

Managing Risk in Pools, Spas, and Workout Facilities

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Maria Bella has spent more than 30 years working in sports and recreation, and specializes in aquatics. She has worked with the hotel industry, managing aquatic and fitness facilities and training engineers in cost and liability reduction strategies.

Bella is one of only four Aquatic Facility Operator Instructor Trainers in the world and a Certified Pool Operator Instructor for the National Swimming Pool Foundation. She also certifies Lifeguards through the American Red Cross, as well as instructs chemical and safety programs for the Pennsylvania Department of Agriculture, and Recreational Water Safety courses for the National Association of Amusement Ride Safety Officials.

Bella was recently appointed to the International Code Council committee drafting the International Swimming Pool Code. She has served on the Centers for Disease Control Model Aquatic Health Code Technical Committee focused on Risk Management and Safety. The National Drowning Prevention Alliance requested that Bella Chair their Policy & Codes Committee.

In addition to working to increase aquatic safety through national codes and standards, Bella was recruited by the National Recreation and Park Association to assist in the ongoing development of their Aquatic Facility Operator course curriculum, and by the National Drowning Prevention Alliance to write the curriculum for their national pool technician training program, funded by the Consumer Products Safety Commission. Bella has also developed core curriculum used by swimming lesson instructors to educate children and adults on hazards inherent in and around water.

In addition to her credentials specific to aquatics, Bella is a Certified Playground Safety Inspector through the National Recreation and Park Association, a Certified Amusement Ride Safety Inspector through the National Association of Amusement Ride Safety Officials and a Certified Emergency Medical Technician.

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Managing Risk in Pools, Spas, & Workout Facilities

I. Introduction

The safe and cost effective operation of fitness facilities, including aquatic venues and exercise rooms will be addressed, with foresight into developing trends and litigation. A systems approach will be introduced, while briefly exploring each component, from equipment selection through the biological contribution of patrons. When any piece of this “system” goes unattended, dangerous conditions are created. Swimming related cases are among the top two producers of significant jury awards or settlements in Sports Injury Litigation.¹ Lawsuits related to recreation have risen steadily during the past 30 years and are expected to continue to increase in the future.²

In 2005, the Seneca Lake Spray Park in Geneva, New York was closed due to a cryptosporidium outbreak that infected hundreds of people and resulted in the requirement for advanced chemical treatment systems at spray parks. As the hospitality industry transitions from conventional swimming pools to aquatic play features that include spray devices, understanding the complexities of these simple-looking systems will reduce construction and operational costs.

II. Recreational Water Illness/Disease Transmission

A. Waterborne contaminants

The Centers for Disease Control and Prevention (CDC) in cooperation with six health departments throughout the United States inspected 22,131 swimming pools and hot tubs from May 1 to September 1, 2002. The results of these inspections can be found in the CDC’s Morbidity and Mortality Weekly Report dated June 6, 2003³. Among the 22,131 facilities inspected, 21,561 violations were recorded and immediate closure was required at 8.3% of the aquatic venues. Hotel hot tubs contributed to a significant number of these violations.

The CDC has grouped various disease-causing bacteria, viruses, and protozoa transmitted through water and air at aquatic facilities as Recreational Water Illness (RWI’s). While some RWI’s are killed in less than a minute in properly maintained water, others are much more difficult to eradicate. Cryptosporidium, for example, may take a week to kill under normal swimming pool operating conditions. As few as ten Cryptosporidium cysts can cause infection

¹ Fried, G. *Punitive Damages and Corporate Liability Analysis in Sports Litigation*. *Marguette Sports Law Journal* 9 Marq. Sports L.D. 45, 1998 : 17

² Hroneck, B., Spengler, J., Baker III, T. *Legal Liability in Recreation, sports, and Tourism*. Sagamore Publishing, 2007 : 5

³ Centers for Disease Control and Prevention. 2003. “Surveillance Data from Swimming Pool Inspections—Selected States and Counties, United States, May – September 2002.” *MMWR*. 52, 513-16.

and lead to death in those with weakened immune systems. The majority of patrons drawn to hotel swimming pools are children and retirees. Due to underdeveloped or declining immune systems, these patrons are most at risk when any type of Recreational Water Illness is being transmitted through aquatic facility water or air.

B. Airborne contaminants

Airborne diseases are transmitted by aerosolizing Legionella and other spores through the use of blower motors on hot tubs as well as the dispersion of water droplets from fountains and slide features. Legionella bacteria grow in an aqueous environment only when other micro-organisms, that supply nutrients for the Legionella, are present.⁴ Legionella may grow in colonies inside of biofilm, a common slime in aqueous environments. When the Legionella bacteria break out of this biofilm, they become free swimming, at which time they can be easily killed by adequate chlorine. If an insufficient supply of chlorine is available in a recreational water environment such as a hot tub, the activation of jet pumps can cause water droplets containing Legionella bacteria to become aerosolized. The aerosolized bacteria will then be inhaled by individuals. If one's immune system cannot overcome the bacteria, Legionnaires Disease or Pontiac Fever will ensue. Proper maintenance will prevent the accumulation of microorganisms and the proliferation of Legionella bacteria in a hot tub.

C. Disease transmission prevention

The National Swimming Pool Foundation and National Recreation and Park Association provide training and certification course for operators of swimming pools, hot tubs, and various water play devices. Despite the availability of these national programs, the Centers for Disease Control and Prevention found that many pool operators did not have adequate training to safely run their aquatic facilities. According to the American Society of Plumbing Engineers:

Untreated pool water is an environment that encourages the rapid growth of organisms. Continual treatment of this water is necessary to prevent the development of a health hazard. Water quality must equal or exceed the standards set by the appropriate authorities.⁵

According to the International Aquatic Foundation:

Legionella bacteria are easily controlled if the proper sanitizer concentration is maintained at all times. No outbreaks have occurred when spas are properly maintained.⁶

⁴ International Aquatic Foundation. Water Treatment Information Bulletins. IAF 2005 : 14

⁵ American Society of Plumbing Engineers. Data Book Volume 3 Special Plumbing Systems. ASPE. IL, 2005 : 146

⁶ International Aquatic Foundation. Water Treatment Information Bulletins. IAF 2005 : 16

In addition to requiring hospitality staff to obtain proper training and certification in the operation of aquatic features, mechanical devices that constantly test and treat water should be installed on each swimming pool, hot tub, and water play feature. The cost for these devices is minimal and provides the owner/operator of aquatic venues with a layer of protection against liability. Additionally, the improved operation that can be realized through selecting the right chemical treatment equipment and monitoring system for each application will quickly lead to reduced operating costs in labor and supplies.

III. Chemical Exposure

Chemicals are fed into swimming pools to mitigate the hazards of biological contaminants introduced by bathers. As these chemicals sanitize germs and oxidize organics, their molecular structure changes. This can result in the build-up of dangerous chemical by-products that can affect patrons and staff at hotel and resort aquatic facilities. Scientific studies into the long-term health effects of indoor air quality on swimmers and lifeguards are ongoing. Diseases such as asthma and even cancer have been linked to disinfection by-products.

A specific illness has been associated with the indoor aquatic environment. It is known as “Lifeguard Lung” and is characterized as a form of sick building syndrome (SBS). It is medically referred to as hypersensitivity pneumonitis (HP) which is an inflammation of the lungs due to the over stimulation of the immune system from the inhalation of viable and nonviable gram negative bacteria and their endotoxins. These endotoxins come from bodily wastes of patrons (sweat, urine, feces), and active chemicals in the pool water at aquatic facilities. Symptoms of Lifeguard Lung may include wheezing, coughing, shortness of breath, problems concentrating, muscle aches, fevers, chills, headache, and eye irritation. The onset of symptoms usually occurs more than 24 hours after exposure. Repeated exposure may lead to the development of granulomatous pneumonitis which results in irreversible scarring of the respiratory tract. Epidemiological studies have shown a direct and increasing correlation between indoor chlorinated pools and the prevalence of asthma in children and adults.⁷

All aquatic staff and patrons are potentially susceptible, with the severity of symptoms directly related to the duration, concentration, and frequency of exposure. A dose-response has been demonstrated linking lifeguards who work longer hours as being more susceptible to Lifeguard Lung and granulomatous pneumonitis than lifeguards who work shorter hours.

A. Aerosolized water

With the proliferation of resort waterparks, exposure and intensity increase. The number, types, and designs of spray devices found in aquatic facilities play a significant role in the illness. A facility may have one or more bubblers, fan sprays, fountains, geysers, hot tubs, slides, wall spouts, or waterfalls. Studies⁸ have shown a direct correlation between the concentration of

⁷ Rin-rin Yu. 2006. “Air Sickness.” *Aquatics International*. October. 26

⁸ Rose, Cecile S., et al. December 1998. “‘Lifeguard Lung’: Endemic Granulomatous Pneumonitis in an Indoor Swimming Pool.” *American Journal of Public Health*. Vol. 88, No. 12. 1795-1800.

respirable aerosol particles and the types of spray devices used in aquatic facilities. Compared to background levels in air, fountains and waterfalls have been shown to cause a 1.4 fold increase in respirable aerosol particles; the addition of a slide or flume causes a 2.3 fold increase. The use of multiple spray devices in a facility can result in a 5.2 fold increase in respirable particle levels, and an 8 fold or greater increase in endotoxin levels.

Aerosolization of water droplets and mist from these devices and patron splashing is often captured by the Heating, Ventilation and Air Conditioning (HVAC) system and recirculated into the facility's enclosed environment. ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality, prescribes ventilation rates for average pools using chlorine as the primary disinfectant.⁹ ASHRAE also provides guidelines for total air movement within the aquatic facility. The recommended rates range from 4 air changes per hour (ACH) to 8 ACH. However, for high occupancy resort pools or when the pool water chemistry is out of balance, the prescribed rates may be insufficient to keep air contaminants at a safe level.

B. Contact injuries

Improper chemical dosing of pool water has resulted in chemical burns to patrons using hotel hot tubs. This hazard can be eliminated through the use of dose control chemical feeders and automated chemical analysis systems that test the water as often as every six seconds and make incremental corrections to water chemistry based on bather load and contaminant levels.

Many facilities operate using liquid or dry chlorine to kill germs and muriatic acid to control pH. Inappropriate mixing of chlorine and acid will result in the release of chlorine gas into the air. This gas has a disagreeable, suffocating odor that is detectable in concentrations as low as 3.5 parts per million and is poisonous. Additional chemical hazards exist in facilities that store both organic and inorganic chlorines onsite. When inorganic chlorine (i.e. calcium hypochlorite) comes into contact with organic chlorine (i.e. trichloro-s-triazinetrione), spontaneous combustion will occur. Likewise, Class 3 oxidizers such as calcium hypochlorite will spontaneously combust if kept in storage too long. These fires cannot be suppressed; they must burn out.

Outsourcing the operation of aquatic facilities to companies that provide management oversight and staffing has seen a quick rise and fall throughout the hospitality industry. These services are costly and often fail to provide the consistent attention to detail required at heavily used swimming pools, hot tubs, and water play features. Where patronage is low, the simple steps necessary to effectively manage aquatic features can be easily accomplished by properly trained onsite engineering staff with a minimal investment in mechanical testing and trouble-notification equipment.

IV. Diving Injury

Recent trends in the aquatic and hospitality industries have included a move away from deep water. Hotels are renovating swimming pools and eliminating water in excess of four feet deep.

⁹ American Society of Heating, Refrigerating and Air-Conditioning Engineers. 2003. Applications Handbook, p 4.6

Similarly, resort waterparks are being built with a focus on shallow water. This increases, rather than lessens, the chance of debilitating spinal injury. Diving into water that is less than five feet deep is dangerous for adults, despite whatever training they may have had as a child. Impact with the bottom or side of a swimming pool can result in trauma to the head and spine. Death, quadriplegia, and paraplegia can result.

Most pool codes require that depth markers, providing both imperial and metric measurements, be installed along the edges of the deck and at the waterline inside of pools. Additionally, the international “No Diving” symbol is often required, and must be placed where it can be recognized in advance of entry into shallow water. Ledges and drop-offs must be marked with a contrasting band of slip-resistant material to alert swimmers both inside and outside of the pool to protrusions, which include steps, ramp edges, and sun tanning shelf ledges that can be obscured by the refraction and reflection of light waves penetrating the water’s surface.

Hospitality staff tasked with the operation of an onsite aquatic facility must be familiar with local and state codes, as well as the aquatic industry standard of care. Because swimming pools are a constructed hazard used to put heads-in-beds, complying with only the minimum standard codified in many jurisdictions will not provide the level of liability protection afforded by meeting the aquatic industry standard of care. In their *Aquatic Management Series*, the National Swimming Pool Foundation describes the standard of care for the operation of aquatic venues:

Any person who manages, operates, owns, builds, repairs or is responsible for an aquatic venue must abide by all pertinent local, state and federal laws, as well as regulations, codes-of-practice and standards of design and operation.¹⁰

V. Drowning

Nationwide, drowning is the second leading cause of death for children ages 1 to 14. It results in the leading level of damages realized through lawsuits against resorts.¹¹ Shallow water can lead to a false sense of security and less attention focused on children who may panic and ingest harmful quantities of water or be unable to upright themselves once they become prone in a pool. Even adults may find entry into a shallow body of water challenging if it comes at the end of a slide. Non-swimmers struggle with balance versus buoyancy and many adults have been rescued from four-foot-deep swimming pools when they could not get their legs underneath them and their heads above water after losing contact with a solid surface.

Wave pools are a big draw for patrons and resort planners alike. Water depth in wave pools is not constant. One moment people are standing in a two foot deep section of the pool. The next moment, a wave has dumped over their heads and driven them into other patrons or into the pavement. Body surfing is a big attraction at resort wave pools, and some wave riders flaunt their abrasions like badges of honor. Waves that are strong enough to carry a body surfer

¹⁰ National Swimming Pool Foundation. *Aquatic Management Series, Volume 2: Emergency Response Planning*. NSPF, 2010 : i

¹¹ Fried, G. *Punitive Damages and Corporate Liability Analysis in Sports Litigation*. *Marguette Sports Law Journal* 9 Marq. Sports L.D. 45, 1998 : 14

forward forty feet are strong enough to cause debilitating injuries when patrons slam into each other. Contusions, concussions, and compound fractures can be expected when people collide.

A. Lifeguards

The solution to this problem is exceptionally complex in the hospitality industry. Employees at resort waterparks face challenges created by conflicting directives. Lifeguards are tasked with the double-duty of protecting and pleasing patrons. Giving away free room nights to unhappy hotel guests flies in the face of the increased revenue that resort waterparks are supposed to produce. Lifeguards who are used to relying on their whistles to grab the attention of the crowd and single out rule breakers at municipal pools may be restricted in the use of this tool at resort waterparks. Likewise the facility may serve alcohol to guests at poolside increasing the chance of unruly and dangerous behavior.

In an industry that has long suffered from a shortage of lifeguards, the additional draw on this resource created by the proliferation of resort waterparks and hotels that add a waterslide and/or lazy river in order to compete, has made safe operation increasing difficult for all aquatic facility owners. Many municipalities that once exempted hotel pools from lifeguarding requirements specifically mandate certified lifeguard staff at any venue with moving water. Whether this staff is supplied by the hotel, or an outside contractor engaged by the hotel, the responsibilities and liability flow through to the owner and/or management company of the hotel. To complicate the problem even further, the Department of Labor has mandated that lifeguards under the age of 16 be restricted in the duties that they can perform at a waterpark.¹² While young lifeguards are allowed to guard slide catch pools, they are not allowed to be on the loading platform of elevated slides. Additionally, “attendants” placed on these loading platforms are often prohibited from performing a dual function as a lifeguard due to positioning of the loading platform.

A rising trend in the aquatics industry is to require non-swimmers to wear lifejackets. In wave pools, all swimmers under 48-inches-tall may be subject to the lifejacket requirement, whether or not they can swim.

VI. Suction Entrapment

In December, 2008, the first federal legislation directed at the operation of aquatic facilities went into effect and required the removal or guarding of all suction outlets at commercial aquatic facilities. For many, this became a costly effort in plastic swapping. Some drain covers installed in 2008 and 2009 have come under fire and may in fact be more likely to cause suction entrapment than covers previously installed over suction outlets.

While owners of hospitality industry aquatic features can redirect liability for entrapment to equipment manufacturers and installers, the national attention focused on every entrapment case

¹² U.S. Department of Labor. *Fact Sheet #60*. “Application of the Federal Youth Employment Provisions of the Fair Labor Standards Act (FLSA) to the Employment of Lifeguards.” January 2006. Available from <http://www.dol.gov/esa/regs/compliance/whd/whdfs60.htm>. Accessed 17 January 2007.

creates a public relations nightmare that must be avoided. Fortunately, the solution to this problem is simple.

Testing equipment that will determine whether or not entrapment is possible at a suction outlet can be inexpensively obtained. Its use is simple and the interpretation of test results is straight forward. If a “main drain” is shown to be an entrapment hazard through testing, eliminating flow through that portion of the system is inexpensive and easy to do. Of course, flow must be redirected so that adequate filtration and sanitation can be maintained to protect bathers from other known recreational water hazards including disease transmission and opaque water that interferes with the recognition of a drowning victim.

A. Missing grate = Pool closed!

Even if no flow is directed through a suction outlet, a secure grate must cover the opening. The grate must be attached with screws manufactured to hold up in chemically treated water and installed into an adequate anchoring system. If the grate is missing or damaged, the pool must be closed until that cover can be replaced.

VII. Construction & Maintenance

An aquatic facility that is not properly designed and/or constructed can still be safely operated; the costs will be extremely high and the level of expertise necessary to run a poorly designed facility is considerably above the skill-set maintained by most hospitality industry engineering departments.

Prior to building any aquatic facility, an independent consultant should perform a thorough review of the project. Familiarity with the ebb and flow of hospitality industry guests is key to selecting cost-effective, low maintenance equipment. Likewise, knowledge of the inner-workings of hotel engineering and housekeeping departments is essential throughout the design, operation and maintenance process. A multi-million dollar aquatic complex, when improperly operated, will suffer thousands of dollars of damage in just a few years due to improper water chemistry alone. Pound-foolish-and-penny-wise errors like failing to purchase a \$600 electronic test kit or replace \$50 worth of reagents each and every year lead to thousands of dollars of wasted chemicals and filtration media, damaged HVAC systems, and compromise of the structural integrity of the facility. A pool should not have to be replastered or repainted on a regular basis, nor should corrosion of equipment be accepted as an environmental norm. Any damage to the structure that houses the pool or maintains the water should be seen as a red flag and interpreted to mean that errors were made in the design or construction of the facility, or the operator lacks sufficient knowledge to protect the owner’s investment.

A. Consultant pros & cons

In order to protect that investment, in addition to requiring that onsite personnel receive and maintain operator certification, an independent consultant should audit the facility at least every

three years. If the consultant works for a pool equipment supplier, solutions to current and potential problems are likely to involve replacing equipment with products that the consultant represents. "Free advice" can be very costly.

Anyone selected to provide advice to aquatic facility owners/operators and/or training to staff should have extensive hands-on operating experience, be recognized as an expert in the aquatics and hospitality industries and have the credentials to backup that expertise.

VIII. Fitness Equipment

Exercise equipment should have at least three feet of clearance on all sides. Additional space is necessary around units designed with extension components, such as seated quadriceps machines, and around semi-restrained movement systems like lat pull-down bars.

Treadmills and elliptical machines should be placed on equipment mats, which will help to reduce the amount of dust drawn into the machine while it is being used.

Daily maintenance is necessary to remove dirt that can build up and lead to heat overload and cause motor failure. Housekeeping staff must receive manufacturer-specific instruction in fitness equipment cleaning procedures. Just because staff can turn a room well does not mean that they will know which treadmill components need special attention.

In addition to vacuuming under each machine every day, housekeeping staff should disinfect seats and handholds that patrons come into contact with during their workout. Even when bactericidal wipes are provided by the facility, daily cleaning by hotel staff must be performed. At that time, all safety equipment, including foot straps on bicycles and barbell collars should be inspected for damage and replaced if signs of wear are evident. Likewise, cables, pulleys, and weight stack selector pins must be inspected daily and replaced when damage is apparent.

Quarterly maintenance should be performed by the fitness equipment vendor and include inspection of all belts, pulleys, motors, and safety gear to ensure that the equipment is and will continue to function as intended. At least one member of the hotel staff should be present when the vendor performs maintenance, to ensure that all aspects of the contract are being met. At a minimum, the motor cover should be removed so that interior components can be inspected and cleaned. Bolts and belts should be checked for wear and the amperage draw should be tested.

The advertised lifespan of commercial fitness equipment should factor in to both purchase and replacement schedules. Warranties are based on construction materials and intended use. Fitness equipment that is used beyond its intended life-span is more likely to lead to injury of guests and maintenance personnel.

IX. Conclusion

Risk management, like customer service, maintenance, and marketing must be a daily focus for owners and operators of hospitality recreation facilities. Sports activities encourage guests to push their limits. Distractions provided by televisions built into cardiovascular equipment, water

that appears too shallow to cause harm, and pool-side alcohol vendors that lessen a patron's apprehension level all combine to increase the foreseeability of guest injury. Where hazards cannot be removed, they must be guarded against with proper design, operation, and maintenance. The use of readily available safety devices and the application of safe management practices can result in reduced operating costs and a substantial reduction in owner/operator liability.