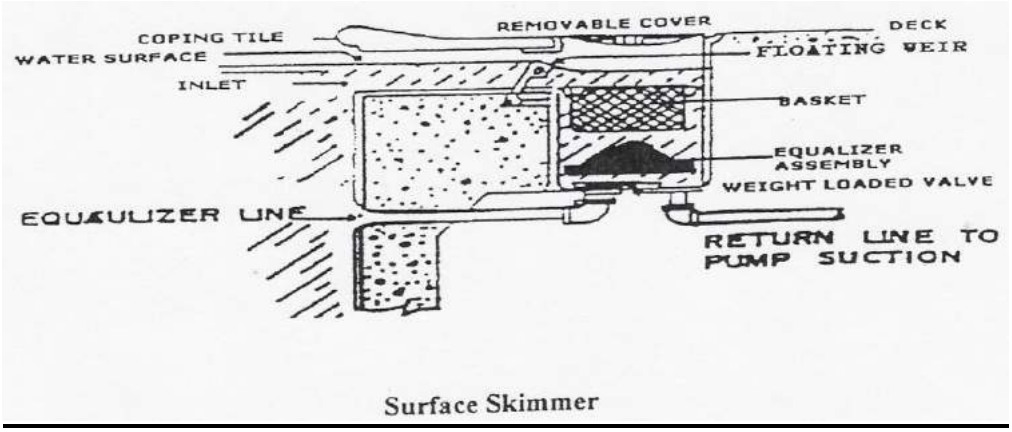
In the filtration process, the trapping of suspended particles by the passage of swimming pool water through the filter media causes resistance to flow. On a pressure filtration system this resistance is expressed as a pressure (PSI). On a vacuum filtration system the resistance to flow is expressed as vacuum (inches of Mercury). Each type of filter has its own advantages. All have specific characteristics such as a wastewater disposal requirement, filter run length, ability of filtering media, maintenance requirements, and space needs.

There is no "super filter". All filters work efficiently when properly sized, properly installed, and properly operated. Each filter, however, has different characteristics as to flow rates, space requirements, waste disposal requirements, lengths of run, degree of filtration, levels of operation and maintenance. Selection of a swimming pool filter should be left to experienced professionals who can select a filter designed to fit the unique characteristics of the aquatic facility. Remember, air pressure in a filter vessel represents a much greater hazard than water pressure. Air pressure does not indicate water circulation.

# II – CIRCULATION

## Skimmers

A skimmer allows water from the pool surface to be returned to the filter. A properly maintained surface skimmer will help in a keeping the surface water in the swimming pool free of floating debris. It will also aid in the reduction of the overall maintenance level of the pool, because it will aid in the collection of debris before it falls to the bottom of swimming pool. The floating weir of the surface skimmer needs to be in place and functioning. In addition, proper water level in the swimming pool must be maintained in order to assure maximum efficiency. Skimmer baskets need to be cleaned regularly. If using the skimmer as a vacuum line, take precautions not to let the skimmer "suck air". This will cause the pump to lose prime, resulting in little or no flow through the filter. The ideal level of pool water should be in the middle of skimmer.



Surface Skimmer

## The Main Drain

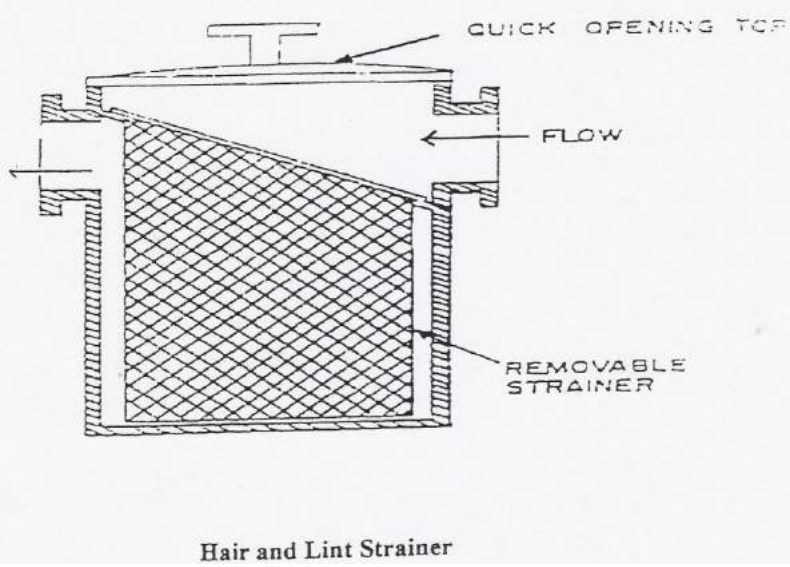
There should be more than one main drain in a swimming pool. The reason for this is that it will lessen the chance for an entrapment or suction accident. All plastic/metal grates protecting the actual pipe opening should be in place and secured at all times. The main drain's function is to ensure complete swimming pool water circulation and chemical distribution. Drain grates must be clearly visible at all times from the swimming pool deck. Depending on the legal code requirements and pool design, a main drain could be left closed, or if left open, it may be recommended to be open only 10-25% of the way.

## Water Level Control

Every pool should have, but is not required to have, a water-level control device to make up water lost to evaporation, filter cleaning, and splash out. Proper water level contributes to peak pool operation and safety. Make up water often has to be added during the time the pool is open to the public. The fill spout (traditionally located under the diving board or by a ladder) should have at least a 6" air gap.

## Hair and Lint Strainer

Circulation pumps have relatively small water passages and small running clearances. Objects such as Band-Aids, stones, human hair, hairpins, etc., can clog a pump, restricting flow. To prevent such clogging, a strainer should be installed on the suction side of pumps used with all pressure filtration systems. The pump should NEVER be operated without the strainer basket in place. Strainer baskets should be checked and cleaned daily. A swimming pool should have at least one extra strainer basket. If a sudden reduction in the rate of flow is indicated, the strainer basket should be checked first. If replacing a strainer basket, replace with the exact same type.




Hair and Lint Strainer

## Circulating Pump

The "heart" of the swimming pool is the re-circulation pump. It causes pool water to flow though the filtration and purification systems and back to the pool. The following components are part of the re-circulation system:

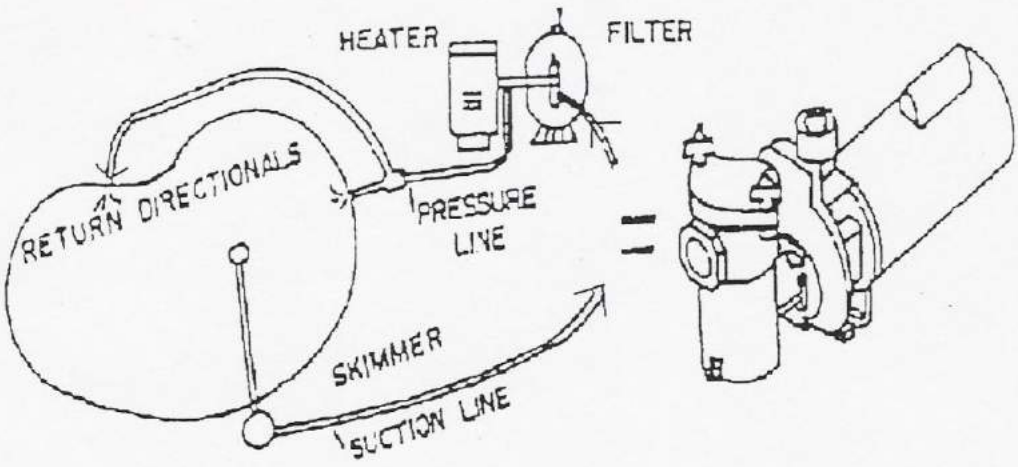
1. Re-circulation motor and pump
2. Influent and effluent pipe and fittings
3. Valves
4. Filter
5. Heater (Note: Most gas fire pool heaters should be turned off 20 minutes before turning off pump or backwashing. In older pool heater models this will prevent heater component meltdown.)

The re-circulation motor and pump pushes or pulls water through the swimming pool systems and causes swimming pool water to flow. Al of the other components in the above list is resistors to flow. Therefore, the pump furnishes pressure or force (head pressure) to overcome the resistors to flow. In public swimming pools, the pump must be able to re-circulate a volume of water (every six hours) through the filters equal to the pool volume. In a properly designed re-circulation system, adequate flow is maintained without creation of high pressure. Swimming pool pumps are all of the centrifugal type. These type pumps use centrifugal force to accomplish their task. There are two types of centrifugal pumps:

1. Straight Centrifugal
2. Self-Priming Centrifugal

The straight centrifugal swimming pool pump does not have the ability to prime itself. In most cases this type of pump is located below the water level, so the pool water will gradually flow to it. The self-priming centrifugal swimming pool pump has the ability to prime itself and can be located above the swimming pool surface. Always fill a pump and strainer basket with water before running. Never run a pump dry. Always inspect a pump daily. Swimming pool pumps have two types of seals around the shaft. In a pump that has a mechanical seal there should be NO water leaking from the shaft area. On the other hand, swimming pool pumps that have a seal with a packing gland should leak several drops of water every minute while the pump is in operation. Always replace the packing at the start of each swimming session. Air bubbles in the return line usually mean an air leak in the influent (suction) side of the pump. Cavitation of a pump takes place when it is unable to obtain enough water from the suction side. Pumps and motor should last for years. Follow the manufacturer's specifications for lubrication; keep the motor area well ventilated, dry and clean.

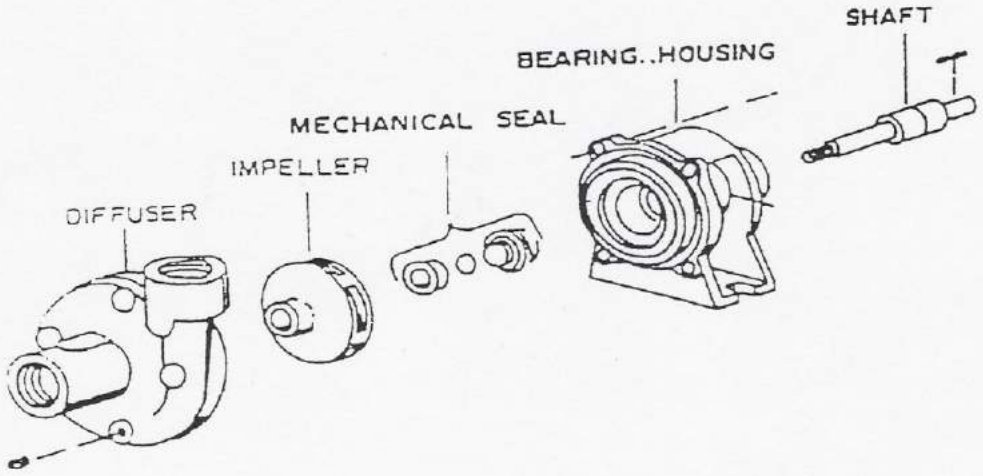
***Safety Note**: never turn circulation pump on before re-adjusting valves to normal operation positions.



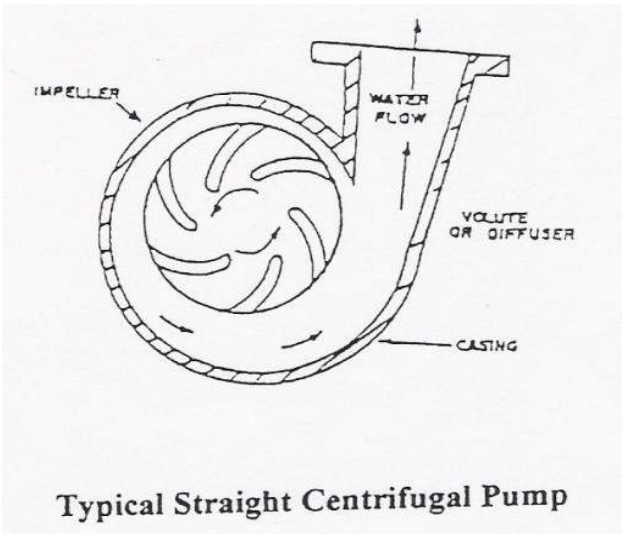

**Friction**
**Resistance Flow**

**Pump**
**Overcomes Resistance to Flow**

**Resistance to Flow**



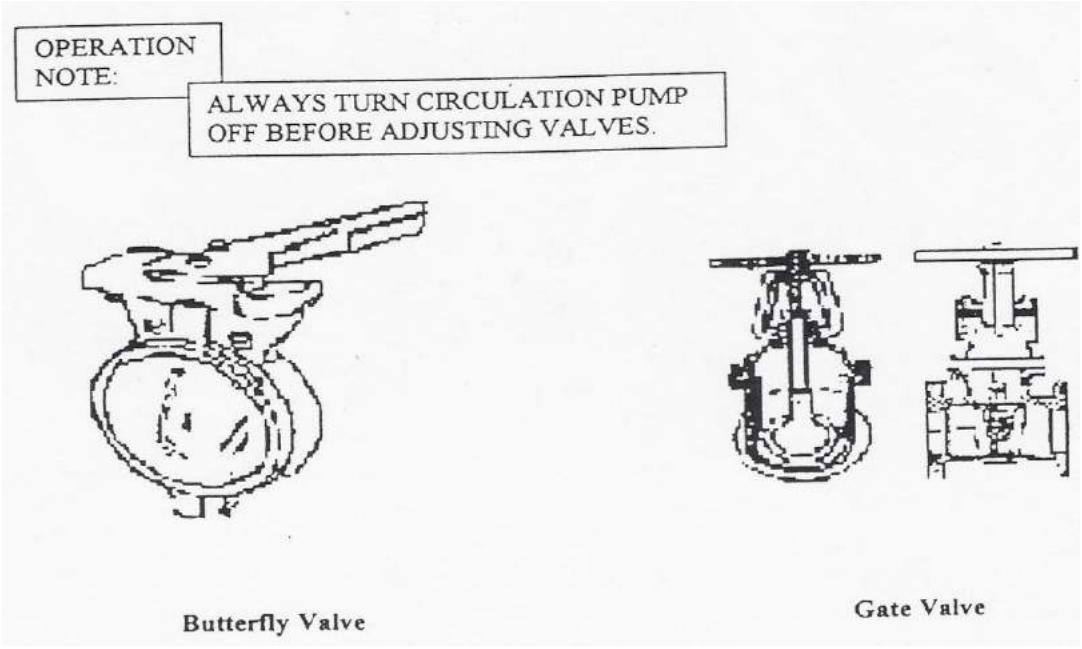

**Exploded View of a Straight Centrifugal Pump**




Typical Straight Centrifugal Pump

## Valves

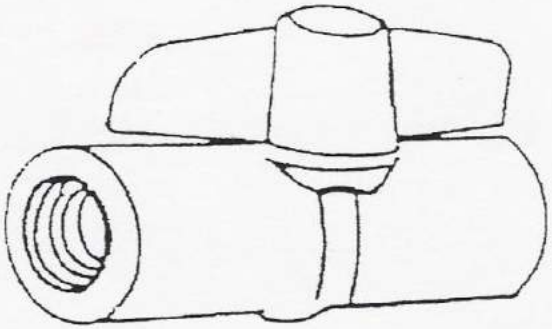
Swimming pool water must be distributed throughout the pool properly. Proper valving permits this function to be accomplished. Al valves should function smoothly and efficiently. Throttling a valve will permit reduction of the flow used in various swimming pool operation situations. Valves should be closed slowly to prevent mechanical damage, and with the circulation pump turned off.



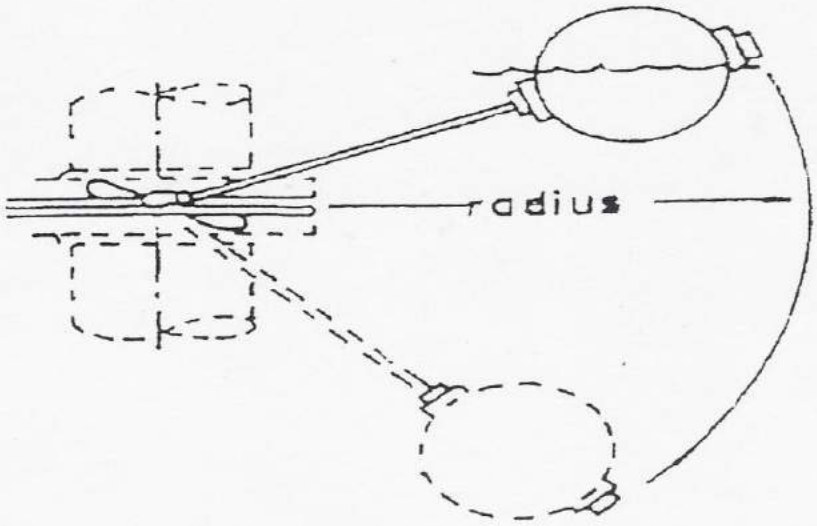

Butterfly Valve

Gate Valve

**Ball Valve**

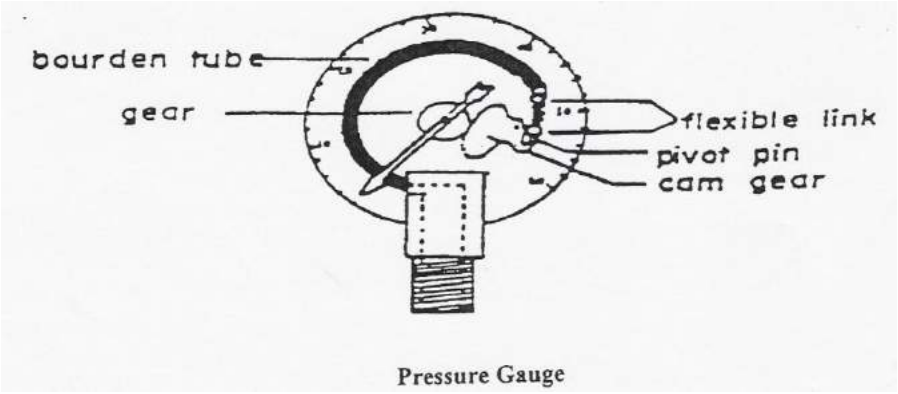


**Modulating/ Float Valve**



## Pressure Gauge

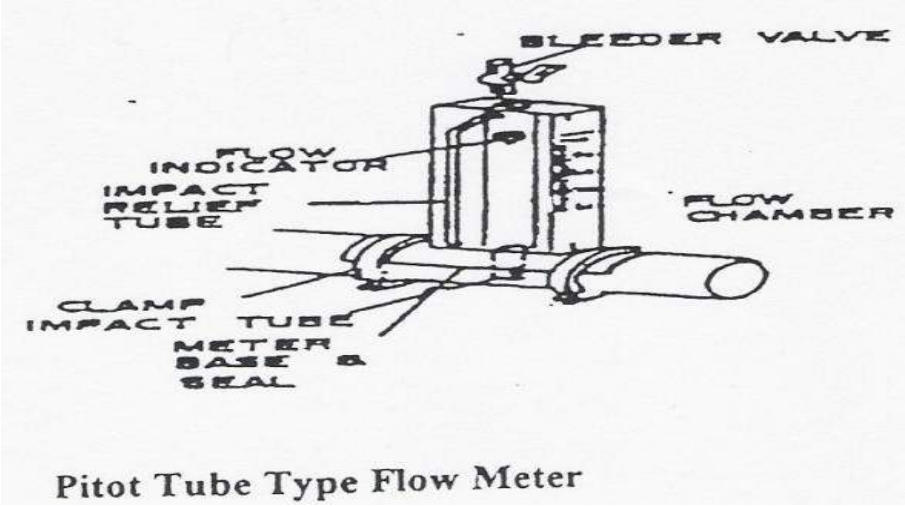
Swimming pool re-circulation systems have a pressure gauge. Gauges should be in working condition at all times. Gauges serve as an indicator of when it is time to clean the filter, and or strainer basket.




Pressure Gauge

## Rate of Flow Meter

All public swimming pools must have a properly functioning rate of the flow meter. They are of importance in determining the effectiveness of the re-circulation system. They are one determining indicator of when it is time to clean the filter. The rate of flow meter should be located on the discharge line from the filters. All flow meters must be installed according to manufacturer's instructions.




Pitot Tube Type Flow Meter

# WATER CHEMISTRY

## Disinfection

Swimming pool water disinfection began in the late 1920's. Because of earlier experiments that proved effectiveness of disinfectants in preventing disease in public drinking water, swimming pool operators began applying this knowledge to aquatic facilities.

Much improvement in the quality of swimming pool water was readily apparent. From this beginning came the modern chemicals we used in a swimming pool today. Disinfectants used in swimming pools have become very safe and effective when used by a trained swimming pool operator.

## Chlorine

Chlorine is an effective swimming pool disinfectant. Chlorine has properties that are both bactericidal and algicidal. It is safe and easy for a swimming pool operator to handle. Chlorine can be dispensed through a wide variety of devices. Chlorine should never be added by hand as a regular means of disinfection. The swimming pool operator can easily measure its presence in water. When using chlorine as a disinfectant, the swimming pool operator must measure its presence in swimming pool water in precise quantities. The unit of measurement used for chlorine in swimming pools is called (PPM) PARTS PER MILLION. This measurement is very small, representing one pound for every million pounds of water.

The recommended level of free chlorine is about 1.0 to 3.0 parts per million in a public swimming pool. Free active chlorine is the name given to both the chlorine present in the water as hypochlorous acid and the hypochlorite ions. It is the free active chlorine that does the vast majority of sanitizing and oxidizing.

Combined chlorine is the hypochlorous acid combined with the nitrogen compounds (ammonia as an example) in a very strong chemical bond called a chloramine. Chloramines are the largest single problem in proper swimming pool maintenance. Chloramines have very little of the germ killing power as compared to hypochlorous acid. They are the source of some eye and mucus membrane irritations in swimmers, as well as the "chlorine odor" complaint so often encountered around a swimming pool.

Total available chlorine, as the name implies, is in the sum of total of the free active chlorine plus that combined available chlorine. A free chlorine level of 1.0 to 3.0 ppm maintained constantly will help keep your pool sanitary and algae free. Free chlorine is the key. Free chlorine, as previously stated, is one of the forms chlorine may take when added to swimming pool water. It is the most important form and the only form that is effective.

Chlorine may be supplied as a liquid, gas, or solid form.

1. Liquid Form: Sodium hypochlorite is sold household bleach (5% to &% available chlorine). As a commercial product supplied to swimming pools, sodium hypochlorite may be obtained in strengths up to 15% available chlorine.
2. Gas Form: steel pressure cylinders containing pure liquid chlorine under pressure. Again, extreme caution must be taken when using this form of chlorine. (100% available chlorine).
3. Solid Form: dry chlorine is also available in a solid dry form, (tablet, stick or granular). Calcium hypochlorite is the most common form of dry chlorine containing about 65% available chlorine. In addition, the cyanurates (dichlorisocyanurate and trichlorisocyanurate) are 62% to 90% available chlorine. Added to this chlorine, is a stabilizing agent called Cyanuric Acid. Lithium Hypochlorite contains 35% available chlorine and is a dust-free granular product. It is completely soluble in swimming pool water.

Chlorine that is added to water in any form produces hypochlorous acid. It is a hypochlorous acid that forms the effective germicide and is referred to as free chlorine. Hypochlorous acid penetrates the bacteria cell walls, thus killing them. Throughout the years hypochlorous acid has proven itself to be an effective disinfectant when used correctly for the following reasons:

1. Hypochlorous acid germicidal efficiency is very good.
2. Hypochlorous acid as an algaecide is very effective.
3. Hypochlorous acid is an excellent oxidizer, thus destroying organic matter. When used properly, sparkling, polished swimming pool water will result.
4. At proper concentrations in swimming pool water, hypochlorous acid is taste and odor free.

**Bromine**

Bromine is a halogen that is an aggressive algaecide, bactericide and viricid. Bromine is a weak oxidizer. Bromine, a dry organic compound in an extruded stick or tablet form, has reduced the risk involved in handling to a risk factor similar to that of dry chlorine. Bromine levels in swimming pool water should be kept between 2.0 to 4.0 ppm with the pH between 7.8 and 7.8. if using bromine as your primary disinfectant, it is best to use a swimming pool water test kit designed for bromine. You do not use a chlorine stabilizer in a bromine treated pool. Whenever chlorine is added to the pool, it serves to reactivate the "spent bromine" in the swimming pool water. Bromine ion (spent bromine) always exists at some level in bromine treated swimming pool water. When bromine is added to swimming pool water hypobromous acid (free bromine) forms, which, like hypochlorous acid, reacts to kill bacteria, fungi and oxidized organic materials.

## Other Disinfecting Agents

There are other disinfecting agents that have been applied to swimming pool water sanitation. These include ozone, silver, quaternary ammonium compound, and ultraviolet light. These methods of disinfection are considered "secondary" methods. All usually have to chlorine or bromine must be usually used as a primary disinfectants.

Swimming pool water receives all types of dirt and bacteria, so it is essential that whatever form of disinfection that is used, it must, above all, BE EFFECTIVE. Disinfectant agents must be capable of killing bacteria quickly and must maintain sustained killing properties to eliminate harmful bacteria. A disinfectant should:

1. Be safe to all swimmers
2. Be readily available
3. Be economical to use
4. Be easily stored
5. Be used and handled easily
6. Be an effective algaecide
7. Not create any undesirable effects in the swimming pool

## pH

pH (Potential of Hydrogen) is the single most important element in swimming pool water chemistry. Every other chemical balance in swimming pool water is effective by pH. pH is an easy concept to understand. It is simply a numerical scale representing one aspect of swimming pool water chemistry. pH scale of 0 to 14. The mid-point of 7 is considered neutral, and above this point represents an increasing more basic or alkaline state. The state below 7 represents an acid condition of the swimming pool water. The lower the number the stronger the acid condition. An example would be that the pH of 6.8 is more acidic than a pH of 7.5, the latter being considered perfect pH for swimming pool water. Ideally, the pH range for a swimming pool should be 7.2 to 7.8.

As stated previously, free chlorine, (hypochlorous acid) is a very powerful disinfectant and will kill bacteria and algae very quickly. However, it does have a very serious drawback. Free chlorine's disinfectant ability is directly related with the pH of the swimming pool water. Free chlorine may be present in swimming pool water as:

1. Hypochlorous acid – a very effective disinfectant within tolerable pH range.
2. Hypochlorous ion – a very ineffective ionized from of hypochlorous acid, depending upon the pH of the swimming pool water.

When pH is high, 8.4 as an example, it is going to take considerably more chlorine to properly disinfect the swimming pool water that would if the swimming pool water had a pH of 7.5.

The problems associated with pH are very real, and if not maintained at the proper level will cause numerous problems. Some of these include:

**Low pH (below 7.0)**

1. Water acidic
2. Swimmer will experience eye irritation
3. Plaster finish in swimming pool will begin to etch
4. Metal fitting, pump impeller, and heater core will corrode
5. Stains may begin to appear as a result of metals in solution precipitating out
6. Chlorine residuals will dissipate rapidly

**High pH (greater than 8.0)**

1. Scaling of the swimming pool walls the bottoms
2. Stains and discolorations combined to make the scaling unsightly
3. Turbidity (a cloudy milk-like color) can result because of high pH
4. Reduction in effectiveness of chlorine

**pH and its Adjustment**

Raising and lowering pH level in your swimming pool involves the addition of specific chemicals in the correct amounts. pH in a swimming pool can be raised by the addition of soda ash (sodium carbonate).

When the pH of swimming pool water is too high, this condition requires the addition of acid. Swimming pool acid may be muriatic acid or sodium bisulfate. MURIATIC ACID OR SODIUM BISULFATE ARE THE PREFERRED pH REDUCING CHEMICALS FOR PUBLIC SWIMMING POOL USE. WHEN USING AN AUTOMATIC CONTROLLER, A CARBON DIOXIDE SYSTEM IS THE SAFEST METHOD TO LOWER pH. Sodium bisulfate is an acid in a dry form. This acid is much weaker than Muriatic acid. It is easier to handle and use but is more expensive. Sodium bisulfate is a good choice of chemical to reduce pH for small pools, spas, therapy pools, and wading pools. Remember when handling all chemicals; add all acids to swimming pool water. NEVER add water to acid. Always disperse the acid away from the swimming pool walls, giving the acid a chance to mix thoroughly with the pool water. NEVER pour acid down a surface skimmer line.

**Breakpoint Chlorination**

Free chlorine residual increases in direct proportion to the quantity of chlorine added, if the chlorine is introduced into distilled water. In swimming pool water, however, contaminations from outside sources all have their effect on the purity of the water. These contaminant include bather, animals, rain, wind and swimming pool chemicals. Minerals and organic materials are

always present even in the most meticulously operated swimming pool. When a disinfectant is added to swimming pool water it begins destroying some of the contaminates.

Many chemicals reactions take place, a part of which are beneficial. Bacteria which is killed is a beneficial chemical reaction. An example of an undesirables chemical reaction would be when chloramines are formed. As previously stated, chloramines are:

1. Odorous (strong chlorine smell)
2. Poor disinfectants
3. Irritating to eyes and mucus membranes
4. May cause cloudy water

Swimming pool water relies on free chlorine for disinfection. Various outside containers such as plant life, urine, and body perspiration can gradually build upon pool water until all the free chlorine is tied up. In order to break this situation a large dose of chlorine is added to the swimming pool water treatment as a treatment. This will result in the oxidizing of the chloramines and a total chlorine residual breakpoint. After this procedure, chlorine added to swimming pool water will five free chlorine residuals in direct proportion to the amount of chlorine added. Super-chlorinating or reaching the breakpoint in swimming pool water is a simple process. Products such as a calcium hypochlorite and sodium hypochlorite can be used. Add enough chlorine in a **shock** treatment to give 10 ppm residual. Apply this treatment as needed and avoid swimming afterward until the free chlorine residual is at acceptable levels. Super-chlorination, therefore, is simply adding enough chlorine to eliminate the undesirable chloramine compounds in order to maintain free chlorine residual.

## De-chlorination

Add 1 lb. sodium thiosulphate to drop free chlorine 1 ppm per 10,000 gallons of water. Allow twenty-four hours to circulate.

## Algae

Algae are microscopic plants which grow in wet environments. Millions of algae can be deposited in a swimming pool during a windstorm or by rainfall. Carbon dioxide in the swimming pool water allows algae spores to grow. An excellent algae killer (algaecide) is free chlorine. Is free chlorine is maintained at a constant residual is not maintained algae growth will occur, requiring super-chlorination to effectively rid the swimming pool water of it.

These are three main types of algae which effect swimming pool water. They are:

1. GREEN ALGAE: Green algae will turn the pool water green. The pool water will look as if it is a light green paint. When conditions are right it will develop in just a few hours. This phenomenon is called "Algae Bloom". To treat fro algae the procedure is recommended:
    a. When the pool have been closed for the evening, turn off the pump.
    b. Add granular chlorine (calcium hypochlorite) as recommended by manufacturer. Broadcast the calcium hypochlorite directly into the swimming pool with the heaviest amount in the pool areas with visible algae growth. After an hour turn the recirculation pump back on. Then next morning vacuum the dead algae from the swimming pool walls and bottom, and then clean the filter. If needed, use a stainless steel wall and floor brush. Repeat the same procedure the following night if any algae spots remain. REMEMBER, this treatment is a shock treatment and will produce extremely high chlorine levels, too high for any swimming. The swimming pool must be kept closed until the chlorine level is down to acceptable levels. NEVER use this treatment on swimming pools that are fiberglass or vinyl-lined. For this type of swimming pool, pre-dissolve the calcium hypochlorite and ass it as a solution.
2. BLACK ALGAE: To treat black algae, turn the pump off when the swimming pool has been closed for the evening. Vigorously brush the algae spots with a stainless steel wall and floor brush. This will help open the algae buds for more effective chemical treatment. Black algae in advanced stages is difficult to destroy but can be controlled during early stages. It will appear as small dark black spots. The treatment for black algae is the same as for green algae. Special care should be taken to add the chlorine granules as close as possible to the algae buds.

3. MUSTARD ALGAE: This type of algae, which is yellow-green in color, clings loosely to walls and steps. Mustard alga is easily dispersed in swimming pool water by simply stirring it up. This will, however, spread it to other areas of the swimming pool. This type of algae has been charactersitly depicted as "now you see it, now you don't". Mustard algae can be removed by using the same treatment method described for green algae.

Algae tend to raise the pH level of swimming pool water through its use of carbon dioxide. Each kind of algae described has its own chlorine resistance level. If the proper chlorine and pH level is constantly maintained and the swimming pool is weekly super-chlorinated the swimming pool will be less likely to have algae.

## Temperature

When operating a swimming pool, temperature is very important consideration. These effects of temperature include:

1. In swimming pool water, algae growth increases as the temperature increases.
2. Chlorine is dissipated more quickly from warm swimming pool water, especially in direct sunlight.
3. Evaporation of swimming pool water increases. This causes increased chemical usage and deposits of scale can occur.
4. Body wastes, such as urine, perspiration, and suntan lotions, increase as the number of swimmers increase, adding to the overall load on all swimming pool systems.

# Stabilizing a Pool

## Cyanuric Acid

Several common names used for Cyanuric acid are "stabilizer" or "conditioner". It is a common compound that extends or holds chlorine in swimming pool water. Cyanuric acid helps chlorine resist the effect of sunlight. Sunlight has a drastic effect upon chlorine in swimming pool water. Stabilizers act as a screen helping to maintain free chlorine longer in swimming pool water. In comparison, unstabilized swimming pool water uses many times the amount of chlorine in a swimming pool season than a stabilized one.

Cyanuric acid does not use up, evaporate or wear out. The only way to lose stabilizer once introduced to swimming pool water is through backwashing, splash out, leakage, or by draining the swimming pool.

Chlorinated (iso) cyanurates, a type of chlorine, provide chlorine for disinfection and add a small amount of Cyanuric acid, thus acting as an effective disinfectant and adding a measured amount of Cyanuric acid at the same time. It is best to check the Cyanuric acid level on a regular basis.

There is a simple test kit available for measuring the Cyanuric acid in the pool water. ALL swimming pools using Cyanuric acid level is found to be too low, additional Cyanuric acid may be added to the swimming pool water.

Cyanuric acid is compatible with any type of chlorine. Therefore, the use of chlorinated isocyanate is not necessary is a stabilizer is going to be used. Cyanuric is a white granular powered. Add Cyanuric acid in sufficient quantity to achieve a residual of 20 ppm. Then allow several days for all the Cyanuric acid to be evenly distributed then check the residual level. Indoor swimming pools should not be stabilized. Cyanuric acid is not compatible with bromine. During the swimming season the water should be checked once a week for the level of Cyanuric acid.

**Word of Caution**

Never super-chlorinate a stabilized pool with either dichlor or trichlor forms of chlorine because the Cyanuric acid will be increased to a very high level. The only way that concentrations of Cyanuric acid can be reduced is by dilution, which can be accomplished by partial draining of the pool and refilling it with fresh water.

**How to Add Cyanuric Acid**

Since Cyanuric acid is hard to dissolve in water and will go to the bottom, it should never be thrown directly into the pool. To add Cyanuric acid you should:

1. Use a 30=gallon plastic container and fill it with warm water. Add Cyanuric acid and stir. Pour solution into the pool and then fill the container with water. Repeat until all the Cyanuric acid is dissolved and added to the pool.

**Common Pool Chemistry**

Store all products in an elevated, cool, dry area and keep in **ORIGINAL CONTAINERS**. Always use gloves and masks when handling.

**ALGAECIDE** – liquid used to control and destroy algae growth in swimming pools.

**BROMINE** – typically a dry tablet or granular product used to sanitize pool or whirlpool water.

**CALCIUM CHLORIDE** – dry flake used to raise the calcium hardness in swimming pool water.

**CHLORINE** – sanitizer/oxidizer used for swimming pool water.

- Calcium Hypochlorite – dry granular chlorine used for super-chlorination
- **DO NOT USE IN EROSION FEEDERS**

- Liquid Chlorine (bleach) – sodium hypochlorite fed by chemical feed pump, contains no stabilizer.
- TriChlor (tablet) – used in erosion chlorine feeders, contains stabilizer.

**pH PRODUCTS (DECREASERS) –**

- Carbon Dioxide ($CO_2$) – gas fed to lower pH in swimming pool water.
- Muriatic Acid (Hypochloric Acid) – dangerous liquid used to lower pH and total alkalinity in swimming pool water.
- **HANDLE WITH CARE**
- Sodium Bisulfate (pH Lower) – granular used to lower pH in swimming pool water.

**pH PRODUCTS (INCREASES) –**

- Soda Ash – powder used to raise pH in swimming pool water.

**SODIUM BICARBONATE** – powder used to raise total alkalinity in swimming pool water. *Note: that Muriatic Acid will lower total alkalinity.

**STABILIZER** – (Cyanuric Acid) – Powder or granular product used to reduce chlorine dissipation caused by the sun's ultra violet rays. **FOR OUTDOOR POOLS ONLY.**

**CLARIFIER** – liquid used to help the filter remove particles from swimming pool water. Enhances filtration.

**CHLORINE NUETRALIZER (SODIUM THIOSULPHATE)** – granular used to decrease free active chlorine levels in swimming pool water.

**Chemical Feeders**

There are many methods of feeding chemicals into a swimming pool. Chemical feeding equipment must be checked and cleaned regularly in order to assure maximum performance. Only used recommended chemicals in proper amounts when operating any chemical feeding device. No chemicals should be placed in the swimming pool water while the swimming pool is open to the public except through approved and properly functioning feeding devices.

**Chlorinators**

The chlorinator is a device that enables swimming pool water to be disinfected by continuous application of disinfectant. A key component in the re-circulation system is the chlorinator. Contaminants are continually being drawn into swimming pool water by wind, rain, dirt, and swimmers. In order to kill these contaminant (bacteria, algae_, the chlorine level in the

swimming pool must be constantly maintained. Chlorine is available in forms, which include gases, liquids, or solids.

## Gas Chlorine

Gas chlorine can be used to disinfect swimming pool water. REMEMBER, chlorine gas in dangerous and highly corrosive. It is rarely used in swimming pools any longer.

## Hypochlorites

A hypochlorinator can be used to feed liquid, hypochlorite bleach into the swimming pool. This type of chlorinator is a pump, which draws liquid from a container and forces it into the return water line. When operating a liquid hypochlorinator, a regular maintenance schedule is needed to keep the equipment clean and in good working order.

Many sources of this liquid are available. Some of these sources include:

1. Sodium hypochlorite (contains 10-15% available chlorine)
2. Household bleach (contains 5-7% available chlorine)
3. Calcium hypochlorite (dry granular from dissolves when mixed with water)

Care is required when using hypochlorites. Remember – always ass chemicals to water. NEVER add water to chemicals.

The shelf life of sodium hypochlorite is rather short compared to other dry forms of chlorine. A three or four week supply stored out of direct sunlight will not lose its' strength very much.

## Erosion Type Feeders

Chlorinators/Brominators which use dry or solid forms of chlorine/bromine are usually the erosion type. Water is pumped through the vessel, thus eroding the disinfectant compound gradually. They usually require no booster pump, have no mechanical parts and are very simple to operate. Only use recommended types of chlorine/bromine in these units. Explosions can occur is improper chemicals are used in erosion feeders.

## Electronic Testing and Control Devices

There are many different systems now available for electronic surveillance, testing and control of disinfectant and pH. Automatic feeding mechanisms can be connected to the system to automatically add disinfectant or pH control chemicals.

These electronic systems are sensitive and maintain the proper chemical balance better than the operator can with manual methods. They maintain fee residual chlorine as opposed to combined residual, and make pool operation more economical by eliminating fluctuations in chemical treatment. This type of chemical control device is highly recommended.

# IV – Water Testing

Swimming pool water should be clear, sparkling, appealing in color, and no odor or taste. When the filtering system and chemicals levels are maintained properly the water should have these desirable characteristics. Chemical tests must be conducted on a regular basis. To eliminate guessing, various chemical test kits have been developed for this purpose. Swimming pool personnel should be familiar with the test kits they will be expected to use. A water sample should come from at least 18" below the water surface level.

## Swimming Pool Water Test Kit

A swimming pool test kit should be easily read, easily maintained, sufficiently accurate, and have fresh chemical reagents. Always start the swimming season with fresh test reagents. The chlorine test kit comparator should have a range between 0 and 5 ppm. The pH comparator should have a range from 6.8 to 8.2 ppm. It is good practice to try and use the same type of test kit that the local Environmental Health Department will be using. This way, all reading will be read accurately.

*OPERATOR'S NOTE: KEEP AN EXTRA TEST KIT AT YOUR FACILITY AND EXTRA COMPARATOR CAPS IN CASE THEY ARE LOST OR BROKEN

## Free Chlorine Test

DPD (diethyl-phenylene-diamine) is the preferred test to determine free chlorine. By far, the DPD method is the most accurate of all the methods in determining free chlorine levels. The DPD method for testing free chlorine produces a shade of violet depending upon the chlorine level.

## Test for pH

Phenol red is the most frequently used reagent for testing pH. It has a pH range of 6.8 to 8.4. At lower limits, phenol red produces a yellow color, indicating a very acidic condition. Phenol red produces a red color, which increases in intensity with increasing pH. Sodium thiosulfate neutralizes chlorine in the pool water sample. The presence of residual chlorine is undesirable because it bleaches the color from the pH test sample, and an accurate pH reading cannot be obtained. An accurate reading should be obtained by following the instructions that come with the kit.

## Precautions in Chlorine and pH Testing

The shelf life of the test reagents for the chlorine and pH is limited and they should be purchased new and season.

Phenol red is sensitive to all foreign substances. The phenol red container should be tightly capped when not in use, and when opened, great care should be exercised in preventing the cap and the dropper end of the container from coming in contact with and foreign material. Phenol red should have a deep color. If it turns orange, discard and replace it.

*Special Note: Always when bromine is used as the primary disinfectant, use a test kit specially designed for bromine use.

**Cyanuric Acid Test**

Cyanuric acid (pool stabilizer) is weak, organic acid. When a pool is properly stabilized, the chlorine cost can be reduced significantly. When Cyanuric acid is added to a pool, it combines with chlorine, thereby preventing the rapid loss of chlorine due to action of ultraviolet light (sunlight). It is a stable chemical and it will only be lost when the pool water goes to waste, and not by action of sunlight or other chemicals. A check should be made weekly.

**Test for Iron**

Iron can cause pool water can become green and turn yellowish-orange after chlorine is added. The source of iron is either in the water added to the pool, or allowing the pool water to become extremely acidic which etches the iron components in the circulating system. Before adding any well water to a pool, check the source of iron content. Usually the local Environmental Health Department can conduct the test, or a pool supplier. If the iron level is high, a sequestering agent should be added to prevent precipitation of the iron. The other source of iron can be prevented by keeping the pH between 7.2 and 7.8.

**Water Color**

Metals in solution, algae, or other foreign substances in swimming pool water can cause it to be colored. Metals in solution cause the following reaction in swimming pool water:

1. Iron – reddish-brown tint; in some cases a green color similar to green algae
2. Manganese – brownish-black
3. Copper – blue-green

**Sequestering Agents**

Sequestering agents are used in swimming pools to reduce color caused by iron, copper, and manganese. They increase the ability of water to hold minerals in solution instead of precipitating out of form stains. If sequestering agents are used (such as pools with high iron content in water) manufacturer's instructions must be followed.

## Floccing

For many years, when suspended particles in swimming pool water may be coagulated by adding alum was used. Alum was difficult to use for many reasons. It can be used in all types of filters. Always follow manufacturer's recommendations when using this product.

## Total Alkalinity

Bicarbonate alkalinity often referred to as total alkalinity, is very desirable for swimming pool water because it provides a buffering capacity. Alkalinity allows swimming pool water to overcome rapid changes in pH when impurities or chemicals are added to water. A swimming pool that is unbuffered would be impossible to maintain because of the pH level would vary rapidly. Furthermore, improper pH in swimming pool water can and will reduce total alkalinity of the water to undesirable levels. The level of total alkalinity should be maintained at 75 to 125 ppm. Levels may be increased by adding sodium bicarbonate. Sodium bicarbonate (baking soda) does not affect the pH much. High levels of alkalinity are associated with the formation of scale (200 ppm and over). This may be reduced by addition on Muriatic Acid.

## Calcium Hardness in Swimming Pool Water

Dissolved salts such as those contained in calcium, iron, and magnesium cause hardness. If the pH and total alkalinity are maintained within the required limits, hardness will generally not present any problems.

Calcium hardness is increased by the addition of hydrated calcium chloride. Swimming pool water should maintain a minimum level of 250 ppm. Reduction of calcium hardness is a simple process; remove some of the pool water and replace it with fresh water.

## Stains

The smooth appearance of any swimming pool can be ruined by a stain. Rust, algae, chemical imbalance, abrasion, dirt, and foreign materials can cause a stain to occur. Hair pins, nails, paper slips, toys, etc., if left in the swimming pool, can cause rust stains. A rust stone will easily remove this surface stain quickly. A more difficult rust stain occurs when water seeps through the plaster and gunite and starts to attack a reinforcing bar of tire ware. The rust bleeds out of this subsurface, and causes a very bad rust stain under the plaster. Usually this type of stain will grow and expand. In order to correct this type of stain the plaster and gunite will have to chipped out of the offending reinforcing bar. The bar's surface must be dried and painted with rust proof paint. When the paint dries re-patch the area.

Algae can, in some cases, permanently stain a swimming pools surface. In some cases algae, if unchecked, will grow into plaster that is chipped and cracked. The best solution to prevent algae growth is by using the preventative measures that have been previously described.

Leaves, dirt, debris, chemicals, dyes, and multitude of foreign materials cause stains. Remove any foreign material as soon as possible so a satin will not occur.

An excessively high or low pH is a serious offender as far as stains are concerned. The problem with chemical imbalance stains is that they more than likely involve the entire professional swimming pool surface. If the entire swimming pool surface is stained, it is best to let a professional swimming pool service company handle the job.

Concrete pools are usually painted. In order to correct a staining problem, repainting the pool will generally correct the situations. Gunite pools, with a plaster surface, should not ordinarily be painted. If the plaster surface is eroded, re-plastering may be needed.

Stains, in some cases, can be a complex and unsightly situation. The best solution is to keep the swimming pool walls and floors clean at all times, and to maintain the proper chemical balance.

## Chemical Handling and Storage

The proper use and storage of swimming pool chemicals is a serious responsibility. These chemicals when properly used are safe, but if handled carelessly are dangerous and life threatening. Read and follow the package directions. There are few riles, however, that pertain to all swimming pool chemicals:

1. Never mix chemicals.

2. Store chemicals in a cool, dry, vented and shaded location. Always keep chemicals stored in original containers. Chemical storage should be maintained in an area separate from the filtration equipment room.
3. Keep chemicals away from hot water heaters, furnaces, and electrical equipment.
4. Clean up any spillage immediately and dispose of it properly.
5. Do not breathe chemical fumes.
6. Avoid combine in direct skin contact with chemicals
7. Never add water to any chemical.

SAFTEY NOTE: DO NOT MIX POOL CHEMICALS OR ANY CLEANING PRODUCTS WITH ANYTHING OTHER THAN WATER. A DANGEROUS REACTION MAY OCCUR: FIRE, EXPLOSION OR POSONOUS FUMES!

8. Always add the recommended quantity of chemicals. Adding more chemicals will only cost money and in some cases can have a destructive effect on the swimming pool. Adding less chemical, however, is false economy and could pose a health problem.
9. Dispose of old deteriorated chemicals in the proper manner.
10. Select chemicals with care and only buy what you need. Never store chemicals from one season to the next.
11. NO SMOKING when handling any chemicals.
12. Always use personal protective gear when handling chemical products. Gloves, goggles, apron, and mask should always be available.

The pool, deck, surrounding land, building, apparatus and all fixtures associated with the swimming pool are included in the physical plant.

# Glossary

(Some definitions are modified so as to apply specifically to swimming pools)

ACID A chemical compound which releases hydrogen ions in water solution.

ALGAE Plant life of many colors which grows in water in the presence of sunlight and carbon dioxide. In swimming pools it produces slippery spots and cloudy, uninviting water.

ALGAECIDE A chemical which will kill algae.

ALGISTAT A chemical which inhibits the growth of algae.

ALKALINE That property of a compound which allows it to neutralize an acid.

ALKALINITY The amount of bicarbonate, carbonate, or hydroxide compounds present in water solution.

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

ALUMINUM SULFATE See above.

AMMONIA A chemical compound of hydrogen and nitrogen which combines with free chlorine in pools to form chloramines, or "combined" chlorine.

AMMONIUM ALUM Ammonium aluminum sulfate. Used as a flocculent or coagulant in pools when chloramines are specifically desired.

ANTHRACITE Hard coal.

ANTHRAFILT 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.

AVAILABLE CHLORINE , Chlorine, either free or combined, which is active 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.

BASE A chemical which neutralizes acids. Usually by furnishing hydroxyl ions.

BACTERIA Microorganisms present in all water supplies. Some are necessary to life, others cause disease.

BACTERICIDE Any chemical which kills bacteria.

BLUESTONE Common name for copper sulfate, an effective algaecide which is declining in popularity as a swimming pool

algaecide because of its toxicity and incompatibility with some pool chemicals.

BODY COAT Diatomaceous earth which 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, which 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 in a pool completely. Chlorine added thereafter will be in uncombined, or free, state. It 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 chlorine is introduced.

BROMINE A heavy dark reddish-brown liquid in the same chemical family as chlorine. It is used as a bactericide in some swimming pools. Great caution should be used in handling liquid bromine.

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 from hard water. Also refers to incrustation caused by magnesium hydroxide.

CALCIUM HYPOCHLORITE A compound of chlorine and calcium used in white granular or tablet form as a bactericide in pools. In water solution it releases 70% of its weight as available chlorine. Must be handled with care.

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 which imparts circular motion to the water in a pump.

CHEMICAL FEEDER A mechanism for automatic addition of chemicals to swimming pool water. May be a proportioning pump, injector type feeder, pot feeder operating on a water pressure differential, or a dry type feeder.

CHLORINATOR A chemical feeder for automatic addition of chlorine to pool water.

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

CHLORINE DEMAND The amount of chlorine necessary to oxidize all organic matter present in pool water at any given moment, or over a period of time.

CHLORINE RESIDUAL The amount of available chlorine remaining in pool water after the chlorine demand has been satisfied at any given moment.

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 which is available as a bactericide in water, but which is combined with another substance, usually ammonia. Combined chlorine is usually less effective against bacteria.

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 algaecide, declining in popularity for pool use because

of its toxicity and incompatibility with some other compounds found in pools.

CORROSION Chemical reaction at the surface of a substance, usually metal, causing deterioration of the surface.

C.N.C.A. Council for National Cooperation in Aquatics. A national organization of agencies interested in all phases of aquatics.

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.

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.

DIATOMACEOUS EARTH White powder composed of fossilized skeletons of one celled organisms called diatoms. Porous, containing microscopic holes. Used as a filter media 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.

DIATOMITE Shortened name for diatomaceous earth.

DISINFECTANT A chemical which 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.

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

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

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, which 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 which is equivalent to the height of a column of water which would cause the same resistance. The total 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 which are insoluble in water, and will precipitate.

FERROUS IRON Compounds of iron which 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 surface of the cartridge, 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 diatomite filter on which the filter aid is deposited.

FILTER MEDIA Any fine grain material, carefully graded as to size, which 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 and/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 some type of alum, 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 which might pass through the sand.

FLOC (See Flocculent) A gelatinous substance resulting from the mixture of a flocculent such as alum with alkalinity such as soda ash. Chemically, floc is a complex compound of hydrated aluminum oxide and aluminum hydroxide.

FLOW METER See RATE OF FLOW INDICATOR.

FOOT BATH A shallow water area between bathhouse 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.

GALVANIC ACTION Creation of electrical current by electro-chemical action.

GALVANIC CORROSION Corrosion of metals which 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, which may deposit scale in pipes, pools and heaters. Carbonate and bicarbonate hardness is also considered to be alkalinity. Sodium and potassium compounds are not considered to be hardness compounds.

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 by-product 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 (OCl) radical. Most commonly refers to calcium, sodium, or lithium hypochlorite in pool usage.

HYPOCHLOROUS ACID An unstable acid with excellent bactericidal and algaecidal 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.

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.

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

LOGARITHM A mathematical term. The number which 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 which 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 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.

N.S.P.I. National Swimming Pool Institute. A trade organization of people and institutions in the swimming pool industry.

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.

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

ORTHOTOLIDINE An organic test reagent which 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 iron rust stains on pool walls and floors, or to clean iron rust from filter septa. Poisonous, use with care.

PATHOGEN A microorganism which causes disease in man.

pH The logarithm of the reciprocal of the hydrogen ion concentration of a water solution. A measure of the degree of acid or alkaline qualities a solution possesses. A pH below 7.0 is considered acid. A pH of 7.0 is considered neutral. A pH above 7.0 is considered alkaline.

PHENOL-RED An organic dye which 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.

POTABLE Water which is bacteriologically safe and otherwise suitable for drinking.

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

p.p.m. Parts per million. Calculated in weight units. In dilute water solution the weight-volume relationship of milligrams per liter may be substituted.

p.s.i. Pounds per square inch. Commonly a unit of pressure or head.

PRECIPITATE An insoluble compound, such as calcium carbonate, which 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 diatomite 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 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 AMMONIA COMPOUNDS A family of compounds 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 surface tension.

RATE OF FLOW Quantity of water flowing past a given point in a unit of time. Usually measured in gallons per minute (g.p.m.).

RATE OF FLOW INDICATOR — FLOWMETER A device which measures pressure differential across a calibrated orifice and indicates the rate of flow at that point. Usually in g.p.m.

RECIRCULATING SYSTEM The entire system of pipes and pumps and filters which 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 or 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.

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

SLURRY FEED Body feed for a diatomite 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 the use of chlorine gas for chlorination.

SODIUM BICARBONATE A chemical used to raise total alkalinity content of a pool with little change in pH.

SODIUM BISULFATE ($NaHSO_4$) A dry white powder which 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 containing 12% to 15% available chlorine. One of the most commonly used products for chlorination of pools. Produces hypochlorous acid when added to pool water.

SODIUM THIOSULFATE Chemical solution used to remove all chlorine from a test sample to avoid false pH test readings, or false bacteria test results.

STERILIZE To kill all microorganisms by heat or chemical action.

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

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 day.

UNDERDRAIN The distribution system 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 diatomite 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 which 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 diatomite but lighter in weight. Used as a filter media or filter aid in diatomite-type filters.

# Hyperchlorination to kill *Cryptosporidium*[*]

***Cryptosporidium*** **(or "Crypto") is a chlorine resistant parasite, so even well-maintained pools, water parks, and interactive fountains can spread Crypto among swimmers. If an outbreak of Crypto infections occurs in your community, the health department might ask you to hyperchlorinate. Additionally, to help keep Crypto levels in the water low, you might choose to hyperchlorinate regularly (for example, weekly). If necessary, consult an aquatics professional to determine and identify the feasibility, practical methods, and safety considerations before attempting to hyperchlorinate.**

**Step 1:** Close the pool to swimmers. If you have multiple pools that use the same filtration system — all pools will have to be closed to swimmers and hyperchlorinated. Do not allow anyone to enter the pool(s) until hyperchlorination is completed.

**Step 2:** Raise the free chlorine concentration (see Table) and maintain pH 7.5 or less and the temperature at 77°F (25°C) or higher.

**Step 3:** Achieve a contact time (CT) inactivation value of 15,300 to kill Crypto. The CT inactivation value refers to the concentration of free chlorine in parts per million (ppm) multiplied by time in minutes at a specific pH and temperature.

| Use the formula below to calculate contact time (CT) | | | | |
|---|---|---|---|---|
| **Parts per million (ppm) free chlorine** | **x** | **Minutes** | **=** | **CT** |
| **20**[†] | **x** | **765** | **=** | **15,300**[¶,§] |
| **10** | **x** | **1,530** | **=** | **15,300** |

**Step 4:** Confirm that the filtration system is operating while the water reaches and is maintained at the proper chlorine level for disinfection.

**Step 5:** Backwash the filter thoroughly after reaching the CT inactivation value. Be sure the effluent is discharged directly to waste and in accordance with state or local regulations. Do not return the backwash through the filter. Where appropriate, replace the filter media.

**Step 6**:** Allow swimmers back into the water only after the required CT inactivation value has been achieved and the free chlorine and pH levels have been returned to the normal operating range allowed by the state or local regulatory authority.

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* Check for existing guidelines from your local or state regulatory agency before use. CDC recommendations do not replace existing state or local regulations or guidelines.

† Many conventional test kits cannot measure free chlorine levels this high. Use chlorine test strips that can measure free chlorine in a range that includes 20–40 ppm or mg/L (such as those used in the food industry) or make dilutions for use in a standard DPD test kit using chlorine-free water.

¶ Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008;6(3):513–20.

§Crypto CT inactivation values are based on killing 99.9% of Crypto. This level of Crypto inactivation cannot be reached in the presence of 50 ppm chlorine stabilizer, even after 24 hours at 40 ppm free chlorine, pH 6.5, and a temperature of 77°F (25°C). Extrapolation of these data suggest it would take approximately 30 hours to kill 99.9% of Crypto in the presence of 50 ppm or less cyanuric acid, 40 ppm free chlorine, pH 6.5, and a temperature of 77°F (25°C) or higher. Shields JM, Arrowood MJ, Hill VR, Beach MJ. The effect of cyanuric acid on the chlorine inactivation of *Cryptosporidium parvum*. J Water Health 2008; in press.

** CDC does not recommend testing the water for Crypto after hyperchlorination is completed. Although hyperchlorination destroys Crypto's infectivity, it does not necessarily destroy the structure of the parasite.

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# Chapter 39 - SWIMMING POOLS[1]

Footnotes:

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**Editor's note—** Ord. No. 4739-95, adopted June 27, 1995, amended Ch. 39, in its entirety, to read as herein set out. Prior to inclusion of said ordinance, Ch. 39 pertained to similar subject matter. See the Code Comparative Table.

**Cross reference—** Building regulations, Ch. 13; parks, squares and recreational facilities, Ch. 29.

**State Law reference—** Ordinances requiring fencing of swimming pools, Code of Virginia, § 15.2-921.

## ARTICLE I. - IN GENERAL

### Sec. 39-1. - Definitions.

For the purpose of this chapter, the following words and phrases shall have the meanings respectively ascribed to them by this section, except as otherwise provided in this chapter:

*Certified operator.* The individual responsible for the everyday operation of a public swimming pool and who has successfully passed a course approved by the health department in proper pool operation and maintenance.

*Disinfectant.* Any chemical that kills or neutralizes the organisms that cause disease and/or infection and is readily measurable.

*Fence.* A close type vertical barrier not less than four (4) feet in height above ground or more than two (2) inches from the ground at the bottom. A woven wire, chain link, picket or solid board type fence or a fence of similar construction which will prevent the smallest of children from getting through and which has a gate capable of being locked shall be construed as being within this definition.

*Free available (residual) chlorine.* The portion of the total chlorine remaining in water that is not combined with ammonia or nitrogen compounds and will react chemically with undesirable or pathogenic organisms.

*Hazard.* Any condition or situation which exists within a pool or pool area that poses a risk of injury or harm to the patron(s).

*Health officer.* The director of public health of the city or his duly authorized representative.

*Hot tub.* A hydrotherapy spa constructed of wood with sides and bottoms formed separately; and the whole shaped to join together by pressure from the surrounding hoops, bands or rods; as distinct from spa units formed of plastic, concrete, metal and other materials.

*Hydrotherapy spa.* A unit designed for recreational and therapeutic use which is not drained, cleaned or refilled for each user. It may include but not be limited to hydrojet circulation, hot water, cold water mineral baths, air induction bubbles, or some combination thereof. Industry terminology for a spa includes but is not limited to "therapeutic pool," "hydrotherapy pool," "whirlpool," "hot spa," "hot tubs," etc.

*Maximum load.* Maximum or design load, determined by dividing the total square footage of swimming pool surface area by twenty-seven (27).

*Operator* or *manager.* The individual responsible for the operation and management of a public swimming pool.

*Person.* Any person, firm, partnership, association, corporation, company, governmental agency, club, school or organization of any kind.

*Pool area.* That area immediately surrounding and adjacent to the swimming pool to include all areas within the fence, if required, or within the walls of the room in which the pool is located if it is an indoor pool.

*Private residential swimming pool.* Any swimming pool located on private residential property under the control of the homeowner or a tenant, the use of which is limited to swimming by members of the homeowner's or tenant's family and their guests.

*Public spa and hot tubs.* Any spa and/or hot tub, other than a residential spa or hot tub, which is intended solely for bathing and is operated by an owner, lessee, operator, licensee, or concessionaire, regardless of whether a fee is charged for such use. Public spas and hot tubs may be individual units or may be integrated into a larger swimming pool or bathing pool.

*Public swimming pool.* Any swimming pool intended to be used collectively by persons, whether they be owners, lessees, operators or concessionaires, regardless of whether a fee is charged for such use. Such term shall include, but not be limited to, a swimming pool owned and operated by a private club or association, a civic club or any other association. "Public swimming pool" shall include public spas and hot tubs.

*Spa.* A hydrotherapy unit (see "hydrotherapy spa") of irregular or geometric shell design.

*Swimming pool.* Any swimming, wading or spray pool, including all appurtenant equipment, structures and facilities, constructed for the purpose of providing a swimming or wading place for any person or persons.

*Turnover rate.* The amount of time required by a filtration system to filter the equivalent of the entire volume of a pool or spa.

(Ord. No. 4739-95)

Sec. 39-2. - Applicability and purpose of chapter generally.

(a) This chapter, except as otherwise provided herein, is adopted to provide regulations relating to the design, construction, alteration and maintenance of sanitation and safety features applying to the use and operation of all swimming pools, with the exception of single-occupant tanks or showers used exclusively for therapeutic purposes and tourist establishment swimming pools, as defined under Section 35.1-13 of the Code of Virginia, and to provide for requirements for permits for the construction of such pools and for administration and enforcement by the health officer.

(b) The primary purposes of this chapter, in its application to swimming pools, are:

(1) To assure that the water in a swimming pool is sufficiently clear, free from dirt or other foreign substances and properly treated by approved chemicals to make it free from undue hazard to the health of its patrons and the citizens of the city.

(2) To provide the health officer with a means for insuring that these objectives are carried out and made effective both with respect to existing swimming pools and those which may be built in the future.

(3) To assure that the appurtenances of swimming pools are so organized and operated that they promote and protect the safety of their patrons and of the citizens of the city.

(4) To assure that new construction of swimming pools shall have the benefit of this chapter as a guide for persons interested in planning, organizing and building such swimming pools.

(Ord. No. 4739-95)

Sec. 39-3. - Application of chapter to existing pools.

The structural and equipment provisions and requirements of this chapter shall not apply to any swimming pool constructed prior to the effective date of the ordinance from which this chapter is derived, except as follows:

(1) Any alteration, placement or replacement of any equipment shall comply with such requirements.

(2) The provisions and requirements of this chapter with respect to fences, operational procedures and standards, chemical feeding equipment, flowmeters, pressure gauges and toilet facilities shall be complied with by all public swimming pools, regardless of the date of construction, except where specifically provided otherwise.

(Ord. No. 4739-95)

Sec. 39-4. - Applicability of plumbing, building, electrical and zoning regulations.

In addition to the requirements of this chapter, the requirements of the city building, plumbing and electrical codes and the zoning ordinance shall also apply in the construction, maintenance and operation of all swimming pools. Any appeal from a decision by the director of codes compliance or a building, plumbing, electrical or zoning inspector with respect to such additional requirements or the design and construction requirements contained in this chapter shall be made under the provisions of such codes and ordinances, as applicable.

(Ord. No. 4739-95)

Sec. 39-5. - Notice to comply with chapter.

When any violation of this chapter occurs, the operator or owner of the swimming pool involved shall be notified in writing and shall be given a time limit, not to exceed ninety (90) days, in which to comply.

(Ord. No. 4739-95)

Sec. 39-6. - Submission of plans.

For any proposed public swimming pool or spa, it is the responsibility of the owner of the real estate on which the said pool or spa is to be located to provide detailed plans and specifications to the health officer for review and approval. Such plans and the review thereof must be completed prior to the issuance of a building permit.

(Ord. No. 4739-95)

Sec. 39-7. - Building permit.

A building permit shall be obtained from the department of codes compliance before the construction, remodeling or major alteration of any swimming pool. Plans and specifications for other than private residential swimming pools shall have been approved by the health officer prior to the issuance of such permit. Such plans and specifications must be submitted in triplicate to the health officer and one (1) set of plans and specifications, when approved, shall be stamped and returned to the applicant. Original tracings shall not be stamped for approval.

(Ord. No. 4739-95)

Sec. 39-8. - Authority of health officer to close pools.

When the health officer finds that the provisions of this chapter are not met or that any condition exists that endangers the life, health or safety of the users of any swimming pool, such officer may order the facility closed until the condition is corrected.

(Ord. No. 4739-95)

Sec. 39-9. - Location.

The location of a swimming pool shall in no way hinder the operations for which it is designed nor adversely affect swimmers' safety or the quality of the water.

(Ord. No. 4739-95)

Sec. 39-10. - Water supply.

All water used in swimming pools shall be from an approved source. No piping arrangement shall exist which, under any conditions, will permit sewage or wastewater to enter the swimming pool water system or water from the swimming pool to enter the make-up water supply. In the case of spray pools, spray heads shall be installed so that there will be no possibility for their submergence, as might result in the case of clogged drains.

(Ord. No. 4739-95)

Sec. 39-11. - Outlet drain.

An outlet drain shall be provided for completely emptying any swimming pool. Direct connections to a sanitary sewer or a septic tank shall not be permitted. Indirect connection to a storm sewer is subject to approval by the director of public works and the health officer.

(Ord. No. 4739-95)

Sec. 39-12. - Fencing.

(a) It shall be unlawful for any person to construct, maintain, use, possess or control any swimming pool located outdoors, unless such swimming pool is completely enclosed by a substantial fence not less than four (4) feet in height nor more than two (2) inches above the ground surface and is located not closer than five (5) feet from any swimming pool edge. A woven steel wire, chain link, picket or solid board type fence or a fence of equal or greater strength shall be construed as meeting this requirement. The fence shall have at least one (1) gate, and all gates shall be kept locked at all times when the swimming pool is not in use.

(b) All fences required by this section shall conform to the city's building code and to the zoning ordinance.

(c) Any person convicted of violating this section shall be punished by a fine of not more than three hundred dollars ($300.00), or by imprisonment for not more than thirty (30) days, or by both such fine and imprisonment. Each day's violation shall be construed as a separate offense.

(Ord. No. 4739-95)

Secs. 39-13—39-21. - Reserved.

ARTICLE II. - PUBLIC POOLS

DIVISION 1. - GENERALLY

Sec. 39-22. - Application of article.

The provisions of this article shall apply to public swimming pools and shall be in addition to other provisions of this chapter applicable to such pools.

(Ord. No. 4739-95)

Sec. 39-23. - Approval of materials, design features, etc., not covered by article.

For any items not specifically covered by this article, the health officer is hereby authorized to require that all materials, methods of construction and design features for public swimming pools shall prove to function adequately, effectively and without excessive maintenance and operation difficulties, before granting approval thereof. Such approval shall be based upon the need for protecting the health and safety of those using the pool. It shall be the duty of the applicant to provide such data, tests or other adequate proof that the device, material or product will satisfactorily perform the function for which it is intended before such item shall be approved.

(Ord. No. 4739-95)

Sec. 39-24. - Operating permit; health officer's right to inspect.

(a) No person shall operate a public swimming pool, unless an annual permit has been secured from the health officer. Such permit shall be issued to an individual who has been certified as a pool operator by the Tidewater Swimming Pool Conference Committee or equivalent certification approved by the health officer or to an organization naming a specific certified pool operator to be in charge, and shall be valid only until the end of the calendar year in which it is issued, unless sooner revoked by the health officer. Such permit shall only be issued for those public swimming pools meeting the requirements of this chapter; and, as a condition for the issuance of such permit, the operator or person in charge of the swimming pool shall, upon request of the health officer, permit access to all parts of the pool at all reasonable times for the purpose of making inspections.

(b) The permit required by this section shall be posted under a transparent waterproof material in view of the users of the swimming pool.

(c) Continued failure to comply with the provisions of this chapter shall be cause for revocation, by the health officer, of any operating permit under this section.

(Ord. No. 4739-95)

Sec. 39-25. - Supervision.

The operation of a public swimming pool and all of its appurtenances shall be under the direct supervision of the certified operator. The certified operator shall be readily accessible at all times and capable of responding within two (2) hours of notification of a problem when the pool is open.

(Ord. No. 4739-95)

Sec. 39-26. - Operating records.

A daily record of the operation of each public swimming pool shall be maintained by the operator. The record shall include date, pH and free chlorine residual at least every three (3) hours, cyanuric acid content, weather conditions, chemicals added and amounts, filter pressure (inlet and outlet gauges), and rate of flow in gallons per minute. Such record shall also contain a report of all accidents in detail.

(Ord. No. 4739-95)

Sec. 39-27. - Accessibility to rescue, emergency and maintenance vehicles.

Each public swimming pool and its appurtenances shall be so located and constructed that a rescue or emergency vehicle and maintenance vehicle shall be capable of being admitted to within fifty (50) feet of the swimming pool.

(Ord. No. 4739-95)

Sec. 39-28. - Lifeguards.

The management of any public swimming pool shall designate and have on duty, within the pool area, a lifeguard or lifeguards, each of whom shall, as a minimum, have passed a current lifeguard training certification and also possesses a current approved first aid and CPR certification conducted by the American Red Cross or the Y.M.C.A. or a program shown to be the equivalent thereof to the director of public health. Each pool shall be equipped with and have available the following lifesaving equipment: a rescue tube per lifeguard, ring buoy, shepherd's crook, reaching pole, first aid kit, and any other equipment necessary. The required number of lifeguards shall be determined as follows:

(1) For pools greater than two thousand (2,000) square feet in area, there shall be two (2) or more lifeguards.

(2) For pools greater than four thousand (4,000) square feet in area, there shall be no fewer than two (2) lifeguards, plus an additional lifeguard for each fifty (50) bathers over one hundred fifty (150).

(3) For pools two thousand (2,000) square feet in area or less, there shall be at least one (1) lifeguard; provided, however, that no lifeguard shall be required for such pools (i) if the pool is no more than five (5) feet in depth; and (ii) the pool is owned by a homeowners' association, recreation association, health club or condominium, or the pool is operated within a gated housing complex whose residents are limited primarily to unaccompanied military personnel; and (iii) if the following restrictions are adhered to for use of the pool:

   a. Only persons eighteen (18) years and older are allowed in the pool and pool area;

   b. A sign is clearly posted in the pool area, in four-inch or larger letters, that there is no lifeguard on duty;

   c. All other lifesaving equipment as specified in this chapter shall be available within the pool area.

(Ord. No. 4739-95; Ord. No. 5902-03; Ord. No. 6666-10)

Sec. 39-29. - Lifesaving equipment.

Except as otherwise provided in section 39-28, the management or operator shall furnish lifeguards with the following lifesaving and safety equipment: a rescue tube per lifeguard, one (1) backboard per facility which is OSHA Compliant and meets The American Red Cross Standards, one (1) whistle for each lifeguard on duty, a ring buoy with rope of not less than one-fourth (¼) inch in diameter and twenty-five (25) feet in length, a shepherd's crook or reaching pole equivalent to not less than one-half (½) the width

of the pool, and a first aid kit containing one (1) CPR barrier device mask, one (1) pair barrier first aid gloves, adhesive bandages, gauze bandages (square), gauze bandages (roll), medical tape, one (1) scissors, first aid antibiotic ointment, and one (1) blood or body fluid spill clean-up kit. All equipment and supplies must be readily available within the pool area.

(Ord. No. 4739-95; Ord. No. 5902-03; Ord. No. 6099-05)

Sec. 39-30. - Telephones.

A telephone capable of contacting emergency agencies (police, fire, etc.) shall be readily available within one hundred (100) feet of the pool area at all times while the pool is open.

(Ord. No. 4739-95; Ord. No. 5902-03; Ord. No. 7560-19)

Sec. 39-31. - Separation of wading pools.

Public wading pools shall be separated from swimming pools and appropriate protection features, such as a fence, shall be installed.

(Ord. No. 4739-95)

Sec. 39-32. - Protection of wading pools from contamination during rainfall.

Every public wading pool shall be located so that drainage from the surrounding area will not wash contamination into the pool during rainfall.

(Ord. No. 4739-95)

Sec. 39-33. - General requirements for shells; materials for spray pools.

(a) Public swimming pool shells shall be of reinforced concrete, or its equivalent in strength and durability, designed and built to withstand anticipated stresses. Such shell shall be of watertight construction and shall have a smooth and easily cleanable surface. A white or light colored waterproof interior finish, which will withstand repeated brushing, scrubbing and cleaning procedures, shall completely line the pool to the coping.

(b) Public spray pools shall be constructed of permanently impervious material that shall have and retain a finish as smooth as possible and that is nonslip to bare feet.

(Ord. No. 4739-95)

Sec. 39-34. - Shape, contour, slope, etc.

(a) A public swimming pool shall be designed and constructed of such shape, contour, and the like that efficient and safe control of swimmers can be accomplished. In water depths under five (5) feet, the slope of the bottom shall not exceed one (1) foot in twelve (12) feet.

(b) The bottom of public wading pools and spray pools shall slope not less than three (3) inches in ten (10) feet toward the drains.

(Ord. No. 4739-95)

Sec. 39-35. - Deck generally.

(a) There shall be a deck at least four (4) feet wide extending around the entire perimeter of a public swimming pool. The deck shall be constructed of concrete or other approved material. The material shall have a nonslip but smooth finish. The deck shall have a pitch of not less than one-eighth ( 1/8 ) of an inch nor more than five-eighths ( 5/8 ) of an inch to the foot and be designed so as to conduct drainage away from the pool area in a manner that will not create or maintain pools of water or become a health nuisance.

(b) If the recirculation system is designed for water to enter the bottom and overflow the top or near the top of the pool, then adequate drainage of the scum and floating material from the deck must be provided. This may be a continuous drain or multiple drains. In multiple drains, each drain grating shall have a total orifice area of at least four (4) times the cross-sectional area of the drainpipe, which shall have minimum diameter of two and one-half (2½) inches. In the use of drain channels, continuous around the perimeter of the pool, the channel grating shall be designed so as not to create a hazard to fingers and toes and be resistant to corrosion.

(Ord. No. 4739-95)

Sec. 39-36. - Persons in street clothes and furniture on deck.

No person in street clothes shall be allowed on the deck of a public swimming pool, within six (6) feet of the pool rim, except the operating personnel, health officer or personnel engaged in repair work. No tables, chairs, lounges, umbrellas or other furniture shall be placed on the deck, within six (6) feet of the pool rim.

(Ord. No. 4739-95)

Sec. 39-37. - Ladders and steps.

(a) Two (2) or more ladders shall be provided for all public swimming pools having a perimeter greater than one hundred (100) feet and one (1) means of egress shall be provided for such pools having a perimeter of one hundred (100) feet or less. Steps below the water level projecting out into the pool are prohibited. Treads of all steps, ladders or other means of egress shall be of nonslip construction. Each recessed step area shall be provided with one (1) or more handrails.

(b) Steps and ladders, when provided at a public wading pool, shall be of a nonslip construction.

(Ord. No. 4739-95)

Sec. 39-38. - Overflow facilities.

(a) Provisions shall be made for removal of floating material and scum from the surface of the water in public swimming pools. If a recessed type of gutter located near the top of the walls is to be used, the gutter shall have a minimum depth of three (3) inches and shall be of a design which will permit satisfactory cleaning of the overflow channel. The lip of the scum gutter shall be level and be designed to serve as a handrail for swimmers. The gutter drain outlets shall be spaced around the pool not more than fifteen (15) feet on centers and shall not exceed three (3) feet in either direction from any corner or irregularity in the gutter. The gutter bottom shall slope toward these outlets with a minimum slope of one-eighth ( 1/8 ) inch to the foot. The drains shall not be less than two and one-half (2½) inches in diameter and the total orifice area of the grating shall be at least twice the cross-sectional area of the outlet pipe.

(b) In lieu of the gutter referred to in subsection (a) above the pool may be equipped with an arrangement of overflow devices, henceforth known as "skimmers," in the walls which will provide

the proper removal of scum and floating material. There shall be one (1) such device for each four hundred (400) square feet of pool area, with a minimum of four (4) per pool, each of which shall be individually controlled. "Skimmers" shall be maintained so that they are functioning properly and in good repair at all times.

(Ord. No. 4739-95)

Sec. 39-39. - Outlet drain cover.

The outlet drain for any public swimming pool, as required by section 39-11 shall be covered with a grate of such design that it cannot be readily removed by or produce a hazard to the swimmers. All pools installed after the effective date of this ordinance shall be equipped with anti-vortex type main drain covers.

(Ord. No. 4739-95)

Sec. 39-40. - Drains for spray pools.

Each public spray pool shall be equipped, at its low point, with an unvalved drain to waste. The drain shall be of such size and design that water sprayed into the pool will not pond in the pool bottom.

(Ord. No. 4739-95)

Sec. 39-41. - Depth markings.

The depth of the water in a public swimming pool shall be marked at every foot increment of depth in water depths five (5) feet and under, on both the horizontal and vertical surfaces on both sides of the pool and on the top of the coping. In water deeper than five (5) feet, the markings need not be closer than three (3) feet apart. Numerals and letters shall be at least five (5) inches in size and of good contrast with the pool wall and deck.

(Ord. No. 4739-95)

Sec. 39-42. - Diving boards and areas.

(a) At least twelve (12) feet of free and unobstructed headroom shall be provided above the diving boards at public swimming pools. The minimum depth of water in diving areas shall be determined as follows:

| *Elevation ofDiving PointAbove Water Surface* | Depth of Water | End Wall To Maximum Depth | Maximum Depth To 5 Feet |
|---|---|---|---|
| 0″ to 24″ inclusive | 8 ft. | 12 ft. | 12 ft. |
| 24″ to 30″ inclusive | 8 ft. | 13 ft. | 17 ft. |
| 30″ plus to 1 meter incl. | 8 ft. 10 in. | 15 ft. | 20 ft. |

| | | | |
|---|---|---|---|
| 1 meter plus to 3 meters incl. | 10 ft. | 15 ft. | 20 ft. |
| 3 meters plus to 5 meters | 14 ft. 6 in. | 17 ft. | 23 ft. |

(b) The minimum length of any diving area terminating at a vertical wall shall be thirty (30) feet.

(c) Where multiple diving boards are used, the space between centerlines shall not be less than ten (10) feet, and no board over twenty-four (24) inches above the water shall be closer than twelve (12) feet to a side wall. Boards twenty-four (24) inches and under shall be no closer than ten (10) feet to a side wall and space between centerlines shall not be less than ten (10) feet. These dimensions shall apply both at the end wall and the point of maximum depth.

(d) The space between centerlines of three (3) meter and five (5) meter diving boards shall be not less than fifteen (15) feet, and between five (5) meter and ten (10) meter boards, shall be not less than eighteen (18) feet. The minimum distances from centerlines of five (5) meter and ten (10) meter boards shall be the same to side walls.

(e) A life line shall be provided at the five-foot break point to separate the diving area from the swimming area of a public swimming pool.

(f) All diving boards shall have a minimum of three (3) feet of their length extended out over the water beyond the pool edge.

(Ord. No. 4739-95)

Sec. 39-43. - Lighting fixtures.

Where public swimming pools are used after dark, the swimming pool area shall be equipped with lighting fixtures of such number and design as to light all parts of the pool area and the water therein. Fixtures should be installed in such a manner as to create no hazard to swimmers and to prevent light-attracted insects from falling into the water. The design and installation of fixtures shall be such that lifeguards can see clearly every part of the pool, including the decks, diving boards and other appurtenances, without being blinded by glare. If installed, submarine lights shall provide at least one (1) watt per square foot of pool area. Each submarine light must be properly connected to a ground.

(Ord. No. 4739-95)

Sec. 39-44. - Water fountains.

Each public swimming pool area shall be equipped with at least one (1) approved type water fountain that is readily accessible to swimmers.

(Ord. No. 4739-95)

Sec. 39-45. - Food and drink regulations.

(a) Food and drink preparation, serving or consumption facilities shall not be permitted on the deck of a public swimming pool or closer than twelve (12) feet from the rim of the pool. If food and drink are served at a pool, the operator may be required to obtain a food permit from the health officer.

(b) Any person in the process of eating or drinking shall be confined to an area no closer than six (6) feet of the pool rim. Food or drink in glass containers shall not be permitted or consumed within the fenced confinement of any public swimming pool.

(Ord. No. 4739-95)

Sec. 39-46. - Dressing room; showers, toilet facilities and lavatories.

(a) A dressing room for each sex shall be provided at all public swimming pools. Metal lockers, wire baskets, hooks or other sanitary means of storage of clothing and personal accessories shall be provided. Wooden lockers or cloth bags will not be permitted. All liquid waste shall be discharged to an approved public sewer. The floors shall have a minimum pitch of three (3) inches in ten (10) feet to the drains, with no low spots which will allow water to stand. The floors shall be of smooth but nonslip finish and the rooms shall be ventilated so that floors do not remain damp or wet between periods when the swimming pool is in use.

(b) Showers, toilet facilities and lavatories shall be provided at public swimming pools in accord with the provisions of the city's plumbing code. Soap shall be provided at each shower and lavatory and toilet paper shall be provided at each water closet.

(c) The floor of the dressing room required by this section shall be maintained in a clean and dry condition, when the swimming pool is not in use, to aid in the prevention of the spread of "athletes foot" disease. All of the dressing room facilities shall be maintained in a healthful and safe manner.

(d) Apartment and condominium swimming pools shall be exempt from the provisions of this section requiring dressing rooms.

(e) Separate dressing rooms shall not be required for wading pools or spray pools operated in conjunction with a public swimming pool.

(f) A minimum of one (1) shower for patron use shall be provided at each public swimming pool.

(Ord. No. 4739-95)

Sec. 39-47. - Common use of combs, cups, etc.; laundering and handling of swimming suits and towels furnished by management.

(a) The common use of brushes, combs, towels and drinking cups at public swimming pools is prohibited.

(b) Swimming suits and towels furnished by the management of a public swimming pool shall be laundered and handled in a healthful and safe manner.

(Ord. No. 4739-95)

Secs. 39-48—39-51. - Reserved.

DIVISION 2. - RECIRCULATION SYSTEM AND APPURTENANCES

Sec. 39-52. - General requirements.

(a) All public swimming pools shall be equipped with a recirculation system consisting of pumps, hair and lint catcher, filters, disinfection equipment and necessary pipe connections to the inlets and outlets. Adequate provision shall be made for backwashing filters. The recirculation system shall be designed for at least a six-hour turnover of the swimming pool water.

(b) A complete recirculation system shall be installed at public wading pools which cannot be served adequately by an adjacent swimming pool recirculation system. The recirculation system shall provide a pool volume turnover rate of once in three (3) hours or less.

(Ord. No. 4739-95)

Sec. 39-53. - Inlets.

The inlets for recirculation shall be submerged and be located to produce uniform circulation of water throughout any public swimming pool, without the existence of dead spots. Wall inlets shall be located on not more than twenty-foot centers entirely around the perimeter of the pool. Bottom inlets shall be spaced, depending on the pool dimensions, so as to produce uniform water circulation. Each inlet shall be designed as an adjustable orifice or provided with a valve.

(Ord. No. 4739-95)

Sec. 39-54. - Filtration system generally.

(a) The recirculation system shall be equipped with a filtration system that will filter the entire content of a I [inlet] within six (6) hours or less at the rate of three (3) gallons or less per square foot of filter area for rapid sand filter and twenty (20) gallons or less per square foot of filter area for high-rate sand filters. Pressure filters shall be equipped with readily accessible air relief valves and with an access hole large enough to permit inspections, maintenance and repair work. Each pressure filter system shall be equipped with a pressure gauge, at least four (4) inches in diameter, on the inlet and outlet (unless the system is designed for one (1) gauge and is approved by the National Sanitarian Foundation or equivalent), to indicate the pressure in pounds per square inch; and a sight glass that can be easily removed for cleaning shall be provided on the waste discharge line. Gravity type filters shall be equipped with loss-of-head gauges.

(b) The filtration rate for diatomaceous earth filters and similar equipment may not exceed one and one-half (1½) gallons per square foot of filter area with six (6) hours' turnover of pool volume, unless continuous slurry feed is provided, in which case the rate shall not exceed three (3) gallons per square foot of filter area.

(c) Arrangements of equipment shall be provided for application of filter aid and proper precoating and cleaning of filter elements. All filters shall be so designed and capable of being cleaned or backwashed by use of the washwater pump and the manipulation of valves. In view of the constant change of design of such equipment, it will be necessary to evaluate each system individually and approval or rejection will be at the discretion of the health officer, based upon the need for protecting the health and safety of those using the pool.

(Ord. No. 4739-95)

Sec. 39-55. - Filter room.

(a) Any room containing the filtration equipment, pumps and other recirculation system appurtenances for a public swimming pool shall be finished in a light color and be provided with a minimum twenty (20) foot candles of illumination and ventilation. The floor of the filter room shall be designed to provide for adequate drainage. Any facility for discharging filter backwashing water onto the filter room floor is strictly prohibited. Adequate provision shall be made for disposal of backwash water and collection and disposal of filter media. All the recirculation equipment in this room shall be installed so that it is easily convenient to operate and repair. All entrances below ground surface shall be by stairway. Adequate headroom shall be provided above all pressure filters. The filter room

shall be maintained in a neat and orderly fashion and shall not be used for storage of potentially hazardous or toxic chemicals other than those necessary for the operation of the pool.

(b) A placard shall be prominently displayed in the filter room provided for in this section, showing the following data: Size of pool in feet and volume in gallons; capacity of filters in square feet and gallons per minute; capacity of pumps in gallons per minute at the appropriate head in feet; head loss at which filters should be backwashed; and any other operating data the operator or health officer considers pertinent to the swimming pool.

(Ord. No. 4739-95)

Sec. 39-56. - Pumping equipment.

The pumping equipment of a public swimming pool shall have sufficient capacity to discharge the volume of water for the required turnover of the pool against the maximum head of the recirculation system. The pump used for backwashings and filters shall have sufficient capacity to backwash the unit at the rate of at least twelve (12) gallons per minute per square foot of filter area.

(Ord. No. 4739-95)

Sec. 39-57. - Hair and lint catcher.

The hair and lint catcher of a recirculation system required by this division shall be installed ahead of the filter pump and be designed and located so that it can be easily and simply dismantled for cleaning and inspection.

(Ord. No. 4739-95)

Sec. 39-58. - Rate of flow indicator.

The recirculation system required by this division shall be equipped with a rate of flow indicator reading in gallons per minute and so located so as to indicate the rate of flow of filtered water returned to the pool. The rate of flow indicator shall also be capable of indicating the rate of backwash in gallons per minute in sand or anthracite coal filters.

(Ord. No. 4739-95)

Sec. 39-59. - Suction cleaners.

(a) A suction cleaner shall be provided for each public swimming pool. Where the suction cleaner is operated by the recirculating pump, a device shall be provided for throttling the flow from the pool outlet and the suction cleaner line shall be connected through the hair and lint catcher.

(b) The suction cleaner required by this section shall be used at such times as are necessary to maintain the floor of the swimming pool free from all visible sediment.

(Ord. No. 4739-95)

Sec. 39-60. - Chemical feeding and testing equipment generally.

(a) Means shall be provided for regulating the feeding of chemicals to the water in the recirculating system required by this division. The installation of mechanically operated, positive, chemical feeders

or open type chemical machines is required. The installation of closed type solution pots is prohibited. Hand feeding of chlorine is strictly prohibited.

(b) Each public swimming pool shall be provided with satisfactory equipment for determination of hydrogen-ion concentration ranging from 6.8 to 8.0. Satisfactory equipment shall be provided for determination of residual chlorine content ranging from 0.1 to 1.0 ppm. In swimming pools using isocyanurate chlorine compounds or similar types of chlorination, an approved test kit for checking the cyanuric acid content of the pool water must be provided. Such kit shall be capable of reading from 0.1 to 2.0 ppm. All isocyanurate chlorine compounds and equipment must be approved by the National Sanitation Foundation Testing Laboratory, Inc. The use of orthotolidine-type test kits is prohibited.

(Ord. No. 4739-95)

Sec. 39-61. - Disinfection equipment; chlorinator room.

(a) All public swimming pools shall be provided with approved chlorine-feeding equipment. The chlorinating equipment shall be capable of applying a dose up to six (6) ppm of chlorine, at the rate of circulation. Chlorine gas-feeding equipment and chlorine gas cylinders shall be installed in an enclosed space or room separate from the filter room equipment and shall be equipped with a door capable of being locked. This chlorinator room shall be equipped with a forced draft fan exhausting to the outside from floor level and shall have a fresh air inlet vent located near the ceiling. The exhaust fan shall be capable of exhausting the contents of this room in three (3) minutes.

(b) Unless topography makes it difficult or impossible, the chlorinator room shall be located above ground level and below deck level of the pool. The chlorine gas tanks shall be protected from direct sunlight and fastened in place during storage and use. A canister type gas mask for chlorine or a gas mask with a supply of oxygen under positive pressure or compressed air, either of which have been approved by the United States Bureau of Mines, shall be provided where chlorine gas is being utilized. The canister for the chlorine gas mask shall be replaced after each use or removal of the seal or, if not used, before the manufacturer's expiration date. The gas mask shall be accessible to, but outside of, the chlorinator room.

(Ord. No. 4739-95)

Sec. 39-62. - Chemical content of water.

(a) The chlorine equipment shall be operated so as to maintain a free available chlorine content of not less than one (1.0) ppm nor more than three (3.0) ppm at all points throughout the public swimming pool water. In pools using isocyanurate chlorine compounds, the free available chlorine content of the pool shall be one (1.0) to three (3.0) ppm and the cyanuric acid content shall be forty (40) to sixty (60) ppm. Cyanuric acid content must never exceed one hundred (100) ppm at any time.

(b) The hydrogen-ion concentration (pH) in a public swimming pool should be maintained on the alkaline side at a point between a pH of 7.2 and 7.8.

(c) Chemicals other than chlorine, isocyanurate chlorine compounds, sodium or calcium hypochlorite, lime, soda, ash, aluminum sulfate and hydrochloric acid shall not be used to treat public swimming pool water, without permission from the health officer.

(Ord. No. 4739-95)

Sec. 39-63. - Operation of filters; clarity of water.

The filters for a public swimming pool shall be operated twenty-four (24) hours per day during the season the pool is in use. At all times when the pool is in use, the main drain(s) on the bottom of the pool shall be clearly visible from the deck around the pool.

(Ord. No. 4739-95)

Sec. 39-64. - Public spas and hot tubs.

There is hereby adopted by reference in the city the publication "Health and Safety Guidelines for Public Spas and Hot Tubs," dated April, 1981, as revised January, 1985, published by the United States Department of Health and Human Services, Public Health Service, Center for Disease Control, Atlanta, Georgia. Copies of this publication shall be available in the office of the city clerk.

(Ord. No. 4739-95)

# POOL SPECIFICATIONS PLACARD

POOL NAME _____ LOCATION _____

POOL PERIMETER: _____ FEET
(2 X LENGTH+2 X WIDTH)

POOL AREA _____ SQ. FT.
(LENGTH X WIDTH)

POOL CAPACITY: _____ GALLONS
(AREA X AVG.DEPTH X 7.5)

TURNOVER RATE: _____ HOURS
(CAPACITY / FLOW RATE)

CONSTRUCTION DATE: _____

PUMP SIZE: _____ HP _____ FT.
HORSEPOWER HEAD

FILTER SIZE: _____ SQ. FT.

FLOW RATE: _____ GAL. PER MIN.

DESIGN POOL LOAD: _____
(POOL AREA / 27)

BACKWASH INSTRUCTIONS: _____

_____

_____

_____

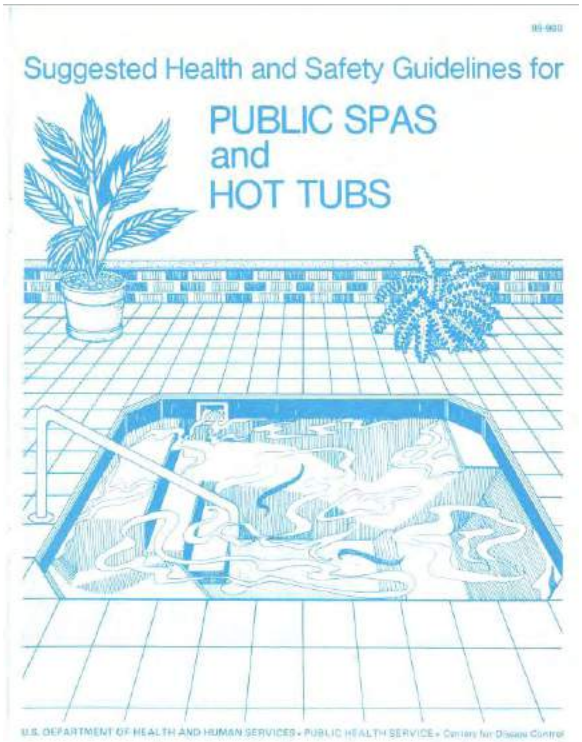
BACKWASH WHEN: _____

**IN AN EMERGENCY CALL:** _____

ACCEPTABLE READINGS

**FREE CHLORINE 1-3 PPM** BROMINE 2-4 PPM PH 7.2 -7.8 TOTAL ALKALINITY 75 - 125 PPM

CALCIUM HARDNESS 200-1500 PPM TEMPERATURE < 104°F CYANURIC ACID 40 - 60 PPM




**This Document is Provided Only as a Reference for the Aquatics and Public Health Communities**

**The following Public Spas and Hot Tubs Guidelines manual was developed by CDC in 1981 and revised in January 1985. Much of the information in this manual may still be helpful to aquatics staff, designers, and public health professionals. However, the CDC Healthy Swimming website is the most current information on water quality, disinfection, and operation for aquatic venues. It should be consulted first at:**

**http://www.cdc.gov/healthyswimming**

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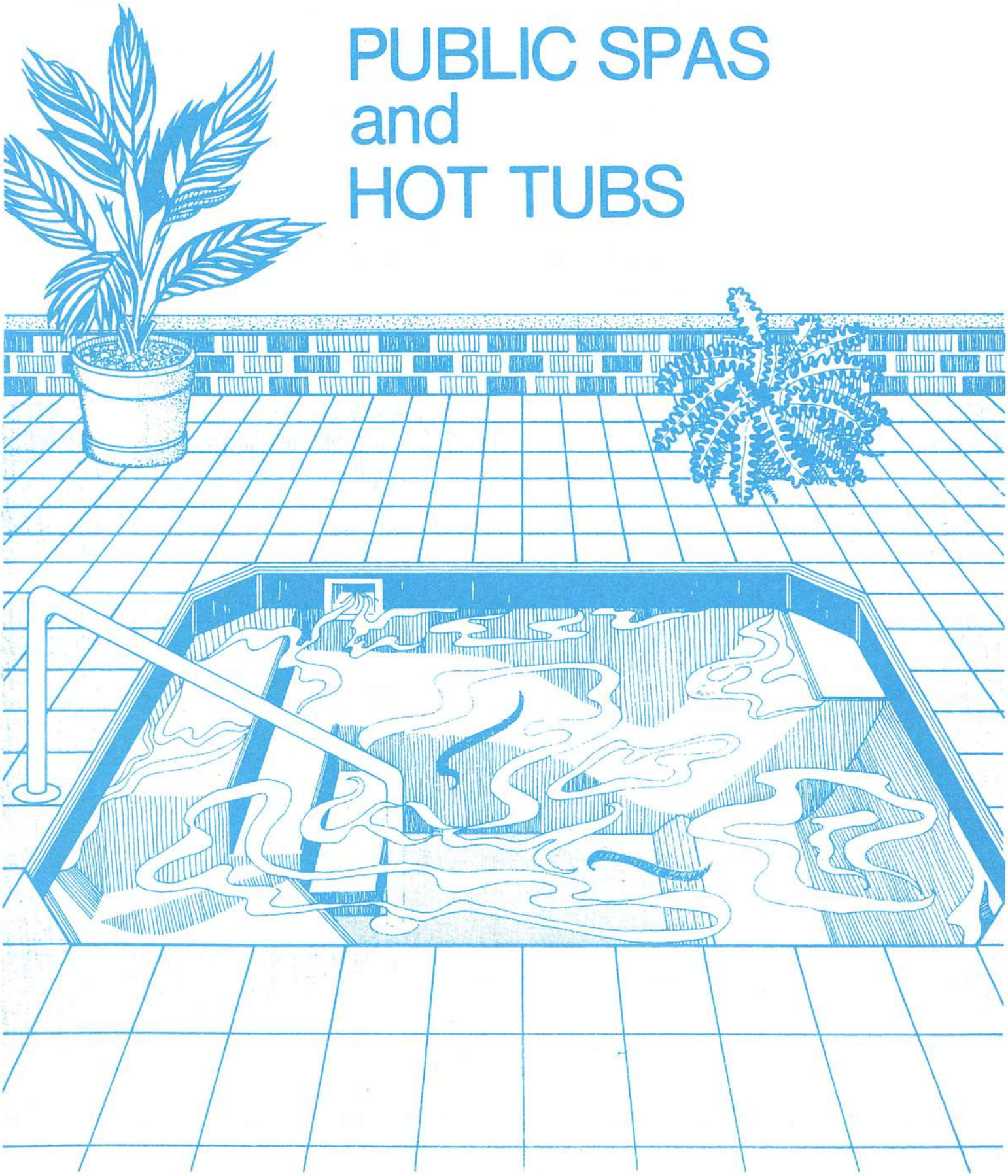
# Suggested Health and Safety Guidelines for

# PUBLIC SPAS and HOT TUBS



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • PUBLIC HEALTH SERVICE • Centers for Disease Control

**This Document is Provided Only as a Reference for the Aquatics and Public Health Communities**

**The following manual was developed by CDC in 1981 and revised in January 1985. Much of the information in this manual may still be helpful to aquatics staff, designers, and public health professionals. However, the Healthy Swimming website is the most current information on water quality, disinfection, and operation guidance and should be consulted first at**

**http://www.cdc.gov/healthyswimming**

99-960

# Suggested Health and Safety Guidelines for

# PUBLIC SPAS
# and
# HOT TUBS

**April 1981**
**Revised January 1985**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES**
Public Health Service
Centers for Disease Control
Center for Environmental Health
Atlanta, Georgia 30333

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# PREFACE

The spa and hot tub industry is currently expanding into States which do not have adequate regulations to control the health and safety features of these facilities. Epidemiologic evidence has shown that spas and hot tubs can be of significant public health concern if they are not properly designed, operated and maintained.

This publication has been prepared to assist State and local health agencies develop practical spa and hot tub safety and health regulations. These guidelines, along with the appropriate inspection and enforcement procedures, should serve as the foundation for the establishment of practical regulatory programs. Modifications to the technical content of the guidelines may be necessary to meet the particular needs of a State or local agency.

Readers are directed to the American National Standards Institute's (ANSI) standard for making buildings and facilities accessible to, and usable by, the physically handicapped. The reference standard is A117.1-1976 (1971) by the ANSI, 1430 Broadway, New York, New York 10018.

The preparation of this publication would not have been possible without the valuable advice provided by numerous individuals within many organizations. Special thanks are due to the National Spa and Pool Institute for preparing the initial draft of this document and for its liaison efforts with members of the spa and hot tub industry. Appreciation is extended to the following organizations for their review comments in the preparation of the first printing:

Swimming Pool Consensus Review Panel, American Public Health Association; Preventable Disease Division, Department of Health Services, State of Connecticut; Division of Personal Environmental Health Services, Department of Health, State of Ohio; Division of Communicable and Venereal Disease, Department of Health, The Commonwealth of Massachusetts; Division of Water Supply, Bureau of Environmental and Occupational Health, Department of Public Health, State of Michigan; and the Sanitary Engineering Section, Department of Health Services, State of California.

Appreciation is extended to members of the following organizations for providing review comments for this first revision:

National Spa and Pool Institute; National Sanitation Foundation; Joint Committee on Swimming Pools and Bathing Places, American Public Health Association; National Swimming Pool Foundation; Fairchild Engineering Corporation; Hydrotech Chemical Corporation; Olin Research Center; Baltimore County Health Department, Maryland; Fulton County Health Department, Georgia; City of Milwaukee Health Department, Wisconsin; Illinois State Department of Public Health; Summit County General Health District, Ohio; Collegiate Athletics and Intramural Sports, Clemson University; Department of Epidemiology and Public Health, Yale University; and the Hospital Infections Program, Center for Infectious Diseases, Centers for Disease Control.

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# 1.0 INTRODUCTION

## 1.1 Objective

This document provides health and safety officials at the State and local levels preliminary guidelines for the evaluation and approval of the design, construction and operation of spas and hot tubs. It describes monitoring techniques and other procedures for ensuring safe operation.

These guidelines are meant to provide a basic view of these facilities from a health and safety standpoint. They are not meant to be used as a final standard for determining whether a public spa or hot tub is to be approved for construction or continued operation. These guidelines exclude facilities used or under the direct supervision and control of licensed medical personnel.

Because of the infinite variations in the installation and operational conditions of public spas and hot tubs, health and safety officials must look beyond these guidelines to uncover any special problems which may be unique to the particular facility being evaluated.

## 1.2 General Description—Public Spas and Hot Tubs

Spas and hot tubs are pools designed for recreational and therapeutic use and for physiological and psychological relaxation. These pools are not drained, cleaned and refilled after each use and may include, but are not limited to these types: hydrojet circulation, hot water, cold water, mineral baths, air induction systems or some combination of these.

Spas and hot tubs are shallow in depth and not meant for swimming or diving.

However, these facilities, like swimming pools, are closed cycle water systems and may be designed with complete water circulation, filtration, heating and, in some cases, disinfectant and overflow systems integrated with the water circulation system. In most cases, both spas and hot tubs equipped with heaters have automatic water temperature controls.

A public spa or hot tub, depending on its size, location and support equipment capacity, can accommodate from one to many bathers.

## 1.3 Health and Safety Problems Related to Public Spas and Hot Tubs

The primary health and safety problems experienced with public spas and hot tubs can be placed in three distinct categories:

- Drugs, alcohol and temperature
- Sanitation
- Injuries

### 1.3.1 Drugs, Alcohol and Temperature

Most fatalities reported in the use of public spas and hot tubs have been attributed to the combination of high water temperature and the use of alcohol or drugs by the victims.

The deaths have inevitably resulted from drowning after the victim has fallen asleep in the hot tub or spa. These individuals were either alone or in the company of another person who had been drinking or had taken medication and was similarly affected.

The high temperatures of the spas or hot tubs in combination with even a moderate level of alcohol in the blood stream tend to accelerate drowsiness.

Consequently, careful monitoring of water temperatures and close supervision of patrons by the hot tub or spa operator as well as a strict prohibition against alcohol and drugs are fundamental for safety.

### 1.3.2 Sanitation

Because of the inherent design and purpose of public hot tubs and spas, which feature high water turnover rates, high temperatures, and water agitation with a high bather load, safe disinfectant residuals and pH levels are quickly depleted during periods of use. If water conditions and quality are not properly maintained, serious health hazards could result.

Periodic checks (hourly testing or use of continuous reading devices) for safe disinfectant residuals during operation is mandatory for continued safety. Logs should be kept by the operator and vigilant independent checks should be made by local health authorities.

### 1.3.3 Injuries

Injuries can occur when drain grates are broken or missing. For example, children playing around broken or missing grates may be drawn to the drain outlet and be unable to free themselves, or a person's long hair may become entangled in raised drain openings or suction jets. Therefore, broken or missing drain covers should be replaced immediately; children should be supervised and warned about playing around grates or other drain covers; and persons with long hair should wear it tightly pinned up or at least not allow it to flow loosely where drain covers are raised.

Safe exit from and entry to public spas and hot tubs are also areas of concern. Slips, trips and falls on wet interior and deck surfaces could result in injury. Consequently, proper deck materials, good drainage, handholds, and the safe design of exterior and interior steps and ladders to avoid slips and entrapment are important adjuncts to safety in any public spa and hot tub facility.

# 2.0 DESIGN AND CONSTRUCTION CRITERIA

## 2.1 Materials of Manufacture

**General.** The materials of components and accessories used in and around spas and hot tubs should be harmless to humans and compatible with the environment in which they are installed. These materials should fulfill the design, installation, and use requirements of the particular spa or hot tub for which they are intended. Spas and hot tubs may be constructed indoors or outdoors.

**Effects of Environment.** The materials for components and accessories to be used in and around spas and hot tubs should be such that the operational strength of the entire assembly will not be adversely affected by exposure to rain, snow, ice, sunlight, local normal temperature extremes, local normal wind variations, expected local air pollution products and the mechanical, electrical and chemical environment. "Local normal temperature extremes" and "local normal wind variations" are defined

as the average annual recorded limits of these measures for the past ten years at any installation point in the U.S.A. where such statistical information exists in "Statistical Abstract of the United States," U.S. Department of Commerce, Bureau of the Census, Section 6, Geography and Environment.

**Materials Selection.** All materials for components and accessories to be used in and around spas and hot tubs should be non-toxic and all parts with external surfaces and edges that may come in contact with the user should be assembled, arranged and/or finished (deburred, polished, etc.) so that they will not constitute a cutting, pinching, puncturing, or abrasion hazard under expected or casual contact.

**Toxicity and Chemical Compatibility.** The selection of materials for components and accessories to be used in and around spas and hot tubs should be such that the assembled and installed product will not be toxic to humans or harmful to the environment, and will be chemically compatible with the materials and environment contacted under intended use.

**Design Strength.** The strength of the assembled and installed components and accessories to be used in and around spas and hot tubs should be such that no structural failure of any part shall cause the failure of any other component part.

### 2.2 Structural Design

**Construction.** The structural design and materials used in spas and hot tubs should be in accordance with local building codes and with generally accepted good structural engineering practice. They should provide a sound, durable structure which will safely sustain the weights and pressures (dead load, live loads, liquid, hydrostatic and earth pressures) involved in each case. The spas and hot tubs should be watertight and surfaces should be inert, non-toxic, smooth and easily cleaned. Except for wooden tubs, where approved, spas and hot tubs should have light-colored interiors.

Roofs or canopies over spas or hot tubs should be constructed so that moisture or condensation from the roof or canopy will not drain into the spa or hot tub.

### 2.3 Dimensional Design

The maximum operational water depth should be 4'0" (1.2 m) measured from the waterline. Exceptions may be made for spas or hot tubs designed for a special purpose such as instruction, treatment or therapy.

The maximum depth of any seat or sitting bench should be 2'0" (61 cm) measured from the waterline.

A minimum height between the top of the spa/hot tub rim and the ceiling should be established. One State health agency requires a height of 7½'.

Spas and hot tubs should be provided with suitable handholds around their perimeter in areas where water depth exceeds 3'6" (1.1 m). Handholds should be no farther than 4'0" (1.2 m) apart and may consist of any one or a combination of the following:

a. Coping, ledges, tub lips, radiused flanges, or decks along the immediate top edge should provide a suitable slip-resistant handhold located not over 12" (30 cm) above the waterline.
b. Ladders, steps, or seat ledges.
c. A rope or railing fastened to the wall not over 12" (30 cm) above the waterline.

The slope of the floor of the spa or hot tub should not exceed 1'0" (30 cm) of fall in 12'0" (3.7 m).

### 2.4 Steps, Recessed Steps, Ladders, and Recessed Treads

Steps, step-seats, ladders or recessed treads should be provided where spa and hot tub depths are greater than 24" (61 cm). Contrasting color bands or lines could be used to indicate breaks in the floor level of the hot tub or spa.

A spa or hot tub should be equipped with at least one handrail (or ladder equivalent) for each 50' (15.2 m) of perimeter, or portion thereof, to designate points of entry and exit, or with a deck designed to facilitate safe entry or exit.

**2.4.1** The design and construction of steps and recessed steps, when required, should conform to the following:

a. Uniform step treads should have a minimum depth of 10" (25 cm) and a minimum width of 12" (30 cm).
b. Riser heights should not be less than 7" (18 cm), nor greater than 12" (30 cm). When the bottom tread in a hot tub serves as a bench or seat, the bottom riser should be a maximum of 14" (36 cm) above the tub floor.
c. The first and last risers need not be uniform in height with other risers but should comply with riser height requirements as noted above. The first (top) riser is measured from the finished deck or tub rim.
d. Intermediate risers, those between the first and last risers, should be uniform in height.
e. Step treads should have slip-resistant surfaces.
f. Each set of steps should be provided with at least one handrail serving all treads.
g. Handrails should be installed so that they can be removed only with tools.
h. The leading edge of handrails facilitating exit should be located within 18" (45.7 cm) ± 3" (7.6 cm), measured horizontally, of the bottom riser.
i. Steps may function as seats or benches.

**2.4.2** The design and construction of ladders, when required, should conform to the following:

a. Ladders should be made entirely of corrosion-resistant materials.
b. Ladder treads should have slip-resistant surfaces.
c. Ladder designs should provide two handholds or handrails which fully serve all treads.
d. The maximum outside diameter of handrails should be 1.9" (4.8 cm) and the minimum should be 1" (2.5 cm).
e. There should be a clearance of not more than 6" (15.2 cm) nor less than 3" (7.6 cm) between any ladder and the wall of the tub or spa.

**2.4.3** The design and construction of recessed treads, when provided, should conform to the following:

a. Stepholes at the centerline should have a uniform vertical spacing of 12" (30 cm) maximum and 7" (17.5 cm) minimum.
b. Maximum vertical distance between the coping edge and

the uppermost recessed tread should be 12" (30 cm).

c. Stepholes should have a minimum tread depth of 5" (13 cm) and a minimum width of 12" (30 cm).
d. Stephole treads should drain into the spa or hot tub to prevent the accumulation of dirt.
e. Each set of recessed treads should be provided with two handrails which fully serve all treads.

### 2.5 Heater and Temperature Requirements

**2.5.1** Spa and hot tub gas heaters must be American Gas Association (AGA) design certified, display a rating data plate and AGA seal, and be certified as meeting the latest American National Standards Institute's (ANSI Z21.56) standard or other applicable and equivalent standards. Electric heaters for spas and hot tubs should be tested by a recognized agency and designed for the purpose intended. Current collectors having a separate ground shall be installed at each inlet and outlet of the electric heater.

**2.5.2** The maximum operating temperature of spa and hot tub water should never exceed 104°F (40°C). A thermostatic control for the water temperature which ensures that this limit will not be exceeded and is accessible only to the operator is essential. An in-line thermometer on the spa/hot tub water return line may be required.

**2.5.3** These maximum water temperature limits should be included in the operator's manual and user labels provided with each spa or hot tub by the manufacturer or installer. The labels should be posted in a prominent place on or in close proximity to the spa or hot tub itself.

### 2.6 Electrical Requirements

The latest National Electrical Code, as published by the National Fire Protection Association, should be used for the wiring and grounding of all electrical equipment associated with a spa or hot tub and the bonding and grounding of all metallic appurtenances. Electrical switches, outlets and equipment shall be at least 15' from the edge of the spa or hot tub and accessible only to the operator.

### 2.7 Inlets and Outlets

**2.7.1** An over-the-rim fill spout should have an air gap and be properly shielded so as not to create a hazard. The open end should have no sharp edges and should not protrude more than 2" (5.1 cm) beyond the edge of the spa or hot tub.

**2.7.2** The arrangement of water inlets and outlets should produce a uniform circulation of water so as to maintain a uniform disinfectant residual throughout the whirlpool or hot tub. The inlets for treated water should be flow-rate adjustable. State regulations should provide the criteria for inlet number and spacing.

**2.7.3** A means should be provided to completely drain the spa or hot tub and may include: bottom drains, a circulatory system, drain plug, etc.

**2.7.4** The total velocity through grate openings should not exceed 2' per second (61 cm/second). The open area in the grates should be designed to prevent the entrapment of fingers, toes, etc.

**2.7.5** Outlets, except skimmers, on pump suction should be covered with suitable protective grates that cannot be removed without tools and that pose no safety hazard.

**2.7.6** Piping should be large enough to permit the rated flows for filtering and cleaning without exceeding the total head developed by the pump at the rated flow.

**2.7.7** The water velocity in spa or hot tub discharge piping should not exceed 10' per second (3.1 m/second). Suction water velocity in any piping should not exceed 6' per second (1.8 m/second).

**2.7.8** Piping subject to damage by freezing should be sloped for adequate drainage and supported at sufficiently close intervals so that sagging between supports will not trap water. Provisions should be made for expansion and contraction of pipes.

**2.7.9** Water outlets should be designed so that each pumping system in the spa or hot tub (filter system(s) or booster system(s) if so equipped) provides one of the following alternatives:

a. Two outlets whose pipe diameter sizes are equal. (This may be two outlet drains or an outlet drain and a skimmer.) The system should be designed so that neither one of the two outlets is cut out of the suction line by a valve or other means.
b. One antivortex drain. Antivortex drains should not provide a tripping or stubbing hazard.
c. A 12" x 12" (30 cm x 30 cm) or larger square grate.
d. Other approved means that guard against outlet entrapment.

### 2.8 Circulation Systems

**2.8.1** Spas and hot tubs should have circulation and filtration equipment as specified in these guidelines and as approved by the appropriate health agency.

**2.8.2** The equipment should provide a turnover rate for the entire water capacity at least once every 30 minutes and be capable of returning the water to a turbidity of 0.50 Nephleometric Turbidity Units (NTU's) at least once during the 4 hours following the peak bather use.

**2.8.3** Equipment should be designed and fabricated so that the water drains from the equipment, and can be drained from exposed face piping by removal of drain plugs and manipulating winter drain valves or other methods.

**2.8.4** Equipment furnished should be warranted by the manufacturer to be free from manufacturing defects in materials and workmanship.

**2.8.5** Equipment furnished should be provided with installation and operation instructions. These instructions should be readily available to the operator on the site.

**2.8.6** A flow meter should be provided on the effluent side of the filter system and a pressure gauge with an appropriate range should be provided on the influent and effluent side of all filters.

**2.8.7** Materials used in the circulation system should comply with appropriate requirements, such as the National Sanitation Foundation's (NSF's) Standard 50, *Circulation System Components for Swimming Pools, Spas or Hot Tubs.*

**2.8.8** In climates subject to freezing temperatures, the spa or hot tub shell and appurtenances, piping, filter system, pump and motor, and other components should be designed and constructed so as to be protected from damage due to freezing.

### 2.9 Overflow Systems

**2.9.1** The overflow system should be designed and constructed so that the water level of the spa or hot tub is maintained at the operating level of the rim or weir device.

**2.9.2** When surface skimmers are used as the sole overflow system, one surface skimmer should be provided for each 100 square feet (30.5 $m^2$) or fraction thereof of the spa or hot tub surface area. When two or more skimmers are used they should be located to maintain effective skimming action over the entire surface area of the spa or hot tub.

### 2.10 Filters

**2.10.1** Filter requirements — General

a. Filters should be designed to maintain water quality under anticipated operating conditions in accordance with these guidelines.
b. Filters should be designed so that filtration surfaces can be inspected, serviced, and easily restored to the original design capacity.

**2.10.2** A means should be provided to permit release of air which enters the filter tank. This may be automatic or manual. Any filter and/or separation tank incorporating an automatic internal air release as its principal means of air release should have as a part of its design a means to provide a slow and safe release of pressure.

**2.10.3** All separation tanks should have a cautionary statement warning the user not to start up the filter pump without first opening the air release. The statement should be visible and noticeable within the area of the air release.

**2.10.4** Piping furnished with the filter should be of suitable material and capable, after installation, of withstanding three times the working pressure. The suction piping should not collapse when there is a complete shut-off of flow on the suction side of the pump.

**2.10.5** Filter components which require servicing should be accessible and available for inspection and repair.

**2.10.6** Filters should meet safety performance standards, such as NSF Standard 50.

### 2.11 Pumps and Strainers

**2.11.1** The design and construction of the pump and component parts should provide safe operation and perform the functions for which they are intended.

**2.11.2** A pump and motor should be provided for circulation of the spa and hot tub water. Performance of all pumps should meet the conditions of flow required for filtering and for cleaning (if applicable) the filters.

**2.11.3** With all pressure filter systems, a suitable removable strainer or screen should be provided for all circulation pumps(s) to remove solids, debris, hair, lint, etc. Water entering the pump should pass through the screen.

**2.11.4** Units must be accessible for inspection and service. Replacement parts should fit with existing parts in the pump without the need for redrilling mounting holes or otherwise altering the replacement part of the pump.

**2.11.5** Where a mechanical seal is provided, components of the seal must be corrosion-resistant and capable of operating under conditions normally encountered in spa and hot tub operation.

**2.11.6** Proper direction of rotation for the pump should be clearly indicated on the pump.

**2.11.7** All motors should have as a minimum an open drip-proof enclosure (as defined by National Electrical Manufacturers Association's standards) and be constructed electrically and mechanically so they will perform satisfactorily and safely under the conditions normally encountered in spa and hot tub installations.

**2.11.8** Motors should be capable of operating the pump under full load with a voltage variation of at least 10 percent from nameplate rating. If the maximum service factor of the motor is exceeded (at full voltage), the manufacturer should indicate this on the pump curve. A pump data plate should be required on all pumps and positioned so that it is visible to the operator.

**2.11.9** All motors should have thermal overload protection or the equivalent, either built-in or in the line starter, to provide locked rotor and running protection.

**2.11.10** The motor frame must contain adequate provision for proper grounding.

### 2.12 Valves

**2.12.1** When the pump is below the overflow rim of the spa or hot tub, valves should be installed on permanently connected suction and discharge lines and located in an accessible place outside the walls of the spa or hot tub.

**2.12.2** All valves should be located where they will be readily and easily accessible for maintenance and removal.

**2.12.3** Multiport valves should comply with a suitable standard, such as NSF Standard 50.

### 2.13 Air Induction Systems

**2.13.1** An air induction system, when provided, must totally prevent water back-up that would cause electrical shock hazards.

**2.13.2** Air intake sources should be positioned and/or designed to minimize contamination (such as from deck water, dirt, etc.) of the spa or hot tub.

**2.13.3** Integral air passages shall be designed and tested at time of manufacture to provide structural integrity for a value of 1.5 times the indicated working pressure.

### 2.14 Disinfectant and Chemical Feeders

**2.14.1** A means of disinfecting the spa or hot tub should be employed which provides a disinfectant residual in the water. Various methods/bactericidal agents are acceptable if they are registered by the U.S. Environmental Protection Agency and approved by the health department.

**2.14.2** Adequate and appropriate procedures for introducing a disinfectant into the recirculation system should be used. The means of introducing approved disinfecting agents should be sufficient to maintain the appropriate disinfectant residual. The DPD (diethyl-p-phenylenediamine) test or other suitable disinfectant test should be required for testing for the free residual disinfectant.

**2.14.3** Feeding equipment should be required and be capable of providing the required quantity of disinfecting agent into the spa water. The disinfecting material used should be subject to field testing procedures which are simple and accurate.

**2.14.4** Chemical feeding equipment should conform to a standard such as NSF Standard 50.

### 2.15 Sanitary Facilities

Minimum sanitary facilities (toilets, showers, dressing rooms) shall be provided and maintained in accordance with recommended State and/or local sanitary requirements.

### 2.16 Ventilation

Indoor spas, spa equipment rooms, bathhouses, dressing rooms, shower rooms, and toilet spaces should be ventilated adequately by natural or mechanical means, or a combination of both.

## 3.0 INSTALLATION CRITERIA

### 3.1 Water Supply

The water supply serving the spa or hot tub should meet the requirements of the appropriate local authorities.

### 3.2 Waste Water Disposal

**3.2.1** Overflow water should be discharged to a waste system or returned to an approved filter system. Where perimeter overflow water discharges into a sewer, an air gap of at least two times the discharge diameter should be provided and located above possible flood or waste-water back-up level.

**3.2.2** Where an air gap cannot be provided in a practical manner, a relief manhole may be approved by the health agency. Where approved, the relief manhole should be constructed in the perimeter overflow main waste line with a grated cover, which should have a clear area twice the area of the main waste piping. The manhole should be established at a level such that the waste flow in the line will rise in the manhole and overflow at the surface of the ground not less than 2' (61 cm) below the level of the perimeter overflow lip.

**3.2.3** Backwash water should be discharged into a sanitary sewer through an approved air gap or to an approved sub-surface disposal system or by other means approved by the appropriate local authorities.

### 3.3 Decks

Deck work should be designed and installed in accordance with approved engineering practices. This includes the design and quality of sub-base when required, concrete mix design, reinforcing, etc. In the absence of specific local engineering practices, the work may be performed in accordance with the recommended practices of the American Concrete Institute's Standard #302-69.

**3.3.1** Decks, ramps, and similar surfaces, including step treads and coping, should be slip-resistant and free of excessive standing water at all times.

**3.3.2** The roughness or irregularity of such surfaces should not cause injury or discomfort under intended use.

**3.3.3** Special features in or on decks such as depth markings, pool brand insignias or the similar should conform to the guidelines in this section.

**3.3.4** Risers for deck steps should be uniform and have a minimum height of 3-3/4" (9.5 cm) and maximum height of 7-3/4" (19.7 cm). Uniform step treads should have minimum unobstructed depth of 10" (25 cm).

**3.3.5** Earthen ramp areas should be adequately compacted to properly support the decks.

**3.3.6** A 4' (1.2 m) wide minimum continuous unobstructed deck, which may include the coping, should be provided around 50 percent or more of the spa or hot tub.

**3.3.7** The maximum slope of decks should be 1/2" per foot (4 cm per meter) except for ramps, which may vary according to their intended use. Such ramps should be approved by the appropriate health agency.

**3.3.8** The maximum horizontal clearance between adjoining concrete slabs and/or between concrete slabs and expansion joint material should be 3/16" (.48 cm) with a maximum difference in vertical elevation of 1/4" (.64 cm).

**3.3.9** Joints where coping meets concrete deck work should be watertight.

**3.3.10** Joints in decks should be provided to prevent cracks which may be hazardous due to changes in elevations, separation of surfaces, or movement of the slab.

**3.3.11** Areas where deck work joins concrete work other than that of the spa or hot tub should be protected by expansion joints filled with a non-rigid material such as mastic to adequately protect the spa or hot tub from the pressures of relative movements.

**3.3.12** Where deck work joins coping, the joining areas should be designed and installed so as to adequately protect coping and its mortar bed from damage as a result of normal movement of adjoining deck work.

**3.3.13** Decks should be edged, radiused or otherwise relieved so as to present no exposed sharp corners.

**3.3.14** Decks should be sloped to effectively drain water off to either perimeter areas or to deck drains. Drainage should remove spa and hot tub splash water, deck cleaning water, and rain water as quickly as it accumulates without leaving excessive puddles.

**3.3.15** Site drainage should be provided away from all deck work so as to direct all perimeter deck drainage, as well as general site drainage, away from such work. When required, yard drains should be installed to prevent the accumulation or puddling of site water in the general area of the deck work and related improvements. Gutters and downspouts should carry roof water away from spa and hot tub and deck areas.

**3.3.16** Piping, other than that integrally included in the manufacture of the spa or hot tub, should be pressure tested.

**3.3.17** There should be no valves installed in or under any deck work except for recirculation line valves. These may be placed in deck areas if a minimum 10" (25 cm) diameter access cover and shaft is provided to each such valve to facilitate servicing.

**3.3.18** Backwash sumps of the open pit or leaching design should be located so that they fall completely below adjacent deck work and fully outside of a line projected 45° downward and away from such deck work.

### 3.4 Deck Slope Recommendations

Slopes to provide proper drainage on poured or built-up decks may vary with the texture of the surface, but they should not exceed 1/2" per foot (4 cm per foot). Some recommended minimums are:

| | |
|---|---|
| Smooth hand-finished concrete ..... | 1/8" per foot |
| Exposed aggregate concrete ..... | 1/4" per foot |
| Synthetic deck surface ..... | 3/8" per foot |

### 3.5 Equipment Room

An area approved by the health department should be used exclusively as an equipment room to house the pump, filter, heater, and support equipment. This area should include ample space for safely storing chemicals.

## 4.0 RECOMMENDATIONS FOR OPERATION

### 4.1 Operating Instructions

A detailed written manual for all phases of operation and normal maintenance of each component of the system should be available at each facility. The guide should be kept in a secure area and made available to each employee. This guide should include as a minimum the following information:

a. Customer safety rules which should be posted at entrance to spa or hot tub.
b. Required training or certification levels of operator employees.
c. The number and type of operating personnel.
d. Specific work statements for each employee.
e. Spa or hot tub operation, maintenance and cleanup procedures.
f. Proper water maintenance procedures.
g. Chlorinator cylinder changing procedure (if applicable).
h. Pump operating instructions.
i. Backwash procedure.
j. Operating instructions for vacuum filters (if applicable).
k. Water test instructions—frequency of testing, method of test, test kit to be used, and interpretation of results.
l. Filter check procedure.
m. Recordkeeping for health department (operation report form).
n. First-aid report forms.
o. Emergency phone numbers.

### 4.2 Competence of Operators

The most important safety factor in the operation of public spas and hot tubs is the presence of trained and conscientious employees.

#### 4.2.1 Operating Personnel

Personnel responsible for public spa and hot tub operation should be qualified in the operation of equipment, the procedure for performing the necessary water quality tests and safety checks, and the appropriate emergency procedures. At least one employee on duty during operating hours should have completed the Standard First-Aid and Personal Safety Course as offered by the American National Red Cross or an equivalent course and should be certified in cardiopulmonary resuscitation (CPR).

#### 4.2.2 Responsibility for Disinfection and Water Treatment

A specific person on each shift should be made responsible for disinfection and water treatment operations. These people should be carefully trained in the performance of all routine operations as well as in emergency procedures and leak control procedures. If possible, these people should complete training courses given through local health departments. A typical reference text available for such training is "Pool/Spa Operators Handbook," published by the National Swimming Pool Foundation (NSPF). It is available from the NSPF, 10803 Gulfdale, Suite 300, San Antonio, Texas 78216. As an alternate, employees should be trained by a professional operator. The facility should not be in operation without such a trained employee present. Unauthorized persons should not attempt disinfection and water treatment operations.

#### 4.2.3 Responsibility for Circulation and Filter System Operation

A specific person on each shift should be made responsible for circulation and filter system operation, checks, maintenance, backwash, makeup water, and cleaning. This person should be trained by a professional operator or expert in swimming pool operations and should carry out all scheduled cleanings and maintenance on the circulation and filter systems.

### 4.3 Refilling

Unlike swimming pools, spas and hot tubs must be emptied and cleaned frequently. The addition of daily makeup water and frequency of changing the water should be related directly to

water quality, to the length of time the spa/hot tub is in operation, and to the number of people using it. If the spa or hot tub is outdoors, possible dust and vegetation fallout could influence frequency of cleaning. Because of the high temperatures (up to 104°F, 40°C) at which spas and hot tubs are operated and because of the agitation and aeration of the water, excessive and rapid evaporation may also occur. The rate of evaporation is directly related to the length of time the aerator, the heater, and the filtration system are in operation. As the water evaporates, the concentration of dissolved solids rapidly increases in the water and eventually reaches the point where the water becomes cloudy and the chemicals begin to precipitate out of the water.

When this occurs, the spa or hot tub must be emptied, cleaned, and refilled with fresh water. Depending on the usage—number of bathers and the length of time the unit is in operation—water may be maintained for periods of 2 days to 1 month. The health department should be consulted.

### 4.4 Signs

A caution sign should be mounted adjacent to the entrance to the spa or hot tub. It should contain the following warnings:

**CAUTION**

- Pregnant women; elderly persons; and persons suffering from heart disease, diabetes, or high or low blood pressure should not enter the spa/hot tub without prior medical consultation and permission from their doctor.
- Do not use the spa/hot tub while unde the influence of alcohol, tranquilizers, or other drugs that cause drowsiness or that raise or lower blood pressure.
- Do not use at water temperatures greater than 104°F.
- Do not use alone.
- Unsupervised use by children is prohibited.
- Enter and exit slowly.
- Observe reasonable time limits (that is, 10-15 minutes), then leave the water and cool down before returning for another brief stay.
- Long exposure may result in nausea, dizziness, or fainting.
- Keep all breakable objects out of the area.

A sign should be posted in the immediate vicinity of the spa or hot tub stating the location of the nearest telephone and indicating that emergency telephone numbers are posted at that location. Those emergency telephone numbers should include the name and phone number of the nearest available police, fire and/or rescue unit, physician, ambulance service, and hospital.

A sign should also be posted requiring a shower for each user prior to entering the spa or hot tub and prohibiting oils, body lotion, and minerals in the water.

### 4.5 Oils, Body Lotions, and Minerals

The use of oils, body lotions, and minerals should be prohibited.

### 4.6 Personal Hygiene

Personal cleanliness of the users is important in preventing the introduction of dirt and infective material into the pool. A shower should be required before entering the spa or hot tub.

### 4.7 Maintenance of Public Spa and Hot Tub Water

#### 4.7.1 Elements of Maintenance

Maintenance of clear, clean, odor-free water in spas and hot tubs depends on a daily program which achieves

- Proper physical operation
- Proper chemical balance
- Proper biological control.

#### 4.7.2 Physical Operation

Rapid turnover of water, proper skimming, and a clean, efficient filter are important physical requirements for proper water quality in spas and hot tubs.

Heavy use, turbulent and hot water, and increased concentrations of minerals and other solids make it imperative that spa and hot tub water be turned over quickly so that the filters may continuously remove insoluble debris from the water. Public spa and hot tub systems should be capable of minimum turnover rates of 30 minutes or less and daily filter cleanings (or cleaning schedules according to usage as specified by the filter manufacturer). (See Appendix.)

#### 4.7.3 Chemical Balance

Chemically balanced water depends primarily on the amount of acid or base in the water (pH) and on those chemicals which help maintain or stabilize the pH (total alkalinity) and scaling (calcium hardness).

Table 1 gives the range of pH and alkalinity for properly balanced water.

Test kits are available to make these measurements.

#### 4.7.4 Biological Control

High water temperature, the velocity and turbulence of the water, and heavy bather use all contribute to the organic contamination of spa/hot tub water.

An effective sanitizing chemical residual must be maintained in the spa/hot tub water at all times as shown in Table 1 and daily shock treatments (burn-out or oxidation of the organic materials in spa and hot tub water) should be employed.

In outdoor spa/hot tub installations the growth of algae may become a problem. A non-metallic, non-foaming, swimming pool algicide may be used as needed.

#### 4.7.5 Foaming

Foaming may occur when the spa or hot tub is first filled and operated or as the spa/hot tub water evaporates and the solids content becomes concentrated.

Anit-foaming agents are available to dissipate or prevent foam buildup and may be used on a regular basis if needed.

### 4.8 Operational Parameters

The suggested operational parameters in Table 1 apply to indoor and outdoor spas/hot tubs and are based on current data and experience. As new information becomes available, certain recommendations may be modified. Spa/hot tub operators should consult with the local health department regarding specific operational parameters. Table 2 provides a quick and easy reference for operators of public spas and hot tubs.

### 4.9 Use of Elemental Chlorine

Although not preferable from a safety standpoint, gaseous chlorine may be approved as a disinfectant. If gaseous chlorine is used as the disinfectant for a public spa or hot tub, however, the following procedures should be used.

#### 4.9.1 General

Chlorine gas has a characteristic odor and greenish yellow color and is about 2½ times as heavy as air. Chlorine is shipped in Department of Transportation specified steel cylinders; standard sizes contain either 100 or 150 pounds of chlorine. In the cylinder the chlorine has both a liquid and a gas phase. All cylinders are equipped with the Chlorine Institute Standard Chlorine Cylinder Valve.

Chlorine is a "hazardous material" subject to Department of Transportation and Environmental Protection Agency regulations. Users of chlorine must be informed as to the proper procedures for handling chlorine and as to appropriate emergency procedures. Detailed information is available from chlorine suppliers and the Chlorine Institute, 342 Madison Avenue, New York, New York 10017.

#### 4.9.2 Equipment and Installation

**4.9.2.1** Chlorination equipment should be located so that an equipment failure or malfunction will have minimum effect on evacuation of spa or hot tub users in an emergency.

**4.9.2.2** The chlorinator, cylinders of chlorine, and associated equipment should be housed in reasonably gas-tight and corrosion-resistant housing having a floor area adequate for the purpose. Provision should be made to securely fasten cylinders to a wall or post. Storage of any other chemicals in the chlorine enclosure should be forbidden except those used to check chlorine leaks.

**4.9.2.3** It is strongly recommended that enclosures be located at ground or above-ground level. If installation below grade is necessary, the enclosure should be provided with air-tight ducts from the bottom of the enclosure to atmosphere in an unrestricted area, a motor driven exhaust fan capable of producing at least one air change per minute and automatic louvers of good design near the top of the enclosure for admitting fresh air.

**4.9.2.4** Containers may be stored indoors or outdoors. Storage areas should: (a) protect against external corrosion, (b) be clean and free of trash and other chemicals, (c) not be near an elevator or ventilation system, (d) be away from elevated temperatures or heat sources. Full and empty cylinders should be segregated and appropriately tagged.

**4.9.2.5** Contents of a chlorine cylinder can be determined only by weight; therefore, facilities should include a scale suitable for weighing the cylinders. Cylinders should be changed only after weighing proves the contents of the cylinder to be exhausted.

**4.9.2.6** It is recommended that an automatic chlorine leak detector be installed. This is especially important in below-grade installations.

**4.9.2.7** Respirators approved by the National Institute for Occupational Safety and Health should be provided for protection against chlorine. It is recommended that at least one approved self-contained breathing apparatus be provided. Respiratory equipment should be mounted outside the chlorine storage enclosure.

**4.9.2.8** Elemental chlorine feeders should be activated by a booster pump using recirculated water supplied via the recirculation system. The booster pump should be interlocked to the filter pump to prevent feeding of chlorine when the recirculation pump is not running.

**4.9.2.9** Connections from the cylinders to the system depend on the type of chlorinator to be used and should comply with the chlorinator manufacturer's recommendation.

**4.9.2.10** Electrical switches for the control of artificial lighting and ventilation within the enclosure should be on the outside of the enclosure and adjacent to the door.

#### 4.9.3 Operational Procedures

**4.9.3.1** A specific person should be made responsible for chlorination operations and should be trained in the performance of routine operations as well as emergency procedures and leak control procedures.

**4.9.3.2** It is recommended that a safety wall chart be posted in or near the chlorine storage enclosure and a second chart in the pool office near the telephone. Such charts are available from many suppliers and from the Chlorine Institute, 342 Madison Avenue, New York, New York 10017. The telephone number of the chlorine supplier should be shown on this chart.

**4.9.3.3** Chlorine cylinders must be handled with care. Valve protection caps and valve outlet caps should be in place at all times except when the cylinder is connected for use. Cylinders must not be dropped and should be protected from falling objects. Cylinders should be used on a first-in, first-out basis. Fresh washers should be used each time a cylinder is connected.

**4.9.3.4** Chlorine Institute Emergency Kit A, which can be obtained from chlorine suppliers, contains devices for capping leaks at cylinder valves and some leaks which occur in the cylinder wall. Further information on these kits and training slides demonstrating their use are available from the Chlorine Institute.

**4.9.3.5** Although chlorine suppliers attempt to furnish chlorine in properly conditioned cylinders, chlorine gas leaks may still occur. Operating personnel should be informed about leak control procedures.

**4.9.3.6** As soon as a container is empty, the valve should be closed and the lines disconnected. The outlet cap should be applied promptly and the valve protection hood attached. The open end of the disconnected line should be plugged or capped promptly to keep atmospheric moisture out of the system.

**4.9.3.7** To find a chlorine gas leak, tie a cloth soaked in ammonia to the end of a stick and hold close to the suspected area. A white cloud will result if there is any chlorine leakage. Never use

water on a chlorine leak. The corrosive action of chlorine and water will make the leak worse.

## 5.0 RECOMMENDATIONS FOR MONITORING PUBLIC SPAS AND HOT TUBS

### 5.1 General

The routine inspection of public hot tubs and spas is basically an inventory of operation and maintenance procedures. The detection of structural and equipment defects which exist because of poor operation and maintenance are also important goals of this type of visit by the health authority.

The evaluation of water quality and general sanitation procedures practiced by the operator are of high importance.

Structural and operational changes caused by changes in normal patron use or operational character are also matters of concern in the routine inspection.

### 5.2 Inspection Policies

#### 5.2.1 Frequency of Inspection

One inspection every week during the operating season is essential for public spas and hot tubs until such time as health officials are satisfied that the operator is following proper sanitation procedures. At that point, a visit every two weeks as a minimum should be maintained. These suggested intervals are for the average public spa/hot tub and less frequent or more frequent inspection might be in order for some facilities at the discretion of the health official.

#### 5.2.2 Time of Inspection

Inspections at times of least use and most use are as valuable in this field as they are in other fields of environmental health (e.g. restaurant inspection). Operational problems such as difficulty in maintaining disinfectant residuals and water clarity will necessitate review during high-use periods while problems of backwashing, structural soundness, and proper operation of support equipment might be helped by inspection during off-hours or when spas and hot tubs have been drained just prior to a refill.

#### 5.2.3 Inspection Routine

The most efficient technique is one that will permit a thorough inspection in the least possible time by avoiding excessive retracing of steps. One suggested technique is to view the pool water and surroundings first, then proceed with an inspection of the support equipment and controls area, and finish with a review of the operator's records since the last inspection.

The spa/hot tub manager or operator should accompany the person making the inspection during the tour of the facility. This will increase the effectiveness of the inspection. If possible, inspection should be made after a heavy bather load day and just prior to the opening of the spa/hot tub on the next day.

### 5.3 Safety Checks

The person making the inspection of public spas/hot tubs should check for the following during the inspection:

#### 5.3.1 Decks and Surroundings

Decks should be checked for slippery areas and protrusions. Such items as standing water, growth of algae or fungi, drainage, general cleanliness, sharp edges and protrusions, obstructions in the deck, inadequate handrails and areas of possible entanglement or entrapment of the bather's foot should be highlighted. The facility should be equipped with at least one exit with a handrail for each 50' of perimeter or portion thereof.

#### 5.3.2 Spa/Hot Tub Water

Spa and hot tub water should be clear and have the proper disinfectant residual and pH. Standard test kits (e.g., DPD test for chlorine residual) can be used for these measurements. Maximum water temperatures should be checked by thermometer with the thermostatic controls operational. Turnover rates of 30 minutes or less under full flow operation should be checked as well as the proper operation of any automatic disinfectant feed equipment. Inspectors should look for the presence of oils, body lotions, and minerals not associated with chemicals used for water chemistry. Review of the operator's records on chemical balance should be made at this time.

#### 5.3.3 Spa/Hot Tub Shells

**5.3.3.1** Spa/hot tub shells, including seats, steps, water outlets, deck copings and tub rims, should have no protrusions, extensions, means of entanglement, dangerous suction heads or other obstructions which can cause the bather to be trapped or injured.

All suction openings should have anti-vortex covers or grates which prevent flow velocities from exceeding 2' per second.

**5.3.3.2** Maximum water depth of 4' (1.2 m) and maximum depth of any seat or bathing bench of 2' (0.6 m) measured from the water line should be checked.

**5.3.3.3** A public spa/hot tub should have one or more suitable, slip-resistant handholds around the perimeter, located no farther than 4' apart.

**5.3.3.4** If surface skimmers are used, one surface skimmer should be provided for each 100 square feet (30.5 $m^2$) of spa/hot tub surface area or fraction thereof.

**5.3.3.5** Spa and hot tub shells should be made of suitable materials as specified in Sections 2.1 and 2.2 of these guidelines.

#### 5.3.4 Spa/Hot Tub Equipment

**5.3.4.1** Check certifications of gas-fired or electric heaters as well as pump and filter capacities and operational flow-rates.

**5.3.4.2** Electric switches, outlets, and equipment should be at least 15' (4.6 m) from edge of the spa/hot tub and water temperature controls should be accessible only to spa/hot tub operator.

**5.3.4.3** Agitation systems should be separate from the water treatment recirculation or heating system and connected to a 15-minute timer located out of the reach of a person in the spa or hot tub.

**5.3.4.4** Disinfectant feeders should be capable of supplying at least 20 ppm chlorine or the equivalent.

**5.3.4.5** Air induction systems, when provided, should prevent water backup that could cause electrical shocks. Air intake sources should not permit the introduction of toxic fumes or other contaminants.

**5.3.4.6** Spas and hot tubs of over 200 square feet of surface area should have provisions for vacuuming.

**5.3.4.7** All public spas and hot tubs should have air vent lines without valves between the atmosphere and all main drain lines. The air vent lines should be plumbed into the main drain lines near the main drain grates. The air vent lines should be the same diameter as the main drain lines.

**5.3.5 Gas Chlorine Rooms**

Problems with the gas chlorine storage room may be critical to the safety of public spa/hot tub users. It should be carefully checked on each inspection. Items to be checked include:

Proper ventilation; cleanliness; the storage of other chemicals, especially oxidizers in the room; proper operation and maintenance of the scale; location of electrical switches; proper warnings and emergency instructions in and just outside the door to the room; posted instructions on how to properly change chlorination cylinders; chlorine leaks as detected by ammonia at the cylinder valve packing, the head gasket seal between the chlorinator and the chlorine cylinder valve (chlorine leaking out the vent may be an indication of a leak at the safety shut-off valve); and, finally, the existence of proper gas masks on the premises and in an area least affected by the gas, if possible, so operators have ready access to them.

**5.3.6 Warnings**

A warning sign clearly readable by the user from the spa or hot tub should be posted. It should have the specific cautions spelled out in Section 4.4 of these guidelines.

**5.4 Procedures for Monitoring Chemical Content**

All tests for chemical content of spa and hot tub water should be carried out with standard test kits designed to test for that specific requirement (i.e., disinfectant residual, pH, alkalinity and cyanuric acid). Local health departments and local distributors of swimming pool equipment can give advice on proper test kits. Each kit is supplied with specific instructions and pass-fail criteria. However, the pass-fail criteria of precedence should be those spelled out in local sanitary codes or in Table 1 of these guidelines.

**5.5 Procedures for Sampling Bacteriological Content**

Local health and sanitation codes usually provide instructions on sampling techniques and safe water quality limitations for bacteriological content of swimming pool waters. These and the following general techniques may also be used for public spa and hot tub water:

**5.5.1 Sample Bottles**

All sample bottles must be sterilized and treated with sodium thiosulfate to reduce the chlorine (or other halogen) present in the water at the time the sample is collected. If sodium thiosulfate were not used, the chlorine would be acting on the bacteria in the sample while it was being held or transported for testing.

**5.5.2 Collection of Samples**

1. Time of collection — Samples should generally be collected only when the pool is in use and preferably during periods of heaviest use. The hour of the day and day of the week should be varied to obtain, over a period of time, a representative sampling of the sanitary quality of the pool. The frequency of sampling should be determined by the State and local health authorities.

2. Place of collection — The sampling point should be in the vicinity of groups of bathers and between return water inlets.

3. Technique of sampling — The first step in sampling is to carefully remove the cap and stopper from the bottle without touching the inner surfaces of the stopper. Hold the sterile bottle near its base and downward at a 45° angle. Fill in one slow sweep down through the water with the mouth of the bottle always ahead of the hand. Care should be taken to avoid contamination of the sample by floating debris. The stopper and cap are then replaced. The bottle must not be rinsed in the spa/hot tub or the sodium thiosulfate will be removed.

**5.5.3 Disposition of Sample**

The sample should be taken to the laboratory as soon as possible for processing, preferably within 6-12 hours. The sample should be refrigerated immediately upon collection and held at less than 10°C if it is not immediately transported to the laboratory for assay. Pertinent data such as sampling time, location of sample, sampler's identification, and desired analysis should accompany the sample.

**5.5.4 Bacteriological Analysis of Spa/Hot Tub Waters**

**5.5.4.1 Tests for Bacteriological Quality of Water.** The following tests should be conducted according to *Standard Methods For the Examination of Water and Waste-water* or equivalent.

1. Presence of the coliform group of organisms — Coliform organisms are easily tested for, and the test is sensitive. No appreciable quantity of fresh fecal material can be present in the water and escape detection when the coliform test is properly carried out.

2. Total numbers of bacteria by the standard plate count — This is a valuable measure of the quality of spa/hot tub water and when used with the coliform test gives important complementary information.

3. Any other tests deemed necessary by the health department.

**5.5.4.2 Interpretation of Test Results.** Authorities differ somewhat on details for standards for spa/hot tub waters. One State uses the following standard: "The presence of organisms of the coliform group, or a standard plate count of more than 200 bacteria per milliliter, or both, in 2 consecutive samples or in more than 10 percent of the samples in a series shall be deemed as unacceptable water quality."

**5.5.4.3 Causes of Bacterial Limit Violations**

1. Spa/Hot Tub Area and Equipment
   a. Structure of spa/hot tub — The lack of a smooth inner spa/hot tub surface contributes to the accumulation of foreign matter and growth of microorganisms.

b. Disinfection — Inadequate disinfection devices, poor algae control, and easy contamination by foreign matter such as leaves and other organic matter may result in high bacterial counts.

c. Water treatment equipment — Filtration equipment of inadequate design or size is a prime cause of poor water condition.

2. Bather control — Failure to require showers or limit the number of bathers may contribute to unsatisfactory bacterial levels. Some states require at least 10 square feet of surface area per bather.

3. Makeup water — Poor quality makeup water added to the spa/hot tub will obviously result in the contamination of otherwise satisfactory water.

4. Sampling procedure — Deviation from recommended sampling procedures could yield false results.

**5.5.4.4 Actions.** If the bacterial count is high in any test, proper disinfectant procedures should be reviewed with the operator and changes made to improve the situation. At the discretion of the health authority, the facility may be temporarily closed and decontaminated. Daily checks by the inspector will be necessary until the problem has been resolved.

## 6.0 RECOMMENDATIONS FOR IDENTIFYING AND TROUBLESHOOTING HEALTH AND SAFETY PROBLEMS DURING THE OPERATION OF PUBLIC SPAS AND HOT TUBS

The identification of the potential health and safety problems one may encounter with public spa/hot tub operation is detailed in Sections 4.0 and 5.0 above. Troubleshooting these problems in an attempt to find their cause may require:

- A careful review of all records kept by the operator.
- Personal discussions with employees.
- Personal observations on the site of the typical job operations of each employee, especially disinfectant and water quality control.
- Personal observations of the site with regard to general maintenance.
- Personal observations of how employees deal with large groups of bathers.
- Personal observations of how maintenance is carried out on the circulation, filtration, and sanitation systems.
- Personal observations of spa/hot tub structure, walkways, decks, and stairways during operation and during shutdown.

In general, health and safety problems experienced with public spas/hot tubs may be tied to facility installation and design or to operator proficiency. Installation and design problems will for the most part be discernible by observation or simple testing and can be identified and resolved by specific maintenance or structural changes. Operator proficiency, however, will continually vary depending upon the training and conscientiousness of both the operator and other employees.

Therefore, a plan of frequent (weekly) and thorough inspections by local health officials of these facilities is recommended with careful follow-up on items found deficient in earlier inspections until a history of compliance is established. If possible, the local health authority should specify that at least one person on each shift at these facilities be trained in the operation of spa and hot tub techniques and that specific detailed recordkeeping and logs of all operational and sanitation activities be kept for review by local health authorities.

Because of the high water turnover rates, high water temperatures and water agitation, hourly testing for disinfectant residual and pH are recommended during periods of high bather load. This testing should be recorded in the logs kept by the operator. In addition, the operator should be required to keep a detailed weekly log of all reported accidents at the site.

The typical format of water tests, filter checks, and accident report forms are shown for reference (Figures 1-2). In addition, a list of emergency phone numbers and other important phone numbers applicable to public spa/hot tub operational needs is shown in Figure 3.

### 6.1 Special Situations

Occasionally situations arise with spas and hot tubs that require special attention. Some are common to all types of spas and hot tubs. Some are unique to redwood tubs, others to fiberglass units or plastered spas.

**6.1.1.** Corrosion, a frequent occurrence, is the destruction of metal by chemical or galvanic action. Plastered spas are particularly susceptible to corrosion. If left unchecked, corrosion can lead to electrical hazards, expensive replacements of heaters, pipes, and metal fittings, and early resurfacing of plaster spas. If green, brown, or cloudy water or pitting of fittings, pipes, or surface of plastered spas is detected, a corrosive condition may be present.

To minimize corrosive action:

(a) Check that all electrical equipment is properly grounded.

(b) Be sure two dissimilar metals are not directly connected to one another.

(c) Make sure the operator always dilutes all chemicals, especially acids, before adding them to the spa or hot tub. These compounds should be added only in small amounts.

The Langelier Saturation Index should be considered for use in determining if the water is corrosive or scale forming (Appendix).

### 6.1.2 Scale Formation

Another special situation is scale formation, which is a result of deposits produced by crystallization and precipitation of mineral salts. Scale formation results in decreased heater efficiency and, if left unchecked, may completely plug the heater tubes. High pH values (above 7.8) and high total alkalinity (above 180 ppm) increase the rate of scaling. If the water in the spa or hot tub takes on a cloudy appearance and white chalky deposits develop, a scaling condition may be present. To minimize scale formation, ensure the chemical balance of the water (see Appendix).

### 6.1.3 Redwood Problems

Redwood is used for the construction of many hot tubs because of its high strength to weight ratio, its availability, its ease of fabrication and its natural resistance to decay. It is composed of 50% cellulose, 30% lignin and 20% natural extractives. Cellulose exists as long fibers and gives wood its strength. Lignin acts as the cementing agent for the cellulose. The extractives contain natural compounds which contribute to the resistance of decay.

Unfortunately, the extractives present in all woods are largely water soluble and will be leached from the wood by the circulating water. While the strength of the wood does not appear to be affected by leaching, the wood does become more susceptible to decay.

Wooden tubs may be coated with an approved finish to prevent this leaching and to preserve the wood's color and texture. Tub liners are also available and should be considered. Protected wood is more easily cleaned and disinfected, is less likely to harbor organisms, and is less susceptible to decay than unprotected wood.

**6.1.3.1** One of the water extractives in redwood is called tannic acid. Until the leaching process is completed, the water may take on a reddish brown color due mainly to tannic acid. If iron is also present in the water, iron tannate is formed which may color the water a blue-black color. As tubs age, leaching decreases. It may be necessary to empty the water quite frequently during the first few weeks of operation. These extractives usually are acid and may also lower the pH of the water below the recommended 7.2-7.8 levels. The tannic acid problem does not represent a hazard to bathers.

#### 6.1.3.2 Leakage

Wood shrinks when it is dry and swells when it is thoroughly soaked. Some tubs may leak when they are first filled, but as the wood swells the leaks rapidly disappear. This situation can be minimized if the operator prevents the tub from drying.

#### 6.1.3.3 Lignins

Chemical deterioration in the form of lignin removal (the cementing agent in wood) may occur when high concentrations of oxidizing agents, such as chlorine, and of alkaline chemicals, such as soda ash, are present in the water. The attack is particularly severe when the combination of excessively high chlorine residuals and high alkalinity concentrations are maintained simultaneously. The adverse effect of the wood is restricted to the surface, which becomes rough and white in color. It begins to look like white fibrous matting. Also, this condition tends to clog the filters and therefore may affect overall sanitation of the hot tub. To minimize this condition, the operator should avoid using excessive amounts of soda ash for pH adjustment and excessive amounts of chlorine compounds for shock treatment. Non-chlorine oxidizers for shock treatment of redwood hot tubs are commercially available.

#### 6.1.3.4 Fiberglass Spas

Occasionally, fiberglass spas may develop random black spotting and blistering. While the appearance of these spots may suggest an algae or fungus problem, the cause may be chemical in nature. The discolorations usually occur at pinhole imperfections of the gelcoat. The color results from an oxidative reaction between the metal—cobalt—and chemicals in the gelcoat. This situation is not hazardous to the bather, but if left unchecked, it could result in the creation of sites for bacteria growth which cannot be cleaned out. There are commercial chemicals available to correct this condition.

## 7.0 EMERGENCY PROCEDURES

The need for emergency planning in areas of public recreation is well founded in past experience. Being prepared for problems is the best method of minimizing their consequences. Therefore, a plan for emergencies should be carefully devised and kept up to date. All employees should be trained and drilled periodically in executing the plan. A person qualified in first-aid, CPR, and advanced life saving through American National Red Cross certification should be on duty at all times during operational hours.

The emergency plan should take into consideration drownings, electrical shock, heat prostration, fractures, poisonings, cuts and burns, neck and back or spinal injuries, and exposure to chlorine gas. Each of these topics is addressed in the latest American National Red Cross handbook on first-aid, a copy of which should be on hand at the same location as the first-aid kit and emergency telephone numbers.

Each facility should have available the following first-aid supplies:

- First-Aid Kit — A standard 24-unit kit should be kept stocked and readily accessible for use.
- A stretcher and blankets.
- A standard plywood backboard or other acceptable splint made to the specifications of the American National Red Cross for back and neck injuries.

An area or room should be set aside for the emergency care of casualties.

Every facility should have posted by its phone a list of current emergency numbers such as the nearest available physician, ambulance service, hospital, rescue squad, police department and fire department.

Of course, one of the most effective ways to control emergencies is to plan for them in the original design of the facility, and wherever possible, health and safety officials should try to review and comment on the original plans and layouts before a building permit is issued.

Two types of emergencies for which evacuation procedures should be developed are:

- Major release of chlorine gas
- Power outage during nighttime operation.

#### Chlorine Gas Release

Gas masks should be provided at a point accessible to the operator in the event of an emergency, generally immediately outside the chlorine room door. Front-mounted or back-mounted gas masks equipped with a chlorine-type canister may

be used with low concentrations of chlorine in the air. Self-contained breathing apparatus, with a full face piece and a cylinder of air or oxygen carried on the body, is suitable for high concentrations of chlorine and is the preferred means of protection. The apparatus should be the pressure-demand type in which the pressure inside the face piece is positive during both inhalation and exhalation. If the mask uses replaceable cartridges, specific instructions to replace the cartridge in the mask with a new one directly after every use should be posted.

In addition to the general emergency plan, a carefully devised plan specific for a chlorine gas emergency should be posted. Personnel should be drilled regularly in executing the plan.

A plan should also be devised for general evacuation of a facility. The most feasible approach is for each facility to devise an individual plan of action. This plan should be approved by local health authorities.

Disposal of chlorine can be achieved through a standby alkali absorption system. A suitable tank capable of holding the required alkaline solution should be provided. The alkali should be stored in a form so that a solution can be readily prepared when needed. Chlorine should be passed into the solution through a connection properly submerged and weighted to hold it under the surface. The contents of a full 100-pound cylinder of chlorine can be absorbed in 300 gallons of water, or 125 pounds of caustic soda dissolved in 40 gallons of water.

**Power Outage**

Each facility should make provision for an emergency plan in the event of a power outage that deprives the bather of safe illumination.

Battery operated emergency lighting packs are available as standard safety items. In addition, portable lights and bullhorns should be available to personnel at all times and an evacuation plan devised. Personnel should be drilled regularly in execution of the plan.

If the power outage is temporary, no evacuation is necessary as long as emergency lighting is available. If the outage is long term, then bathers should be asked to leave the spa or hot tub and, under supervision of an employee, taken to areas where they can dress and then leave the premises.

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**Table 1**
**Operational Parameters: Public Spas and Hot Tubs**

Listed below are guidelines for the proper treatment and maintenance of water in spas and hot tubs.

Chemical treatment alone will not produce clear and sanitary spa water. An efficient filtration system, periodic water replacement, and proper operation and maintenance by conscientious personnel also are required.

| | Minimum | Ideal | Maximum | Comments |
|---|---|---|---|---|
| A. DISINFECTANT LEVELS | | | | |
| 1. Free chlorine, mg/l (ppm) | 2 | 3-5 | 5* | During hours of operation, test the water and record the results hourly (or use continuous reading devices), maintain this range continually, and superchlorinate (shock treat) the water at the end of the daily use period. |
| 2. Combined chlorine, ppm | None | None | 0.2 | High levels of combined chlorine result in reduced chemical efficacy. Take remedial action. See Section E-1 below.<br>Signs of combined chlorine:<br>• Sharp chlorinous odor<br>• Eye irritation<br>• Algae growth |
| 3. Bromine, ppm | 2 | 3-5 | 5* | During hours of operation, test the water and record the results hourly (or use continuous reading devices); maintain this range continually, and shock treat the water at the end of the daily use period. |
| 4. Iodine, ppm | Levels not confirmed | | | Note: Consult local health department officials before use. |
| 5. Alternative methods of disinfection, such as ozonization or ultraviolet light/ hydrogen peroxide. | Levels not confirmed (follow manufacturers' recommendations) | | | Note: Consult local health department officials before use. Special requirements, such as free residual disinfectant or additional bacteriological testing, may be necessary. |
| B. CHEMICAL VALUES | | | | |
| 1. pH | 7.2 | 7.4-7.6 | 7.8 | If pH is:<br>Too Low<br>• Rapid dissipation of chlorine or bromine<br>• Plaster and concrete etching<br>• Eye discomfort<br>• Corrosion of metals<br>Too High<br>• Low chlorine efficiency<br>• Scale formation<br>• Cloudy water<br>• Eye discomfort |

*The National Spa and Pool Institute has recommended that levels between 5 and 10 ppm be allowable to facilitate frequent shock treatments. Although health departments may consider exceptions, current data suggest that during periods of use, levels between 2 and 5 ppm free residual disinfectant are appropriate if maintained continuously in a properly operated facility.

**Table 1 (Continued)**

| | Minimum | Ideal | Maximum | Comments |
|---|---|---|---|---|
| B. CHEMICAL VALUES | | | | |
| 2. Total alkalinity (buffering), ppm as $CaCO_3$ | 60 | 80-100<br>For calcium hypochlorite, lithium hypochlorite, and sodium dichlor | 180 | If total alkalinity is:<br>Too Low<br>• pH bounce<br>• Corrosion tendency<br>Too High<br>• Cloudy water<br>• Increased scaling potential<br>• Tendency for pH to be too high |
| | | 100-120<br>For sodium hypochlorite, trichlor, chlorine gas, and bromine | | |
| 3. Dissolved solids, ppm | 300 | — | 2,000 | These values are offered as guidelines only because limits have not been confirmed. Excessively high total dissolved solids (TDS) may lead to hazy water, corrosion of fixtures, etc. Consult local or State health department.<br>High initial TDS may indicate poor water quality due to corrosive mineral salts, humus, or organic matter. Consult local water authority.<br>Increasing TDS indicates buildup of impurities to be controlled by water replacement. |
| 4. Hardness, ppm as $CaCO_3$ | 150 | 200-400<br>to balance water | 500+ | Operation of spas and hot tubs at maximum hardness will depend on alkalinity (buffering) requirements of the sanitizer used. Minimum alkalinity and lower pH must be used with maximum hardness (over 500 ppm).<br>If hardness is:<br>Too Low<br>• Plaster or concrete etching may occur.<br>• Corrosion may occur.<br>Too High<br>• Scaling may occur.<br>• Short filter runs may occur. |
| 5. Heavy metals | None | None | None | If heavy metals, such as copper, iron, or manganese, are present:<br>• Staining may occur.<br>• Water may discolor.<br>• Chlorine dissipates rapidly.<br>• Filter may plug.<br>• Low pH and corrosion may be indicated. |

**Table 1 (Continued)**

| | Minimum | Ideal | Maximum | Comments |
|---|---|---|---|---|
| C. BIOLOGICAL VALUES | | | | |
| 1. Algae | None | None | None | If algae are observed:<br>• Shock treat the water. (Section E-1)<br>• Supplement with brushing and vacuuming.<br>• Maintain adequate free disinfectant residual.<br>• Use approved algicide according to label directions. |
| 2. Bacteria | None | None | Refer to local code. | If bacteria count exceeds health department requirements:<br>• Consult the health department for required decontamination procedures.<br>• Drain, clean, and disinfect the spa/hot tub, and replace the water.<br>• Shock treat (E-1), and follow proper maintenance procedures.<br>• Maintain proper free disinfectant residual in the spa/hot tub before reuse. |
| D. STABILIZER (If Used) | | | | |
| 1. Cyanuric acid, ppm | 10 | 30-50 | 100 | If stabilizer is:<br>Too Low<br>• Chlorine residual rapidly destroyed by sunlight<br>Too High<br>• May exceed health department regulations<br>• May reduce chlorine efficacy.<br>Stabilizer is not needed in indoor or brominated spas/hot tubs. |
| E. REMEDIAL PRACTICES | | | | |
| 1. Daily shock treatment (to establish break point) | 10 ppm | — | — | • Apply at the end of daily usage period. Hold this level for 1 to 4 hours to clarify the water, remove ammonia (combined chlorine), and kill any algae present.<br>• Apply when spa/hot tub is not in use and as required to maintain clear water and the required halogen residual. |
| 2. Water clarification | When needed | | | Treat only to maintain water clarity and supplement filtration. |

**Table 1 (Continued)**

| | Minimum | Ideal | Maximum | Comments |
|---|---|---|---|---|
| 3. Water replacement | Spas/hot tubs require partial and complete water replacement periodically. Frequency recommendations are based on bather load and water quality. Water should be partially replaced as often as necessary to maintain water quality. Requirements for completely replacing the water may vary from once every 2 days - 1 month. Health departments should be consulted. | | | Replace water as necessary to dilute dissolved solids, to maintain water clarity, and to do necessary routine maintenance. Facility should be thoroughly cleaned and disinfected while empty. Although minimum requirements may vary, the National Swimming Pool Foundation recommends a weekly regimen. |
| 4. Algicides | Follow manufacturers' directions. | | | Use U.S. Environmental Protection Agency-registered products. |
| F. TEMPERATURE | | | | |
| 1. Temperature | — | Bather preference | 104°F (40°C) | If temperature is:<br>Too Low<br>• Bather discomfort<br>Too High<br>• Health hazard or bather discomfort<br>• Excessive fuel requirement<br>• Increased evaporation<br>• Increased scaling potential<br>• Increased use of halogen |
| G. WATER CLARITY | | | | |
| 1. Water turbidity Nephelometric Turbidity Units (NTU) | 0 | 0.5 or less | 1.0 | If water is turbid:<br>• Halogen level may be low.<br>• Filtration system may be inoperative. |

**Table 2**

**Guidelines for Operators of Public Spas and Hot Tubs**

These guidelines are a quick, easy reference for the public spa and hot tub operator. Listed below are the most frequently needed chemical values and most obvious problems encountered when treating spa and hot tub water. Among the most important equipment the operator will need to maintain clear, sanitary spa and hot tub water are suitable test kits, automatic chemical feeding equipment, and a filtration system in proper operating condition. Section 5.4 of this publication should be consulted for additional guidelines. Safe handling and storage of chemicals is very important in operating any public spa or hot tub. Chemicals should be stored and used according to the manufacturers' directions.

| | Recommended Values | Comments |
|---|---|---|
| I. CHECK HOURLY | | |
| A. Disinfectant | 2-5 ppm free residual (chlorine or bromine) (See Table 1, A) | Check chlorine value by DPD (diethyl-p-phenylenediamine) free chlorine method. Suitable test kits are available for other disinfectants. Check disinfectant hourly or continuously by automatic recording device. |
| B. pH | 7.2-7.8 | Accurate pH control is essential for proper spa/hot tub operation. |
| C. Temperature | 104°F maximum (40° C) | Excessively high water temperature is dangerous. |
| II. CHECK WEEKLY | | |
| A. Total alkalinity | 60-180 ppm | Consult pool/spa service specialist. |
| B. Calcium hardness | 150-500 ppm + (200-400 to balance water) | Consult pool/spa service specialist. |
| C. Stabilizer (cyanuric acid), if used | 100 ppm maximum | Excessive chlorine requirement in outdoor pools may indicate low stabilizer value. Stabilizer is not needed or recommended for indoor spas/hot tubs. |
| D. Test kits | Maintain fresh reagents; clean and store vials and comparators properly. | Use only those reagents manufactured for the kit in use. |
| E. Water replacement needs | (See Table 1, E-3) | Inability to chemically balance water and other problems may indicate need to drain, clean, and refill. Consult health department. |

**Table 2 (Continued)**

III. PROBLEMS TO WATCH FOR

| | Symptom | Diagnosis/Test | Action/Remedy |
|---|---|---|---|
| A. | Odor (foul, locker-room smell) | Test free available disinfectant. | Shock treat the water following manufacturers' directions. Fresh, laundry-like smell should result. May need to drain and clean spa/hot tub and replace water. |
| B. | Cloudiness | Check disinfectant.<br>Check pH.<br>Check filter and circulation system. | If low, shock treat. Adjust pH to 7.5. Backwash; if cloudiness persists, drain, clean, and refill. |
| C. | Foaming | Check visually. | Antifoam agents may be approved. Check with manufacturer and health department. |
| D. | Stains | Check pH.<br>Check calcium hardness and total alkalinity. | Adjust pH to 7.5.<br>Adjust to 200-400 and 80-100 ppm, respectively. Check with pool/spa specialist and health department. |
| E. | Green or brown water | Test fill water for heavy metals. | Refer to Section 4.8, "Operational Parameters." |
| F. | Mineral deposits | Check pH. | Adjust pH to 7.5. If not possible, drain and refill, and balance water chemically. |

**Figure 1**

TYPICAL DAILY WATER QUALITY LOG

Location: _____ Weather: _____

Date: _____ _____

Day: _____ _____

WATER TEST AND FILTER CHECK

| Time | Disinfectant Level | pH | Water Clarity | Back-wash | Temperature | Initial |
|---|---|---|---|---|---|---|
| 10: | | | | | | |
| 11: | | | | | | |
| 12: | | | | | | |
| 1: | | | | | | |
| 2: | | | | | | |
| 3: | | | | | | |
| 4: | | | | | | |
| 5: | | | | | | |
| 6: | | | | | | |
| 7: | | | | | | |
| 8: | | | | | | |
| 9: | | | | | | |
| 10: | | | | | | |
| 11: | | | | | | |
| 12: | | | | | | |

Figure 2

TYPICAL FIRST-AID REPORT

Location _____ Date _____

Employee ( ) Time _____

Please check one a.m. p.m.

Guest ( )

Victim: Name _____ Age _____

Address _____

City _____ State _____ Zip _____

Phone _____

What Happened – Victim Statement:

_____

_____

_____

As the victim of this accident, I hereby certify that the above statement is true to the best of my knowledge.

Signature of Victim: _____

Location of Accident: _____

_____

Witness: Name _____

Address _____

City _____ State _____ Zip _____

Phone _____

Statement of Witness:

_____

_____

_____

Describe Injury: _____

_____

Figure 2 (Continued)

On Site Treatment: _____

Was Ambulance Called? Yes _____ No _____

Attending Employee on Duty: _____

Statement: _____

Manager on Duty: _____

Statement: _____

Note: If you need more space for witnesses, write information on the back of this report.

DIRECTIONS: This report must be filled out completely and accurately with the original report to be mailed each Monday to the health authority along with the Daily Reports.

Figure 3



## EMERGENCY PHONE NUMBERS

Location _____

POLICE _____ SHERIFF _____

HWY PATROL _____ AMBULANCE _____

FIRE DEPT _____ HOSPITAL _____

## OTHER IMPORTANT PHONE NUMBERS

PLUMBER:

Company _____ Phone _____

Person _____ Home Phone _____

Other Emp _____ Home Phone _____

GENERAL CONTRACTOR:

Company _____ Phone _____

Person _____ Home Phone _____

Other Emp _____ Home Phone _____

ELECTRICIAN:

Company _____ Phone _____

Person _____ Home Phone _____

Other Emp _____ Home Phone _____

SWIMMING POOL SUPPLY:

Company _____ Phone _____

Person _____ Home Phone _____

Other Emp _____ Home Phone _____

VENDING MACHINE COMPANY:

Company _____ Phone _____

Person _____ Home Phone _____

Other Emp _____ Home Phone _____

## GLOSSARY

**Air Induction System** — A system whereby air is induced into ducting built into or affixed on a spa floor, bench or other location. The Air Induction System is activated by a separate Air Power Unit.

**Alkalinity** — The amount of bicarbonate, carbonate, or hydroxide compound present in water solution.

**Antivortex Drain** — A drain with a raised cover designed to prevent the vacuuming effect on a body which may come in contact with the drain.

**Backwash** — The process of thoroughly cleansing the filter media and/or elements by reverse flow.

**Backwash Cycle** — The time required to thoroughly backwash the filter media and/or elements and the contents of the filter vessel.

**Backwash Rate** — The rate of application of water through a filter during the cleaning cycle. It is normally expressed in U.S. gallons per minute per square foot of effective filter area.

**Band** — See Hoop.

**Breakpoint Chlorination** — When chlorine is added to water containing ammonia it reacts with the ammonia to form chloramines. If more chlorine is added to the water, the total residual chlorine continues to rise until the concentration reaches a point that forces the reaction with ammonia to go rapidly to completion. Compounds of nitrogen and chlorine are released from the water, and the apparent residual chlorine decreases. The point at which the residual suddenly drops is called the breakpoint. When enough chlorine is added to pass the breakpoint, all combined chlorine compounds disappear, eye irritation potential and "chlorine odors" disappear, and the chlorine that remains in the water is all in the free state. The breakpoint occurs at different concentrations in different waters. Superchlorination usually results in exceeding the breakpoint.

**Deck, Above-Ground** — Any structure that is on top of or adjacent to the outer edges of the spa/hot tub/pool that can support person(s) in a sitting or upright position.

**Decks** — Those areas surrounding a spa or hot tub which are specifically constructed or installed for use by bathers.

**Effective Filter Area** —

**Permanent Media Type:** The effective filter area is the cross section area of the filter surface that is perpendicular to the flow direction.

**Cartridge Filter:** The total effective filter area is that cartridge area which is exposed to the direct flow of water. This excludes cartridge ends, seals, supports and other areas where flow is impaired.

**Face Piping** — The piping, with all valves and fittings, which is used to connect the filter system together as a unit.

**Factor of Safety** — The ultimate load divided by the safe load or the ultimate strength divided by the allowable stress.

**Filter** — A device that separates solid particles from water by recirculating it through a porous substance (a filter media or element).

**Permanent Media Filter:** A filter that utilizes a media that can be regenerated and will not have to be replaced.

**Diatomaceous Earth Filter:** A filter that utilizes a thin layer of filter aid as its filter media. The aid must be replaced periodically.

**Cartridge Filter:** A filter that utilizes a porous cartridge as its filter media.

**Filter Agitation** — The mechanical or manual movement to dislodge the filter aid and dirt from the filter element.

**Filter Cycle** — The operating time between cleaning and/or backwash cycles.

**Filter Element** — A device within a filter tank designed to entrap solids and conduct water to a manifold collection header, pipe or similar conduit. Filter elements usually consist of a septum and septum support.

**Permanent Filter Media:** A finely graded material (such as sand, anthracite, etc.) which removes filterable particles from the water.

**Filter Aid:** A type of finely divided medium used to coat a septum type filter; usually diatomaceous earth, processed perlite or similar material.

**Filtration Flow** — The rate of flow, in volume per time (GPM, GPH), through the filter system installed per manufacturer's instructions with new clean media.

**Filtration Rate** — The rate of filtration of water through a filter during the filter cycle expressed in U.S. gallons per minute per square foot of effective filter area.

**Head** — A basic measurement of pressure or resistance in a hydraulic system which is equivalent to the height of the column of water which would cause the same resistance. The *total head* is the sum of all the resistance in an operating system (energy per unit weight of flowing fluid).

**Hoop** — A circumferential constraint that prohibits the reaction to the pressure tending to separate the staves in a hot tub.

**Hot Tub** — A hydrotherapy spa constructed of wood with sides and bottoms formed separately; and the whole shaped to join together by pressure from the surrounding hoops, bands or rods; as distinct from spa units formed of plastic, concrete, metal, and other materials.

**Hydrojets** — A fitting which blends air and water creating a high velocity, turbulent stream of air enriched water.

**Hydrotherapy Spa** — A unit designed for recreational and therapeutic use which is not drained, cleaned or refilled for each user. It may include, but not be limited to hydrojet circulation, hot water, cold water mineral baths, air induction bubbles, or some combination thereof. Industry terminology for a spa includes, but is not limited to, "therapeutic pool," "hydrotherapy pool," "whirlpool," "hot spa," "hot tubs," etc.

**Liner** — That membrane that acts as a container for the water.

**Expandable Liner:** A liner that is constructed of a material that has the capability of stretching into a depth or shape other than the original construction dimensions.

**Hopper Liner:** The liner that is used to obtain greater depth by geometrical pattern construction of the liner bottom to fit a predetermined size or shape.

**Loads** — The weights of materials used in building construction are tabulated and classified as dead loads. Live loads are generally considered to be uniformly distributed and are classified according to occupancy.

**Multiport Valve** — A separate switching valve with a separate position for each of the various filter operations. This valve combines in one unit the functions of several direct-flow valves.

**Nephelometric Turbidity Units (NTU's)** — A measure of water clarity.

**Overflow System** — The term encompasses perimeter type overflows, surface skimmers and surface water collection systems of various design.

**Pinching Hazard** — Any configuration of components that would pinch or entrap the fingers or toes of a child or adult.

**Pools** —

**Above-Ground Spa/Hot Tub:** A pool of any shape that is deeper than 24" (61 cm) or holds more than 2,500 gallons of water or has a water surface area in excess of 150 square feet. The above-ground pool is located entirely above-ground (i.e., with no excavated portions) and has a constant depth.

**In-Ground Spa/Hot Tub:** Any spa/hot tub/pool whose sides reside partially or fully below the natural ground level.

**Non-Permanently Installed Spa/Hot Tub:** Any pool that is so constructed that it may be readily disassembled for storage and reassembled to its original integrity.

**On-Ground Spa/Hot Tub:** Any pool whose sides rest fully above the surrounding earth and which has a deep area below ground level.

**Permanently Installed Spa/Hot Tub:** One that is constructed in the ground, or in a building, in such manner that the pool cannot be readily disassembled for storage.

**Public Spa and Hot Tubs** — Any spa and/or hot tub, other than a residential spa or hot tub which is intended solely for bathing and is operated by an owner, lessee, operator, licensee, or concessionaire, regardless of whether a fee is charged for use. Public spas and hot tubs may be individual units or may be integrated into a larger swimming pool or bathing pool.

**Recessed Steps** — A riser/tread or series of risers/treads extending down from the deck with the bottom riser/tread terminating at the spa/hot tub/pool wall, thus creating a "stairwell."

**Recessed Treads** — A series of vertically spaced cavities in the spa/hot tub/pool wall creating tread areas for stepholes.

**Removable** — Capable of being taken away from the main unit with the use of only simple tools, such as a screwdriver, pliers or wrench.

**Rod** — See Hoop.

**Septum** — That part of the filter element consisting of cloth, wire screen or other porous material on which the filter medium or aid is deposited.

**Spa** — A hydrotherapy unit (see Hydrotherapy Spa) of irregular or geometric shell design.

**Spray Rinse, Mechanical** — A fixed or mechanically movable spray system which directs a stream of water against the filter surface, causing the filter aid and accumulated dirt to dislodge into the empty tank.

**Superchlorination** (Shock Treatment) — This refers to raising the residual chlorine level to 10 ppm for several hours to clarify the water, remove ammonia (combined chlorine) and to kill any algae present. This procedure is necessary on a routine basis as required (daily/weekly) to maintain acceptable water conditions.

**Tamperproof** — Tools are required to alter or remove portions of the equipment.

**Tread Contact Surface** — Foot contact surfaces of ladder, step, stair or ramp.

**Turnover** — The period of time (usually in hours) required to circulate a volume of water equal to the pool capacity. The *turnover rate* is the number of times a quantity of water equal to the pool capacity passes through the filters in a stated time (usually in turnovers per day).

**Water Line** — The water line shall be defined in one of the following ways:

a. Skimmer System — The water line shall fall in the midpoint of the operating range of the skimmers.
b. Overflow Systems — The water line shall be established by the height of the overflow rim.

## ADDITIONAL TECHNICAL TERMS*

**Air Pump Assist Backwash** — The compressing of a volume of air in the filter effluent chamber (by means of an air compressor or by the water pressure from the recirculating pump) which, when released, rapidly decompresses and forces water in the filter chamber through the elements in reverse, dislodging the filter aid and accumulated dirt, carrying it away as waste.

**Cartridge** — A replaceable porous element.

**Depth Type Cartridge:** A filter cartridge with media not less than 3/4" (.18 cm) thick which removes particulates as they penetrate into the media.

**Surface Type Cartridge:** A filter cartridge with media less than 3/4" (.18 cm) thick which relies on retention of particulates on the surface of the cartridge to achieve their removal.

**Chine** — That portion of the stave of a hot tub below the bottom of the croze.

**Chine Joist** — A brace that provides supports to the floor of a hot tub.

**Cold Crack** — The temperature at which the liner material will physically crack when folded 180 degrees on itself. See ASTM Specification D. 1790, "Brittleness, Temperature of Plastic Film By Impact," revised 1970.

**Croze** —The milled groove in the stave of a wooden hot tub that accommodates the floor boards.

**Edge Guards** — Shields designed to cover sharp edges in above-ground spas or hot tubs.

**Filter Vacuum** (or Suction) — A filter which operates under a vacuum from the suction of a pump.

**Floor** — Shall refer to the interior bottom spa/hot tub/pool surface and consists of that surface from a horizontal plane up to a maximum of a 45° slope.

**Freeboard** — The clear vertical distance between the top of the filter media and the lowest outlet of the upper distribution system in a permanent media filter.

**Lower Distribution System** (Underdrain) — Those devices used in the bottom of a permanent media filter to collect the water uniformly during the filtering and to distribute the backwash uniformly during the backwashing.

**Precoat** — The coating of filter aid on the septum of a diatomite type filter at the beginning of each filter cycle.

**Primary Structural Members** — Any part of the structure that carries or retains for reasonable foreseeable use any static or dynamic load or stress caused by water pressure, surcharge and/or natural forces.

**Secondary Structural Members** — Any part of the above-ground structure that is not subject to load caused by water pressure.

**Upper Distribution System**—Those devices designed to distribute the water entering a permanent media filter in a manner such as to prevent movement or migration of the filter media. This system shall also properly collect water during filter backwashing unless other means are provided.

**Upright Supports** — That portion of the frame which is adjacent to the above-ground wall in a vertical position which supports the top rail and braces the wall.

*Many of the terms included in this list do not appear in the text. However, since they are relevant to this particular industry, their inclusion in these guidelines was felt to be beneficial.

## APPENDIX
## LANGELIER SATURATION INDEX

The Saturation Index (S.I.), determined by the following formula, is useful in determining if water is corrosive (undersaturated) or scale forming (oversaturated).

S.I. = pH + TF + CF + AF − 12.1
pH, actual reading
12.1, constant
TF, temperature factor (table)
CF, calcium hardness factor (table)
AF, total alkalinity factor (table)

**Numerical Values for S.I. Formula**

| Temp. F (C) | TF | Calcium Hardness | CF | Total Alkalinity | AF |
|---|---|---|---|---|---|
| 32 (0) | 0.0 | 5 | 0.3 | 5 | 0.7 |
| 37 (3) | 0.1 | 25 | 1.0 | 25 | 1.4 |
| 46 (8) | 0.2 | 50 | 1.3 | 50 | 1.7 |
| 53 (12) | 0.3 | 75 | 1.5 | 75 | 1.9 |
| 60 (16) | 0.4 | 100 | 1.6 | 100 | 2.0 |
| 66 (19) | 0.5 | 150 | 1.8 | 150 | 2.2 |
| 76 (24) | 0.6 | 200 | 1.9 | 200 | 2.3 |
| 84 (29) | 0.7 | 300 | 2.1 | 300 | 2.5 |
| 94 (34) | 0.8 | 400 | 2.2 | 400 | 2.6 |
| 105 (40) | 0.9 | 800 | 2.5 | 800 | 2.9 |
| 128 (53) | 1.0 | 1,000 | 2.6 | 1,000 | 3.0 |

Balanced water = S.I. between -0.5 and +0.5
Corrosive water = S.I. below -0.5
Scale forming = S.I. above +0.5

Example: Given temperature 102°, total hardness 200 ppm, total alkalinity 100 ppm, $CaCO_3$ and pH = 7.6

S.I. = pH + TF + CF + AF − 12.1
S.I. = 7.6 + 0.9 + 1.9 + 2.0 − 12.1 = (+) 0.3

Therefore, the saturation index is close to 0, and the water is considered chemically balanced.

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## Recommendations for Preventing Pool Chemical–Associated Injuries

Chemicals are added to pool* water to kill disease-causing germs, maximize the efficacy of the disinfection process (e.g., pH control), improve water quality, stop corrosion and scaling of equipment, and protect against algal growth. However, pool chemicals can also lead to injury when mixed together or appropriate personal protective equipment is not used during handling. The following recommendations are based on a review of reports of pool chemical–associated injuries.†

### Design of Chemical Storage Area and Pump Room

- Construction
  - Include spill containment features, also known as secondary containment, in chemical storage areas to prevent pool chemical leaks or spills from mixing with any other substances.
  - Provide aquatics staff and patrons with easily accessible safety showers, eye wash stations, and other appropriate chemical safety equipment.
  - Install appropriate fire suppression equipment.
    - Consult with local fire department or code enforcement agency for guidance.
  - Provide adequate lighting for reading labels on containers throughout the chemical storage area and pump room.
- Air handling (*for indoor pools)*
  - Follow local building codes and/or American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standards.
    - Separate the air handling systems for the chemical storage area and pump room from the rest of the building.
    - Separate the air handling system for the pool area from the rest of the building.
    - If an older aquatic facility does not have separate air handling systems for the chemical storage area and pump room as well as the pool area, consider installing emergency heating, ventilating, and air conditioning (HVAC) cutoffs in these areas.
  - Ensure that the chemical storage area and pump room as well as the pool area are well-ventilated.
  - Ventilate the chemical storage area, pump room, and pool area to the outside.
- Engineering
  - Install an alarm to alert the aquatics staff if the recirculation pump shuts down.
  - Install a device that automatically deactivates the chlorine/pH feed pumps when there is no flow in the recirculation system.
  - Install check valves in chemical feed lines. These valves allow chemicals (liquid or gas) to flow through only in one direction and stop suction events from causing an overfeeding of chemicals.

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* To limit the length of this document, the word pool will be used to refer to all treated recreational water venues. Treated recreational water venues include but are not limited to pools, water parks, spas, and interactive fountains.

† Yoder JS, Hlavsa MC, Craun GF *et al*. Surveillance of Waterborne Disease and Outbreaks Associated with Recreational Water Use and Other Aquatic Facility–Associated Health Events — United States 2005–2006. *MMWR* 2008; 57(SS-9):1–38. For additional information pool chemical–associated health events, visit http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5709a1.htm?s_cid=ss5709a1_e.

- Security
  - Secure the chemical storage area and pump room to limit access, especially to children and animals.
  - Provide locking mechanisms for the chemical controller to prevent unauthorized tampering.
- Material Safety Data Sheets (MSDSs)
  - Ensure availability of and easy access to up-to-date MSDSs near (e.g., in the hallway just outside of) the chemical storage area, pump room, pool area, and any other location pool chemicals are stored or used.
    - Ensure availability of and easy access to up-to-date MSDSs at a location other than those listed above in case of chemical spill or accident that would prevent access.
- Personal protective equipment (PPE) (e.g., safety glasses or gloves)
  - Ensure availability of and easy access to PPE near (e.g., in the hallway just outside of) the chemical storage area, pump room, pool area, and any other location pool chemicals are stored or used.

**Chemical Storage**

- Store pool chemicals in compliance with local or state building and fire codes.
- Store pool chemicals below 95°F/35°C and in conditions recommended by the manufacturer (e.g., low humidity and out of direct sunlight).
- Protect stored pool chemicals from getting wet.
  - Do not store containers of any pool chemical directly on the floor.
  - Store pool chemicals away from doors and windows.
  - Cover opened containers with waterproof material.
  - Check the chemical storage area regularly for any evidence of water entry and fix any identified problems immediately.
    - Potential routes of water entry include roofs, ceilings, windows (particularly if they are open or broken), doors, walls, wall/floor joints, water pipes/hoses, sprinkler systems, drains (particularly if they are faulty or clogged).
- Protect individual stored chemicals from mixing together or with other substances.
  - Store each pool chemical separately.
    - Separate all chlorine products from one another (e.g., liquid chlorine, calcium hypochlorite, and stabilized chlorine products such as dichlor or trichlor).
  - Store only identical chemicals above or below each other (e.g., do not stack incompatible chemicals together). This is particularly important for liquid chemicals, which can leak and then mix with other pool chemicals or substances stored below.
  - Dedicate a storage location to each pool chemical (e.g., chlorine and acid). Changing chemical storage locations can lead to chemical-mixing errors.
  - Do NOT store pool chemicals with incompatible or flammable materials, which include but are not limited to gasoline, oil, grease, fertilizer, herbicides, paint, solvents (e.g., turpentine), oily rags, and alcohol.
  - Clean the storage area, pump room, pool deck, chemical safety equipment and adjacent environmental surfaces only with chemicals that are compatible with pool chemicals.
- Store chemicals in original manufacturer's labeled containers.
  - Consult with the chemical manufacturer if the container is damaged.
  - Dispose of deteriorating or unwanted pool chemicals or chemicals in unlabeled containers.
    - Contact the product's manufacturer or the local or state hazardous materials group for proper disposal procedures for deteriorating or unwanted pool chemicals.

        - Contact the local or state hazardous materials group for proper disposal procedures for chemicals in unlabeled containers.
- Protect pool chemicals from heat sources and flames.
    - Do NOT store possible ignition sources (e.g., welding equipment), especially gasoline-, diesel-, or gas-powered equipment (e.g., lawn mowers, motors, grills, or portable stoves) in the chemical storage area.
    - Do NOT smoke in the chemical storage area.
- Prioritize good housekeeping in the chemical storage area. Do NOT allow rags, trash, debris, etc. to collect in the area.
- Limit stored supplies of chemicals by having frequent, regular deliveries.
- Rotate inventory on a first-in, first-out basis.
- Store and consume food and beverages away from chemical storage area.

**Chemical Handling**

- Limit the authority to handle pool chemicals to those who have been trained in safe chemical storage and handling practices.
    - Give only people trained in chemical handling the responsibilities of ordering, accepting delivery, and stocking of pool chemicals.
- Maintain good communication among trained people with the authority to handle pool chemicals.
    - Establish a chain of command among them.
    - Document the use of pool chemicals (e.g., keep records on the name of chemical added, the reason why it was added, the date and time it was added, and the amount added).
- Post instructions on safe chemical handling practices in the chemical storage area and pump room. These messages should include:
    - Read product labels or MSDSs.
        - Contact supplier or manufacturer if additional information is needed.
    - Use only pool chemicals in original manufacturer's labeled containers. Never guess the identity of unlabeled chemicals. If a chemical is in an unlabeled container, do NOT use it.
    - Read the product name and directions before each use. Do NOT simply rely on the container's shape, size, or color to identify its contents.
    - Use appropriate PPE when handling pool chemicals.
        - Check the MSDSs to determine which PPE (e.g., safety glasses or gloves) is needed.
    - Keep children and animals away from the area when handling pool chemicals.
    - Do NOT smoke while handling pool chemicals.
    - Use caution when opening containers to avoid splashing them and generating dust (e.g., minimize the amount of dust generated when handling powdered or granular products).
    - Do NOT mix individual pool chemicals together or with any other substances.
        - Do NOT mix different types of chlorine products.
        - Do NOT mix old and fresh chemicals, even if they are the same product.
    - Dedicate equipment — such as scoops, buckets, crocks, and their lids — to one pool chemical. Do NOT use this equipment for any other chemical.
        - Label the equipment to indicate to which chemical it is dedicated.
    - Use only dry equipment (e.g., scoops) when handling chemicals.
    - Do NOT pre-dissolve solid pool chemicals or dilute liquid pool chemicals before use.
    - Add individual pool chemicals to water, never the reverse.
    - Close containers properly after each use.
    - Wash hands after working with pool chemicals.

- Respond to pool chemical spills immediately.
  - Follow the emergency response plan.
  - Never put spilled chemicals back in the original container because they might be contaminated with substances such as dirt or grease.
  - Use separate, dedicated materials to clean up and appropriately dispose of each spilled chemical.
  - Do NOT pour spilled chemicals down the drain or sewer.

**Maintenance and Repair**

- Close the pool to swimmers if the recirculation system is not running. Do NOT allow swimmers back into the pool until AFTER the recirculation system is restarted (if water quality meets required standards).
- Close the pool to swimmers before servicing the chlorine/pH control feed or recirculation system. Do NOT allow swimmers back in the pool until AFTER the chlorine/pH control feed or recirculation system is restarted (if water quality meets required standards).
- Turn off both the chlorine/pH control feed and recirculation systems before servicing either system.
- Ensure that only properly trained people service chlorine/pH control feed and recirculation systems.
- Ensure adequate ventilation in and around the pump room and pool area during maintenance and repair.
- Use appropriate PPE when working on equipment that contains or circulates pool chemicals.
- Develop and follow protocols for the maintenance of the chlorine/pH control feed system that will prevent mixing of different pool chemicals. Examples of procedures include
  - Clamp the chemical feed lines after turning the pumps off and before disconnecting lines to prevent spills.
  - Flush water through the chlorine feed tubing before cleaning it with acid. Flush the chlorine tubing with water again after the cleaning is completed and before reconnecting it to the chlorine feed system. Follow these steps in an area where pool chemicals other than acid (e.g., chlorine products) are neither stored nor used.
  - Monitor the cleaning processes, especially if chemicals can potentially mix. Never leave cleaning processes unattended.
- Ensure the same person or people complete maintenance procedures, if possible.
  - Communicate clearly to the replacement staff member(s) if this is not possible. Issues to be discussed with replacement staff include
    - Why the procedure(s) is/are being done, the stage of maintenance or repair, anticipated problems, and needed actions.
- Maintain the chlorine/pH control feed and recirculation systems according to manufacturer's guidelines.
- Set up a preventive maintenance program and regularly replace equipment or parts before they fail (e.g., check for leaks in feed pump tubing, replace tubing regularly, and check clamps and check valves).

**Pool Chemical Training for Aquatic–Facility Staff**

- Train all staff in pool chemical safety basics (e.g., emergency response procedures).
- Provide additional training to staff working with pool chemicals.
- Include at least the following topics in pool operator training/certification to decrease the likelihood of pool chemical–associated injuries in aquatic–facility staff and patrons:
  - Impact of each pool chemical on the water's chemistry and the monitoring systems,

    - If the test kit's limit is exceeded, how to measure higher chlorine levels (e.g., using dilution or higher range test strips).
  - Layout of a safe chemical storage area and pump room,
  - Calculation of pool volume,
  - Calculation of appropriate amount of pool chemicals needed,
  - Safe chemical storage and handling practices,
    - For example: 1) protect individual pool chemicals from mixing together or with other substances and 2) use PPE while handling chemicals.
    - Check out Occupational Safety and Health Administration (OSHA) resources: Chemical Hazard Communication (OSHA 3084) at www.osha.gov/Publications/osha3084.html; Compliance with Hazard Communication (OSHA 3111) at www.osha.gov/Publications/osha3111.html,
  - Basics of preventive and safe maintenance of equipment,
    - For example: 1) close pool to swimmers if recirculation system not running and 2) use PPE when working on equipment that contains or circulates pool chemicals.
  - First aid for pool chemical exposures, and
  - Emergency response basics.

**Emergency Response Plan**

*Before an incident*

- Develop an emergency response plan which includes
  - Spill-cleanup procedure,
  - Chemical accident and exposure response,
  - Clear chain of command and alternates with contact information,
  - Evacuation plan, and
  - Communication plan for alerting patrons, staff, and emergency responders.
- Train the aquatics staff on the procedures in the emergency response plan.
  - Keep a copy of the emergency response plan near (e.g., in the hallway just outside of) the chemical storage area, pump room, and pool area and ensure that another copy is also available at a remote location in case of an evacuation.
  - Ensure up-to-date MSDSs are easily accessible to first responders in case of evacuation.
- Have a phone with updated emergency numbers near (e.g., in the hallway just outside of) the chemical storage area, pump room, and pool area and ensure that a phone is accessible in case of an evacuation.
- Practice emergency response with first responders.

*In case of an incident*

- Activate emergency response plan.
  - For indoor pools:
    - If chemical fumes are released in the chemical storage area, pump room, or pool area and the corresponding air handling system is separate from other areas of the building, leave HVAC system on to ventilate.
    - If chemical fumes are released in the chemical storage area, pump room, or pool area and the corresponding air handling system is shared with other areas of the building, turn off the HVAC system immediately.

*After an incident*

- Document the incident and response and report the incident to local or state permitting officials.[‡]
- Conduct a post-incident critique with all parties involved in the response.
  - Revise the emergency response plan as needed.

**Chemical Packaging and Labeling (for manufacturers and suppliers)**

- Package and label each pool chemical (e.g., chlorine and acid) so that they can be easily identified and distinguished from each other.
- Package and label each pool chemical consistently. Changing the shape, size, or color of the container or labeling can lead to chemical-mixing errors.
- Notify customers of any changes in the packaging or labeling of pool chemicals.
- Consider identifying pool chemicals on the container lids.
- Use labels resistant to both corrosion and deterioration.

**Additional sources of guidance:**

U.S. Environmental Protection Agency (EPA): Safe Storage and Handling of Swimming Pool Chemicals (2001) at www.epa.gov/oem/docs/chem/spalert.pdf

EPA: Chemical Emergency Preparedness and Prevention Advisory — Swimming Pool Chemicals: Chlorine (1990) at www.epa.gov/OEM/docs/chem/chlor.pdf

Transport Canada: Swimming Pool Chemicals at www.tc.gc.ca/canutec/en/articles/pool.htm

[‡] Local or state permitting officials should consider revising public health regulations in response to reports of pool chemical–associated health events to reduce the future likelihood of such events.

# REGULATIONS GOVERNING TOURIST ESTABLISHMENT SWIMMING POOLS AND OTHER PUBLIC POOLS.

**PART I** General Provisions.

**PART II** Swimming Pools; Design and Construction.

**PART III** Spray Pools.

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## PART I. General Provisions.

**12 VAC 5-460-10**. Definitions.

**12 VAC 5-460-20**. Local requirements.

**12 VAC 5-460-30**. Permits.

### 12 VAC 5-460-10. Definitions.

The following words and terms, when used, shall have the following meanings unless the context clearly indicates otherwise:

"Construction" means any construction, remodeling, or major alterations.

"Design load" means the maximum number of persons permitted in the pool at any given time, to be

determined by dividing the total square footage of swimming pool water surface area by 27.

"Operator" or "manager" means the individual or individuals responsible for operation and management of the lodging facility and all of its facilities including the swimming pool.

"Person" means an individual, firm, corporation or association.

"State Health Commissioner" means the Commissioner of Health for the Commonwealth of Virginia.

"Swimming pool" shall mean any swimming, wading, or spray pool, including all appurtenant equipment, structures, and facilities provided for the use of guests by transient lodging establishments.

**12 VAC 5-460-20. Local requirements.**

In addition to the requirements of this chapter, all applicable local ordinances, including plumbing, building, electrical, and zoning ordinances shall also apply in the construction, maintenance, and operation of all swimming pools.

**12 VAC 5-460-30. Permits.**

A permit shall be obtained from the State Health Commissioner before the construction, remodeling, or major alteration of any swimming pool. Plans and specifications shall have been approved by the State Health Commissioner prior to the issuance of such permit. Plans and specifications must be submitted in triplicate to the State Health Commissioner, and one set of plans and specifications, when approved, will be so stamped and returned to the applicant. Original tracings will not be stamped for approval.

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## PART II. Swimming Pools; Design and Construction.

**12 VAC 5-460-40. Water supplies.**

**12 VAC 5-460-50. Location.**

**12 VAC 5-460-60. Materials of pool shell.**

**12 VAC 5-460-70. Shape and slopes.**

**12 VAC 5-460-80. Pool decks.**

**12 VAC 5-460-90. Fences.**

**12 VAC 5-460-100. Steps and ladders.**

**12 VAC 5-460-110. Overflow facilities.**

**12 VAC 5-460-120. Inlets and outlets.**

**12 VAC 5-460-130. Depth marking.**

**12 VAC 5-460-140. Diving boards.**

**12 VAC 5-460-150. Lighting.**

**12 VAC 5-460-160. Food and drink facilities.**

**12 VAC 5-460-170. Recirculation systems.**

**12 VAC 5-460-180. Filter rooms.**

**12 VAC 5-460-190. Pumps.**

**12 VAC 5-460-200. Hair and lint catchers.**

**12 VAC 5-460-210. Filters.**

**12 VAC 5-460-220. Rate of flow indicators.**

**12 VAC 5-460-230. Suction cleaners.**

**12 VAC 5-460-240. Chemical feeding equipment.**

**12 VAC 5-460-250. Disinfection equipment.**

**12 VAC 5-460-260. Chemical testing equipment.**

**12 VAC 5-460-270. Operating records.**

**12 VAC 5-460-280. Disinfection.**

**12 VAC 5-460-290. Alkalinity.**

**12 VAC 5-460-300. Filtration; water clarity.**

**12 VAC 5-460-310. Filter room placards.**

**12 VAC 5-460-320. Lifeguards.**

**12 VAC 5-460-330. Commissioner approval.**

**12 VAC 5-460-340. Water supplies, lighting, overflow facilities, inlets and outlets.**

**12 VAC 5-460-350. Location and slopes.**

**12 VAC 5-460-360. Deck area.**

**12 VAC 5-460-370. Protection.**

**12 VAC 5-460-380. Water circulation systems.**

**12 VAC 5-460-390. Waste discharge.**

**12 VAC 5-460-40. Water supplies.**

All water used in swimming pools shall be from sources that are approved by the State Health Commissioner. No piping arrangements shall exist which, under any conditions, will permit sewage or waste

water to enter the swimming pool water system or water from the swimming pool to enter the make-up water supply.

**12 VAC 5-460-50. Location.**

The location of a pool shall in no way hinder the operation for which it is designed nor adversely affect the bathers' safety or water quality.

**12 VAC 5-460-60. Materials of pool shell.**

Swimming pool shells shall be constructed of reinforced concrete or its equivalent in strength and durability, designed and built to withstand anticipated stresses, water tight, and shall have smooth and easily cleanable surfaces. A white or light colored waterproof interior finish which will withstand repeated brushings, scrubbing, and cleaning procedures shall completely line the pool to the coping.

**12 VAC 5-460-70. Shape and slopes.**

The pool shall be designed and constructed of such shape, contour, etc., that efficient and safe control of the bathers can be accomplished. In water depths under five feet, the slope of the bottom shall not exceed one foot in 12 feet. Pool walls shall be vertical from the break point toward the deep end for at least three feet below the water line and vertical from the break point to the shallow end to within one foot of the finished floor of the pool.

**12 VAC 5-460-80. Pool decks.**

There shall be a deck at least four feet wide extending around the entire perimeter of the pool. The deck shall be constructed of concrete or other approved material. The material shall have a nonslip but smooth finish. The deck shall have a pitch of not less than 1/8 of an inch nor more than 5/8 of an inch to the foot and be so designed as to conduct drainage away from the pool area in a manner that will not create or maintain pools of water or a nuisance.

**12 VAC 5-460-90. Fences.**

All outdoor swimming pools shall be enclosed by a substantial barrier or fence of at least three feet in height to promote safety and cleanliness of water. A gate at least three feet in height and of material as substantial as the fence or barrier shall be provided.

**12 VAC 5-460-100. Steps and ladders.**

Two or more ladders shall be provided for all pools having a perimeter greater than 100 feet and one means of egress for pools having a perimeter of 100 feet or less. Steps projecting into the pool area are prohibited.

Treads of all steps, ladders, or other means of ingress or egress shall be of nonslip construction. Each recessed step area shall be provided with one or more handrails.

**12 VAC 5-460-110. Overflow facilities.**

Provision shall be made for removal of floating material and scum from the surface of the water.

If a recessed type of gutter located near the top of the walls is to be used, the gutter shall have a minimum depth of three inches and shall be of a design that will permit satisfactory cleaning of the overflow channel. The gutter drain outlets shall be spaced around the pool not more than 15 feet on centers. The gutter bottom shall slope toward these outlets with a minimum slope of 1/8 of an inch to the foot. The drains shall not be less than 2 ½ inches in diameter and the total orifice area of the grating shall be at least twice the cross-sectional area of the outlet pipe.

For pools with overflowing gutters, a water level control tank shall be provided which will effectively provide for maintenance of the water level so as to produce constant surface skimming action at all times.

The above-described gutter may be replaced by an arrangement of overflow devices in the pool walls which provides the proper removal of scum and floating material. There shall be one such device for each 400 square feet of pool area with a minimum of four per pool, each of which shall be individually controlled.

If the recirculation system is designed for water to enter the bottom portion of the pool and overflow the top, then adequate drainage of the scum and floating material from the deck must be provided. This drainage may be by a continuous drain or multiple drains. (See also 12VAC 5-460-80.) In multiple drains, each drain grating shall have a total orifice area of as least four times the cross-sectional area of drainpipe, which shall have a minimum diameter of 2 ½ inches. In the use of drain channels, continuous to and around the perimeter of the pool, the channel grating shall be designed so as not to create a hazard to fingers and toes and be restraint to corrosion.

**12 VAC 5-460-120. Inlets and outlets.**

The inlets for recirculation shall be submerged and located to produce uniform circulation of water throughout the swimming pool without the existence of dead spots. Wall inlets should be located on not more than 20-foot centers entirely around the perimeter of the swimming pool. Bottom inlets shall be spaced, depending on the pool dimensions, so as to produce uniform water circulation. The number of bottom inlets shall be the same as required of wall inlets. Each inlet is to be designed as an adjustable orifice or provided with a valve.

An outlet drain shall be provided for completely emptying the swimming pool. Direct connection to a sanitary sewer shall not be permitted. Disposal of waste water to a storm sewer or natural watercourse shall be subject to approval of the State Health Commissioner. The outlet drain shall be covered with a grate of such

design that it cannot be readily removed by, or produce any hazard to, the bathers.

**12 VAC 5-460-130. Depth marking.**

The depth of the water in the swimming pool shall be marked at every foot increment of depth in water depths five feet and under on both sides of the pool. In water deeper than five feet the markings need not be closer than three feet apart. Numerals and lettering shall be at least five inches in size and of good contrast with the walls and decks.

**12 VAC 5-460-140. Diving boards.**

At least 12 feet of free and obstructed headroom shall be provided above the diving boards.

The minimum depth of water in the diving area shall be determined as follows:

| | Dimensions | | |
|---|---|---|---|
| Elevation of diving point above water surface | Depth of water | End wall to maximum depth | Maximum depth to five feet |
| 0 to 24 in. inclusive | 8 ft. | 12 ft. | 12 ft. |
| 24 in. to 30 in. inclusive | 8 ft. | 13 ft. | 17 ft. |
| 30 in. to 1 meter inclusive | 8 ft. 6 in. | 15 ft. | 20 ft. |
| 1 meter plus to 3 meters inclusive | 10 ft. | 15 ft. | 20 ft. |
| 3 meters to 5 meters | 14 ft. 6 in. | 17 ft. | 23 ft. |

The minimum length of any diving area terminating at a vertical wall shall be 30 feet.

Where multiple diving boards are used, the space between centerlines shall not be less than 10 feet, and the center of no board shall be closer than 10 feet to a sidewall. These dimensions shall apply both from a point

of projection four feet from the end wall and the point of maximum depth.

The space between centerlines of three-meter and five-meter diving boards shall be not less than 15 feet and between five-meter and 10- meter boards shall be not less than 18 feet. The minimum distances from center lines of five-meter and 10-meter boards shall be the same as to the side walls.

**12 VAC 5-460-150. Lighting.**

Where pools are to be used after dark, the swimming pool area shall be equipped with lighting fixtures of such number and design as to light all parts of the pool, the water therein, and the entire area. Fixtures should be installed in such a manner as to create no hazard to the bathers. The design and installation of the fixtures should be such that lifeguards can clearly see every part of the swimming pool including decks, spring boards, and other appurtenances without being blinded by glare. If installed, submarine lights shall provide at least one watt per square foot of pool area. Each submarine light shall be properly connected to a ground wire.

**12 VAC 5-460-160. Food and drink facilities.**

Food and drink preparation, serving, consumption facilities shall be permitted only within designated areas approved for these purposes.

**12 VAC 5-460-170. Recirculation systems.**

All swimming pools shall be equipped with a recirculation system consisting of pumps, hair and lint catchers, filters, disinfection equipment, and necessary pipe connections to the inlets and outlets. Adequate provision shall be made for backwashing filters. Recirculation systems shall be designed for an eight hour or less turnover of the swimming pool water.

**12 VAC 5-460-180. Filter rooms.**

Any room containing the filtration equipment, pumps, and other recirculation system appurtenances shall be finished in a light color and be provided with adequate illumination and ventilation. The floor of the filter room shall be designed to provide adequate drainage. The provision of any facility for discharging filter backwashing water onto the filter floor is strictly prohibited, and adequate provision shall be made for the discharge of backwash water. All of the

recirculation equipment in filter rooms shall be installed so that it may easily be operated or repaired. All entrances below ground surface shall be by stairway and vertical door. Adequate headroom shall be provided above all filters. Belowground filter rooms shall be provided with mechanical ventilation.

**12 VAC 5-460-190. Pumps.**

Pumping equipment shall have sufficient capacity to discharge the volume of water for the required turnover of the pool against the maximum head in the recirculation system. The pump used for backwashing sand filters shall have sufficient capacity to backwash the unit at the rate of at least 12 gallons per minute per square foot of filter area against the maximum head developed during backwashing.

**12 VAC 5-460-200. Hair and lint catchers.**

Hair and lint catchers shall be installed ahead of the filter pump and be designed and located so that they can easily and simply be dismantled for cleaning and inspection.

**12 VAC 5-460-210. Filters.**

The recirculation system shall be equipped with a filtration system that will filter the entire contents of the swimming pool within eight hours or less at the rate of three gallons or less per square foot per minute. In sand filters, the layer of filter sand shall be at least 20 inches in depth, properly supported by uniform layers of clean graded gravel to a minimum depth of 12 inches or supported by porous plates. The filter sand shall have an effective size of between 0.45 and 0.55 millimeters with a uniformity co-efficient not greater than 1.7. In anthracite coal filters, the anthracite shall have a depth of at least 24 inches and shall have an effective size between 0.6 and 0.8 millimeters with a uniformity co-efficient of not greater than 1.8. Pressure filters shall be equipped with readily accessible air relief valves and access holes large enough to permit inspections, maintenance, and repair work. Each pressure filter system shall be equipped with a pressure gauge at least four inches in diameter on the inlet and outlet to indicate the pressure in pounds per square inch, and a sight glass that can be easily removed for cleaning shall be provided on the waste discharge line. Gravity type filters shall be equipped with loss of head gauges.

The filtration rate for diatomaceous earth filters and similar equipment may not exceed 1½ gallons per square foot of filter area with eight hours turnover of pool volume unless continuous slurry feed is provided, in which case, the rate shall not exceed three gallons per minute per square foot of filter area.

Arrangements or equipment shall be provided for application of filter aid and proper precoating and cleaning of filter elements. All filters shall be capable of being cleaned or backwashed by use of the washwater pump and the manipulation of valves. In view of the constant change of design of such equipment, it will be necessary to evaluate each system individually. Approval or rejection of systems will be at the discretion of the State Health Commissioner, based upon the need for protecting the health and safety of those using any such pool.

**12 VAC 5-460-220. Rate of flow indicators.**

Recirculation system shall be equipped with a rate of flow indicator reading in gallons per minute, located so as to indicate both the rate of flow of the effluent from the filter and the rate of backwash in gallons per

minute in sand or anthracite coal filters.

**12 VAC 5-460-230. Suction cleaners.**

Suction cleaners shall be provided. Where the suction cleaner is operated by the recirculating pump, a device shall be provided for throttling the flow from the pool outlet, and the suction cleaner line shall be connected through the hair and lint catcher.

**12 VAC 5-460-240. Chemical feeding equipment.**

Means shall be provided for regulating the feeding of chemicals into the water in their circulation system. The installation of mechanically operated, positive, chemical feeders or open-type chemical machines is required. The installation of closed-type solution pots is prohibited.

**12 VAC 5-460-250. Disinfection equipment.**

All swimming pools shall be provided with approved chlorine feeding equipment. The chlorinating equipment shall be capable of applying a dose up to 6.0 ppm of chlorine at the rate of recirculation. Chlorine gas feeding equipment and chlorine gas cylinders shall be installed in an enclosed space or room separate from the filter room and equipped with a door capable of being locked. When this chlorinator room is tight, it shall be equipped with a forced draft fan exhausting to the outside from the floor level, and a fresh air inlet shall be provided near the ceiling. Forced draft apparatus shall have sufficient capacity to exhaust the contents of the room in at least three minutes. The chlorine gas tanks shall be protected from direct sunlight and fastened in place during storage and use. An approved type gas mask shall be provided where chlorine gas is being utilized. Gas masks shall be located accessible to, but outside of, the chlorinator room.

Nothing in this section shall be construed as debarring any other method of disinfection or filtration equipment demonstrated to be of at least equal efficiency and approved by the State Health Commissioner.

**12 VAC 5-460-260. Chemical testing equipment.**

Each swimming pool shall be provided with satisfactory equipment for the determination of hydrogen-ion concentration (pH) ranging from 6.8 to 8.0. Satisfactory equipment shall also be provided for the determination of residual chlorine content ranging from 0.0 to 1.0.

**12 VAC 5-460-270. Operating records.**

Acceptable records of the operation of the swimming pool shall be maintained. These records shall include pH levels, free chlorine residual, water clarity, cleanliness, and such other things as may be required for the health and safety of the bathers. These records shall be kept on file for a period of one year.

**12 VAC 5-460-280. Disinfection.**

The chlorination equipment shall be operated so as to maintain a free chlorine residual content of not less than 0.5 ppm at all points throughout the swimming pool water when there are bathers present.

**12 VAC 5-460-290. Alkalinity.**

The hydrogen-ion concentration should be maintained at 7.2 or above.

**12 VAC 5-460-300. Filtration; water clarity.**

The filters should be operated 24 hours per day during the season of use of the swimming pool. At all times when the pool is open for use, the water shall be sufficiently clear to permit a disc six inches in diameter, divided into alternate black and white quadrants, when placed on the bottom of the pool at the deepest point, to be clearly visible from the swimming pool deck at all distances up to ten yards in a horizontal direction from the projection of the disc on the swimming pool surface.

Chemicals other than chlorine, sodium or calcium hypochlorite, lime, soda ash, and aluminum sulfate shall not be used to treat swimming pool water without permission.

**12 VAC 5-460-310. Filter room placards.**

A placard shall be prominently displayed showing the following data: (I) size of the swimming pool in feet and volume in gallons; (ii) capacity of the filters in square feet and gallons per minute; (iii) capacity of the pumps in gallons per minute at the appropriate head in feet; (iv) head loss at which the filters should be backwashed; and (v) complete instructions for operating the recirculation and disinfection equipment.

**12 VAC 5-460-320. Lifeguards.**

The management of any transient lodging establishment where a swimming pool has been provided for the use of guests shall designate and have on duty a reliable and competent person as a lifeguard and management shall further provide for the use of this lifeguard, such life saving equipment as may be required depending upon the size and depth of the pool.

**12 VAC 5-460-330. Commissioner approval.**

For any items not specifically covered in this chapter, the State Health Commissioner is authorized to require that all materials, methods of construction and design features shall be proven to function adequately, effectively and without excessive maintenance and operational difficulties before he grants approval thereof, and such approval shall be based upon the need for protecting the health and safety of those using

swimming pools.

It shall be the duty of the applicant to provide such data, tests, or other adequate proof that the device, material, or product will satisfactorily perform the function for which it is intended before such item shall be approved or accepted for tests.

**12 VAC 5-460-340. Water supplies, lighting, overflow facilities, inlets and outlets.**

See 12 VAC 5-460-40 & 12 VAC 5-460-150.

12 VAC 5-460-350. Location and slopes.

Wading pools shall be located so that drainage from surrounding areas will not wash contamination into pools during rainfall. The bottom of wading pools shall slope not less than three inches in 10 feet toward the drain.

**12 VAC 5-460-360. Deck area.**

Wading pools shall be entirely surrounded by a deck at least four feet in width. Decks shall be constructed of a permanently impervious material, which shall have and retain a finish as smooth as possible that is nonslip to bare feet. The deck shall slope not less than three inches in 10 feet away from the pool edge, and the water on the deck shall be discharged to waste.

**12 VAC 5-460-370. Protection.**

Wading pools and wading areas shall be separated from swimming pools by appropriate protectional features.

**12 VAC 5-460-380. Water circulation systems.**

A complete recirculation system shall be installed at wading pools, which cannot be served adequately by an adjacent swimming pool recirculation system. The recirculation system shall provide a pool volume turnover rate of once in three hours or less.

An alternate method to the water circulation system is the continuous addition of water properly treated at a rate of flow sufficient to replace all of the water in the wading pool once in three hours or less. The overflow water, with this method, shall be continuously discharged to waste.

**12 VAC 5-460-390. Waste discharge.**

See 12 VAC 5-460-120.

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**PART III. Spray Pools.**

12 VAC 5-460-400. Water supplies.

12 VAC 5-460-410. Materials.

12 VAC 5-460-420. Slopes.

12 VAC 5-460-430. Drains.

12 VAC 5-460-440. Deck areas.

**12 VAC 5-460-400. Water supplies.**

Water sprayed into a pool shall be from an approved supply. Spray heads shall be installed so that there will be no possibility of their submergence and, as a result of clogged drains.

**12 VAC 5-460-410. Materials.**

Spray pools shall be constructed of permanently impervious material, which shall have and retain a finish as smooth as possible that is nonslip to bare feet.

**12 VAC 5-460-420. Slopes.**

Spray pool bottoms shall slope not less than three inches in 10 feet toward the drains.

**12 VAC 5-460-430. Drains.**

Spray pools shall be equipped at low points with an unvalved drain to waste. The drain shall be of such size and design that water sprayed into the pool will not pond in the pool bottom.

**12 VAC 5-460-440. Deck areas.**

Spray pools shall be entirely surrounded by a deck at least four feet in width. Decks shall be constructed of a permanently impervious material, which shall have and retain a finish as smooth as possible and nonslip to bare feet. The deck shall slope not less than three inches in 10 feet away from the pool edge and the water on the deck discharged to waste.

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Note: All subsequent pages will look best when viewed with a Web browser that is fully compliant with the proposed HTML 3.0 extensions. HTML 2.0 compliant browsers should be able to access all information; however in some cases, the format may be less than desirable.

# WATER QUALITY TEST RESULTS

FOR _____ AT: _____

DATE TIME

_____ _____ ppm

DISINFECTANT TYPE (chlorine, bromine, etc.) DISINFECTANT LEVEL

_____ _____ °F _____

pH TEMPERATURE OPERATOR

## ACCEPTABLE LEVELS

| PARAMETER | POOLS MINIMUM | MAXIMUM | PARAMETER | SPAS MINIMUM | MAXIMUM |
|---|---|---|---|---|---|
| CHLORINE | 1.0 ppm | 3.0 ppm | CHLORINE | 2.0 ppm | 10.0 ppm |
| BROMINE | 2.0 ppm | 4.0 ppm | BROMINE | 2.0 ppm | 10.0 pm |
| pH | 7.2 | 7.8 | pH | 7.2 | 7.8 |
| TEMPERATURE | NONE | 104 degrees F (heated pools only) | TEMPERATURE | NONE | 104 degrees F |

IF NOT WITHIN ACCEPTABLE LEVELS, PLEASE CALL THE LOCAL HEALTH DEPARTMENT AT: _____

# REGULATIONS GOVERNING TOURIST ESTABLISHMENT SWIMMING POOLS AND OTHER PUBLIC POOLS.

**PART I General Provisions.**

**PART II Swimming Pools; Design and Construction.**

**PART III Spray Pools.**

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**12 VAC 5-460-20. Local requirements.**

**12 VAC 5-460-30. Permits.**

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"Swimming pool" shall mean any swimming, wading, or spray pool, including all appurtenant equipment, structures, and facilities provided for the use of guests by transient lodging establishments.

### 12 VAC 5-460-20. Local requirements.

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Commissioner prior to the issuance of such permit. Plans and specifications must be submitted in triplicate to the State Health Commissioner, and one set of plans and specifications, when approved, will be so stamped and returned to the applicant. Original tracings will not be stamped for approval.

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**PART II. Swimming Pools; Design and Construction.**

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**12 VAC 5-460-50. Location.**

**12 VAC 5-460-60. Materials of pool shell.**

**12 VAC 5-460-70. Shape and slopes.**

**12 VAC 5-460-80. Pool decks.**

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**12 VAC 5-460-220. Rate of flow indicators.**

**12 VAC 5-460-230. Suction cleaners.**

**12 VAC 5-460-240. Chemical feeding equipment.**

**12 VAC 5-460-250. Disinfection equipment.**

**12 VAC 5-460-260. Chemical testing equipment.**

**12 VAC 5-460-270. Operating records.**

**12 VAC 5-460-280. Disinfection.**

**12 VAC 5-460-290. Alkalinity.**

**12 VAC 5-460-300. Filtration; water clarity.**

**12 VAC 5-460-310. Filter room placards.**

**12 VAC 5-460-320. Lifeguards.**

**12 VAC 5-460-330. Commissioner approval.**

**12 VAC 5-460-340. Water supplies, lighting, overflow facilities, inlets and outlets.**

**12 VAC 5-460-350. Location and slopes.**

**12 VAC 5-460-360. Deck area.**

**12 VAC 5-460-370. Protection.**

**12 VAC 5-460-380. Water circulation systems.**

**12 VAC 5-460-390. Waste discharge.**

**12 VAC 5-460-40. Water supplies.**

All water used in swimming pools shall be from sources that are approved by the State Health Commissioner. No piping arrangements shall exist which, under any conditions, will permit sewage or waste water to enter the swimming pool water system or water from the swimming pool to enter the make-up water supply.

**12 VAC 5-460-50. Location.**

The location of a pool shall in no way hinder the operation for which it is designed nor adversely affect the bathers' safety or water quality.

**12 VAC 5-460-60. Materials of pool shell.**

Swimming pool shells shall be constructed of reinforced concrete or its equivalent in strength and durability, designed and built to withstand anticipated stresses, water tight, and shall have smooth and easily cleanable surfaces. A white or light colored waterproof interior finish which will withstand repeated brushings, scrubbing, and cleaning procedures shall completely line the pool to the coping.

**12 VAC 5-460-70. Shape and slopes.**

The pool shall be designed and constructed of such shape, contour, etc., that efficient and safe control of the bathers can be accomplished. In water depths under five feet, the slope of the bottom shall not exceed one foot in 12 feet. Pool walls shall be vertical from the break point toward the deep end for at least three feet below the water line and vertical from the break point to the shallow end to within one foot of the finished floor of the pool.

**12 VAC 5-460-80. Pool decks.**

There shall be a deck at least four feet wide extending around the entire perimeter of the pool. The deck shall be constructed of concrete or other approved material. The material shall have a nonslip but smooth finish. The deck shall have a pitch of not less than 1/8 of an inch nor more than 5/8 of an inch to the foot and be so designed as to conduct drainage away from the pool area in a manner that will not create or maintain pools of water or a nuisance.

**12 VAC 5-460-90. Fences.**

All outdoor swimming pools shall be enclosed by a substantial barrier or fence of at least three feet in height to promote safety and cleanliness of water. A gate at least three feet in height and of material as substantial as the fence or barrier shall be provided.

**12 VAC 5-460-100. Steps and ladders.**

Two or more ladders shall be provided for all pools having a perimeter greater than 100 feet and one means of egress for pools having a perimeter of 100 feet or less. Steps projecting into the pool area are prohibited. Treads of all steps, ladders, or other means of ingress or egress shall be of nonslip construction. Each recessed step area shall be provided with one or more handrails.

**12 VAC 5-460-110. Overflow facilities.**

Provision shall be made for removal of floating material and scum from the surface of the water.

If a recessed type of gutter located near the top of the walls is to be used, the gutter shall have a minimum depth of three inches and shall be of a design that will permit satisfactory cleaning of the overflow channel. The gutter drain outlets shall be spaced around the pool not more than 15 feet on centers. The gutter bottom shall slope toward these outlets with a minimum slope of 1/8 of an inch to the foot. The drains shall not be less than 2 ½ inches in diameter and the total orifice area of the grating shall be at least twice the cross-sectional area of the outlet pipe.

For pools with overflowing gutters, a water level control tank shall be provided which will effectively provide for maintenance of the water level so as to produce constant surface skimming action at all times.

The above-described gutter may be replaced by an arrangement of overflow devices in the pool walls which provides the proper removal of scum and floating material. There shall be one such device for each 400 square feet of pool area with a minimum of four per pool, each of which shall be individually controlled.

If the recirculation system is designed for water to enter the bottom portion of the pool and overflow the top, then adequate drainage of the scum and floating material from the deck must be provided. This drainage may be by a continuous drain or multiple drains. (See also 12VAC 5-460-80.) In multiple drains, each drain grating shall have a total orifice area of as least four times the cross-sectional area of drainpipe, which shall have a minimum diameter of 2 ½ inches. In the use of drain channels, continuous to and around the perimeter of the pool, the channel grating shall be designed so as not to create a hazard to fingers and toes and be restraint to corrosion.

**12 VAC 5-460-120. Inlets and outlets.**

The inlets for recirculation shall be submerged and located to produce uniform circulation of water throughout the swimming pool without the existence of dead spots. Wall inlets should be located on not more than 20-foot centers entirely around the perimeter of the swimming pool. Bottom inlets shall be spaced, depending on the pool dimensions, so as to produce uniform water circulation. The number of bottom inlets shall be the same as required of wall inlets. Each inlet is to be designed as an adjustable orifice or provided with a valve.

An outlet drain shall be provided for completely emptying the swimming pool. Direct connection to a sanitary sewer shall not be permitted. Disposal of waste water to a storm sewer or natural watercourse shall be subject to approval of the State Health Commissioner. The outlet drain shall be covered with a grate of such design that it cannot be readily removed by, or produce any hazard to, the bathers.

**12 VAC 5-460-130. Depth marking.**

The depth of the water in the swimming pool shall be marked at every foot increment of depth in water depths five feet and under on both sides of the pool. In water deeper than five feet the markings need not be closer than three feet apart. Numerals and lettering shall be at least five inches in size and of good contrast with the walls and decks.

**12 VAC 5-460-140. Diving boards.**

At least 12 feet of free and obstructed headroom shall be provided above the diving boards.

The minimum depth of water in the diving area shall be determined as follows:

| | Dimensions | | |
|---|---|---|---|
| Elevation of diving point above water surface | Depth of water | End wall to maximum depth | Maximum depth to five feet |
| 0 to 24 in. inclusive | 8 ft. | 12 ft. | 12 ft. |
| 24 in. to 30 in. inclusive | 8 ft. | 13 ft. | 17 ft. |
| 30 in. to 1 meter inclusive | 8 ft. 6 in. | 15 ft. | 20 ft. |
| 1 meter plus to 3 meters inclusive | 10 ft. | 15 ft. | 20 ft. |
| 3 meters to 5 meters | 14 ft. 6 in. | 17 ft. | 23 ft. |

The minimum length of any diving area terminating at a vertical wall shall be 30 feet.

Where multiple diving boards are used, the space between centerlines shall not be less than 10 feet, and the center of no board shall be closer than 10 feet to a sidewall. These dimensions shall apply both from a point of projection four feet from the end wall and the point of maximum depth.

The space between centerlines of three-meter and five-meter diving boards shall be not less than 15 feet and between five-meter and 10- meter boards shall be not less than 18 feet. The minimum distances from center lines of five-meter and 10-meter boards shall be the same as to the side walls.

**12 VAC 5-460-150. Lighting.**

Where pools are to be used after dark, the swimming pool area shall be equipped with lighting fixtures of such number and design as to light all parts of the pool, the water therein, and the entire area. Fixtures should be installed in such a manner as to create no hazard to the bathers. The design and installation of the fixtures should be such that lifeguards can clearly see every part of the swimming pool including decks, spring boards, and other appurtenances without being blinded by glare. If installed, submarine lights shall provide at least one watt per square foot of pool area. Each submarine light shall be properly connected to a ground wire.

**12 VAC 5-460-160. Food and drink facilities.**

Food and drink preparation, serving, consumption facilities shall be permitted only within designated areas approved for these purposes.

**12 VAC 5-460-170. Recirculation systems.**

All swimming pools shall be equipped with a recirculation system consisting of pumps, hair and lint catchers, filters, disinfection equipment, and necessary pipe connections to the inlets and outlets. Adequate provision shall be made for backwashing filters. Recirculation systems shall be designed for an eight hour or less turnover of the swimming pool water.

**12 VAC 5-460-180. Filter rooms.**

Any room containing the filtration equipment, pumps, and other recirculation system appurtenances shall be finished in a light color and be provided with adequate illumination and ventilation. The floor of the filter room shall be designed to provide adequate drainage. The provision of any facility for discharging filter backwashing water onto the filter floor is strictly prohibited, and adequate provision shall be made for the discharge of backwash water. All of the

recirculation equipment in filter rooms shall be installed so that it may easily be operated or repaired. All entrances below ground surface shall be by stairway and vertical door. Adequate headroom shall be provided above all filters. Belowground filter rooms shall be provided with mechanical ventilation.

**12 VAC 5-460-190. Pumps.**

Pumping equipment shall have sufficient capacity to discharge the volume of water for the required turnover of the pool against the maximum head in the recirculation system. The pump used for backwashing sand filters shall have sufficient capacity to backwash the unit at the rate of at least 12 gallons per minute per square foot of filter area against the maximum head developed during backwashing.

**12 VAC 5-460-200. Hair and lint catchers.**

Hair and lint catchers shall be installed ahead of the filter pump and be designed and located so that they can easily and simply be dismantled for cleaning and inspection.

**12 VAC 5-460-210. Filters.**

The recirculation system shall be equipped with a filtration system that will filter the entire contents of the swimming pool within eight hours or less at the rate of three gallons or less per square foot per minute. In sand filters, the layer of filter sand shall be at least 20 inches in depth, properly supported by uniform layers of clean graded gravel to a minimum depth of 12 inches or supported by porous plates. The filter sand shall have an effective size of between 0.45 and 0.55 millimeters with a uniformity co-efficient not greater than 1.7. In anthracite coal filters, the anthracite shall have a depth of at least 24 inches and shall have an effective size between 0.6 and 0.8 millimeters with a uniformity co-efficient of not greater than 1.8. Pressure filters shall be equipped with readily accessible air relief valves and access holes large enough to permit inspections, maintenance, and repair work. Each pressure filter system shall be equipped with a pressure gauge at least four inches in diameter on the inlet and outlet to indicate the pressure in pounds per square inch, and a sight glass that can be easily removed for cleaning shall be provided on the waste discharge line. Gravity type filters shall be equipped with loss of head gauges.

The filtration rate for diatomaceous earth filters and similar equipment may not exceed 1½ gallons per square foot of filter area with eight hours turnover of pool volume unless continuous slurry feed is provided, in which case, the rate shall not exceed three gallons per minute per square foot of filter area.

Arrangements or equipment shall be provided for application of filter aid and proper precoating and cleaning of filter elements. All filters shall be capable of being cleaned or backwashed by use of the washwater pump and the manipulation of valves. In view of the constant change of design of such equipment, it will be necessary to evaluate each system individually. Approval or rejection of systems will be at the discretion of the State Health Commissioner, based upon the need for protecting the health and safety of those using any such pool.

**12 VAC 5-460-220. Rate of flow indicators.**

Recirculation system shall be equipped with a rate of flow indicator reading in gallons per minute, located so as to indicate both the rate of flow of the effluent from the filter and the rate of backwash in gallons per minute in sand or anthracite coal filters.

**12 VAC 5-460-230. Suction cleaners.**

Suction cleaners shall be provided. Where the suction cleaner is operated by the recirculating pump, a device shall be provided for throttling the flow from the pool outlet, and the suction cleaner line shall be connected through the hair and lint catcher.

**12 VAC 5-460-240. Chemical feeding equipment.**

Means shall be provided for regulating the feeding of chemicals into the water in their circulation system. The installation of mechanically operated, positive, chemical feeders or open-type chemical machines is required. The installation of closed-type solution pots is prohibited.

**12 VAC 5-460-250. Disinfection equipment.**

All swimming pools shall be provided with approved chlorine feeding equipment. The chlorinating equipment shall be capable of applying a dose up to 6.0 ppm of chlorine at the rate of recirculation. Chlorine gas feeding equipment and chlorine gas cylinders shall be installed in an enclosed space or room separate from the filter room and equipped with a door capable of being locked. When this chlorinator room is tight, it shall be

equipped with a forced draft fan exhausting to the outside from the floor level, and a fresh air inlet shall be provided near the ceiling. Forced draft apparatus shall have sufficient capacity to exhaust the contents of the room in at least three minutes. The chlorine gas tanks shall be protected from direct sunlight and fastened in place during storage and use. An approved type gas mask shall be provided where chlorine gas is being utilized. Gas masks shall be located accessible to, but outside of, the chlorinator room.

Nothing in this section shall be construed as debarring any other method of disinfection or filtration equipment demonstrated to be of at least equal efficiency and approved by the State Health Commissioner.

**12 VAC 5-460-260. Chemical testing equipment.**

Each swimming pool shall be provided with satisfactory equipment for the determination of hydrogen-ion concentration (pH) ranging from 6.8 to 8.0. Satisfactory equipment shall also be provided for the determination of residual chlorine content ranging from 0.0 to 1.0.

**12 VAC 5-460-270. Operating records.**

Acceptable records of the operation of the swimming pool shall be maintained. These records shall include pH levels, free chlorine residual, water clarity, cleanliness, and such other things as may be required for the health and safety of the bathers. These records shall be kept on file for a period of one year.

**12 VAC 5-460-280. Disinfection.**

The chlorination equipment shall be operated so as to maintain a free chlorine residual content of not less than 0.5 ppm at all points throughout the swimming pool water when there are bathers present.

**12 VAC 5-460-290. Alkalinity.**

The hydrogen-ion concentration should be maintained at 7.2 or above.

**12 VAC 5-460-300. Filtration; water clarity.**

The filters should be operated 24 hours per day during the season of use of the swimming pool. At all times when the pool is open for use, the water shall be sufficiently clear to permit a disc six inches in diameter, divided into alternate black and white quadrants, when placed on the bottom of the pool at the deepest point, to be clearly visible from the swimming pool deck at all distances up to ten yards in a horizontal direction from the projection of the disc on the swimming pool surface.

Chemicals other than chlorine, sodium or calcium hypochlorite, lime, soda ash, and aluminum sulfate shall not be used to treat swimming pool water without permission.

**12 VAC 5-460-310. Filter room placards.**

A placard shall be prominently displayed showing the following data: (I) size of the swimming pool in feet and volume in gallons; (ii) capacity of the filters in square feet and gallons per minute; (iii) capacity of the pumps in gallons per minute at the appropriate head in feet; (iv) head loss at which the filters should be backwashed; and (v) complete instructions for operating the recirculation and disinfection equipment.

**12 VAC 5-460-320. Lifeguards.**

The management of any transient lodging establishment where a swimming pool has been provided for the use of guests shall designate and have on duty a reliable and competent person as a lifeguard and management shall further provide for the use of this lifeguard, such life saving equipment as may be required depending upon the size and depth of the pool.

**12 VAC 5-460-330. Commissioner approval.**

For any items not specifically covered in this chapter, the State Health Commissioner is authorized to require that all materials, methods of construction and design features shall be proven to function adequately, effectively and without excessive maintenance and operational difficulties before he grants approval thereof, and such approval shall be based upon the need for protecting the health and safety of those using swimming pools.

It shall be the duty of the applicant to provide such data, tests, or other adequate proof that the device,

material, or product will satisfactorily perform the function for which it is intended before such item shall be approved or accepted for tests.

**12 VAC 5-460-340. Water supplies, lighting, overflow facilities, inlets and outlets.**

See 12 VAC 5-460-40 & 12 VAC 5-460-150.

12 VAC 5-460-350. Location and slopes.

Wading pools shall be located so that drainage from surrounding areas will not wash contamination into pools during rainfall. The bottom of wading pools shall slope not less than three inches in 10 feet toward the drain.

**12 VAC 5-460-360. Deck area.**

Wading pools shall be entirely surrounded by a deck at least four feet in width. Decks shall be constructed of a permanently impervious material, which shall have and retain a finish as smooth as possible that is nonslip to bare feet. The deck shall slope not less than three inches in 10 feet away from the pool edge, and the water on the deck shall be discharged to waste.

**12 VAC 5-460-370. Protection.**

Wading pools and wading areas shall be separated from swimming pools by appropriate protectional features.

**12 VAC 5-460-380. Water circulation systems.**

A complete recirculation system shall be installed at wading pools, which cannot be served adequately by an adjacent swimming pool recirculation system. The recirculation system shall provide a pool volume turnover rate of once in three hours or less.

An alternate method to the water circulation system is the continuous addition of water properly treated at a rate of flow sufficient to replace all of the water in the wading pool once in three hours or less. The overflow water, with this method, shall be continuously discharged to waste.

**12 VAC 5-460-390. Waste discharge.**

See 12 VAC 5-460-120.

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**PART III. Spray Pools.**

12 VAC 5-460-400. Water supplies.

12 VAC 5-460-410. Materials.

12 VAC 5-460-420. Slopes.

12 VAC 5-460-430. Drains.

12 VAC 5-460-440. Deck areas.

**12 VAC 5-460-400. Water supplies.**

Water sprayed into a pool shall be from an approved supply. Spray heads shall be installed so that there will be

no possibility of their submergence and, as a result of clogged drains.

**12 VAC 5-460-410. Materials.**

Spray pools shall be constructed of permanently impervious material, which shall have and retain a finish as smooth as possible that is nonslip to bare feet.

**12 VAC 5-460-420. Slopes.**

Spray pool bottoms shall slope not less than three inches in 10 feet toward the drains.

**12 VAC 5-460-430. Drains.**

Spray pools shall be equipped at low points with an unvalved drain to waste. The drain shall be of such size and design that water sprayed into the pool will not pond in the pool bottom.

**12 VAC 5-460-440. Deck areas.**

Spray pools shall be entirely surrounded by a deck at least four feet in width. Decks shall be constructed of a permanently impervious material, which shall have and retain a finish as smooth as possible and nonslip to bare feet. The deck shall slope not less than three inches in 10 feet away from the pool edge and the water on the deck discharged to waste.

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Note: All subsequent pages will look best when viewed with a Web browser that is fully compliant with the proposed HTML 3.0 extensions. HTML 2.0 compliant browsers should be able to access all information; however in some cases, the format may be less than desirable.

# H.R. 6—303 to 309
# TITLE XIV—POOL AND SPA SAFETY

**SEC. 1401. SHORT TITLE.**

This title may be cited as the ''Virginia Graeme Baker Pool and Spa Safety Act''.

**SEC. 1402. FINDINGS.**

Congress finds the following:

(1) Of injury-related deaths, drowning is the second leading cause of death in children aged 1 to 14in the United States.

(2) In 2004, 761 children aged 14 and under died as a result of unintentional drowning.

(3) Adult supervision at all aquatic venues is a critical safety factor in preventing children from drowning.

(4) Research studies show that the installation and proper use of barriers or fencing, as well as additional layers of protection, could substantially reduce the number of childhood residential swimming pool drownings and near drownings.

**SEC. 1403. DEFINITIONS.**

In this title:

(1) ASME/ANSI.—The term ''ASME/ANSI'' as applied to a safety standard means such a standard that is accredited by the American National Standards Institute and published by the American Society of Mechanical Engineers.

(2) BARRIER.—The term ''barrier'' includes a natural or constructed topographical feature that prevents unpermitted access by children to a swimming pool, and, with respect to a hot tub, a lockable cover.

(3) COMMISSION.—The term ''Commission'' means the Consumer Product Safety Commission.

(4) MAIN DRAIN.—The term ''main drain'' means a submerged suction outlet typically located at the bottom of a pool or spa to conduct water to a recirculating pump.

(5) SAFETY VACUUM RELEASE SYSTEM.—The term ''safety vacuum release system'' means a vacuum release system capable of providing vacuum release at a suction outlet caused by a high vacuum occurrence due to a suction outlet flow blockage.

(6) SWIMMING POOL; SPA.—The term ''swimming pool'' or ''spa'' means any outdoor or indoor structure intended for swimming or recreational bathing, including in-ground and aboveground structures, and includes hot tubs, spas, portable spas, and non-portable wading pools.

(7) UNBLOCKABLE DRAIN.—The term ''unblockable drain'' means a drain of any size and shape that a human body cannot sufficiently block to create a suction entrapment hazard.

**SEC. 1404. FEDERAL SWIMMING POOL AND SPA DRAIN COVER STANDARD.**

(a) CONSUMER PRODUCT SAFETY RULE.—The requirements described in subsection (b) shall be treated as a consumer product safety rule issued by the Consumer Product Safety Commission under the Consumer Product Safety Act (15 U.S.C. 2051 et seq.).

(b) DRAIN COVER STANDARD.—Effective 1 year after the date of enactment of this title, each swimming pool or spa drain cover manufactured, distributed, or entered into commerce in the United States shall conform to the entrapment protection standards of the ASME/ANSI A112.19.8 performance standard, or any successor standard regulating such swimming pool or drain cover.

(c) PUBLIC POOLS.—

(1) REQUIRED EQUIPMENT.—

(A) IN GENERAL.—Beginning 1 year after the date of enactment of this title—

(i) each public pool and spa in the United States shall be equipped with anti-entrapment devices or systems that comply with the ASME/ANSI A112.19.8 performance standard, or any successor standard; and (ii) each public pool and spa in the United States with a single main drain other than an unblockable drain shall be equipped, at a minimum, with 1 or more of the following devices or systems designed to prevent entrapment by pool or spa drains that meets the requirements of subparagraph (B):

(I) SAFETY VACUUM RELEASE SYSTEM.—A safety vacuum release system which ceases operation of H. R. 6—305 the pump, reverses the circulation flow, or otherwise provides a vacuum release at a suction outlet when a blockage is detected, that has been tested by an independent third party and found to conform to ASME/ANSI standard A112.19.17 or ASTM standard F2387.

(II) SUCTION-LIMITING VENT SYSTEM.—A suction-limiting vent system with a tamper-resistant atmospheric opening.

(III) GRAVITY DRAINAGE SYSTEM.—A gravity drainage system that utilizes a collector tank.

(IV) AUTOMATIC PUMP SHUT-OFF SYSTEM.—An automatic pump shut-off system.

(V) DRAIN DISABLEMENT.—A device or system that disables the drain.

(VI) OTHER SYSTEMS.—Any other system determined by the Commission to be equally effective as, or better than, the systems described in subclauses (I) through (V) of this clause at preventing or eliminating the risk of injury or death associated with pool drainage systems.

(B) APPLICABLE STANDARDS.—Any device or system described in subparagraph (A)(ii) shall meet the requirements of any ASME/ANSI or ASTM performance standard if there is such a standard for such a device or system, or any applicable consumer product safety standard.

(2) PUBLIC POOL AND SPA DEFINED.—In this subsection, the term ''public pool and spa'' means a swimming pool or spa that is—

(A) open to the public generally, whether for a fee or free of charge;

(B) open exclusively to—

(i) members of an organization and their guests;

(ii) residents of a multi-unit apartment building, apartment complex, residential real estate development, or other multi-family residential area (other than a municipality, township, or other local government jurisdiction); or

(iii) patrons of a hotel or other public accommodations facility; or

(C) operated by the Federal Government (or by a concessionaire on behalf of the Federal Government) for the benefit of members of the Armed Forces and their dependents or employees of any department or agency and their dependents.

(3) ENFORCEMENT.—Violation of paragraph (1) shall be considered to be a violation of section 19(a)(1) of the Consumer Product Safety Act (15 U.S.C. 2068(a)(1)) and may also be enforced under section 17 of that Act (15 U.S.C. 2066).

**SEC. 1405. STATE SWIMMING POOL SAFETY GRANT PROGRAM.**

(a) IN GENERAL.—Subject to the availability of appropriations authorized by subsection (e), the Commission shall establish a grant program to provide assistance to eligible States.

(b) ELIGIBILITY.—To be eligible for a grant under the program, a State shall—

(1) demonstrate to the satisfaction of the Commission that it has a State statute, or that, after the date of enactment of this title, it has enacted a statute, or amended an existing statute, and provides for the enforcement of, a law that—

(A) except as provided in section 1406(a)(1)(A)(i), applies to all swimming pools in the State; and

(B) meets the minimum State law requirements of section 1406; and

(2) submit an application to the Commission at such time, in such form, and containing such additional information as the Commission may require.

(c) AMOUNT OF GRANT.—The Commission shall determine the amount of a grant awarded under this title, and shall consider—

(1) the population and relative enforcement needs of each qualifying State; and

(2) allocation of grant funds in a manner designed to provide the maximum benefit from the program in terms of protecting children from drowning or entrapment, and, in making that allocation, shall give priority to States that have not received a grant under this title in a preceding fiscal year.

(d) USE OF GRANT FUNDS.—A State receiving a grant under this section shall use—

(1) at least 50 percent of amounts made available to hire and train enforcement personnel for implementation and enforcement of standards under the State swimming pool and spa safety law; and

(2) the remainder—

(A) to educate pool construction and installation companies and pool service companies about the standards;

(B) to educate pool owners, pool operators, and other members of the public about the standards under the swimming pool and spa safety law and about the prevention of drowning or entrapment of children using swimming pools and spas; and

(C) to defray administrative costs associated with such training and education programs.

(e) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Commission for each of fiscal years 2009 and 2010 $2,000,000 to carry out this section, such sums to remain available until expended. Any amounts appropriated pursuant to this subsection that remain unexpended and unobligated at the end of fiscal year 2010 shall be retained by the Commission and credited to the appropriations account that funds enforcement of the Consumer Product Safety Act.

**SEC. 1406. MINIMUM STATE LAW REQUIREMENTS.**

(a) IN GENERAL.—

(1) SAFETY STANDARDS.—A State meets the minimum State law requirements of this section if—

(A) the State requires by statute—

(i) the enclosure of all outdoor residential pools and spas by barriers to entry that will effectively prevent small children from gaining unsupervised and unfettered access to the pool or spa;

(ii) that all pools and spas be equipped with devices and systems designed to prevent entrapment by pool or spa drains;

(iii) that pools and spas built more than 1 year after the date of the enactment of such statute have—

(I) more than 1 drain;

(II) 1 or more unblockable drains; or

(III) no main drain;

(iv) every swimming pool and spa that has a main drain, other than an unblockable drain, be equipped with a drain cover that meets the consumer product safety standard established by section 1404; and

(v) that periodic notification is provided to owners of residential swimming pools or spas about compliance with the entrapment protection standards of the ASME/ANSI A112.19.8 performance standard, or any successor standard; and

(B) the State meets such additional State law requirements for pools and spas as the Commission may establish after public notice and a 30-day public comment period.

(2) NO LIABILITY INFERENCE ASSOCIATED WITH STATE NOTIFICATION REQUIREMENT.—The minimum State law notification requirement under paragraph (1)(A)(v) shall not be construed to imply any liability on the part of a State related to that requirement.

(3) USE OF MINIMUM STATE LAW REQUIREMENTS.—The Commission—

(A) shall use the minimum State law requirements under paragraph (1) solely for the purpose of determining the eligibility of a State for a grant under section 1405 of this Act; and

(B) may not enforce any requirement under paragraph (1) except for the purpose of determining the eligibility of a State for a grant under section 1405 of this Act.

(4) REQUIREMENTS TO REFLECT NATIONAL PERFORMANCE STANDARDS AND COMMISSION GUIDELINES.—In establishing minimum State law requirements under paragraph (1), the Commission shall—

(A) consider current or revised national performance standards on pool and spa barrier protection and entrapment prevention; and

(B) ensure that any such requirements are consistent with the guidelines contained in the Commission's publication 362, entitled ''Safety Barrier Guidelines for Home Pools'', the Commission's publication entitled ''Guidelines for Entrapment Hazards: Making Pools and Spas Safer'', and any other pool safety guidelines established by the Commission.

(b) STANDARDS.—Nothing in this section prevents the Commission from promulgating standards regulating pool and spa safety or from relying on an applicable national performance standard.

(c) BASIC ACCESS-RELATED SAFETY DEVICES AND EQUIPMENT REQUIREMENTS TO BE CONSIDERED.—In establishing minimum State law requirements for swimming pools and spas under subsection (a)(1), the Commission shall consider the following requirements:

(1) COVERS.—A safety pool cover.

(2) GATES.—A gate with direct access to the swimming pool or spa that is equipped with a self-closing, self-latching device.

(3) DOORS.—Any door with direct access to the swimming pool or spa that is equipped with an audible alert device or alarm which sounds when the door is opened.

(4) POOL ALARM.—A device designed to provide rapid detection of an entry into the water of a swimming pool or spa.

(d) ENTRAPMENT, ENTANGLEMENT, AND EVISCERATION PREVENTION STANDARDS TO BE REQUIRED.—

(1) IN GENERAL.—In establishing additional minimum State law requirements for swimming pools and spas under subsection (a)(1), the Commission shall require, at a minimum, 1 or more of the following (except for pools constructed without a single main drain):

(A) SAFETY VACUUM RELEASE SYSTEM.—A safety vacuum release system which ceases operation of the pump, reverses the circulation flow, or otherwise provides a vacuum release at a suction outlet when a blockage is detected, that has been tested by an independent third party and found to conform to ASME/ANSI standard A112.19.17 or ASTM standard F2387, or any successor standard.

(B) SUCTION-LIMITING VENT SYSTEM.—A suction-limiting vent system with a tamper-resistant atmospheric opening.

(C) GRAVITY DRAINAGE SYSTEM.—A gravity drainage system that utilizes a collector tank.

(D) AUTOMATIC PUMP SHUT-OFF SYSTEM.—An automatic pump shut-off system.

(E) DRAIN DISABLEMENT.—A device or system that disables the drain.

(F) OTHER SYSTEMS.—Any other system determined by the Commission to be equally effective as, or better than, the systems described in subparagraphs (A) through (E) of this paragraph at preventing or eliminating the risk of injury or death associated with pool drainage systems.

(2) APPLICABLE STANDARDS.—Any device or system described in subparagraphs (B) through (E) of paragraph (1) shall meet the requirements of any ASME/ANSI or ASTM performance standard if there is such a standard for such a device or system, or any applicable consumer product safety standard.

**SEC. 1407. EDUCATION PROGRAM.**

(a) IN GENERAL.—The Commission shall establish and carry out an education program to inform the public of methods to prevent drowning and entrapment in swimming pools and spas. In carrying out the program, the Commission shall develop—

(1) educational materials designed for pool manufacturers, pool service companies, and pool supply retail outlets;

(2) educational materials designed for pool owners and operators; and

(3) a national media campaign to promote awareness of pool and spa safety.

(b) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Commission for each of the fiscal years 2008 through 2012 $5,000,000 to carry out the education program authorized by subsection (a).

**SEC. 1408. CPSC REPORT.**

Not later than 1 year after the last day of each fiscal year for which grants are made under section 1405, the Commission shall submit to Congress a report evaluating the implementation of the grant program authorized by that section.

# Vomit and Blood Contamination of Pool Water

**Check for existing guidelines from your local or state regulatory agency before use. Healthy Swimming recommendations do not replace existing state or local regulations or guidelines.**

The most common germs spread through recreational water are germs that cause diarrheal illnesses and skin rashes. These are spread by swallowing water contaminated with feces or by skin exposure to contaminated water. Pool water is unlikely to spread illness.

## Vomit in Pool Water

Vomiting while swimming appears to be a common event. Often, vomiting is a result of swallowing too much water and, therefore, the vomit is probably not infectious. However, if the full contents of the stomach are vomited, follow the guidance in these Q & As:

**Q: What germs are likely to be spread by vomit?**

A: Noroviruses (also known as Norwalk-like viruses)

**Q: Assuming that norovirus is in the vomit, what should I do?**

A: Respond to the vomit accident as you would respond to a formed fecal accident, using CDC's recommendations. The time and chlorine level combinations needed to kill noroviruses and *Giardia* are similar. Since killing *Giardia* is the basis of CDCs formed fecal accident response recommendations, this protocol should be adequate for disinfecting a potentially infectious vomit accident.

## Blood in Pool Water

Germs (e.g., Hepatitis B virus or HIV) found in blood are spread when infected blood or certain body fluids get into the body and bloodstream (e.g., by sharing needles and by sexual contact). CDC is not aware of any of these germs being transmitted to swimmers from a blood spill in a pool.

**Q: Does chlorine kill the germs in blood?**

A: Yes. These germs do not survive long when diluted into properly chlorinated pool water.

**Q: Swimmers want something to be done after a blood spill. Should the pool be closed for a short period of time?**

A: There is no public health reason to recommend closing the pool after a blood spill. However, some pool staff choose to do so temporarily to satisfy patrons.

Content Source: Division of Parasitic Diseases, National Center for Zoonotic, Vector-borne, and Enteric Diseases
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**Page Located on the Web at http://www.cdc.gov/healthyswimming/bloodandvomit.htm**

# POOL/SPA OPERATORS WEEKLY REPORT

POOL NAME _____ ADDRESS _____

OPERATOR _____ DATES _____ TO _____

| TIME | | MON | TUES | WED | THUR | FRI | SAT | SUN |
|---|---|---|---|---|---|---|---|---|
| | CHLORINE | | | | | | | |
| | PH | | | | | | | |
| | CHLORINE | | | | | | | |
| | PH | | | | | | | |
| | CHLORINE | | | | | | | |
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| | PH | | | | | | | |
| | CHLORINE | | | | | | | |
| | PH | | | | | | | |
| | CHLORINE | | | | | | | |
| | PH | | | | | | | |

## DAILY TASKS AND READINGS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BACKWASH | | | | | | | |
| HAIR STRAINER | | | | | | | |
| VACUUM POOL | | | | | | | |
| CHECK SKIMMERS | | | | | | | |
| ADD CHLORINE | | | | | | | |
| ADJUST pH (+/-) | | | | | | | |
| WATER TEMP. | | | | | | | |
| WATER CLARITY | | | | | | | |
| WEATHER | | | | | | | |
| COMMENTS | | | | | | | |

## WEEKLY TESTS AND READINGS

| CYANURIC ACID | TOTAL ALKALINITY | CALCIUM HARDNESS |
|---|---|---|
| _____ppm | _____ppm | _____ppm |

Produced and Distributed by TFHA Swimming Pool Conference

## Sec. 17-1. - Definitions.

For the purpose of this chapter, the following words and phrases shall have the meanings respectively ascribed to them by this section:

*Director of public health* shall mean the director of public health for the city or his authorized agent.

*Fence* shall mean a close type vertical barrier not less than four feet in height above ground surface; a woven steel wire, chain link, picket or solid-board type fence or a fence of similar construction which will prevent the smallest of children from getting through.

*Maximum or design load* shall mean the maximum number of bathers permitted in the pool at any one time and shall be determined by dividing the total square footage of swimming pool water surface area by 27.

*Operator or manager* shall mean the individual responsible for the operation and management of the swimming pool.

*Private residential swimming pool* shall mean any swimming pool located on a single-family residential lot, under the control of the homeowner, the use of which is limited to swimming or bathing by members of his family or their invited guests.

*Public swimming pool* shall mean any swimming pool that is used or intended to be used collectively by numbers of persons for swimming or bathing, operated by any person, whether an owner, lessee, operator or concessionaire, regardless of whether a fee is charged for such use, including but not limited to a swimming pool owned or operated as a private club or association, a civic club or any association, a homeowners association, an apartment complex or a time-share establishment. The following are excluded from this definition: private residential swimming pools as defined in this section 17-1 and hotel or motel swimming pools operated in conjunction therewith and duly regulated and inspected by the Virginia Department of Health.

*Swimming pool* shall mean any swimming, wading or spray pool, including all appurtenant equipment, structures and facilities, for the purpose of providing a swimming, bathing or wading place for any person.

*(Code 1975, § 25.1-3; Ord. No. 07-40, § 1, 11-8-07)*

***Cross reference—*** *Definitions and rules of construction generally, § 1-2.*

## Sec. 17-2. - Purpose of chapter.

The purpose of this chapter is to provide for regulations relating to the design, construction, alteration and maintenance of sanitation and safety features applying to the use and operation of all constructed swimming pools, with the exception of private therapeutic purposes, to provide for permits for the construction of swimming pools, to provide for administration and enforcement of this chapter and to provide a penalty for violations thereof.

*(Code 1975, § 25.1-1)*

## Sec. 17-3. - Applicability.

The structural and equipment provisions and requirements of this chapter shall not apply to any swimming pools constructed prior to April 14, 1977, except:

(1)

When any condition exists in such swimming pool that would endanger the health, safety or life of any person, the director of public health shall have the authority to order such swimming pool closed until such condition is corrected.

(2)

When any alteration, placement or replacement of any equipment is made in any such swimming pool, such portion that is altered, placed or replaced shall comply herewith.

(3)

The provisions and requirements of this chapter with respect to fences, operational procedures and standards, chemical feeding equipment, flowmeters, pressure gauges, toilet facilities and lifeguards shall be complied with by all public swimming pools, regardless of date of construction.

*(Code 1975, § 25.1-2)*

## Sec. 17-4. - Permit to operate required.

It shall be unlawful for any person who does not possess an unrevoked operator's permit issued to him by the director of public health to operate a public swimming pool in the city or to open such pool for use. An operator's permit as provided for in this chapter shall be issued only to an individual or to an organization, naming a specific individual to be in charge, and shall be valid only until the end of the calendar year in which it is issued unless sooner revoked by the director of public health. A permit to operate shall only be issued for those public swimming pools meeting the requirements of this chapter. Such permit shall be posted under transparent waterproof material in view of the bathers at such swimming pool.

*(Code 1975, § 25.1-12)*

## Sec. 17-5. - Inspection.

As a condition for the issuance of an operator's permit, the operator or person in charge of any public swimming pool shall upon request of the director of public health permit access to all parts of the establishment at all reasonable times for the purpose of inspection.

*(Code 1975, § 25.1-13)*

## Sec. 17-6. - Authority to order pools closed; revocation of operator's permit.

When the director of public health finds that any condition exists that endangers the health or safety of the users of a public swimming pool, he may order the pool closed until such condition is corrected. Continued failure to comply with this chapter shall be cause for revocation of any operator's permit issued pursuant to this chapter.

*(Code 1975, § 25.1-14)*

## Secs. 17-7—17-25. - Reserved.

## Sec. 17-26. - Permit required for construction, alteration, etc.

No person shall begin construction of a swimming pool or shall substantially alter or reconstruct any swimming pool without first having submitted plans and specifications to the director of public health for review and approval and obtained a permit to construct or alter such swimming pool. All plans and specifications, when approved, will be so stamped and returned to the applicant together with a permit to construct or alter. Original tracings will not be stamped for approval. A building permit shall not be issued by the building official until approval has been granted for construction by the director of public health and other necessary departments as required by law.

*(Code 1975, § 25.1-4)*

## Sec. 17-27. - Design and construction of pool and pool area.

(a)

*Water supply.* All water used in swimming pools shall be from sources that are approved by the director of public health. No piping arrangements shall exist which, under any conditions, will permit sewage or wastewater to enter the swimming pool system or water from the swimming pool to enter the make-up supply.

(b)

*Location.* The location of the pool shall in no way hinder the operation for which it is designed nor adversely affect the bathers' safety or water quality.

(c)

*Materials of pool shell.* Swimming pool shells shall be of reinforced concrete, or its equivalent in strength and durability which is designed and built to withstand anticipated stresses and which is of watertight construction. The pool shell shall have smooth and easily cleanable surfaces. A white or light colored waterproof interior

finish which will withstand repeated brushings, scrubbing and cleaning procedures shall completely line the pool to the coping.

(d)

*Shape and slopes.* The pool shall be designed and constructed to such shape and contour that efficient and safe control of the bathers can be accomplished. In water depth under five feet, the slope of the bottom shall not exceed one foot vertical in seven feet horizontal. To a depth up to five feet from the top, the wall slope shall not be more than two feet horizontal in five feet vertical. The transition point between shallow and deep water shall not be more than five feet deep.

(e)

*Pool decks.* There shall be a deck at least four feet wide extending around the entire perimeter of the pool. The deck shall be constructed of concrete or other material, having a nonslip but smooth finish. The deck shall have a pitch of not less than one-eighth of an inch nor more than five-eighths of an inch to the foot and be so designed as to conduct drainage away from the pool area in the manner that will not create or maintain pools of water or a health nuisance.

(f)

*Steps and ladders.* Two or more ladders shall be provided for all pools having a perimeter greater than 100 feet and one means of egress for pools 100 feet or less. Treads of all steps, ladders, or other means shall be of nonslip construction. Each recessed step area shall be provided with one or more handrails.

(g)

*Overflow facilities.* Provision shall be made for removal of floating material and scum from the surface of the water.

(1)

If a recessed type of gutter located near the top of the walls is to be used, the gutter shall have a minimum depth of three inches and shall be of a design which will permit satisfactory cleaning of the overflow channel. The gutter drain outlets shall be spaced around the pool not more than 15 feet on centers. The gutter bottom shall slope toward these outlets with a minimum slope of one-quarter inch to the foot. The drains shall not be less than 2½ inches in diameter and the total orifice area of the grating shall be at least twice the cross sectional area of the outlet pipe.

(2)

For pools with overflowing gutters, a water-level control tank shall be provided which will effectively provide for maintenance of the water level so as to produce constant surface skimming action at all times.

(3)

The above described gutter may be replaced by an arrangement of overflow devices in the walls which will provide the proper removal of scum and

floating material. There shall be one such device for each 1,000 square feet of pool area or fraction thereof, with a minimum of four per pool, each of which shall be individually controlled.

(4)

If the recirculation system is designed for water to enter the bottom portion of the pool and overflow the top, then adequate drainage of the scum and floating material from the deck must be provided. This may be by a continuous drain or multiple drains. In multiple drains, each drain grating shall have a total orifice area of at least four times the cross-sectional area of drain pipe, which shall have a minimum diameter of 2½ inches. In the use of drain channels, continuous around the perimeter of the pool, the channel grating shall be designed so as not to create a hazard to fingers and toes and to be resistant to corrosion.

(h)

*Inlets and outlets.* The inlets for recirculation shall be submerged and be located to produce uniform circulation of water throughout the swimming pool without the existence of dead spots. Wall inlets shall be located on not more than 20-foot centers entirely around the perimeter of the swimming pool. Bottom inlets shall be spaced, depending on the dimensions, so as to produce uniform water circulation. The number of bottom inlets shall be the same as required of all wall inlets. Each inlet is to be designated as an adjustable orifice or provided with a valve.

(1)

Direct connection to a sanitary sewer or septic tank shall not be permitted.

(2)

Disposal of wastewater to a storm sewer or natural watercourse shall be subject to approval of the director of public health and the director of public works, having regard for the health, safety and public welfare.

(3)

The outlet drain shall be covered with a grate of such design that it cannot be readily removed by or produce any hazard to the bathers.

(i)

*Depth markings.* The depth of the water in the swimming pool shall be marked at every foot increment of depth in water depth five feet and under on both sides of the pool and on top of the coping. In water deeper than five feet, the markings need not be closer than three feet apart. Numerals and letters shall be at least five inches in size and of good contrast with the walls and deck.

(j)

*Diving boards.* At least 12 feet of free and unobstructed headroom shall be provided above the diving boards.

(1)

The minimum depth of water in the diving areas shall be determined as follows:

| Elevation of Diving Point Above Water Surface | Depth of Water | Dimensions End Wall to Maximum Depth | Maximum Depth to 5 feet |
|---|---|---|---|
| 0 to 24 inches inclusive | 8 ft. | 12 ft. | 12 ft. |
| 24 inches to 30 inches inclusive | 8 ft. | 13 ft. | 17 ft. |
| 30 inches plus to 1 meter inclusive | 8 ft. 6 in. | 15 ft. | 20 ft. |
| 1 meter plus to 3 meters inclusive | 10 ft. | 15 ft. | 20 ft. |
| 3 meters plus to 5 meters | 14 ft. 6 in. | 17 ft. | 23 ft. |

(2)

The minimum of length of any diving area terminating at a vertical wall shall be 30 feet.

(3)

Where multiple diving boards are used, the space between centerlines shall be not less than ten feet, and the center of no board shall be closer than ten feet to a side wall. These dimensions shall apply both from a point of projection four feet from the end wall and the point of maximum depth.

(4)

The space between centerlines of three-meter and five-meter diving boards shall be not less than 15 feet and between five-meter and ten-meter boards shall be not less than 18 feet. The minimum distances from centerlines of five-meter and ten-meter boards shall be the same as to the side walls.

(k)

*Lighting.* Where pools are to be used after dark, the swimming pool area shall be equipped with lighting fixtures of such number and design as to light all parts of the pools, the water therein and the entire area. Fixtures shall be installed in such manner as to create no hazard to the bathers. The design and installation of the fixtures shall be such that lifeguards can clearly see every part of the swimming pool, including decks, spring boards and other appurtenances, without being blinded by glare. If installed, submarine lights shall provide at least one watt per square foot of pool area. Each submarine light shall be properly connected to a ground wire.

(l)

*Food and drink facilities.* Food and drink preparation, serving and consumption facilities shall be permitted only within designated areas and, in all cases, a minimum of 12 feet from the water.

*(Code 1975, § 25.1-5)*

## Sec. 17-28. - Fencing requirements.

(a)

It shall be unlawful for any person to construct, maintain, use, possess or control any pool not elevated over four feet above the immediately surrounding ground level of any property in the city unless the property on which the pool is located is enclosed with a fence which complies with the provisions of the building code and the zoning ordinance of the city.

(b)

In lieu of the property being fenced, the pool itself shall be completely surrounded by a fence as provided in the definition of the word "fence." The fence shall be equipped with a self-locking gate or door that shall be kept locked when the pool is not in use. The requirements of this paragraph shall not apply to swimming pools that are constructed as an integral part of a residence or housed in a separate structure. Such fence shall be constructed so as to come within two inches of the ground at the bottom and shall be at least four feet from the edge of the pool at any point.

*(Code 1975, § 25.1-6)*

## Sec. 17-29. - Recirculation system and appurtenances.

(a)

*Recirculation system.* All swimming pools shall be equipped with a recirculation system consisting of pumps, hair and lint catchers, filters, disinfection equipment and necessary pipe connections to the inlets and outlets. The recirculation system shall be designed for an eight-hour or less turnover of the swimming pool water.

(b)

*Filter room.* Any room containing the filtration equipment, pumps and other recirculation system appurtenances shall be finished in a light color and provided with adequate illumination and ventilation. The floor of the filter room shall be designed to provide adequate drainage. The provision of any facility for discharging filter backwashing water onto the filter room floor is strictly prohibited, and adequate provision shall be made for the discharge of backwash water. All of the recirculation equipment in this room shall be installed so that it is easily convenient to operate or repair. All entrances below ground surface shall be by stairway and vertical door. Adequate headroom shall be provided above all filters. Belowground filter rooms shall be provided with mechanical ventilation.

(c)

*Pumps.* The pumping equipment shall have sufficient capacity to discharge the volume of water for the required turnover of the pool against the maximum head in the recirculation system. The pump used for backwashing sand filters shall have sufficient capacity to backwash the unit at the rate of at least 12 gallons per minute per square foot of filter area against the maximum head developed during the backwashing.

(d)

*Hair and lint catcher.* The hair and lint catcher shall be installed ahead of the filter pump and be designed and located so that it can be easily and simply dismantled for cleaning and inspection.

(e)

*Filters.* The recirculation system shall be equipped with a filtration system that will filter the entire contents of the swimming pool within eight hours or less at the rate of three gallons or less per square foot of filter area for rapid sand filters and 20 gallons or less per square foot of filter area for high-rate sand filters. Pressure filters shall be equipped with readily accessible air relief valves and with an access hole large enough to permit inspections, maintenance and repair work. Each pressure filter system shall be equipped with a pressure gauge at least four inches in diameter on the inlet and outlet to indicate the pressure in pounds per square inch, and a sight glass that can be easily removed for cleaning shall be provided on the waste discharge line. Gravity type filters shall be equipped with loss-of-head gauges.

(1)

The filtration rate for diatomaceous earth filters and similar equipment may not exceed 1½ gallons per square foot of filter area with eight hours turnover of pool volume unless continuous slurry feed is provided, in which case the rate shall not exceed three gallons per square foot of filter area.

(2)

Arrangements or equipment shall be provided for application of filter aid and proper precoating and cleaning of filter elements. All filters shall be so designed and capable of being cleaned or backwashed by use of the washwater pump and the manipulation of valves. In view of the constant change of design of such equipment, it will be necessary to evaluate each system individually and approval or rejection will be at the discretion of the director of public health, based upon the need for protecting the health and safety of those using the pool.

(f)

*Rate of flow indicators.* The recirculation system shall be equipped with a rate of flow indicator reading in gallons per minute, located so as to indicate the rate of flow of the effluent from the filter and also, in sand or anthracite coal filters, the rate of backwash in gallons per minute.

(g)

*Suction cleaner.* A suction cleaner shall be provided. Where the suction cleaner is operated by the recirculating pump, a device shall be provided for throttling the flow from the pool outlet, and the suction cleaner line shall be connected through the hair and lint catcher.

(h)

*Chemical feeding equipment.* Means shall be provided for regulating the feeding of chemicals to the water in the recirculation system. The installation of mechanically operated, positive chemical feeders or open type chemical machines is required. The installation of closed type solution pots is prohibited.

(i)

*Disinfection equipment.* All public swimming pools shall be provided with disinfectant feeding equipment capable of applying free residual disinfectants of the type and within the rates of recirculation as prescribed by Virginia Department of Health regulations as in force from time to time. Disinfectant feeding equipment and containers shall be installed in an enclosed space or room, separate from the filter room, equipped with a door capable of being locked. Such room shall be equipped with a forced draft fan exhausting to the outside from the floor level, and a fresh air inlet shall be provided near the ceiling. The exhaust fan discharge shall terminate at least 12 feet above any area that may be occupied by any person or persons. Forced draft apparatus shall have sufficient capacity to exhaust contents of the room in not more than three minutes. Disinfectant storage containers shall be protected from direct sunlight and fastened in place during storage and use. A laboratory approved type gas mask shall be provided where disinfectant gasses are being utilized and shall be located accessible to, but outside of, the room containing the disinfectant containers and equipment. Nothing under this section shall be construed as disqualifying any other method of disinfection, or filtration equipment demonstrated to be of at least equal efficiency and which is approved by the director of public health.

(j)

*Chemical testing equipment.* Each swimming pool shall be provided with satisfactory equipment for the determination of acidity or alkalinity (pH) ranging from 6.8 to 8. Satisfactory equipment shall also be provided for determination of residual chlorine content ranging from 0 to 5.0 ppm.

*(Code 1975, § 25.1-7; Ord. No. 07-40, § 2, 11-8-07; Ord. No. 08-28, 9-11-08)*

## Sec. 17-30. - Pool operation and maintenance.

(a)

*Operating records.* Daily records of the operation of the swimming pool shall be maintained. These records shall include pH, the free chlorine residual, water clarity, cleanliness, safety and such other matters as may be required for the health and safety of the bathers by the director of public health. These records shall be kept on file for a period of one year.

(b)

*Disinfection.* The treatment system shall be so designed and installed as to provide in the water, at all times when the pool is in use, free residual disinfectants of the

types and within rates as may be prescribed by the Virginia Department of Health from time to time.

(c)

*Alkalinity.* Acid alkalinity of the pool water shall not be below 7.2 or more than 7.8.

(d)

*Filtration.* The filters shall be operated 24 hours per day during the season of use of the swimming pool. At all times when the pool is open for use, the water shall be sufficiently clear to permit a disc six inches in diameter, divided into alternate black and white quadrants, when placed on the bottom of the pool at the deepest point, to be clearly visible from the swimming pool deck at all distances up to ten yards in a horizontal direction from the projection of the disc on the swimming pool surface. Chemicals other than chlorine, sodium hypochlorite or calcium hypochlorite, lime, soda ash and aluminum sulfate shall not be used to treat swimming pool water without prior approval of the director of public health.

(e)

*Filter room placard.* A placard shall be prominently displayed showing the following data:

(1)

Size of the swimming pool in feet and volume in gallons.

(2)

Capacity of the filters in square feet and gallons per minute.

(3)

Capacity of the pumps in gallons per minute at the appropriate head in feet.

(4)

Head loss at which the filters should be backwashed and complete instructions for operating the recirculation and disinfection equipment.

(f)

*Lifesaving equipment.* The management of any public swimming pool shall provide minimum lifesaving equipment consisting of either a "shepherd's crook" or a "throw ring" with rope attached, capable of reaching across half of the width of the pool. The director of public health may, in writing, require additional lifesaving equipment, when such is deemed necessary due to the size of the pool or activity therein.

(g)

*Other items.* For any items not specifically covered in these requirements, the director of public health is hereby authorized to require that all materials, methods of construction and design features shall prove to function adequately, effectively and without excessive maintenance and operation difficulties before he grants approval thereof, and such approval shall be based upon the need for protecting the health and safety of those using the pool. It shall be the duty of the applicant to provide such data, tests or other adequate proof that the device, material or product will

satisfactorily perform the function for which it is intended before such item shall be approved.

*(Code 1975, § 25.1-8; Ord. No. 07-40, § 3, 11-8-07; Ord. No. 08-28, 9-11-08)*

## Sec. 17-31. - Wading pool construction and design.

(a)

*Water supply.* Water supply, lighting, overflow facilities, inlets and outlets for wading pools shall be the same as required in section 17-27(a), (g), (h) and (k).

(b)

*Location and slopes.* The wading pool shall be located so that drainage from the surrounding area will not wash contamination into the pool during rainfall. The bottom of the wading pool shall slope not less than three inches in ten feet toward the drain.

(c)

*Deck area.* The wading pool shall be entirely surrounded by a deck at least four feet in width, constructed of permanently impervious material which shall have and retain a finish as smooth as possible that is nonslip to bare feet. The deck shall slope not less than three inches in ten feet away from the pool edge and the water on the deck discharged to waste.

(d)

*Protection.* Wading pools and/or wading areas shall be separated from swimming pools by appropriate protectional features.

(e)

*Circulation system.* A complete recirculation system shall be installed at wading pools which cannot be served adequately by an adjacent swimming pool recirculation system. The recirculation system shall provide a pool volume turnover rate of once in three hours or less.

(f)

*Chlorine content.* A free residual content of disinfectants of the types and within limits as may be prescribed by the Virginia Department of Health from time shall be maintained in all wading pools while in use.

*(Code 1975, § 25.1-9; Ord. No. 07-40, § 4, 11-8-07)*

## Sec. 17-32. - Spray pools.

(a)

*Water supply.* The water sprayed into the pool shall be from an approved supply. Spray heads shall be installed so that there will be no possibility of their submergency as might result in the case of clogged drains.

(b)

*Material.* Spray pools shall be constructed of permanently impervious material that shall have and retain a finish as smooth as possible that is nonslip to bare feet.

(c)

*Design slopes.* Spray pool bottoms shall slope not less than three inches in ten feet toward the drains.

(d)

*Drains.* The spray pool shall be equipped at its low point with an unvalved drain to waste. The drain shall be of such size and design that water sprayed into the pool will not pond in the pool bottom.

(e)

*Deck area.* The spray pool shall be entirely surrounded by a deck at least four feet in width, constructed of permanently impervious material which shall have and retain a finish as smooth as practical and be nonslip to bare feet. The deck shall slope not less than three inches in ten feet away from the pool edge, and the water on the deck shall be discharged to waste.

*(Code 1975, § 25.1-10)*

## Sec. 17-33. - Dressing rooms, showers and toilet facilities.

The following requirements apply to all public swimming pools, except as herein excepted:

(a)

*Dressing rooms.* A dressing room must be provided for each sex at all swimming pools, except as exempted below. Metal lockers, wire baskets, hooks or other sanitary means of storage of clothing and personal accessories shall be provided. Wooden lockers or clothes bags will not be permitted. All liquid wastes shall be discharged to an approved public sewerage system or to an approved individual sewage disposal system. The floors shall have a minimum pitch of three inches in ten feet to the drains with no low spots which will allow water to stand. The floors shall be of smooth but nonslip finish, and the rooms shall be ventilated so that the floors do not remain damp or wet between periods when the swimming pool is in use.

(b)

*Showers.* Showers shall be provided in the proportion of one for each 40 persons at the time of maximum load. Each shower shall supply an adequate quantity of heated water through a device that will prevent scalding. Drainage from each shower shall be such as to prevent water from one shower draining across the floor area of another. Showers shall be so located that the bathers will normally pass them on their way to the pool or have directional signs in the dressing area indicating their locations.

(c)

*Toilets.* A minimum of two water closets for females and one water closet and one urinal for males shall be provided at all swimming pools, except as exempted herein. The urinals and water closets shall be so located that the bathers will pass them on their way to the pool or directional signs provided in the dressing area indicating their location.

(d)

*Lavatories.* A minimum of one lavatory for females and one lavatory for males shall be provided for all swimming pools, except as exempted herein. Each lavatory shall be provided with suitable facilities for making soap available.

(e)

*Apartment facilities.* Pools located at apartment complexes, condominiums and time-shares which restrict the use of such to occupants and guests where the farthest unit is not over 500 feet from the pool shall be exempted from the provisions of subparagraphs (a) and (b) of this section 17-33

(f)

Except as hereinafter provided, the requirements of this section 17-33 shall not apply to any home owners' association or time share swimming pool construction of which commenced prior to November 18, 2007 (the effective date of this ordinance), nor shall it apply to any apartment or condominium swimming pool constructed prior to April 24, 1977. The above, notwithstanding, however, such exceptions shall not extend to any replacement of an excepted pool which replacement pool was/is constructed after the exception date specified above.

*(Code 1975, § 25.1-11; Ord. No. 07-40, § 5, 11-8-07; Ord. No. 08-28, 9-11-08)*

## Sec. 17-34. - Variances.

(a)

*Granting a variance.* The codes compliance administrator, after consultation with the director of public health, may grant a variance to this chapter, and shall follow the procedures set forth below.

(b)

*Requirements for a variance.* The codes compliance administrator may grant a variance if a thorough investigation reveals that the hardship imposed by this chapter outweighs the benefits that may be received by the public, and that the granting of such a variance shall not subject the public to unreasonable health risks.

(c)

*Application for a variance.* Any owner who seeks a variance shall apply in writing. The application shall be signed by the owner. The application shall include:

(1)

A citation to the regulation from which a variance is requested;

(2)

The nature of the variance requested;

(3)

Any relevant analytical results including results of relevant tests conducted pursuant to the requirements of this chapter;

(4)

Statements or evidence why the public health and welfare would not be degraded if the variance were granted;

(5)

Suggested conditions that might be imposed on the granting of a variance that would limit the detrimental impact on the public health and welfare;

(6)

Other information, if any, believed pertinent by the applicant; and

(7)

Such other information as the codes compliance administrator or director of public health may require.

(d)

*Evaluation of a variance application.*

(1)

The codes compliance administrator shall act on any variance request submitted within 60 calendar days of receipt of the request.

(2)

In the evaluation of a variance application, the codes compliance administrator shall consider the following factors:

a.

The cost and other economic considerations imposed by this requirement;

b.

The effect that such a variance would have on protection of the public health, welfare and safety;

c.

Such other factors as deemed appropriate.

(e)

*Disposition of a variance request.*

(1)

The codes compliance administrator may deny any application for a variance by sending a denial notice to the applicant by certified mail. The notice shall be in writing and shall state the reasons for the denial.

(2)

If the codes compliance administrator proposes to grant a variance request, the applicant shall be notified in writing of this decision. Such notice shall identify the variance, swimming pool covered, and shall specify the period of time for which the variance will be effective. The effective date of a variance shall be as stated in the variance.

*(Ord. No. 08-28, 9-11-08)*

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FOOTNOTE(S):

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[(76)] ***Cross reference—*** *Buildings and building regulations, ch. 5.* *(Back)*