Swimming Pool Course

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Purpose

The purpose of this manual is to provide and make readily accessible swimming pool information to anyone whom may have an interest and particularly anyone who wishes to become a Certified Pool Operator (CPO). This manual has been made available online at www.cdh.idaho.gov and has been designed to help pool operators become familiar with Idaho's Swimming Pool Regulations. The Idaho Swimming Pool Rules and Regulations can be found online at: (http://adminrules.idaho.gov/rules/current/16/index.html).

In order to become a CPO, the applicant will be required to obtain a passing score of 70% or higher on a standardized exam. The exam will only be available at your local Health Department offices. If a computer and or the internet is not available to you, please contact your local library as they often provide computer equipment and generally have access to the internet.

Introduction

Swimming pools are a very popular form of recreation in the United States, and their numbers are increasing. With increased popularity, their usage has gone up. Because of this, an improperly managed swimming pool can quickly become a public health hazard.

For this reason, the public swimming pool operator must know how to properly operate a pool. This manual is designed as a general source of information about swimming pools. It does not cover every aspect of swimming pool operations, but provides the basic information that every responsible pool operator should know.

It is important to remember that as a swimming pool operator, you are responsible for providing a safe and sanitary place for the public to swim. This means that you need to know how your particular pool works, and what to do if and when problems arise. This manual only provides general information about swimming pools. However, there is no substitute for learning all you can about your own particular pool.

If you have questions regarding swimming pools that cannot be answered by this manual, you may contact your local Health District or a professional pool service company in your area.

Health

Improper operation and maintenance of your pool can and will lead to health and safety problems. It is the responsibility of you, the pool operator, to assure a clean and safe environment for the public. A clean and well operated pool will help to prevent the spread of communicable diseases and will also help minimize the number of injuries and deaths associated with your pool.

Swimming pools if not operated properly can promote the spread of infectious diseases such as:

- Pseudomonas – ear aches and /or infections
- Staphylococcus – skin rash, itching
- Mycobacteria – lesions and ulcerated sores
- Trichophyton – athletes foot
- Streptococcus - pink eye/conjunctivitis
- Rhinovirus - Pneumonia, flu-like symptoms
- Shigella – diarrhea, vomiting, cramps
- Cryptosporidium – severe diarrhea, cramps, dehydration. For more information please go to www.cdc.gov/healthyswimming & http://www.nspf.org/en/resources/ref_links/factsheets.aspx
- Giardia – Diarrhea, nausea, cramps, greasy stool, dehydration

These are examples of sources from bathers. Notice the numbers of bacteria and viruses that can be introduced into the swimming pool water by just one bather. However, these excessive numbers of bacteria and viruses can be reduced drastically by:

1. Making all swimmers take a cleansing shower with soap and water before entering the pool. Try to imagine the numbers of bacteria and other amounts of waste that can enter a pool on a busy day if no one took a shower! You may as well run a public bath! Another thing to consider is the fact that water is a perfect media for the transmission of communicable and infectious diseases.
2. It is the responsibility of the pool operator to watch for people that may show signs of infectious diseases or rashes, lesions, runny noses, etc., and exclude them from the pool, if possible.
3. Avoiding excessive spitting, blowing of water from the nose, and spouting of water should also be prohibited.

Prevention of Recreational Water illness:

A. Poster for patrons
   1. If ill do not enter the water.
   2. Do not enter the water for two weeks after diarrhea has stopped.
   3. Do not ingest or swallow water.
   4. Do not diaper children at pool side.
   5. Wash hands with soap and water before eating.
   6. Shower with soap and water before entering the pool.

B. Information about disease transmission
C. Recommended disinfection methods
   1. Superchlorinate 20ppm chlorine for 12.75 hours at least 1 time per week.
   2. Investigate supplemental disinfection such as Ultraviolet light and Ozone to kill pathogenic organisms that survive in chlorinated water.
D. Recommend enforcement of showering before entering the pool.

HIV/AIDS:

- HIV virus is very fragile, and cannot survive very long outside the human body.
- No evidence of transmission in a pool.
- Individuals who are immune-compromised have a higher risk of becoming infected by disease producing bacteria in a pool.

Fecal Accidents:

- CLEAR THE POOL
- REMOVE THE "EVIDENCE"
- SHOCK WITH CAL-HYPO (or equivalent)
- SANITIZER LEVEL WITHIN PARAMETERS?

The fecal accident guidance from CDC has been changed. Based on new data, *Cryptosporidium* was found to be more resistant to chlorine disinfection when the pH was raised to 7.5 and an outbreak-associated strain was tested. As a result of these findings, the CT value has been changed from 9,600 to 15,300. A diarrheal event response will increase pool closure time from 8 hours (20 ppm free chlorine, pH 7.5) to 12.75 hours (20 ppm free chlorine, pH 7.5). The new guidelines are posted on the Healthy Swimming website at http://www.cdc.gov/healthywater/pdf/swimming/pools/fecal-incident-response-recommendations.pdf

For more information please go to www.cdc.gov/healthyswimming & http://www.nspf.org/en/resources/ref_links/factsheets.aspx

Safety

It has been said that “swimming pools are an accident waiting to happen”. By being a public swimming pool operator, you are assuming an enormous amount of risk. As representatives of your pool, you should become the lead person in providing operational procedures, developing your own injury prevention program, and securing organizational commitment.

Ultimately, through attending this course you should be able to recognize a situation and intervene before a much worse consequence can be realized. Some of the most common causes of pool-related accidents are:

- Falling on slippery walkways, decks, diving boards, or ladders.
- Hitting the sides/bottom of pool, ladders, or other objects while swimming or diving.
- Drowning while swimming alone or without adult supervision.

Prevention of injuries and maintaining a safe pool can be accomplished by:

1. Prohibiting people from running and rough play in the pool, on decks, on diving boards, and in dressing rooms can also help prevent injuries.
2. Inflatable toys that may be hazardous to a non-swimmer in the event of a rapid loss of air should be considered a safety hazard.

It is therefore extremely important that each employee remain vigilant and exercise every precaution to avoid any legal action that may result from bather injury.

Every pool shall have a means of contacting emergency medical services which is provided on the premises and is readily accessible.

Safety Placards:

- Must address the following:
  1. Shower
  2. Disease
  3. Running and Roughhousing
  4. Contamination
  5. Glass
  6. No Diving

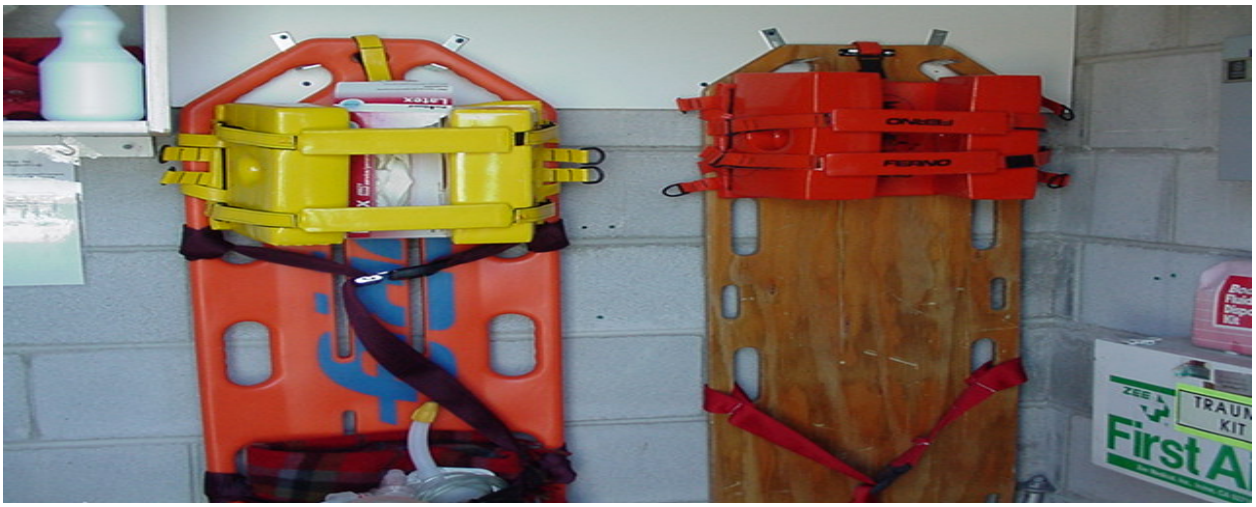
No Diving Sign:

- Shall be posted when:
  1. The pool is not designed for diving and shall contain lettering no less than (6) inches high.
- Pools allowing diving shall be at least (8) feet (6) inches deep and meet the manufacture's installation criteria.

DID YOU KNOW?

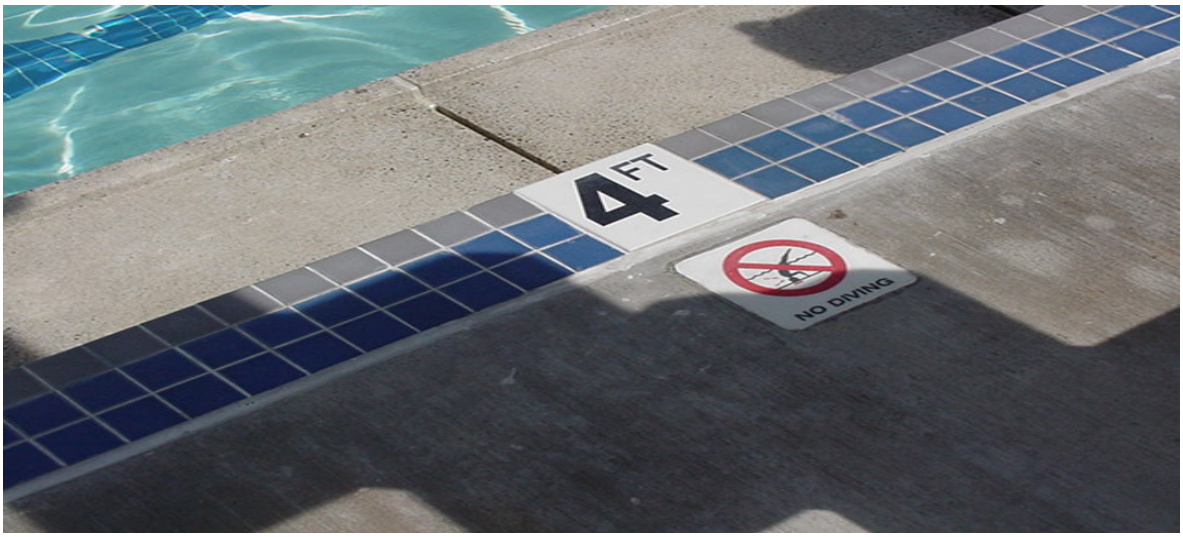
- No overhead electrical wiring within 20 feet of the pool enclosure
- Water supply serving the pool, and drinking water, shall be from an approved source
- Store chemicals in original containers and in accordance with manufacturers' instructions.

Required Lifesaving Equipment:



- Each life guard shall have:
    1. A rescue tube.
- Every pool shall have:
    1. (1) Shepherds crook or life saving pole (with blunted ends) at least (12) feet long.
    2. A readily accessible and full-length backboard (must comply with American Red cross specifications or equivalent).
    3. A readily accessible first aid kit.
    4. A readily accessible face mask to assist with CPR.

DEPTH MARKERS:



- Shall be minimum 4 inches high of color contrasting with the background.
- Shall be located on the vertical wall of the pool
- Shall be located on the horizontal edge of the deck next to the pool.
- Shall be placed:
  1. At the maximum and minimum depths.
  2. At the (5) foot break between the deep and shallow portions.
  3. At intermediate (1) foot increments of depth, where the water depth is (5) feet or less.
  4. At regular intervals around the pool, not more than (25) feet apart.

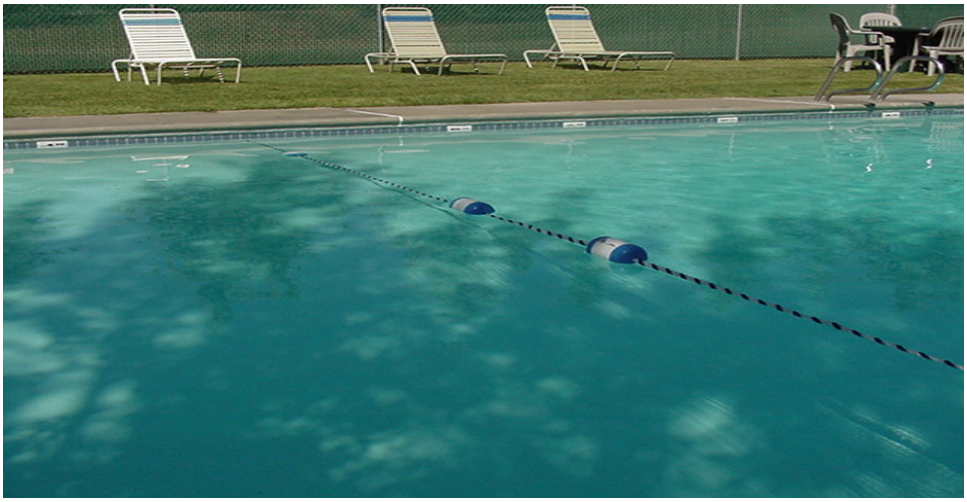
HANDRAILS & LADDERS:

1. Ladders
   - Shall be corrosion-resistant within the pool.
   - Shall be equipped with nonslip treads.
   - Shall be secured to pool deck
2. Stairs
   - Where stairs are provided they must be equipped with a handrail.
   - Walking surfaces and treads shall be a nonslip design and have the leading edge in contrasting color.
   - Shall be secured to pool deck.

LIFEGUARDS CHAIRS:

- If provided they shall be located and constructed as to provide a clear, unobstructed view of the pool bottom in the area under surveillance.

BUOYED SAFETY LINE



Required: Used to show separation between the shallow and deep portions of the pool.

Not Required when:

- Lap swimming
- Competitive swimming
- Supervised training

LIFEGUARDS:

- Lifeguard(s) will be required when bather load exceeds 35 and/or if pool allows bathers under the age of 13 to swim without adult supervision.
- When lifeguard services are not required, a warning sign shall be posted that states: “WARNING NO LIFEGURARD ON DUTY” “CHILDREN UNDER 13 YEARS OLD SHALL NOT USE THE FACILITY WITHOUT AN ADULT IN ATTENDANCE” “do not swim alone”
- Sign letters shall be at least (4) inches in height.

FENCE & BARRIERS

- When pool is not open for use, access shall be restricted.
- (<1800 sq ft. = 4ft high fence or barrier required)
- (≥1800sq. Ft. fence = 8ft high fence or barrier required)

Regulatory Stuff

Idaho's swimming pool rules and regulations can be viewed at: (http://adminrules.idaho.gov/rules/current/16/index.html). Below are some important definitions that may be useful to you while studying to take the CPO standardized exam.

Definitions:

Public Swimming Pool Defined: Herein referred to as public pool. A pool, and its appurtenances, that contains water more than two (2) feet deep, is used or intended to be used for swimming, diving, or recreational bathing, and is for the use of any segment of the public pursuant to a general invitation but not an invitation to a specific occasion or occasions.

Spa: An artificial structure containing water no more that four (4) feet deep and a recirculation system primarily designed for relaxation or therapeutic use where the user is sitting, reclining, or at rest.

Flow-Through Pool: A pool fed by a continuous supply of acceptable water that causes an equal volume of water to overflow to waste.

Private Pool: Any pool constructed in connection with or appurtenant to single family dwellings or condominiums used solely by the persons maintaining their residence within such dwellings and the guests of such persons.

Operator: An individual eighteen (18) years of age or older, who is familiar with the operation of the pool and is responsible for the health and safety of the public using the pool and for operating the pool in compliance with these rules. The operator shall have an approved certification of competency form a Certified Pool Operator (CPO), National Swimming Foundation Certification; an Aquatic Facility Operator (AFO), National Recreation and Parks Association Certification; a National Swimming Pool Institute Certification Program, District Health Department Certification, or other certification programs approved by the Director designee. The operator shall also have a basic life support cardiopulmonary resuscitation (CPR) certificate and current first aid certification as stated in Subsection 010.10 of these rules.

Lifeguard: A person who holds a current lifeguard training certificate and basic life support cardiopulmonary resuscitation (CPR) certificate from the American Red Cross, YMCA, Ellis & Associates, or any other equivalent certifying agency approved by the Director's Designee.

Permits: No public pool may be open to the public unless the operator has applied for and received a permit. Permits shall expire on December 31st of each year, unless earlier revoked or suspended for violation of these rules. Exempt

pools may voluntarily request to obtain a permit and be inspected. Only persons who comply with these rules shall be entitled to receive and retain a permit. Permits are not transferable.

Inspections: The Director's designee is authorized to conduct inspections as deemed necessary to insure compliance with all provisions of these rules and shall have right of entry at any time the pool is in operation.

Notice of Violation. If a violation of any provision of these rules is found during an inspection, the inspector shall provide a written notice of such violation to the operator, which will establish a time frame for correction.

Operations Manual. Each pool shall have a pool operations manual, in order to ensure proper operation and maintenance. The pool operations manual shall be readily accessible. The operations manual should include instructions for such items as maintenance schedules, records and reports, water chemistry, accidents, emergency procedures, care of filters, operation of pumps and other equipment, and proper handling and storage of all chemicals used.

Geothermal Water. Flow through public pool, which uses water solely derived from and heated exclusively by the natural heat energy from the earth.

Violations:

If your pool has been written up for a violation and you do not understand or have questions regarding the violation, please contact your Health Department as soon as possible.

- If a violation has been found during your regulatory inspection, the inspector will give written notice of the violation(s) and a correction date for those violations.
- If a violation has not been corrected within the specified time frame, the health department may temporarily suspend or revoke your pool permit for failure to comply.
- If the inspector determines that conditions at a public pool constitutes a serious danger to the health or safety or public, a written order stating the particular reason for suspension shall be given to the operator; and the permit shall be immediately suspended and the pool closed until such time the condition is corrected.

What Could Cause Immediate Closure?

There are some situations when a swimming pool should not be used and the owner/operator must take the responsibility to close it when these things occur.

- When there is no Certified Operator
- No Lifeguard (when required)

- When the clarity of the pool is such that a black disk, (6) six inches in diameter, cannot be seen when placed on a white field at the deepest point of the swimming pool, or anytime you cannot see the pool bottom clearly (unable to see the main drain or drains).
- When (2) two consecutive water samples taken show the presence of fecal coliform bacteria, the pool shall be immediately closed due to bacterial quality (fecal/vomit accident).
- When ordered closed by the director or the District Health Department based on inspection findings of “Imminent Health or Safety”.

SAMPLING

- Required for pools w/o disinfection systems (usually geothermal pools
- Sampling is done monthly
- Sampling for presence of fecal Coliform Sampling shall be during hours of peak bather loads; if present re-sample within 24 hours

There are situations when the District Health Department may find major problems at a swimming pool, and ask that it be closed until the problem is corrected. When a major problem arises which could result in safety problems, the pool operator should take the initiative to close the pool. Don’t wait until someone calls the District Health Department and files a complaint – that’s a sure way to lose the confidence of your patrons, and the Health Department!

Swimming Pool Chemical Terms

Algaecide: A specialty chemical which kills algae.

Aluminum Sulfate: Often called alum, which is used to floc sand filters and also a way to prepare the sand bed for finer filtration after backwash.

Calcium Chloride: A common and relatively inexpensive salt used in public pools to increase calcium hardness. It is completely safe and easy to handle and available almost everywhere.

Hydrochloric Acid: A strong, common, and relatively inexpensive acid used in pools to lower pH. In diluted, commercial grade it is called Muratic Acid.

Lithium Hypochlorite: Relatively new and still uncommon chlorine and lithium compound, white granular material of 35 % strength by weight.

Muratic Acid: A dilute solution of Hydrochloric acid used to lower pH.

Organic Bromine: Also called stick bromine, is a white solid, slow dissolving stick used for disinfection and oxidation of pool water. Disinfection ability is not affected by pH and combined bromines will disinfect and do not produce objectionable odor and eye irritation.

Polymers: Are extremely large molecules which collect small contaminants into big chunks that sink to the bottom of the pool or are picked up on the filter.

Potassium Monopersulfate: DuPont's "Oxone". It is an oxidizer that can be used in pool water to remove combined chlorines and organics. It is an alternative to super-chlorination.

Quaternary Ammonia Compounds: A family of compounds used in various mixtures and concentrations to combat algae growths in pools. May cause foam on the surface of the water due to their ability to decrease surface tension.

Sodium Bicarbonate: Also called baking soda, it is used to raise total alkalinity content of a pool with little change in pH.

Sodium Bisulfate: A white powder used in pools to lower pH. It is usually mixed with water to form slurry before injection. It is characterized by being safe to handle although considerably more expensive to use than Muratic Acid.

Sodium Carbonate: Also called soda ash, a white powder used in pools to raise pH and increase total alkalinity in pool water. It is also used to react with alum to produce floc on sand filters, and to neutralize hydrochloric acid resulting from the use of chlorine gas.

Sodium Hydroxide: Also called liquid caustic or caustic soda. A very strong, relatively inexpensive liquid material used in pools to raise pH.

Sodium Hypochlorite: A liquid chlorine and sodium compound, identical to household bleach, except sold for pool use in 12% and 15% strength by weight. Effectiveness dissipates with age especially when not stored in cool, dark area.

Sodium Thiosulfate: This chemical comes in a powdered form and a little of it should be kept on hand at all pools for emergencies. It is used to neutralize chlorine.

Cyanuric Acid or Isocyanurates: Cyanuric acid is a common additive that stabilizes chlorine values in residential and small commercial swimming pools, and, to a lesser extent, in larger pools. If not carefully monitored, however, the concentration can increase to a point that the chlorine is over stabilized and rendered ineffective. Dilution is the only way to reduce isocyanurate levels. Often 1/2 the pool or more is drained and replaced to reduce concentration when so called stabilized chlorine compounds are used exclusively as the oxidant, and their built-in Cyanuric acid builds up to excessive levels. It is almost impossible to completely eliminate, even after repeated drainings of pool.

W can see that at 5 ppm CYA, (pH 7.4 chlorine residual 1.5), the equivalent chlorine effectiveness is more than 35% reduced; at 10 ppm it is about 65% reduced, at 20 ppm, chlorine equivalent effectiveness is down a startling 80%. Beyond 25 ppm CYA we can expect, in terms of oxidizing power, only 15% of what we'd have if the chlorine were unstabilized.

Pool Helps and Formulas

- One cubic food of water contains 7.48 gallons
- One gallon of water weighs 8.33 pounds.
- Common Chemicals and their pH:

  Gas Chlorine – pH 1-2

  Calcium Hypochlorite – pH 11.7

  Sodium Hypochlorite – pH 13

  Lithium hypochlorite – pH 10.5

  Sodium – Dichlor- pH 6.0 to 6.2

  Trichlo- iso Cyanuric – pH 2.5 to 2.9

  Bromine – pH 4.0 to 4.5

  Sodium Bicarbonate (Baking Soda) – pH 8.2

  Sodium Bisulfate (Dry Ash) – pH 1.5

  Muratic Acid (Dilute Hydrochloric Acid)- pH 5

  Hydrochloric Acid – pH 1

  Sodium Hydroxide (Caustic Soda) – pH 14
- Super chlorinate to 5 – 10 times the combined chlorine (chloramine) levels.
- To raise free available chlorine (FAC) by 1.0 ppm, add;
  - Approximately .128 pounds or 2 oz of calcium hypocholorite/10,000 gallons of water.
  - 1 1/3 cup of sodium hypochlorite (12%)/10,000 gallons of water.
- To decrease chlorine 1 ppm, add ¼ pound (4 oz) sodium thiosulfate/25,000 gallons.
- To increase total alkalinity 10 ppm, add;
  - 1.5 pounds of baking soda per 10,000 gallons of water.
- To decrease total alkalinity 10 ppm, add;
  - 1.6 pounds of sodium bisulfate per 10,000 gallons of water
  - 1.3 pints muratic acid per 10,000 gallons.
- To increase calcium hardness 10 ppm, add;
  - 1 pound 4 ounces of calcium chloride per 10,000 gallons.
- To decrease calcium hardness add;
  - Soft water
  - 1 pound of anhydrous tri-sodium phosphate per 10,000 gallons will cause an 11 ppm decrease.
- Total alkalinity times calcium hardness should equal 25,000 to 30, 000.

Equivalents:

- Cubic yard = 27 cubic feet
- Cubic foot = 7.48 gallons
- Gallon = 0.134 cubic feet
- Cubic foot of water = 62.4 pounds
- Gallon of water = 8.33 pounds
- Pump resistance
    - 1 foot of head = 0.433 psi
    - 1 pound = 2.32 feet of head

Abbreviations:

A = Area	C = Circumference	D = Depth	H = Height
L = Length	W = Width	r = Radius	d = Diameter
Gpm = gallons per minute	psi = pounds per square inch		π = 3.14

r^2 = radius squared (radius X radius)

Formulas:

Area of a square or rectangle: A = L x W

Area of a right triangle: A = ½ x Base x Height or ½ BH

Area of a circle: $A = \pi r^2$

Celsius: C° = 5/9 (F° – 32)

Fahrenheit: F° = 9/5 (C° + 32)

Volume of rectangular or square pool with <u>no variable depth</u>:

Volume in gallons = L x W x D x 7.48
Volume in cubic feet = L x W x D

Volume of rectangular or square pool with <u>variable depth</u>:

$$\text{Average depth (AD)} = \frac{\text{depth at various locations within the pool added together}}{\text{number of measurements}}$$

Volume in gallons = L x W x AD x 7.48

Pool water flow rate in gallons per minute for six (6) hour and eight hour (8) turnover rate:

$$\text{6 hour flow rate in gpm} = \frac{\text{total gallons in pool}}{\text{6 hours x 60 minutes}} = \frac{\text{total gallons in pool}}{\text{360 minutes}}$$

$$\text{8 hour flow rate in gpm} = \frac{\text{total gallons in pool}}{\text{8 hours x 60 minutes}} = \frac{\text{total gallons in pool}}{\text{480 minutes}}$$

Pool water turnover rate:

$$\text{Turnover rate} = \frac{\text{gallons in pool} \div \text{flow meter reading (gpm)}}{\text{60 minutes}}$$

Langlier Index (Saturation index)

Temp deg F = TF	**Calcium Hardness = CF**	**Total Alkalinity = AF**
32º = **0.0**	5 = **0.3**	5 = **0.7**
37º = **0.1**	25 = **1.0**	25 = **1.4**
46º = **0.2**	50 = **1.3**	50 = **1.7**
53º = **0.3**	75 = **1.5**	75 = **1.9**
60º = **0.4**	100 = **1.6**	100 = **2.0**
66º = **0.5**	150 = **1.8**	150 = **2.2**
76º = **0.6**	200 = **1.9**	200 = **2.3**
84º = **0.7**	300 = **2.1**	300 = **2.5**
94º = **0.8**	400 = **2.2**	400 = **2.6**
105º = **0.9**	800 = **2.5**	800 = **2.9**
128º = **1.0**	1000 = **2.0**	1000 = **3.0**
pH____ + TF ____ + CF ____ AF ____ - 12.1 =		

Pool Records and Schedules

Operation:

Every pool operator must develop and use some efficient method for operating and maintaining a pool. If this is not done, conflict between normal pool maintenance and scheduled programs for pool use is likely to develop. This, in turn, can cause serious conflict between the pool operator and various program directors.

Every pool shall have a pool operations manual, in order to ensure proper operation and maintenance.

Each pool has its own specific problems and programs, and therefore, requires its' own special scheduling to maintain a pool facility at its peak condition. In order to accomplish this, detailed instructions must be given to personnel involved to ensure control of each routine and to make sure that pool maintenance takes place within the scheduled time frame even if the pool operator is not present.

The scheduling items list suggests items and ways that should be considered to effectively schedule pool operation and pool programs, thus reducing conflict and providing you with a well managed pool.

Scheduling Items List

Pool Area:

1. Pool operation record
2. Water sample (if required)
3. Lifeguards on duty
4. Pool bottom for swimmers
5. Safety equipment
6. Program/teaching equipment
7. Vacuum Pool
8. Clean overflow
9. Clean pool deck
10. Pool clarity

Dressing and Shower Rooms:

1. Dry mop or squeegee floors
2. Re-supply soap, toilet paper, and disposable towels
3. Clean mirrors
4. Floors, walls, ceilings, and partitions
5. Clean/flush urinals and toilets
6. Shower off
7. Foot bath filled/drained

8. Empty/clean waste receptacles
9. Check for lost/found articles
10. Vandalism

Mechanical Room:

1. Filters (water pressure in and out)
2. Clean filters/strainers
3. Flow meter reading
    - Complete recirculation of pool water through the pump, filter, heater, and disinfection system once every 8 hours and once every 2 hours for wading pools.
4. Thermometer
5. Pumps, (circulation and chemical feed)
6. Automatic chemical feed equipment
7. Chemical storage

Gas Chlorine Room:

1. Check for leaks
2. Tank weight
3. Chlorinator setting
4. Safety equipment (stored out of room)
5. Spare washers/ gaskets kept on site

General Area:

1. Night Lights
2. Doors
3. Clear of all patrons
4. Empty all waste receptacles
5. Ventilation
6. Outside facilities
7. Vandalism
8. Floors, walls, and ceilings
9. Lobby area
10. Windows and glass
11. Bulletin board

Records:

The following information shall be recorded each day the pool is open, and shall be kept on the premises, and available for review:

- Disinfectant Levels
- pH Readings
- Clarity Readings
- Amount of Type of Chemicals Used
- Accidents Requiring Professional Medical Treatment (including drownings or near drownings.

Please refer to appendix A for a chart/table that may be downloaded and used as your pool's record keeping log.

Glossary

Acid – Chemical compound which releases hydrogen ions in water solution. When added to pool water, it lowers the pH.

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.

Algicide – A chemical which kills algae.

Alum – The common term for aluminum sulfate or any other aluminum compounds. It is used in pools to form a gelatinous floc on sand filters to aid in filtration, and also to precipitate suspended particles in water.

Ammonia – A chemical compound of hydrogen and nitrogen that combines with free chlorine in pools to form chloramines, or combined chlorine.

Automatic Feeders – electronic equipment that senses water variables (primarily chlorine and pH) and controls feed system to maintain desired levels.

Available Chlorine – Active unused chlorine that is available to oxidize organic materials and kill bacteria.

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

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

Bacteria – Microorganisms present in all water supplies. Some are necessary to life and others are pathogenic (cause disease).

Bactericide – Any chemical that kills bacteria.

Base or Basic – A chemical that when added to pool water releases hydroxyl ions, and raises the pH.

Breakpoint – The process of adding sufficient free available chlorine causing the available chlorine to become great enough to oxidize all organic matter and ammonia compounds in a pool completely. Chlorine added thereafter will be in an uncombined or free state. 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.

Bromine – A heavy, dark reddish-brown liquid in the same chemical family as chlorine. It is used as a bactericide in some swimming pools.

Calcium Chloride – A common and relatively inexpensive salt used in public pools to increase calcium hardness.

Calcium Hardness – The calcium portion of the total hardness. About 70-75% of total hardness. Concentrations of calcium determine whether water is “soft” (too little) or “hard” (too much).

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 65% of its weight as available chlorine. Must be handled with care.

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

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

Chlorinated Isocyanurates – These are combinations of chlorine with various forms of Cyanuric salts. When dissolved in a pool, they are resistant to the chlorine reducing ultraviolet rays from the sun. Some of the commercially available forms are trichloroisocyanurate, dichloroisocyanurate, sodium dichloroisocyanurate, and potassium dichloroisocyanurate.

Chlorine Demand – The difference between the amount of chlorine added to water and the amount of residual chlorine remaining at the end of a specified contact period.

Chlorine Residual - The amount of chlorine remaining in water at the end of a specified contact period following chlorination. Combined chlorine residual is that portion of the chlorine which has reacted or combined with ammonia and other materials present in a pool water to form chloramines. Free chlorine residual is rapid biocidal action after the chlorine demand has been satisfied. Free available chlorine is the more effective germicide and Algicide.

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

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

Combined Chlorine – Chlorine that is available as a bactericide in water, but is combined with wastes in the pool water, usually ammonia. When combined with ammonia, chloramines are formed. Chloramines produce a foul smelling odor. Ideally, there should not be any combined chlorine in the pool.

Cross Connection – An unprotected connection between a domestic water supply and a pool or other nonpotable 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 diatom, porous, containing microscopic holes, and used as a filter media for swimming pools.

Disinfectant – A chemical used to destroy infection causing organisms. Examples: chlorine, bromine, and ozone.

D.P.D – Reagent containing Diethyl-Phenylene Diamine indicator used to test for residual chlorine in its various forms.

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

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. It operates automatically.

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. The most common filter type used for hot tubs.

Filter Cycle (Filter Run) – The time of filter operation between backwash procedures.

Filter Media – Any fine grain material, carefully graded as to size, that entraps suspended particles as water passes through.

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

Filter Rock – Graded, rounded rock or gravel used to support filter media.

Filter Sand – A type of filter media composed of hard, sharp silica, quartz, or similar particles with proper grading for size and uniformity.

Filter Septum – The part of a filter on which diatomaceous earth or similar filter media is deposited. Usually consist of cloth, wire screen, or other fine mesh material.

Flocculent – A compound, usually used with sand-type filters to form a thin layer of gelatinous substance on the top of the sand. Aids in trapping fine suspended particles which might pass through the sand. Example: alum or aluminum sulfate.

Flow Through Pool – A unique pool that has water replenished rather than recirculated. These pools are prone to special operation problems but are subject to the same requirements under Idaho Pool Regulations.

Free Chlorine Residual or Free Available Chlorine – The form of chlorine in pool water that is readily available as a disinfectant. At least 1.0 ppm and maximum 5.0 ppm.

Gallons Per Minute or GPM – Gallons per minute as read on the flow meter. This indicates the rate of flow as used for determining the turnover rate of the pool water.

Gutter – Overflow trough at the edge of pool.

Hardness (water) – Refers to the quantity of dissolved minerals, chiefly calcium and magnesium compounds, which may be deposited as scale in pipes, pools, and heaters.

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.

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 (OCI) radical. Most commonly refers to calcium, sodium, or lithium hypochlorite in pool usage.

Hypochlorous Acid (HOCL) – An unstable acid with excellent bactericidal and algicidal properties. The active agent by which chlorine serves as a disinfectant which is formed by dissolving chlorine gas, and hypochlorite, or other chlorinating agent in water.

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

Mg/1 (or mg/L) – Milligram(s) per liter. (See PPM)

Multiple Filter Control Valve – A special switching valve with a separate position for various filter operations, which combines in one unit the function of several single direct-flow valves.

Muratic Acid – A dilute solution of hydrochloric acid.

Orthotolidine – An organic test reagent that turns yellow-green in the presences 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 and is also called a scum gutter.

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 processes. A pH below 7.0 is considered acid and above 7.0 is considered basic or alkaline. The pH range should be no less than 7.2 and no greater than 7.8.

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

Potassium Persulfate – Brand name Oxybrite – an oxidizer that can be used in pool water to remover combined chlorines and organics and is an alternative to super chlorination.

Polymers – Is an extremely large molecule which collects small contaminants into big chunks which sink to the bottom of the pool or are picked up on the filter.

PPM – Parts per million. Calculated in weight units. In dilute water solution, the weight-volume relationship of milligrams per liter may be substituted and equals 1/10,000 of 1%.

PSI – 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.

Pressure Differential – The difference in pressure between two parts of a hydraulic system, such as the influent and effluent of a filter, the suction and discharge of a pump, the upstream and downstream sides of a Venturi tube or an orifice plate.

Pump Strainer – A pump-protecting device placed on the suction side of a pump which contains a removable strainer basket designed to trap debris in the water-flow with a minimum of flow restrictions. (Sometimes referred to as a "hair-and-lint trap").

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 (gpm).

Rate of Flow Indicator-Flowmeter – A device that measures pressure differential across a calibrated orifice and indicates the rate of flow at a point and usually in gpm.

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

Scale – Calcium carbonate deposits that can be found deposited in the filter, heater or on pool wall. Caused by excess hardness and too much magnesium or calcium salts.

Seal of Approval – Evidence of current approval status with the National Sanitation Foundation Testing Laboratory, Inc., such as a decal or imprint bearing the NSF seal.

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

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

Soda Ash – Sodium carbonate ($Na2CO_3$) used to raise pH and increase total alkalinity in pool water. Also to reach with alum to produce floc on sand filters, and to neutralize hydrochloric acid resulting form 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 125 to 155 available chlorine. Is of the most commonly used products for chlorination of pools. Produces Hypochlorous acid when added to pool water. Use care when handling!

Soft Water Scale – A particularly rough, course form of scale. Formed when the calcium hardness of water is 100 ppm or less.

Superchlorination (Shock Treatment) – The practice of adding 5-10 times the normal chlorine dose to destroy algae or prevent problems after heavy bather loads or severe rains.

Surface Skimmer – A device, usually built into the pool wall, consisting of a floating or otherwise adjustable weir over which water flows from the pool surface into a small housing or tank; the pump suction then draws it to the filtration equipment. Basic components are the housing, strainer basket, weir, ring and cover, equalizer valve (air-lock protection) trimmer valve (to adjust flow between skimmers), and pipe connections to pump suction, equalizer line, and sometimes vacuum cleaner.

Total Alkalinity – Measured as calcium carbonate (CaCO3). Acts as a buffer or stabilizer for pH. Regulations state that alkalinity must be between 80-200 ppm.

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. Regulations state that the minimum operational turnover rate of recirculation system at the end of a filter run shall be at least once every (8) hours and every (2) hours for wading pools.

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 form 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.

Appendix A – Record of Swimming Pool Operation Form

Southeastern Idaho Public Health

Record of Swimming Pool Operation

Records of _____ Pool

Location _____, Idaho

Office Use

Rec'd on _____

Year _____

Month _____

Date	# of people using pool daily	Alk ppm	pH of pool water	Disinfectant Residuals					*CLARITY				Gals Make-up Water Added	Rate of recir. or flow thru	*Bact. Sample sub. Result +/-	Miscellaneous *Injuries, Equip. Malfunctions
				Type of Disinfectant:				Super Chlor. ppm								
				Time	ppm	Time	ppm		Time	Read	Time	Read				
1																
2																
3																
4																
5																
6																
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30																
31																
Total																

Certified Pool Operator _____

(Signature)

Notes/Observations

Central District Health
County Office Locations

Ada and Boise County
707 N. Armstrong Place
Boise ID 83704

Elmore County
520 E. 8th Street N.
Mountain Home ID 83647

Valley County
703 N. 1st Street
McCall ID 83638