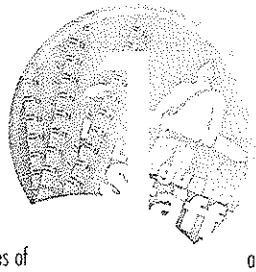
THE LIFEGUARD HANDBOOK



ONE OF THE MOST IMPORTANT WAYS TO communicate your policies to your lifeguards is via a comprehensive staff manual. An employee handbook should be useful, helpful in a timely manner, easy to use and understand, and up to date. It should answer all the questions employees may have. Following are some suggestions.

First, consider the format and layout of your manual. If you don't already have one, you might create an electronic version, hyperlinked for easy use. Hard copies should have tabs for quick access.

Second, in terms of information, the first section of the manual must be most helpful to lifeguards in a timely manner. A good starting point is an easy-to-use emergency reference guide. Opening with an emergency reference guide helps set the tone for lifeguards. Provide information including your emergency action plan, facilities procedures, spinal injury management protocols, emergency phone list, chain of command for notification and an injury report form.

In the next section, describe the job duties of the lifeguard or staff member. Include the facility's opening and closing checklists, policies and procedures, job description, pool rules and regulations, zones of patron surveillance and conducting patron surveillance. This section also should contain staffing requirements for different type of activities that would or could take place at the venue — such as birthday parties — and proper response for aquatic injuries.

Reserve subsequent sections for the general "orientation" information often traditionally placed in the beginning. This includes details such as the venue's mission statement, hours of operation, and staff contact information. Also include your substitution policy; absence/lateness policy; in-service training requirements; employee and employer responsibilities; uniform and required safety items; recording work time; hiring procedures and requirements; and a description of employee benefits.

In the final sections, you'll want to answer questions such as how lifeguards should communicate with supervisors about missing work, illness or other situations. Does it need to be in person, phone, text, voicemail, e-mail, Facebook, Twitter? Also explain which actions working at the venue or outside on personal time could or would lead to disciplinary action or dismissal from employment. How will the lifeguard be evaluated and how often?

Finally, any appendices should contain copies of all forms, diagrams of the zones of patron surveillance for the venue, and a copy of your Lifeguard Employment Agreement. This contract should cover many of the items above.

LIFEGUARD CERTIFICATION

LIFEGUARD "CERTIFICATION" IS A MEANS OF demonstrating that a person has passed a lifeguard training course. Generally, local health regulatory agencies require that public pools and aquatics facilities provide certified lifeguards.

CERTIFICATION OPTIONS

In the United States, health agencies recognize five organizations providing lifeguard training curricula for pools:

1. American Red Cross
2. Ellis & Associates
3. National Aquatic Safety Co.
4. Starfish Aquatics Institute/StarGuard
5. YMCA

Each program includes core lifeguarding skills, but there are differences in teaching methodology (video-/lecture-based vs. hands-on), philosophy (prescriptive vs. objective-based), and the service and delivery models. Some also provide modules or courses for specialty venues such as waterparks and waterfronts.

For open water surf environments, the United States Lifesaving Association provides accreditation for site-specific training programs developed by agencies that operate swimming beaches, and in some locations the Boy Scouts of America provide training for lifeguards at camps operated by that agency. Landmark Learning, in cooperation with the SAI, offers a wilderness lifeguard certification for individuals responsible for aquatic activity safety in remote areas.

EMERGENCY CARE CERTIFICATION OPTIONS

In addition to vigilance and rescue skills, lifeguards are required to have training that prepares them to respond to health and injury emergencies, and to be certified in CPR/AED, first aid, bloodborne pathogens and, for facilities with the equipment, emergency oxygen. Some lifeguard training organizations integrate emergency care content into the lifeguard curriculum, with certifications from recognized emergency care organizations earned concurrently. Others require emergency care certifications as a prerequisite to lifeguard training.

HIRING CERTIFIED LIFEGUARDS

The first step in hiring a competent staff is to determine how individuals will be trained and certified. Following are several options, each with its own pros and cons. You should carefully weigh what will provide the opportunity for your operation.

- Become an authorized provider for, or client of, one of the lifeguard training organizations. This relationship allows operators to have instructors on staff who train lifeguards to work at the facility. This option provides the most integrated training and quality oversight.
- Contract with a lifeguard instructor to conduct courses at your facility.
- Hire lifeguards who have completed a lifeguard course offered in the community, such as those taught by schools.

CERTIFICATION MISCONCEPTIONS

Be sure to avoid some common certification fallacies. First, understand that "certified" does not always mean "qualified." Certification is proof that a lifeguard has, on a given day, demonstrated skill at a level sufficient to successfully complete a training course. Certification does not guarantee competency, nor imply future performance or sufficiency of training for all facilities. The length of certification varies between the organizations, from one to two years. It is likely that a lifeguard's skills have degraded if he or she has not been actively working during the certification period.

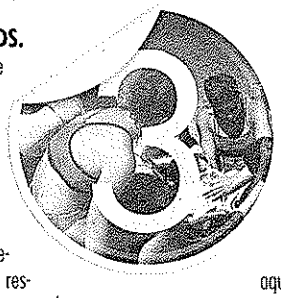
Second, "certification," "license" and "license agreement" are not the same things. Some states or counties require a certified lifeguard to pay a fee and pass a test to obtain a "license" to work. Some of the training organizations offer a "license agreement" for lifeguards. The guards agree to maintain performance standards, and the training organization can revoke the license for cause at any time.

Certification is only the first step. Once you hire "certified lifeguards," your responsibility for aquatic safety is not over. As an employer, you have the responsibility to:

- Verify the competency of the lifeguards you hire in the facility where they will work, and at the depths they will be assigned.
- Provide site-specific training. This training should include facility policy and procedure, emergency action plans, and rescues with facility-specific equipment.
- Supervise the lifeguards, and regularly assess competency.
- Provide ongoing training (in-service).

In the end, certification is only one piece in the overall aquatic safety and risk management system that should be in place at any aquatics facility.

LIFEGUARD IN-SERVICE TRAINING



THINK ABOUT YOUR LIFEGUARDS. How many thousands of rescues have they made? In reality, most pool lifeguards have made very few, if any. But it's essential that operators provide training and education to ensure guards' level of physical competency and to strengthen their various skills.

The goal is to help ensure that lifeguards are ready to recognize, respond, rescue and resuscitate a victim at all times — the 5 R's of a complete lifeguard.

Lifeguards need comprehensive and ongoing practice to maintain readiness, so in-service training must be mandatory, relevant and job-specific. In-service training for guards should include:

- Cardiopulmonary resuscitation.
- Automated external defibrillator.
- First aid and other emergency protocols specific to the facility's emergency action plan.
- Resuscitation and first aid treatment protocols. Only protocols consistent with current Emergency Cardiovascular Care Update and/or ILCOR guidelines should be used during pre-service or in-service training specific to the aquatics facility.
- Emergency response training. Lifeguards should receive monthly emergency response training specific to the facility.
- Aerobic fitness. Physical conditioning for the specific aquatics facility should meet aerobic and anaerobic energy systems requirements for that venue.
- Emergency action plan preparedness. The facility's lifeguards and other aquatic safety team members should practice the emergency action plan.
- Closure procedures. Guards and other aquatic safety team members should receive training on all closure issues specific to the facility.

You might also cover preventive lifeguarding, surveillance and defined zones of patron surveillance for the aquatics facility, victim recognition, and the level of professionalism needed to be a lifeguard.

Once training is scheduled, make sure you have the paperwork in order, as a record of the session. If the in-service is not documented, it basically did not take place. Have each participating guard sign documentation, along with the individual conducting the training, and keep it on file. The record also should contain the topic or activity covered, date and time, and possible suggestions for improvement.

LIFEGUARDING INSTRUCTORS

1, 3 ROY FIELDING *is the program coordinator for the Exercise Science degree program in the Department of Kinesiology as well as director of aquatics for the Department of Recreational Services at the University of North Carolina at Charlotte. He has assisted the American Red Cross for the past 12 years with the development and implementation of the Lifeguard and Lifeguard Management programs, in addition to serving as a chapter volunteer for more than 40 years. He is a member of the National American Red Cross Scientific Advisory Council, and vice chairman of two Model Aquatic Health Code technical committees.*

2 JILL WHITE *is the founder of the Starfish Aquatics Institute. She has developed innovative lifeguard programs, and written several training textbooks. In 2011 Jill received the World Waterpark Association's Al Turner Commitment to Excellence Award for leadership and consistent example of business and operational excellence.*

INSURANCE BASICS

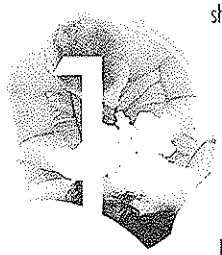
FOR MOST POOL OPERATORS, INSURANCE IS JUST another necessary cost, a budget item that quite often is too big, and seemingly offers too little in return. But insurance allows us to do together, as a community committed to aquatic safety, what we cannot do individually. The idea is to share risk and, most importantly, save lives.

By purchasing insurance, a business transfers its risk of loss to another party (the insurance company) in return for the payment of premiums. This allows an individual aquatics facility to continue to operate even in the face of severe loss, such as a drowning death.

The analysis of our data, and on-site evaluations of thousands of facilities, identifies three key areas that pool operators can focus on to keep their pools safe.

EFFECTIVE LIFEGUARDS

First and foremost, certified and focused lifeguards help ensure swimmers are safe.



Most pools need multiple lifeguards on duty, actively scanning at all times that the pool is in operation, especially when children — who have the highest risk of drowning — are present.

But just putting a body in an elevated chair is not enough; lifeguards need to be set up for success, and held accountable for their behavior. Like all employees, guards will do their jobs better when given clear expectations and held accountable through frequent "quick checks," observations and audits.

NONSWIMMER PROTECTION

Many consider the deep end of the pool the most dangerous, but data shows that even with lifeguards on duty, the majority of submersion injuries involve nonswimmers in the shallow end of the pool, which has less than 5 feet of water.

To protect the most vulnerable individuals in the water, we first need to identify them. Offer a swim test to unknown swimmers, and visibly mark them so staffers can distinguish swimmers from nonswimmers.

Young nonswimmers are at highest risk, and you can further protect them by requiring that they remain within arm's reach of a parent of caregiver. They should be actively engaged with a staff member in an activity or lesson. If that's not an option, nonswimmers should wear life jackets.

NEW TECHNOLOGY

New injury-prevention technology may be the most effective way to reduce losses. To ensure that every person in the water is safe, embrace new technology to assist your lifeguards. Drowning detection and prevention technology is not yet standard at all pools, but practical and effective options are currently installed and being tested in several facilities with good results. Similar to what happened with the adoption of

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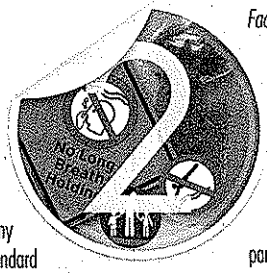
SIGNAGE



LARGELY IGNORED FOR DECADES, water safety signage has, at best, conformed to 1940s guidelines for workplace safety. At worst, it has not conformed to any recognized international or national safety standard at all. Typical pool facilities post a large text-only list of safety rules, such as a "No Lifeguard on Duty —Swim at Your Own Risk" text-only sign, and a couple of "No Diving" signs.

By adopting rigorous conformity to a system of state-of-the-art visual warnings compliant with the latest standards, safety-conscious operations can better prevent tragedies. Here are the latest recommendations developed by leading water safety experts, human factors engineers and safety sign design specialists.

EFFECTIVE POOL SIGNAGE:

- Communicates messages clearly and concisely. Given the sheer volume of information presented, the commonly used "list of rules" signs actually diminish communication. Human factors experts suggest that people are more apt to obey safety signs when they can clearly understand the hazard, its consequences and how to avoid it. These are the essential elements of a safety sign's message as defined by the *2011 ANSI Z535.2 Environmental and Facility Safety Sign Standard*, and by U.S. courts as indicated by decisions regarding what constitutes an "adequate" warning.

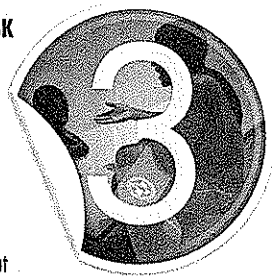
  Signage should clearly explain four major safety messages: no diving (where appropriate); no prolonged breathholding; watch your children; and nonswimmers must wear life jackets. Other statements are superfluous in comparison with these specific safety messages.

- Incorporates a combination of text and symbols to communicate messages beyond language barriers. Graphic art symbols are the global state-of-the-art method for visually communicating safety because they convey messages at a glance, providing greater immediacy than text-based signs.

- Reiterates essential warnings by leveraging strategic placement. Next to the sign's design (its content, layout, colors, size and shape), placement strategy is the most important factor in providing pool users with an "adequate" warning. First and foremost, human factors experts indicate that to be effective, safety signs must be noticed. Signs that blend into the background are worthless.

  Place signs so patrons can view your message in three locations prior to entering the water: at the entrance, in the locker rooms and at poolside, for example. The intention is to inform patrons so accidents don't happen, but if something does occur, you will be able to say you posted adequate warnings, in terms of design and placement.

PROTECTING AGAINST LIABILITY



MANAGING THE WIDE RANGE OF RISK that exists in the aquatic environment is a constant balancing act. State and local codes require that aquatics facility operators follow specific rules and safety regulations, but often operators determine how to best manage all other risk.

Specific risks can vary significantly between facilities, depending on size, design, attractions, use levels and other characteristics. But applying the basic five-step strategy described below can help reduce the frequency and severity of injuries, and minimize potential liability exposure.

To illustrate how to use the risk management decision-making process, consider a risk common to almost all aquatics facilities: the lack of guardian supervision of children.

1. Identify the Risk Simply put, young children are high-risk patrons for drowning and injury at aquatics facilities. Increased supervision by guardians will reduce this risk.

To evaluate the level of risk and set a bench mark, begin by reviewing available rescue statistics, incident reports and related records that may provide insight as to the level and frequency of child/guardian supervision problems at your facility. Also speak directly to your lifeguards, who likely have undocumented first-hand knowledge of child supervision problems.

2. Examine Alternatives Risk reduction techniques to address the supervision of children may include:

- Not allowing children to use your aquatics facility (exposure avoidance)
- Establishing minimum age levels for youngsters to be unsupervised and/or for a child to supervise another child
- Establishing and enforcing group child-to-guardian supervision ratios
- Educating the public on the need for supervising young children at aquatics facilities
- Educating pool patrons as to their responsibilities in supervising children
- Educating large groups that regularly attend or may rent your facility
- Educating your staff in how to manage situations where guardians are not supervising youngsters.

3. Select the Best Technique(s) Next, select a technique or combination of techniques from the options you have identified. To aid in the selection, it can be helpful to seek additional advice from industry experts and/or other advisers, including legal counsel, insurance or risk management professionals, regulatory agencies, lifeguard certification agencies, professional organizations, industry professionals, manufacturer's representatives, coaches, lifeguards, patrons and other stakeholders.

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RISK MANAGEMENT INSTRUCTORS

1 **KEVIN TRAPANI** *is president/CEO of The Redwoods Group, which he founded in 1997 to serve the JCC, YMCA and camp communities. He grew up at the YMCA and has worked as a lifeguard, swim coach and aquatics director.*

1 **GARETH HEDGES** *is associate general counsel for The Redwoods Group. A lifeguard for 14 years, Hedges has been certified by the American Red Cross, YMCA of the USA, Starfish Aquatic Institute, and Ellis and Associates. He has written several articles and presentations on drowning prevention, aquatics and liability.*

2 **TOM GRIFFITHS,** *Ed.D., is a renowned aquatic safety expert and founder of the Aquatic Safety Research Group. Griffiths served as director of aquatics and safety officer for athletics at Penn State University for nearly 25 years and has been involved in all phases of aquatics and water safety for 30 years. A published author, he has been named to* Aquatics International's *Power 25 list multiple times.*

2 **GEOFFREY PECKHAM** *chairs the American National Standards Institute's Standard for Environmental and Facility Safety Signs. For the past 15 years, he has chaired ANSI's U.S. technical advisory group to ISO/TC 145 (the international ISO standards committee responsible for global safety sign standardization).*

3 **KEVIN HOFFMAN** *is director of member services at the Park District Risk Management Agency, an intergovernmental risk management group in Illinois. He is responsible for PDRMA's Risk Management Services Division. Hoffman has more than 25 years of experience in risk management and is a published author in the area of aquatics.*

3 **BILL HOOKER** *is the training program supervisor at PDRMA, responsible for development and implementation of education/training and risk management programs. He has more than 20 years' experience and has developed a wide range of aquatics related risk management and training resources.*

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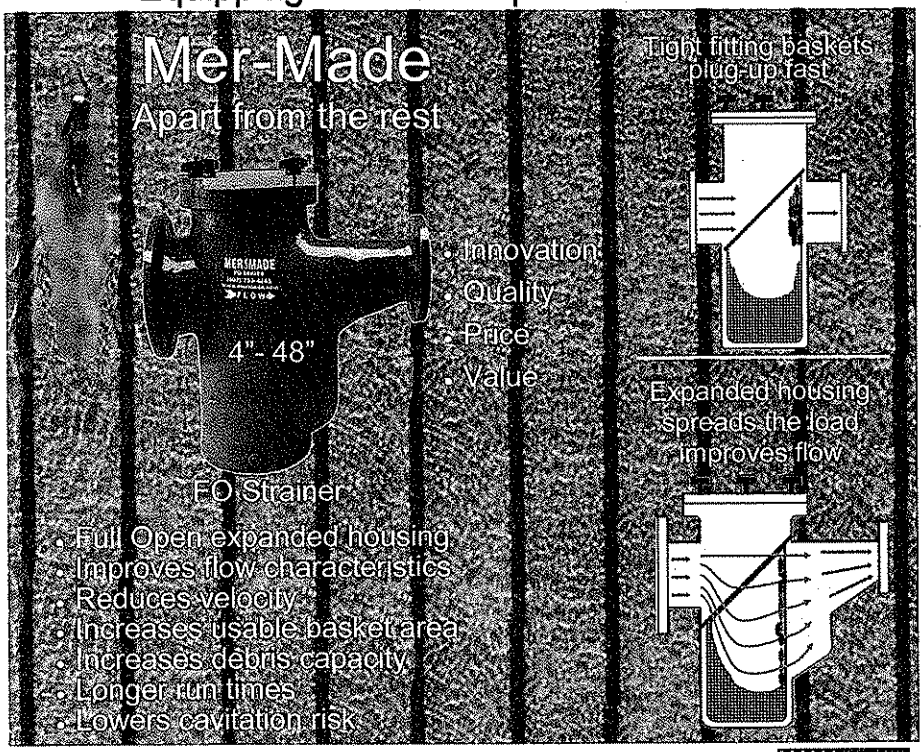

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INSURANCE BASICS

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seat belts or AEDs (in the case of aquatics), as more facilities adopt technology to assist lifeguards, the standard of care may change.

When it comes to insurance, most pool operators will need certain types. First, a general liability policy covering property damage and personal injury to third parties is a must. This is similar to what an individual would get from a homeowner's policy, but specific to a commercial business. Many options and coverages are available, including medical payments coverage for injuries to guests (often regardless of fault), errors and omissions, covering liability due to the decisions of leadership (such as wrongful termination) and endorsements to cover sexual abuse.

Second is a Worker's Compensation policy. Required and closely regulated by the state, it covers injuries to employees (subject to conditions) regardless of fault. Additionally, an errors and omissions policy should be obtained.

Third would be policies for anything not covered. For example, auto, if your organization owns or operates a vehicle.

Furthermore, depending on the size of your organization, you may need a directors and officers liability policy, to cover members of the board of directors.

PROTECTING AGAINST LIABILITY

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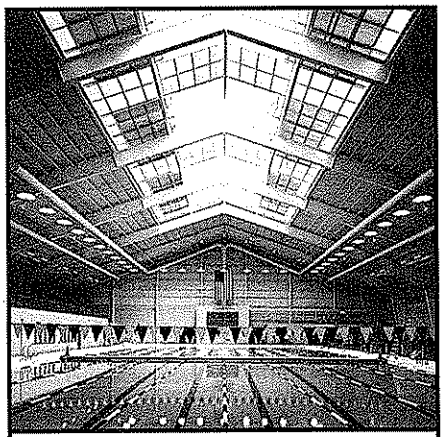
4. Implement the Technique Once you've developed a strategy, form an implementation plan and begin employing the risk management technique(s) you've selected. This can happen all at once or, given budget and operational needs, phased in over time. For example, if you decide to better educate your patrons on the importance of guardian supervision of children, you might visually increase attention to supervision responsibilities and drowning prevention awareness by creating posters and pamphlets, and produce poolside public address announcements for them to hear.

5. Monitor the Results After implementing risk management solutions, careful monitoring and evaluation is essential to assess the results.

- Observe, monitor and document supervision-related incidents for future comparison.
- Interview and meet with lifeguards, managers, coaches and patrons.
- Review incident and accident reports.
- Stay informed on industry-related trends, incidents and best practices.

Also, always be open to modifying your risk management plans to prevent and minimize future injury and losses.

The risk management process outlined can and should be used throughout your aquatics program. It can be applied to risks such as emergency response planning, adaptive aquatics; and sexual abuse prevention. With proper consideration, it can greatly assist in bringing balance to the ongoing battle between preventing/minimizing risk and providing a fun, competitive aquatic experience.



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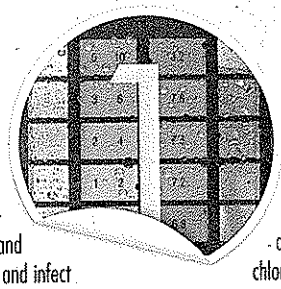
WATER CHEMISTRY BASICS



MANAGING A WATER-TREATMENT PROGRAM for an aquatics facility is like juggling a bowling ball, a soccer ball and three oranges — with a 12-inch butcher knife thrown in. Let your concentration slip for a moment and it gets ugly.

Proper water management protects the health of pool patrons and staff, as well as the facility itself. The process of disinfection protects patrons from illnesses, and water balance protects the physical facility from corrosion or scaling. Both require properly sized filtration and circulatory systems in good working order.

The concept of disinfection is simple. Disinfection helps prevent recreational water illnesses. RWIs may be caused by infections carried into the water by bathers, or certain chemicals that build up in the water. Types of infections include gastrointestinal, dermal and respiratory. Key factors include the concentration of the disinfectant, the chemical form of the chlorine or bromine, pH and time.

Disinfection occurs when a disinfecting agent in the water oxidizes vital components in germs and kills them before they can contact and infect bathers. This takes seconds for bacteria and only a few minutes for others. The only infectious RWI not easily controlled by chlorine is *cryptosporidium*. Outbreaks from all the other germs (*E. coli, shigella, norovirus, giardia, Legionella* and *pseudomonas*) would completely stop if we diligently maintained the free chlorine at 1 ppm or more.

While chlorine is the disinfectant used in nearly all facilities, some opt for bromine. Regardless of the type used (stabilized, unstabilized or salt generator) once dissolved, chlorine is chlorine. When chlorine reacts with organic material, including germs, it may form salt or chloramines. Also called disinfection byproducts, chloramines cause rashes, eye irritations and respiratory complaints.

Testing makes certain there is enough free chlorine to kill the germs and not too much chloramines. Optimal free chlorine should be to 2.0 to 4.0 ppm, and there should be no chloramines. The practical limit for chloramines varies, but up to 0.2 ppm is acceptable for most facilities. If you can smell the pool or get eye or skin complaints, chloramines are to blame. Facilities must test free and combined chlorine at least three times per day, more if local codes require it. Even facilities with automatic controls still must test manually at least once per day.

Balancing the water protects the financial investment in the facility. Water balance factors are pH, alkalinity, hardness, temperature and total dissolved solids (TDS).

A critical factor in water balance and disinfection is pH, which is the amount of acid in the water. The preferred pH range is 7.2 to 7.8. This keeps the chlorine active and is the most comfortable for bathers. Check the pH at least once per day.

Alkalinity is the buffer that stops swings in pH. Alkalinity is the amount of bicarbonate (baking soda) dissolved in the

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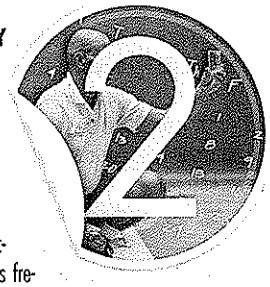
WATER MAINTENANCE BASICS



MAINTAINING THE WATER QUALITY in any public aquatic venue is not an easy job. It takes constant, consistent vigilance and accurate documentation. Here's a look at what you should be monitoring.

DAILY

• Chlorine (disinfectant) level. Disinfectant levels should be monitored at least as frequently as indicated by the local health code; many state health codes recommend three times a day. Heavier bather loads and other environmental factors affect levels, so the recommended frequency could be every two hours while a busy pool is in operation. The minimum chlorine level for venues not using cyanuric acid is 1.0 ppm. For venues using cyanuric acid, it's 2.0 ppm, and for spas it's 3.0 ppm.

• pH. Like the disinfectant level, pH should be monitored frequently, every two hours in a busy pool. While codes indicate a 7.2 to 7.8 pH level, most find a 7.4 to 7.6 pH level is best.

WEEKLY

• Combined chlorine or chloramine levels. Aquatics facilities should monitor combined chlorine or chloramine levels at least weekly, to avoid that stinky smell that starts around 0.4 ppm or higher. Lowering the chloramine level can be accomplished through hyperchlorination.

• Total alkalinity level. Total alkalinity is the anchor for the pH level in the water. Unless you're having difficulties with your pH level, a weekly test should be adequate. Total alkalinity levels should be between 80 and 150 ppm.

• Cyanuric acid and stabilized chlorine products (for outdoor pools only). Cyanuric acid and stabilized chlorine products in a swimming pool will protect the chlorine from the sun's rays the way sunscreen protects from sunburn. Too much cyanuric acid also can cause problems, such as making it more difficult to kill *crypto* or locking up the chlorine level. Be sure to monitor this level weekly so it does not exceed 50 ppm.

MONTHLY

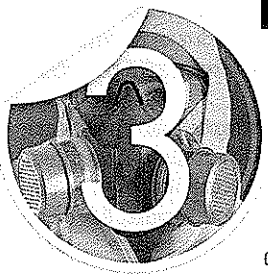
• Source water. Once a month, check the pH, chlorine, total alkalinity and calcium hardness levels in the source water to spot any change in levels. This is especially helpful if your water source is from the drinking water system. Quickly detecting small changes in the source water monthly can sometimes help explain a change in the pool water.

• Calcium hardness level. The calcium hardness or how hard/soft your water is should be checked monthly and should not exceed 400 ppm. The exact level is dependent on the pH and temperature of the pool water. You can calculate the correct ppm using the Langelier Saturation Index, a tool developed in the 1930s to calculate water composition.

• Total dissolved solids level. According to *TheAquapedia.com*, TDS is the measure of the total amount of dissolved matter in water, such as calcium, magnesium, carbonates, bicarbonates or metallic compounds. The maximum acceptable level of TDS for pools is 1,500 ppm above the TDS level in the source water. This level should not change significantly from month to month in most pools, while warm-water therapy pools and spas might require weekly monitoring.

Following these basic daily, weekly and monthly monitoring guidelines will ensure that your aquatics facility is a place everyone will enjoy.

EMERGENCY SITUATIONS



NO MATTER HOW conscientious you are as a pool/spa operator, the time will come when you'll need to deal with some type of emergency at your facility. When it comes to water quality, a number of different emergencies are possible, but a few specific ones elicit the most concern. These include organic matter contamination (a fecal accident, blood or vomit), broken glass and water chemistry issues such as excessively high chlorine.

Opinions may differ on how to respond to these situations, but the underlying premise is, and must remain, protecting the health of the patrons and staff. With this in mind, here are generally accepted responses to these situations.

ORGANIC MATTER CONTAMINATION

According to the Centers for Disease Control and Prevention, fecal contamination of recreational waters is on the rise. Outbreaks in man-made venues have seen the greatest increase, a result of people swimming with infectious, diarrhea-causing pathogens. Contamination from solid stools also is a problem. If you are faced with a fecal incident:

• Close the pool immediately.

• Remove contaminating material and dispose of properly. DO NOT use a vacuum to remove contaminants.

• Properly clean and disinfect the equipment used for removal of the contaminants.

• Properly clean any contaminated surfaces, such as pool walls, and disinfect with a 5,000 ppm bleach solution or equivalent. Disinfectant contact time on the affected area needs to be a minimum of 20 minutes, or as otherwise indicated on the disinfectant label.

• Check the water quality. Verify a stable water temperature of 77 degrees Fahrenheit or above, and pH of 7.5 or less. Adjust if necessary.

• Operate the recirculation system while the pool reaches and maintains the required free chlorine concentration.

For fecal accidents involving solid stools, the free chlorine residual needs to be raised to 2.0 ppm, and maintained for a period of at least 25 minutes.

For fecal accidents involving diarrhea, the free chlorine residual needs to be raised to 20.0 ppm, and maintained for a period of at least 12.75 hours.

Take free chlorine readings at various locations in the pool to ensure proper chlorine concentrations throughout.

Fecal accidents in pools using chlorine stabilizers such as cyanuric acid (which slows disinfection) need additional attention. For such pools, the pH should be lowered to 6.5, and the free chlorine residual raised to 40.0 ppm. These parameters need to be maintained for at least 30 hours. Facilities using bromine as a disinfectant should follow the same procedures and chlorine concentration as specified for a chlorinated pool.

When a pool or spa is contaminated by vomit, follow the same procedures described for fecal contamination. The chlorine concentration and contact time should be the same as that for solid feces contamination.

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WATER QUALITY INSTRUCTORS

1 **ROY VORE** *is an aquatics consultant specializing in water management, RWI control and regulatory issues. He holds a Ph.D. in microbiology and is a Certified Pool Operator and NSPF Instructor.*

2 **TERRI STROUPE** *is the aquatics director of the Raleigh (N.C.) Parks & Recreation Dept., with 31 years' experience in water safety and aquatic management. A Certified Pool Operator Instructor for 24 years, she is currently volunteering on the CDC's Model Aquatic Health Code project with the Disinfection and Water Quality Technical Committee.*

3 **JIM DINGMAN** *has been employed by Underwriters Laboratories, Northbrook, Ill., since 1998. He is a lead regulatory engineer in the Regulatory Services Department, coordinating regulatory activities for UL's Environmental & Public Health programs, including drinking water additives and system components, food safety, and pool equipment.*

WATER CHEMISTRY BASICS

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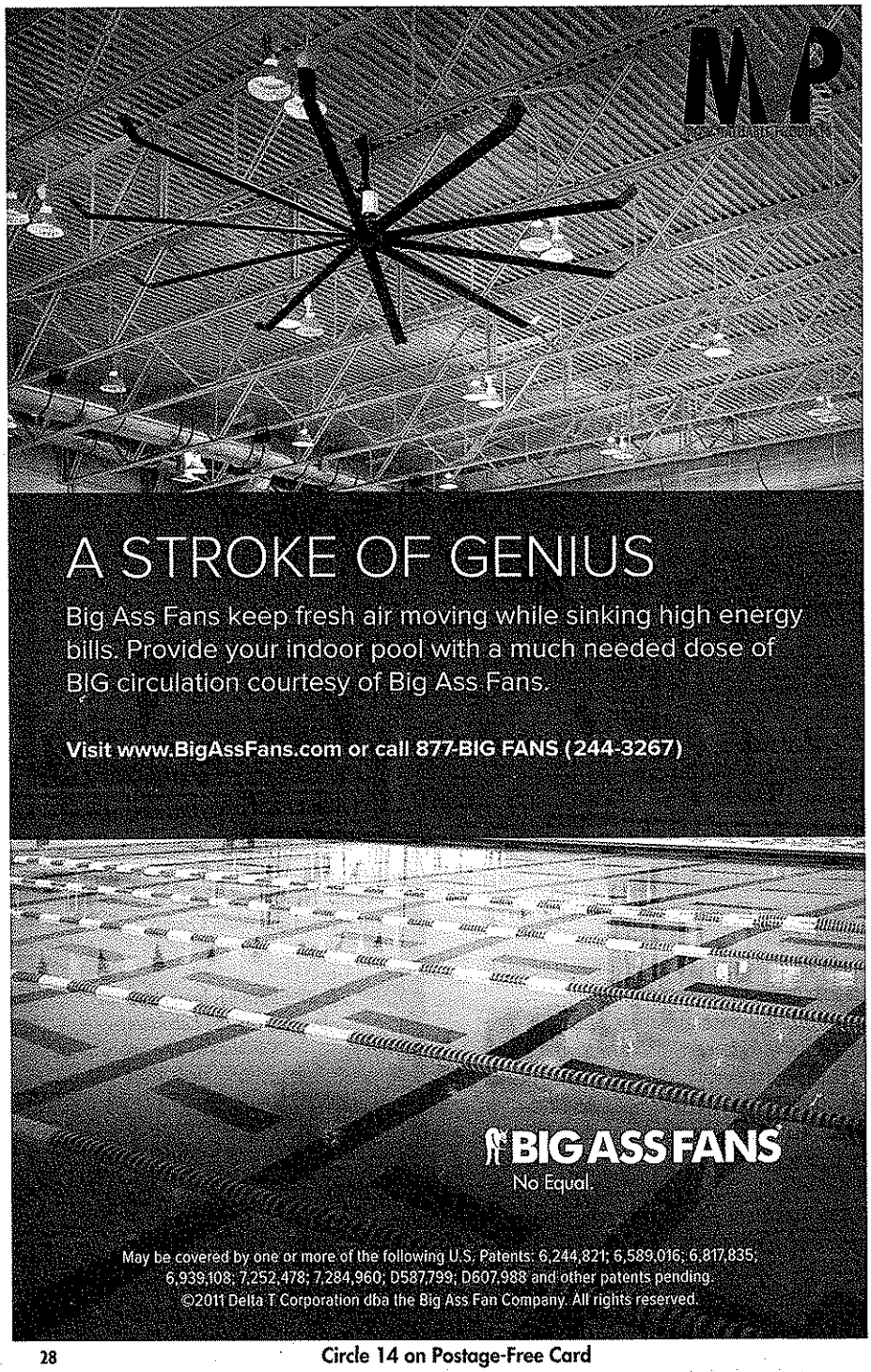
water. Optimal alkalinity is 80 to 120 ppm. Check alkalinity at least once per week or when make-up water is added.

Hardness is the amount of calcium dissolved in the water. Too little and the plaster and metal components are eaten away; too much and the surfaces get scales. Optimal hardness for pools is 200 to 400 ppm. Check hardness at least once per month, or when makeup water is added.

For an aquatics facility to run safely, an operator has to juggle all the factors and keep all the parts in the air at the same time.

To determine whether the water is balanced, measure each factor separately and then plug the numbers into an equation. Allowing the disinfectant level to drop, even in periods when the facility is idle, is just like juggling that 12-inch butcher knife with your eyes closed. Let the water balance slip and that bowling ball can break your foot.

The best place to learn to juggle your water quality is in an accredited class. Friends in the industry and seminars at shows can help you polish basic skills. They may even help you learn how to add flaming batons into the mix!



EMERGENCY SITUATIONS

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Though there is concern about bloodborne pathogens, there is no public health reason to recommend closing a pool due to blood contamination. Data suggests that the risk from bloodborne pathogens is greatly diminished through dilution and normal chlorine residual levels. This does not prohibit the operator from closing the pool temporarily due to aesthetic concerns.

In blood-contaminated water, the chlorine level should be checked. If it is below the required concentration, the affected area or feature should be closed until the chlorine residual is verified at or above the required level.

GLASS CONTAMINATION

Broken glass is very difficult to clean up thoroughly. The hard surfaces in and around pools cause glass to shatter, with large chunks and tiny pieces landing everywhere, including in the pool. If broken glass lands in the pool, it becomes more dangerous and difficult to clean up. The proper response to such accidents obviously depends upon the extent of the contamination. Generally, you should consider the following steps:

- Carefully remove all larger pieces on the deck area using a broom and/or "shop-type" vacuum.
- Vacuum the pool bottom. Depending upon the potential contamination, you may wish to drain the pool first.

WATER CHEMISTRY ISSUES

You can minimize the potential for water chemistry issues with careful and frequent monitoring, but sometimes such issues are unavoidable. Problems include too much or too little disinfectant, algae, and colored or cloudy water. Addressing each of these problems requires a unique approach.

Too much disinfectant can negatively affect other water quality parameters, and create potential respiratory health issues. Correct quantities of disinfectant, as well as careful monitoring of the disinfectant level, are key to minimizing such occurrences. If the chlorine level exceeds requirements, it can be neutralized by adding sodium thiosulfate to the water.

Algae is usually not harmful to swimmers, but it can cause discoloration and staining of the pool walls. Chlorine and bromine disinfectants kill algae, so it is important to maintain these disinfectants at the required levels. There are also chemicals on the market that can help kill and remove algae from pool surfaces.

Colored water can occur when chemicals such as iron and copper are present in excess in the pool water. The reddish-brown color resulting from too much iron can result from erosion/corrosion of pumps and other iron-containing equipment. A greenish color, resulting from too much copper in the water, also may be due to corrosion of metal from low pH.

Maintaining proper levels of water disinfectants and pH can minimize colored water issues. Removal of color resulting from these problems can be achieved through the use of chelating or sequestering agents, which bind up the metal in the water, allowing it to be filtered or vacuumed out. ■

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