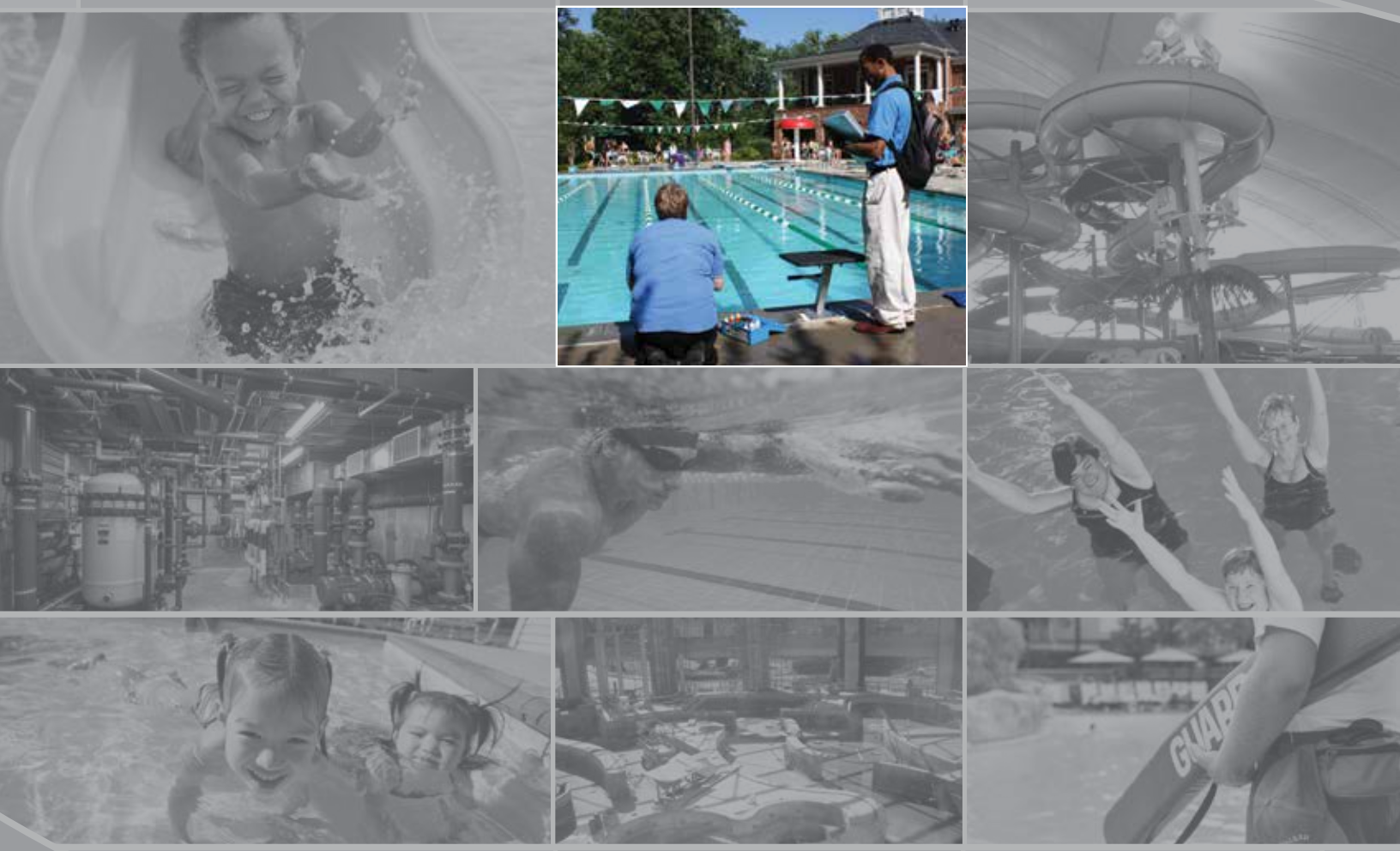
# 2016 Annex to the Model Aquatic Health Code

*Scientific Rationale*

**POLICIES AND MANAGEMENT**



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# 6.0 Policies and Management

The MAHC has worked extensively with ICC and IAPMO to eliminate conflicts between the three codes. These discussions have resulted in changes in the MAHC and plans to change items in the other codes as they are brought up for revision. The MAHC is committed to resolving these conflicts now and in the future as these codes evolve.

### 6.0.1 Staff Training

Chemical injuries are a common occurrence as discussed in Annex 4.9.2. These injuries have been caused by eye splashes, skin exposures, and inhalation following improper handling and/or lack of use of PPE. Some incidents have involved the release of gases affecting multiple bathers or staff. There is a need to reinforce appropriate pool chemical handling and storage. This applies to both longer-term staff but also seasonal employees and young workers who may be less likely to receive appropriate training. Discussion of PPE, Hazard Communication, and Bloodborne Pathogens provisions since they are part of OSHA regulation. All employers, including swimming pool programs, are required to comply with OSHA regulations and ensure training is adequate.

#### 6.0.1.8 Body Fluid Exposure

CDC's Healthy Swimming Site contains additional information on Recreational Waterborne Illnesses *(RWI)*. Employees should not swallow the AQUATIC VENUE water and should thoroughly wash their hands after the response.

- CDC's Healthy Swimming Site:
  - http://www.cdc.gov/healthywater/swimming
- See OSHA 1910.1030 Bloodborne Pathogens:
  - http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051
- CDC's guidance on Cleaning Up Body Fluid Spills on Pool Surfaces:
  - http://www.cdc.gov/healthywater/swimming/pools/cleaning-body-fluid-spills.html

## 6.1 Qualified Operator Training

### 6.1.1 Qualified Operator Qualifications and Certification

AQUATIC VENUE operation and maintenance violations are common.

POOL inspection data from 15 jurisdictions across the United States indicate that over half *(61.1%)* of inspections identified one or more violation*(s)* and 12.1% of inspections resulted in immediate closure because of the seriousness of identified violation*(s)*. In addition, violations regarding the following issues were frequently identified:

- Disinfectant level *(10.7% of inspections)*,
- pH level *(8.9%)*,
- Other water chemistry *(12.5%)*,

- Filtration/RECIRCULATION SYSTEM *(35.9%)*,
- Water test kit *(3.3%)*,
- Record keeping *(10.9%)*, and
- Licensure *(2.7%)*[449].

Review of SPA inspection reports from these same jurisdictions found over half *(56%)* of inspections identified one or more violation*(s)* and 11% of inspections resulted in immediate closure because of the seriousness of identified violation*(s)*. In addition, SPA inspection data indicated that the following violations regarding the following issues are frequently identified:

- Disinfectant residual *(17% of inspections)*,
- pH level *(15%)*,
- Other water chemistry *(17%)*,
- Filtration/RECIRCULATION SYSTEM *(27%)*,
- Water test kit *(2%)*, and
- Record keeping *(13%)*[450].

The authors conclude that the number of overall violations highlights the need for POOL and SPA staff training, which includes information about RWI transmission, and the potential benefits of mandating training for POOL operators throughout the United States. In addition, it underscores the need for operator training courses to include the topic areas related to the common violations listed above.

The PATHOGENS causing approximately 13.7%-18.2% of reported RWI outbreaks of acute gastrointestinal illness associated with treated facilities are CHLORINE sensitive[451]. This CHLORINE sensitivity of PATHOGENS involved in outbreaks indicates that these AQUATIC FACILITIES were poorly operated or maintained. The authors conclude that preventing RWI outbreaks, particularly those associated with inadequate public operation of AQUATIC FACILITIES, calls for required AQUATIC FACILITY operator training[452].

Of 36 reported POOL chemical–associated health events in New York State *(1983–2006)*, 69% (n=25) were caused by poor chemical handling or STORAGE practices and 81% (n=27) resulted from mixing incompatible chemicals. The authors conclude that preventing these events calls for educating public POOL operators and residential POOL owners about safe chemical handling and STORAGE practices[453].

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449 CDC. Violations identified from routine swimming pool inspections – selected states and counties, United States, 2008. MMWR Morb Mortal Wkly Rep. 2010;59(19):582-587.
450 CDC. Surveillance data from public spa inspections — United States, May–September 2002. MMWR Morb Mortal Wkly Rep. 2004;53(25):553–555.
451 Hlavsa MC, et al. Outbreaks of Illness Associated with Recreational Water — United States, 2011–2012. MMWR Morb Mortal Wkly Rep. 2016;64(24):668-72
452 Hlavsa MC, et al. Outbreaks of Illness Associated with Recreational Water — United States, 2011–2012. MMWR Morb Mortal Wkly Rep. 2016;64(24):668-72.
453 CDC. Pool chemical–associated health events in public and residential settings — United States, 1983-2007. MMWR Morb Mortal Wkly Rep. 2009;58(18):489-493.

**Operator Training Reduces Pool Inspection Violations**

Studies have shown that POOLS with operators who have successfully completed formal training in POOL operation, have better water quality than POOLS without a trained operator.

Results from a study in Nebraska demonstrated that FREE CHLORINE violations and concurrent pH and FREE CHLORINE violations were twice as likely in local jurisdictions not requiring certification compared with jurisdictions requiring training. The authors conclude that these results demonstrate the benefit of requiring POOL operator certification to help prevent RWIs[454][455].

### 6.1.2 Essential Topics in Qualified Operator Training Courses

POOL inspection data from 15 jurisdictions across the United States indicated that 12.1% of inspections resulted in immediate closure because of the seriousness of identified violations and violations regarding the following issues are frequently identified:

- FREE CHLORINE level *(10.7% of inspections)*,
- pH level *(8.9%)*,
- Other water chemistry *(12.5%)*,
- Filtration/RECIRCULATION SYSTEM *(35.9%)*,
- Water test kit *(3.3%)*,
- Record keeping *(10.9%)*, and
- Licensure *(2.7%)*[456].

SPA inspection data indicated that the following violations regarding the following issues are frequently identified:

- Disinfectant residual *(17% of inspections)*,
- pH level *(15%)*,
- Other water chemistry *(17%)*,
- Filtration/RECIRCULATION SYSTEM *(27%)*,
- Water test kit *(2%)*, and
- Record keeping *(13%)*[457].

These analyses underscore the need for inclusion of these topic areas in operator training courses. These essential topics are covered in nationally recognized operator training courses.

454 Buss BF, et al. Association between swimming pool operator certification and reduced pool chemistry violations — Nebraska, 2005–2006. J Environ Health. 2009;71(8):36–40.
455 Johnston K, Kinziger M. Certified operators: Does certification provide significant results in real-world pool and spa chemistry? Int J Aquat Res Educ 2007;1:18–33
456 CDC. Violations identified from routine swimming pool inspections – selected states and counties, United States, 2008. MMWR Morb Mortal Wkly Rep. 2010;59(19):582-587.
457 CDC. Surveillance data from public spa inspections — United States, May–September 2002. MMWR Morb Mortal Wkly Rep. 2004;53(25):553–555.

### 6.1.2.1 Course Content

#### 6.1.2.1.1 Water Disinfection

Many other DISINFECTION chemicals or systems with varying effectiveness and suitability are being offered in the market to AQUATIC FACILITY operators for water treatment. In general terms, discuss the evaluation steps that should be used by the AQUATIC FACILITY operator, including required AHJ acceptance of the chemicals or systems for public AQUATIC FACILITIES, in their decision process on using these types of supplemental systems or treatments.

- *DISINFECTANTS* – Training should address OSHA "Right-to-Know" and Hazard Communication Standards and other SAFETY aspects.
- *CHLORINE* – Special emphasis should be given to safe handling of erosion feeders/chemical mixing. See MAHC Annex 4.9.2 for discussion on chemical injuries.
- *Combined CHLORINE* – A discussion of deterioration of buildings, machinery, and structures due to the effects of airborne chloramines in INDOOR AQUATIC FACILITIES is appropriate.
- *SECONDARY DISINFECTION SYSTEMS*– It is appropriate to include a discussion of the effectiveness of in-line treatment versus side stream treatment.
- *SUPPLEMENTAL TREATMENT SYSTEMS* – It is appropriate to include a discussion of the effectiveness of in-line treatment versus side stream treatment.
- *Water Balance* – Water balance elements may also include options for treatment including priority of factors to be adjusted.
- *Water Clarity* – Discussions should include treatment priorities to improve clarity.
- *pH* – It is also important to remember that there are limits on Phenol Red readings when very low or very high pH readings occur.
- *Mechanical Systems* – Common current alternative filter media types that can be mentioned include perlite, zeolite, and food-grade cellulose.
- *Circulation Pump & Motor* – The operator should also become familiar with submerged pumps such as turbine, mixed flow, and others used in waterpark applications. Additionally, the operator needs to have an understanding of the winterizing needs for these types of equipment.
- *Filter Backwashing/Cleaning* – In these days of energy and water conservation, it is increasingly important that water conservation be practiced. Backwash water can be responsible for wasting an unnecessary amount of water if not done properly or too frequently.

If properly treated to meet water quality STANDARDS, AQUATIC FACILITIES can obtain savings with water costs. However, in some cases, it may not be cost effective for an AQUATIC FACILITY to expend funds on retreatment of backwash water. In those cases, it is most important that all water is discharged properly in accordance with the regulations of the local jurisdiction.

#### 6.1.2.1.4 Health and Safety

#### 6.1.2.1.4.1 Recreational Water Illness

The number of outbreaks associated with recreational water has continued to significantly increase since reporting began in 1978, most notably in 1982, 1987, 2004, and 2007. CDC recommends that public health and the aquatic sector collaborate on educating the swimming public, an important source of recreational water contamination, about RWIs and what swimmers can do to protect themselves and others[458].

#### 6.1.2.1.4.3 RWI Prevention

The operator should be aware of the need for frequent manual testing, standardization of automatic controllers, and adequately sized chemical feeders.

Note the need for larger feeders for waterpark type attractions as compared with FLAT WATER POOLS.

#### 6.1.2.1.4.6 Chemical Safety

It is important that the operator be able to read chemical labels and SDS. These include but are not limited to, NFPA 400 “Oxidizer Hazard Classifications and Storage” recommendations.

Reporting of POOL chemical-associated health events in the United States is not universally mandated, and no single surveillance system exists to characterize completely the number of exposures or associated injuries. However, one study of POOL chemical-related events showed 71.9% of the events involved human error[459].

NEISS and the NPDS data indicate that POOL chemical exposures and associated injuries are common. Data from NEISS show that inhalation of chemical fumes and splashing POOL chemicals into the eyes or onto the skin were the primary POOL chemical-associated injuries for which patients sought emergency treatment.

NPDS data reveal that nearly all single POOL chemical exposures likely were unintentional. Additionally, poor chemical handling and STORAGE practices at public AQUATIC FACILITIES, particularly those leading to mixing of incompatible chemicals, were the primary contributing factors of POOL chemical–associated health events reported in New York State.

Although no one data source alone clarifies completely the epidemiology of POOL chemical--associated injuries, together they reveal multiple commonalities that suggest these injuries are preventable. CDC recommendations [460] for preventing injuries

458 Hlavsa MC, et al. Outbreaks of Illness Associated with Recreational Water — United States, 2011–2012. MMWR Morb Mortal Wkly Rep. 2016;64(24):668-72.
459 Anderson AR, et al. The distribution and public health consequences of releases of chemicals intended for pool use in 17 states, 2001-2009. J Environ Hlth 2014;76:10-15.
460 CDC. Healthy Swimming website. Recommendations for preventing pool chemical-associated injuries. Accessed at http://www.cdc.gov/healthywater/swimming/pools/preventing-pool-chemical-injuries.html.

associated with POOL chemicals were based on a review of the New York State health events and other government regulatory guidance.

These recommendations focus on improving facility design, engineering, education, and training that stresses safe chemical handling and STORAGE practices and safe and preventive maintenance of equipment[461].

##### 6.1.2.1.4.7 Entrapment Prevention

The CPSC reports injuries and fatalities regarding entrapment in residential and commercial POOL and SPA settings[462].

##### *6.1.2.1.5 Operations*

Types of AQUATIC FACILITIES that are recommended to be discussed include POOLS, INTERACTIVE WATER AQUATIC VENUES, LAZY RIVERS, THERAPY POOLS, SPAS, WAVE POOLS, WATERSLIDES, competition POOLS, and WADING POOLS.

Settings of AQUATIC FACILITIES that are recommended to be discussed include community POOLS, apartment complex/condominium/homeowners' association POOLS, hotel/motel POOLS, and water parks.

## 6.1.3 General Requirements for Operator Training Courses

### 6.1.3.3 Course Length

The MAHC intentionally does not prescribe a particular length of time for courses. Instead, the MAHC is more PERFORMANCE-BASED by requiring that all of the essential topics in MAHC 6.1.2.1 be covered during the course. Most nationally recognized operator training courses run approximately 16 hours, and the MAHC assesses that it would be unlikely that all essential topics could be effectively taught in a shorter time period.

### 6.1.3.4 Instructor Requirements

Recognized training on AQUATIC FACILITY operation and maintenance as well as instruction *(without work experience)* is sufficient to qualify an individual to be an instructor if the requirements in MAHC 6.1.3.4 are met. It is, however, ideal to have both work experience and training in operation and instruction.

### 6.1.3.5 Final Exam

The final exam is intended to assess the knowledge and skills of the POOL operator. Key components of the exam should include questions on the essential topics outlined in MAHC 6.1.2, performing essential calculations, reading meters and electronic equipment.

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461 CDC. Pool chemical–associated health events in public and residential settings — United States, 1983-2007. MMWR Morb Mortal Wkly Rep. 2009;58(18):489-93.
462 Gipson K. Pool and spa submersion: estimated injuries and reported fatalities, 2010 Report. May 2010. Consumer Product Safety Commission. Accessed on 02/27/2011 at http://www.cpsc.gov/library/foia/foia10/os/poolsub2010.pdf.

In the future, it would be ideal if course final exams included more than just knowledge testing and have skills testing. This should include an on-site evaluation of skills such as proper calculations of quantity and chemicals needed to be added to the AQUATIC VENUE, how to operate the filtration/RECIRCULATION SYSTEM, including backwashing the filters, and water testing *(chemical and physical parameters)*.

The Conference for Food Protection established Food Protection Managers Certification Program Standards[463]. The MAHC has established the CMAHC (www.cmahc.org), which in turn may establish Pool Operator Certification Program Standards at a future date. These STANDARDS will address issues such as examination development, test administration, and computer-based testing development and administration.

#### 6.1.3.6 Course Certificates

The MAHC recommends that each certificate have a unique identifier to minimize the likelihood of mistaking the identity of QUALIFIED OPERATORS.

At this time, a certification process for QUALIFIED OPERATORS is not established. This may make it advisable for some group to develop a certification program similar to that of the Food Code. Thus, the Food Protection Managers Certification Program Standards, Section 7.7, "Responsibilities to the Public and to Employers of Certified Personnel" reflect the following, "A certification organization shall maintain a registry of individuals certified."

These STANDARDS reference certified food operators; however, the same STANDARD shall apply to operator training certificates. Thus, "any title or credential awarded by the course approved organization shall appropriately reflect the" AQUATIC FACILITY QUALIFIED OPERATOR responsibilities and "shall not be confusing to employers, consumers, related professions, and/or interested parties."[464]

#### 6.1.3.7 Continuing Education

It is recommended that a QUALIFIED OPERATOR continue their education by attending seminars or training courses to keep up-to-date in AQUATIC FACILITY operation and SAFETY.

In the long term, there is a need for development of a system for CEUs. However, it may not be prudent to make the leap to require CEUs all at once, especially since the MAHC 1st edition had provisions for all AQUATIC FACILITIES to have QUALIFIED OPERATORS for the first time. To have new requirements for operators at all AQUATIC FACILITIES and for CEUs may be overly burdensome at this time.

463 CFP. Standards for Accreditation of food protection manager certification programs as amended by the 2010 biennial Conference for Food Protection (Reviewed April 2010 (8/5/2010). Accessed 02/27/2011 at http://www.foodprotect.org/media/managercert/Standards%20April%202010%20corrected.pdf.
464 CFP. Standards for Accreditation of food protection manager certification programs as amended by the 2010 biennial Conference for Food Protection (Reviewed April 2010 (8/5/2010). Accessed 02/27/2011 at http://www.foodprotect.org/media/managercert/Standards%20April%202010%20corrected.pdf.

#### 6.1.3.8 Certificate Renewal

Nationally recognized operator training courses require renewal of certificates. However, most professional certifications do not require retaking an entire course to renew certification, just passing an exam.

Most states require these certificates or copies to be readily accessible to the AHJ. Copies of certificates should be kept on file at the site and made available upon request. If photocopies are provided as proof of certificate, or certificate renewal, the original documents should be provided within 72 hours upon request from the AHJ.

#### 6.1.3.9 Certificate Suspension and Revocation

The AHJ is expected to contact course providers with questions about the validity of any certificate or with questions about an operator's performance. In turn, course providers are expected to readily provide verification of certificates and suspensions and revocations of certificates and to notify the AHJ of actions taken in response to its reported concerns.

The Food Protection Managers Certification Program Standards, Section 7.5 reflect the following, "A certification organization shall have formal certification policies and operating procedures including the sanction or revocation of the certificate. These procedures shall incorporate due process."[465]

#### 6.1.3.10 Additional Training or Testing

Reasons for requiring such training or testing include but are not limited to operator performance or new developments in technology or operation. Such situations include but are not limited to repeat or serious violations identified on inspection, an investigation implicating operation as a contributing factor to illness or injury, or implementation of substantial rule changes. Training can range from brief dialogue during POOL inspection to full-day seminar for all operators in a jurisdiction. Testing can range from questions during inspection to paper- or computer-based exams.

#### 6.1.3.11 Certificate Recognition

The MAHC aims to delegate authority to the AHJ both to choose to recognize individual certificates and to reverse its decisions if operators with certificates demonstrate inadequate knowledge or poor performance or due cause.

#### 6.1.3.12 Course Recognition

The MAHC aims to delegate authority to the AHJ to choose to recognize operator training courses and to reverse its decisions if operators demonstrate inadequate knowledge or poor performance or due cause.

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465 CFP. Standards for Accreditation of food protection manager certification programs as amended by the 2010 biennial Conference for Food Protection (Reviewed April 2010 (8/5/2010). Accessed 02/27/2011 at http://www.foodprotect.org/media/managercert/Standards%20April%202010%20corrected.pdf.

#### 6.1.3.13 Length of Certificate Validity

A number of operator training course providers, including the American Swimming Pool & Spa Association, Aquatic Training Institute, National Swimming Pool Foundation, National Recreation and Park Association and YMCA, have set the maximum length of operator certificate validity and certificate renewal at 5 years.

## 6.2 Lifeguard Training

This portion of the MAHC deals directly with providing QUALIFIED LIFEGUARDS in an AQUATIC FACILITY to first, reduce the risk that could lead to injury and, secondly, appropriately respond to incidents when they happen. The duties of an AQUATIC FACILITY lifeguard have been compared with a number of other occupations including comparing the role of the police officer to that of a lifeguard at a swimming POOL.[466] "The majority of the time, the task is very sedentary, sitting and watching. A quadriplegic could do it; until someone needs rescuing. Then the quadriplegic could not perform the required functions. It does not often happen to a lifeguard that someone needs rescuing, perhaps 0.1 percent of the time. But the ability to jump into the water and save the drowning victim is critical to the job. This is the reason why there has been someone sitting and watching for the other 99.9 percent of the time." Bonneau and Brown's[467] position is that, because the disabled lifeguard is unable to perform the critical and essential part of the job, he is incapable of doing the job of lifeguard. Even if he can do 99.9% of the job, he should not be employed as a lifeguard. The perception of the public is that all lifeguards can perform all that is critical and essential to their job set. Unfortunately, this has sometimes been proven to be false.

Many drowning deaths resulted from omissions of basic SAFETY precautions[468,469,470,471,472,473,474,475]. These include absent or inadequate POOL fencing, unattended young children at water sites, faulty POOL design resulting in victims becoming trapped below the surface of the water, poor POOL maintenance resulting in murky or cloudy water that obscured sight of submerged bodies, lifeguards being distracted by socializing with others and doing other chores such as manning admission booths and doing housekeeping chores while on lifeguard duty, and poorly trained lifeguards who did not recognize a person in trouble in the water or had not been properly trained in rescue and resuscitation techniques. In some cases, these are correctable issues that could

466 Trottier A,et al. Police health: a physician's guide for the assessment of police officers: 1994. Ottawa, Canada: Canadian Communication Group, 1993.
467 Bonneau J, et al. Physical ability, fitness and police work. J Clin Forensic Med. 1995;2(3):157-64.
468 Modell JH. Prevention of needless deaths from drowning. South Med J. 2010 Jul;103(7):650-3.
469 Pelletier AR, et al. Fatalities in swimming pools with lifeguards: USA, 2000-2008. Inj Prev. 2011 Aug;17(4):250-3.
470 Quan L, et al. Ten-year study of pediatric drownings and near-drownings in King County, Washington: lessons in injury prevention. Pediatrics. 1989 Jun;83(6):1035-40.
471 Layon AJ, et al. Drowning: Update 2009. Anesthesiology. 2009 Jun;110(6):1390-401.
472 Browne ML, et al. Unintentional drownings among New York State residents, 1988-1994. Public Health Rep. 2003 Sep-Oct;118(5):448-58.
473 Saluja G, et al. Swimming pool drownings among US residents aged 5-24 years: understanding racial/ethnic disparities. Am J Public Health. 2006 Apr;96(4):728-33.
474 Thompson DC, et al. Pool fencing for preventing drowning in children. Cochrane Database Syst Rev. 2000;(2):CD001047.
475 Nichter MA, et al. Profile of drowning victims in a coastal community. J Fla Med Assoc. 1989 Feb;76(2):253-6.

prevent drowning deaths. We anticipate that if POOL and water SAFETY STANDARDS are strictly enforced, and as lifeguards continue to become better trained and adhere to important basic principles of surveillance, rescue, and resuscitation, the death rate in public AQUATIC FACILITIES should decline. The goal of this section is to give POOL owners and operators BEST PRACTICE guidelines for guarded and unguarded POOLS as tools to make AQUATIC FACILITIES safer for the general public.

### 6.2.1 Lifeguard Qualifications

Every day, about ten people die from unintentional drowning[476]. Of these, two are children aged 14 or younger. Drowning is the fifth leading cause of unintentional injury death for people of all ages, and the second leading cause of unintentional injury death for children 1 to 14 years of age[477]. From 2005-2009, there were on average 3,533 fatal unintentional drowning *(non-boating related)* in the United States per year and more than one in five people who die from drowning are children 14 and younger[478]. More than 50% of drowning victims treated in emergency departments require hospitalization or transfer for higher levels of care *(compared with a hospitalization rate of 6% for all unintentional injuries)*[479,480].

Nonfatal drowning can cause brain damage that may result in long-term disabilities including memory problems, learning disabilities, and permanent loss of basic functioning *(e.g., permanent vegetative state)*.[481,482] Appropriately trained lifeguards are one way to reduce this risk at public AQUATIC VENUES.

#### 6.2.1.1 Course Content

This section defines a broad scope of lifeguard training which is further described in the section below. These topics are universally found in all currently recognized national lifeguard training programs.

##### *6.2.1.1.1 Hazard Identification and Injury Prevention*

Lifeguards have an obligation to know and understand common hazards associated with AQUATIC VENUES, and how they may be mitigated or prevented. A vital component of this obligation is to provide PATRON surveillance, commonly referred to as scanning. In order to prevent injuries, a lifeguard must be taught how to recognize various swimmer conditions that need intervention such as "active," "passive", and "distressed", and to use scanning strategies and techniques to be able to see and identify the emergency. This instruction is incomplete without also teaching lifeguards how to identify factors and circumstances which cause victim recognition to become impeded such as overcrowding,

476 CDC. Drowning 2005-2009. MMWR Morb Mortal Wkly Rep. 2012 May 18;61(19):344-7.
477 CDC, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. [cited 2012 May 3]. Available from: URL: http://www.cdc.gov/injury/wisqars.
478 CDC. Drowning 2005-2009. MMWR Morb Mortal Wkly Rep. 2012 May 18;61(19):344-7.
479 CDC. Drowning 2005-2009. MMWR Morb Mortal Wkly Rep. 2012 May 18;61(19):344-7.
480 CDC. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. [cited 2012 May 3]. Available from: URL: http://www.cdc.gov/injury/wisqars.
481 Cummings P, et al. Trends in unintentional drowning: The role of alcohol and medical care. JAMA, 1999;281(23):2198-2202.
482 Spack L, et al. Failure of aggressive therapy to alter outcomes in pediatric near-drowning. Pediatric Emergency Care 1997;13(2):98-102.

cloudiness of the water, glare, or obstacles on the DECK or in the water such as SLIDES, inner tubes, or structures.

#### 6.2.1.1.2 Emergency Response Skill Set

Lifeguards should have a clear understanding of the responsibilities and actions of not only the physical skills, but also the cognitive and decision making skills involved in an emergency response. Training agencies should develop appropriate skills to address the variety of water depths in which a victim may be found. These skills should be trained not only for the technical aspects of the skill, but also how the skill is incorporated into a venue's EAP. Lifeguards should be trained to respond within the scope of, at a minimum, Basic First Aid skills to provide care for illness or injury that may occur on land within the AQUATIC FACILITY until EMS arrives.

#### 6.2.1.1.3 Resuscitation Skills

Lifeguards should be competent in CPR/AED at the professional rescuer level. The predominant body for the research of such skills is the ILCOR. ILCOR currently reviews available research every five years and is composed of physicians and medical researchers from across the globe. One organization from each country/region of the world is assigned to interpret the science-based evidence and prepare guidelines for voluntary use by training agencies in that country/region. In the United States, this designated agency is the American Heart Association. The AHA collaborates with host groups, training agencies, as well as leaders in the field from nonprofit, educational, and commercial organizations to create the "Guidelines for CPR and ECC".[483] These recommendations are also commonly known as "AHA Guidelines". ECCU (www.citizencpr.org) conferences are held biennially to present research and recommendations for guidelines. Detailed Information about the process and current research is available on the ILCOR and ECCU websites.

#### 6.2.1.1.4 First Aid

The evidence-based application of first aid skills is currently reviewed through the National First Aid Science Advisory Board and recommendations published as a separate section of the AHA CPR and ECC Guidelines and are available at the website identified in MAHC 6.2.1.1.3.

#### 6.2.1.1.5 Legal Issues

Lifeguards are part of the pre-hospital chain of response and should have basic understanding of critical legal concepts such as consent, refusal of care, and negligence. Legal topics to be covered are not limited to these listed topics. Training agencies are strongly recommended to add topics based on the typical environment in which the trained lifeguard will be employed.

483 American Heart Association Guidelines available at : http://www.heart.org/HEARTORG/CPRAndECC/Science/Guidelines_UCM_303151_SubHomePage.jsp/.

### 6.2.1.2 Lifeguard Training Delivery

#### *6.2.1.2.1 Standardized and Comprehensive*

A standardized method of training with comprehensive materials is essential to the implementation of a consistently-delivered lifeguard training program.

A specific method is not being recommended by the MAHC.

#### *6.2.1.2.2 Skills Practice*

While much of the necessary cognitive knowledge may be obtained through self-directed study, especially in an interactive online format, physical skills practice is necessary to develop an understanding of how to apply knowledge and identify the various needs in an emergency situation. During skills practice an instructor can provide individualized learning approaches, corrective feedback, and lead simulations and scenarios.

#### *6.2.1.2.3 Shallow Water Training*

It is important that the student lifeguard be able to practice and be tested in the deepest water specified in their certification.

#### *6.2.1.2.4 Deep Water Training*

It is important that the student lifeguard be able to practice and be tested in at least the minimum water depth specified in their certification.

#### *6.2.1.2.5 Sufficient Time*

This CODE does not prescribe a particular length of time for courses. Instead, this CODE is more performance based by requiring that all of the essential topics in MAHC 6.2.1.2 are covered by the training agency. National lifeguard training courses *(not renewal courses)* currently range from approximately 20 to 30 hours based on the type of training received for specific AQUATIC VENUES such as waterfronts or waterparks and the AHJ approval. Numerous factors make a uniform course length difficult to specify. Pre-existing knowledge, student-to-teacher ratio, internet-based learning formats, and course level are examples of these factors.

#### *6.2.1.2.6 Certified Instructors*

The instruction of an instructor course by an individual not directly authorized by the training agency as a lifeguard instructor trainer is extremely problematic and risks the quality controls established by the training agency. This also places public SAFETY at risk, in that the unauthorized instructor may not be fully qualified to teach the materials as intended. It also affects the training agency in that there is no direct recourse against an unauthorized, and unqualified, instructor. Lifeguard certifications, obtained from a lifeguard training course taught by an instructor who is not currently certified or authorized by the training agency to teach lifeguarding courses, will not be recognized as certified or trained by the AHJ per MAHC 6.2.1.3.

##### 6.2.1.2.6.1 Minimum Prerequisites

The creation of minimum instructor prerequisites is a crucial piece to create quality and consistency for the training agency.

#### 6.2.1.2.6.2 Completed Training

Although the MAHC requires only completion of a lifeguard and lifeguard instructor training course as a prerequisite, an effective instructor understands the demands, stresses, and practical application of skills that can be gained from actual lifeguarding experience or the benefit of extensive training in an AQUATIC FACILITY environment. Instructors who lack such experiences may not fully understand the requirements and demands of a lifeguarding position and may not provide an experienced instructor's insight to students on how to apply the skills and knowledge found in the training agency curriculum.

It is necessary that lifeguard instructors have a firm understanding of the course they will be teaching. While it may be possible for an individual to pass a lifeguard instructor course without first taking a basic course, such an instructor would lack a firm understanding of the skills required by the training agency. It should be noted however, that training agencies should have the ability to create curriculum that would allow an individual from another training agency, or an individual who chooses to take an alternative to a full basic level course, to become instructors.

A Lifeguard Instructor Training Course must also provide information to the instructor candidates on how to safely and effectively conduct a course including:

- Knowledge of how to provide for the health and SAFETY of the students. *(example knowing how to disinfect manikins for use)*;
- Ability to maintain adequate supervision at all times during in water skills and have a lifeguard on duty;
- Knowledge of how to effectively use program materials and training equipment as listed in MAHC 6.2.1.2.7;
- Ability to supervise student skill practice and provide timely, positive and corrective feedback; and
- Knowledge and ability to evaluate students as to meeting the criteria set forth by the training agency for which they are an instructor.

#### 6.2.1.2.6.3 Instructor Renewal/Recertification Process

The training agency must have a process in place for renewal/recertification of instructors. The process should identify the criteria when reauthorization is required such as an instructor must teach a certain number of lifeguard courses in a certain time period *(years)* and/or do in-person or on-line updates as needed *(e.g., when course materials or content have been revised)*.

#### 6.2.1.2.6.4 Quality Control

Quality instruction is crucial to the survival of a training agency and, in the case of lifeguard training, crucial to the SAFETY and well-being of millions of swimmers every year.

Training agencies must have procedures that allow for the correction, remediation and, if necessary, the revocation of instructor credentials.

#### *6.2.1.2.7 Training Equipment*

These pieces of equipment are required to accomplish the objectives of lifeguard training as outlined in the CODE. It is educationally sound to provide enough equipment based on the number of students who will be using it at the same time. Below is a listing of ratios recommended by several agencies; however, the training agency can adjust ratios based on their own delivery method.

##### American Heart Association

- Adult, child, and infant CPR training manikins *(1 manikin per 3 students per class period)*;
- CPR masks *(1 per 3 students)*;
- Valves for CPR masks *(1 per student)*;
- AED trainers *(1 per 3 students)*;
- Bag-valve-mask resuscitators *(1 per 3 students)*; and
- Manikin cleaning supplies *(as needed between students and after class)*.

##### American Safety & Health Institute

Recommended student to equipment ratio: 3 to 1

##### American Red Cross

- Rescue tubes *(one for every two participants)*;
- Adult and infant manikins *(one of each for every two participants)*;
- Adult and pediatric bag-valve-mask resuscitators;
- AED training devices *(one for every two participants)*;
- Adult AED training pads *(one set for each training device)*;
- Pediatric AED training pads *(one set for each training device)*;
- External bleeding control materials for each pair of participants, including:
    - Two 3-inch roller bandages, and
    - Four non-sterile dressings or gauze pads;
- Splinting materials for each pair of participants, including:
    - Four triangular bandages,
    - One 3-inch roller bandage,
    - A blanket or pillow, and
    - a rigid splint such as a magazine, cardboard, or long and short boards;
- Spinal immobilization materials;
- Backboards, each equipped with 3 straps and head immobilizers *(one backboard for every three participants is recommended)*; if fewer backboards are available, additional time may be required.

### 6.2.1.3 Competency and Certification

#### *6.2.1.3.2 Requirements*

The readiness of lifeguard candidates to respond to aquatic-based emergencies should be assessed thoroughly for skill mastery, knowledge, and practical application prior to being issued a certificate. In regards to a written exam, all nationally recognized training agencies currently require an 80% correct answer rate as the minimum threshold for passing.

#### 6.2.1.3.3 Instructor Physically Present

The physical presence of the instructor of record assures that students are evaluated accordingly in both cognitive and physical testing. This also significantly reduces the risk of individuals becoming certified who lack the basic skills and knowledge necessary through either acts of omission caused by the substitution of another individual to provide testing, or by student fraud. In addition, the instructor of record should be actively overseeing/conducting the testing to ensure quality control and that all testing objectives have been met.

#### 6.2.1.3.4 Certifications

A certification issued at the end of a lifeguard course indicates that the individual successfully met the training requirements on the day of assessment. A completion certificate does not imply future performance or suitability in all circumstances. It is the responsibility of the employer to verify skills and ongoing competency suitable for the environment in which the lifeguard will be assigned through pre-service and in-service training.

#### 6.2.1.3.5 Number of Years

The USLSC final report[484], the scientific review by the ARC[485], and the MAHC agree that lifeguarding skills need to be refreshed as often as possible. The ARC reviewed 12 peer-reviewed publications on CPR skill retention in healthcare providers *(retraining intervals of 6 weeks to 24 months)* and 28 papers focused on non-healthcare providers *(retraining interval of 3 to 48 months)*.[486] The data from these 40 studies *(all measured manikin skills, none measured patient outcomes)* showed significant CPR skill degradation within the first year after training in both job categories and the majority of skill degradation occurred in the first year. None of the 40 studies documented adequate skill retention after two years but several showed improved retention if a brief refresher was given at 6-12 months. As a result of this review and the low probability that lifeguards use the skill often enough in their job to retain the skill, the MAHC felt that the skills needed to be refreshed every year through re-certification. They did not think that the convenience of aligning the length of valid certifications for lifeguarding and first aid at two years overrode the strong data showing CPR skill degradation over two years that could put BATHER health at risk. The time periods listed in the MAHC are acceptable only if ongoing in-service and pre-service STANDARDS are followed.

484 United States Lifeguard Standards Coalition. United States Lifeguard Standards: An Evidence-Based Review and Report. Int J Aquatic Res Edu. 2011;5(1):61-129.
485 American Red Cross. ACFASP Scientific Review. CPR Skill Retention review. Accessed at http://www.instructorscorner.org/media/resources/SAC/Reviews/CPR%20Skill%20Retention.pdf.
486 American Red Cross. ACFASP Scientific Review. CPR Skill Retention review. Accessed at http://www.instructorscorner.org/media/resources/SAC/Reviews/CPR%20Skill%20Retention.pdf.

#### 6.2.1.3.6 Documentation

In order to verify compliance with MAHC 6.2.1.3.5, requiring the expiration date of the certification allows employers and the AHJ to identify that the lifeguard has a current certification.

Providing the level of training gives guidance for the employer or AHJ for suitability in specific AQUATIC VENUES. Examples of level of training include: Lifeguard, Waterpark Lifeguard, Waterfront Lifeguard, and Shallow Water Lifeguard. Such descriptions are not necessarily universal among all current training agencies.

The ability to identify the lifeguard instructor allows for higher quality control by the training agency. It also aids in the prevention of fraudulent certifications.

Clearly stating the restrictions on water depth for which the lifeguard is qualified allows the employer and the AHJ to quickly ascertain the basic abilities of the lifeguard that were assessed during training.

#### 6.2.1.3.7 Expired Certificate

A 45-day grace period after certificate expiration, was added to accommodate the numerous lifeguards attending college. Consider a senior in high school who takes their course in April. Subsequently they are now in college and typically will not return from college until early May. A grace period of up to 45 days after certificate expiration allows renewal by taking a challenge exam as opposed to completing a new training course, however the lifeguard is not permitted to lifeguard until renewal training is successfully completed. Expiration beyond 45 days requires the retaking of the course

##### 6.2.1.3.7.1 Challenge Program

A challenge course is one in which a lifeguard demonstrates the essential skills and knowledge required by the training agency. This demonstration is performed without prior review and/or instruction at the time of the challenge with the certified instructor present. Prompting or coaching is not performed unless necessary to adequately assess skill level *(e.g., “the victim is not breathing”)*.

##### 6.2.1.3.7.2 Certificate Renewal

A renewal course can also be described as a recertification course. Review / Recertification courses are abbreviated courses designed to be used to assess that a currently certified lifeguard has the necessary skills and knowledge to perform essential competencies required of the training agency.

Although some skills and information are universal to all lifeguard training agencies, there are differences in physical skills. A lifeguard attempting to recertify through a different agency is not likely to have ample time to master these different physical skills. This should not be confused with “crossover” type courses which are specifically designed to teach a currently certified lifeguard the different skills and information from another training agency.

#### 6.2.1.3.8 Certificate Suspension and Revocation

The AHJ is expected to contact course providers with questions about the validity of any certificate or with questions about a lifeguard's performance. In turn, course providers are expected to readily provide verification of certificates and suspensions and revocations of certificates and to notify the AHJ of actions taken in response to its reported concerns.

The Food Protection Managers Certification Program Standards, Section 7.5 reflect the following, "A certification organization shall have formal certification policies and operating procedures including the sanction or revocation of the certificate. These procedures shall incorporate due process."

## 6.2.2 Lifeguard Supervisor Training

### 6.2.2.1 Lifeguard Supervisor Candidate Prerequisites

The MAHC agreed that 18 years and above was an adequate age level to consider a person as being mature enough for this position but there are many examples of good supervising at a younger age. This was a starting point but many other factors with regard to experience, training, management skills, and others were equally or more important. For this reason, the minimum age for a LIFEGUARD SUPERVISOR is not specified and is limited to meeting the minimum age requirement of a lifeguard and having the experience that equates to one season of lifeguarding *(3 months)*.

Concerning having successfully completed a lifeguard training course in the past, the MAHC considers it necessary for a lifeguard supervisor to have had this training and experience, but it is not necessary to have a current certification. However, the MAHC suggests that the training course should have been completed in the recent past such as within a 5-year period.

The requirement of the ability to communicate in English is related to the ability to effectively activate the EAP and deliver instructions as well as interface with emergency services. This is similar to the requirement on airlines for emergency exit row seating.

### 6.2.2.2 Lifeguard Supervisor Training Elements

As of the writing of the MAHC, lifeguard supervision and management training courses are limited. In the development of the MAHC, the MAHC recognizes the importance of ongoing AQUATIC VENUE supervision with adequate training in injury prevention and response. What constitutes supervisor and management training was heavily discussed. The concept of "supervisor training" lends itself to far more than simply MONITORING lifeguards and performing essential functions of the lifeguard as needed. Required skills for the supervisor include staff management skills, emergency response, decision making, knowledge of aquatic industry STANDARDS, etc. This list is obviously not comprehensive. This leads to a main concern in the development of a LIFEGUARD SUPERVISOR course which is course content and length. Training agencies are encouraged to develop a system of training LIFEGUARD SUPERVISORS that incorporates the critical components of supervising lifeguards and responding to incidents in an AQUATIC FACILITY as these items directly affect BATHER SAFETY. This may include a variety of levels

that address this information in various ways and as appropriate for the intended audience of each level course. The skills and knowledge found in this section are considered by the MAHC to be essential to any LIFEGUARD SUPERVISOR training course, regardless of intended depth of scope. The course outline and requirements mirror that of the lifeguard training course requirements.

LIFEGUARD SUPERVISORS need to have knowledge beyond that of the lifeguard training program. The LIFEGUARD SUPERVISOR is responsible for keeping the lifeguard accountable for their own performance and as such should MONITOR scanning and vigilance within the zone of PATRON responsibility. As situations occur, the LIFEGUARD SUPERVISOR will also need to react to reduce risk while they understand the legal responsibilities of the job.

Due to the nature of the content in the LIFEGUARD SUPERVISOR training, it is possible for this content to be delivered in person or online utilizing various methods such as video and interactive media to establish competency.

### 6.2.2.3 Lifeguard Supervisor Training Delivery

#### *6.2.2.3.1 Standardized and Comprehensive*

The term standardized is meant to convey that the materials are STANDARD, in writing, and are consistent from one course to another when delivered. This would require that providers, whether an agency or an AQUATIC FACILITY, have a STANDARD method to deliver the course.

#### *6.2.2.3.2 Sufficient Time*

A course length is not specified as each training agency may have their own program that incorporates all the requirements but may also add other topics. The method used to effectively instruct is up to the training agency. Some may take more time than others. The MAHC is not prescriptive on timing but rather on a course timeline that allows for covering the course content.

#### *6.2.2.3.4 Lifeguard Supervisor Course Instructor Certification*

This is the same rationale as for lifeguard training.

This allows for an AQUATIC FACILITY to have its own internal LIFEGUARD SUPERVISOR training course or use a training course through a training agency.

##### 6.2.2.3.4.2 Minimum Prerequisites

This allows for experienced supervisors that may not have the physical skills to do the current lifeguard course as defined by the MAHC but still require the knowledge of lifeguarding.

The LIFEGUARD SUPERVISOR instructor training course utilizes the same rationale as the lifeguard Instructor training course.

##### 6.2.2.3.4.3 Quality Control

This is the same rationale as for lifeguard training.

#### 6.2.2.4 Competency and Certificate of Completion

##### *6.2.2.4.1 Lifeguard Supervisor Proficiency*

LIFEGUARD SUPERVISOR testing could be in many forms from situational-based observations, shadowing with an experienced supervisor, or testing technical knowledge. Some LIFEGUARD SUPERVISOR skill proficiencies can be subjective so the methodology for testing is not prescribed in the CODE.

##### *6.2.2.4.2 Lifeguard Supervisor Certificate of Completion*

This uses the same rationale as for the lifeguard instructor training course found in MAHC 6.2.2.3.4.1. It is the intent of the MAHC to require completion of a course meeting the described requirements. At this time, it is not intended to be an ANSI-defined certification process, which will require such items as delivering training instruction independently from the testing and assessment process.

## 6.3 Facility Staffing

### 6.3.1 Qualified Operators Requirements and Availability

### 6.3.2 Aquatic Facilities Requiring Qualified Lifeguards

There are many conditions that result in higher risk for BATHERS in an AQUATIC FACILITY and/or higher risk for any persons attempting to assist a BATHER in distress. These conditions each have their own distinct features that the MAHC felt a QUALIFIED LIFEGUARD presence would reduce those risks. These requirements only apply to AQUATIC VENUES with standing water.

1) ***Deeper than 5 Feet:*** The 50th percentile female adult is at least 63.8 inches *(162 cm)* tall. The rationale is that the average adult BATHER'S head would be above the static water line and they could use the AQUATIC VENUE without difficulty. If a BATHER were in distress, another adult BATHER would be able to assist with equipment or without equipment. Under these conditions, assuming adults are present, the likelihood of providing assistance by untrained persons is high compared with water depths above 5 feet *(1.5 m)*.

   The MAHC thinks it necessary to begin working to prevent some of the deaths caused by greater water depth combined with the lack of lifeguard supervision. The hardship this could cause unguarded AQUATIC FACILITIES is recognized. As a result, the MAHC requirements still allow for existing AQUATIC FACILITIES to be unguarded if they follow the requirements outlined in the MAHC, such as posting required signage. However, new construction of unguarded AQUATIC VENUES will require them to be less than 5 feet *(1.5 m)* deep.

2) ***14 years of age or Younger:*** Many STANDARDS recognize that a person who is under the 14 years of age is considered to be a child and that their ability to make

decisions, especially when complying with rules, require adult supervision[487]. Because the AQUATIC VENUE presents the risk of drowning at any depth and despite rules being posted, adult supervision is required for compliance with those rules.

The 50th percentile female at 14 years of age is 63.4 inches *(161.0 cm)* tall while the 50th percentile female at 13 years of age is less than 62.1 inches *(157.7 cm)* tall. This is a critical time frame in which the 1+ inches *(3.3 cm)* are the difference between water over one's nose/mouth or the ability to keep the nose/mouth above the static water line.[488]

The phrase "allows for unsupervised children" implies that an AQUATIC FACILITY that does not allow unsupervised children would not need a QUALIFIED LIFEGUARD. The intent for supervision of children is that parents/guardians or other similar adults responsible for the children are present at poolside with the children and the children are in sight. The critical component is how this is enforced. In some cases, the facility may have a sign posted that persons under the 14 years of age are not allowed, such as a hotel POOL. In these cases, mechanisms should be in place for MONITORING and enforcing the rule understanding that by posting a sign, it is the responsibility of the adult supervising these persons under 14 years of age to also comply with the rule.

3) ***Dedicated Surveillance:*** The responsibilities of a QUALIFIED LIFEGUARD are different from the responsibilities of the chaperone of a youth group. The MONITORING of children in these environments is often more than six children to every chaperone. These responsibilities must be separated by having the presence of a QUALIFIED LIFEGUARD that is not distracted by the activities of the group and is focused on their zone of PATRON surveillance.

   The chaperone, even if trained as a lifeguard, cannot manage both PATRON surveillance and the activities of individual children. If the chaperone is not trained as a lifeguard, it puts them at risk if a rescue is required.

4) ***Group Practice or Instruction:*** Competitive swimming, sports, lifeguard training, exercise programs, and group swimming lessons all include multiple persons being instructed by one or more persons for a distinctly different objective. The primary focus is on the activity and not on PATRON surveillance. Similar to the rationale for youth groups, there is a need to separate the responsibility of the coach/instructor from that of providing dedicated PATRON surveillance.

   Group swim lessons are an obvious reason to have a QUALIFIED LIFEGUARD as participants are not proficient at swimming, thus at higher risk for drowning. Lifeguard training, sports, exercise programs, and competitive swimming involve exertion and could result in a BATHER in distress. If the instructor is focused on an

487 International Standards Organization. ISO/IEC Guide 50:2002. Safety Aspects --Guidelines for Child Safety. Available at http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=32941.
488 McDowell MA, et al. Anthropometric Reference Data for Children and Adults: United States, 2003–2006. National Health Statistics Reports, 2008;10:1-45. Available at http://www.cdc.gov/nchs/data/nhsr/nhsr010.pdf

individual, the risk of a different person drowning unnoticed is higher than if a QUALIFIED LIFEGUARD was assigned just to PATRON surveillance.

5) ***Large Aquatic Venues:*** Aquatic rescue throwing devices have been found to have a reasonable ability to reach 30 feet *(9.1 m)* in distance or less by untrained individuals. AQUATIC VENUES with distances greater than what it is reasonable for SAFETY equipment to be used from the DECK need to be supervised with QUALIFIED LIFEGUARDS.

6) ***Moving Water:*** Anywhere there is moving water, there is a greater chance for a PATRON to be moved by the force of the water in an unwanted manner. This could include moving the PATRON a distance from SAFETY, causing the PATRON to lose their balance and have a sudden submersion, and other disruptive problems. This is not intended to include "normal" flow from filtration system wall INLETS. The MAHC agrees these AQUATIC VENUES need to have QUALIFIED LIFEGUARD supervision.

   WATERSLIDE LANDING POOLS have an induced current from the lift pump providing water as lubrication on the SLIDE. This is not to be confused with POOL SLIDES that are on a POOL DECK and do not have water flowing down them. Some smaller SLIDES have a small amount of water on them to lubricate the surface but generally do not have a dedicated POOL to "catch" or “land” riders and do not generate a significant current.

   INTERACTIVE WATER AQUATIC VENUES that do not include standing water are not included in this line item as they have an induced water movement but do not have standing water. There is no QUALIFIED LIFEGUARD requirement for an AQUATIC VENUE with no standing water.

7) ***Starting Platforms and Diving Boards:*** The risk of spinal injuries increases with activities involving head first entries from starting platforms and diving boards. As such, the need for QUALIFIED LIFEGUARDS to monitor behaviors and control the use of starting platforms and diving boards is important.

### 6.3.3 Safety Plan

The MAHC agreed that there needs to be a SAFETY PLAN that is specific to the AQUATIC FACILITY. Training agencies, ANSI/APSP-1 and -9 STANDARDS for public swimming POOLS and aquatic recreation facilities all speak to having plans written, rehearsed, and reviewed. The MAHC agreed that there are other types of plans that detail processes that directly affect PATRON SAFETY. In the CODE, the SAFETY PLAN is outlined to contain several PATRON-SAFETY components. The SAFETY PLAN is written dependent on whether or not QUALIFIED LIFEGUARDS are present.

*Note that the SAFETY PLAN components are different for guarded and unguarded aquatic facilities.*

The AQUATIC FACILITY staffing plan is meant to identify positions in the AQUATIC FACILITY that address specific risks as well as support staff that would be present to assist in cases of emergency or provide support by MONITORING performance of QUALIFIED LIFEGUARDS *(for AQUATIC FACILITIES requiring them)*. In unguarded AQUATIC FACILITIES, this plan would include other staff in the STAFFING PLAN. Training agencies, ANSI STANDARDS for public swimming POOLS, and AQUATIC FACILITIES all speak to having plans written, rehearsed, and reviewed for emergency action.

Pre-employment testing as well as scheduled training is needed to verify that staff members are qualified for the environment. The MAHC agreed that ongoing in-service training programs for lifeguards, attendants, QUALIFIED OPERATORS, and other aquatic personnel should be required. To address this, the definition for QUALIFIED LIFEGUARD requires ongoing in-service training. Such programs should include drills aimed at raising the awareness of AQUATIC FACILITY surveillance, victim recognition, emergency response, CPR/water drills, and simulations incorporating daily challenges. In addition, in-service training needs to be documented.

#### 6.3.3.1 Code Compliance Staff Plan

In consideration of the requirements of the CODE as it relates to staff, the MAHC recognizes the need for identifying an individual or individuals to be responsible for compliance with the CODE and the general operation of the AQUATIC FACILITY. For this reason, certain functions are identified and the AQUATIC FACILITY should designate persons to be responsible for each function even if multiple functions are accomplished by a single person. The AQUATIC FACILITY staffing plan is meant to identify risks and create accountability for the prevention and/or mitigation of such risks by identifying person*(s)* responsible for each.

##### Risk Management Responsibility

It is important to not only address identified risks but to designate persons who shall be responsible for conducting periodic SAFETY inspections to be proactive about finding and mitigating risk as well as making decisions on closure for imminent hazards. Determining who is responsible for deciding on closure of the AQUATIC FACILITY is important as it empowers the designated person but also creates a clear point-person for staff to go to for making this decision. The AHJ may be conducting periodic reviews and may have recommendations or need additional information. It would be beneficial to identify the individual or position responsible for interfacing with the AHJ to most effectively address changes or to provide background information. This makes it clear to stakeholders where to direct information or requests.

##### Maintenance and Repair of Risks

Once risks are identified, it is critical to determine who is responsible for mitigating those risks. In some cases, it may be a facility maintenance person responsible for conducting repairs, but ultimately it is the responsibility of management to make sure these risks are addressed. Failure to maintain water and air quality can result in illness and it is the responsibility of the AQUATIC FACILITY to maintain proper air and water quality. In some cases, a maintenance team manages these systems and in some cases it may be a third

party contractor or the QUALIFIED LIFEGUARD staff. Nonetheless it is important to determine who is responsible for these systems to minimize the risk to BATHERS.

#### Enforcing Rules and Responding to Emergencies

It is important to identify who is responsible for rule enforcement. One may assume the QUALIFIED LIFEGUARD is the person responsible for rule enforcement, but by identifying the function here, it will make it clear that their primary role is in preventing injury. QUALIFIED LIFEGUARDS will generally be the first responder to an incident but other support staff may participate in the EAP, whether QUALIFIED LIFEGUARDS are present or not. Identifying QUALIFIED LIFEGUARDS, LIFEGUARD SUPERVISORS, medical specialists, and management are critical pieces of an EAP and should be identified as a part of the staffing plan in any SAFETY PLAN.

#### Supervising Staff

It is important to have a person designated as the person responsible for the critical SAFETY functions of an AQUATIC FACILITY. Although each QUALIFIED LIFEGUARD is accountable for their zone, the LIFEGUARD SUPERVISOR makes sure each individual is doing what is expected and is present for responding to emergencies and taking the lead in making decisions about imminent hazards. Accountability for rotations and breaks lies with the LIFEGUARD SUPERVISOR and should be clearly identified in the SAFETY PLAN to show the ability to comply with the CODE.

#### Training

QUALIFIED LIFEGUARDS who cannot demonstrate proficiency in their lifeguarding skills may be a danger to BATHERS and to themselves. Serious deficiencies that are not immediately corrected may cause the serious injury or death of a BATHER, the QUALIFIED LIFEGUARD, or other staff member. For this reason, it is important to identify who is responsible for conducting pre-service evaluations and in-service training. In both cases, it may be someone specifically trained in evaluating skills or trained in training others.

### *6.3.3.1.1 Zone of Patron Surveillance*

The zones of PATRON surveillance are identified in the SAFETY PLAN so that all stakeholders are aware of the zones, how many QUALIFIED LIFEGUARDS are required to effectively cover all parts of the AQUATIC VENUE*(S)*, and show that each zone can be effectively monitored by a QUALIFIED LIFEGUARD in accordance with the CODE.

The MAHC agrees that having identified zones of PATRON surveillance was one of the most needed components for all AQUATIC VENUES. QUALIFIED LIFEGUARDS should be able to determine their area of responsibility and be able to focus on that area. With the proper coverage, all areas of the AQUATIC VENUE needing to be covered would be assigned. The MAHC thought that one of the challenges in AQUATIC VENUE management is to ensure that QUALIFIED LIFEGUARDS understand the exact scope of their zone of PATRON surveillance. Training agencies and the ANSI STANDARDS for AQUATIC FACILITIES speak to “lifeguards understanding their responsibilities to their assigned stations.” This would include understanding what type of position *(e.g., elevated, roaming)* the QUALIFIED LIFEGUARD should be in for the most effective PATRON surveillance.

Both the ANSI/APSP-1 Public Swimming Pools and ANSI/APSP-9 STANDARDS state that the lifeguard "shall be positioned and provided equipment in order to reach the victim within 20 seconds of identification of a trauma or incident *(e.g., response time)*." Note that this time *(20 seconds)* addresses the time the rescuer must reach the furthest extent of the zone, which would include addressing size and shape of each zone, among other factors. It does not include the "recognition phase" in this time.

For the purposes of maintaining effective surveillance of a zone of PATRON responsibility, the zone is generally set up based on the location of the QUALIFIED LIFEGUARD and their ability to see the entire zone. In some cases, it requires the QUALIFIED LIFEGUARD roam to see the entire zone and in some cases the QUALIFIED LIFEGUARD must be elevated to see the whole zone. For this reason, the SAFETY PLAN must stipulate by what method the QUALIFIED LIFEGUARD can see the whole zone.

Additional responsibilities may include MONITORING of adjacent DECKS or MONITORING activities on a structure such as a WATERSLIDE, play element, or other AQUATIC FEATURE. As the aquatics industry has added other AQUATIC FEATURES to traditional AQUATIC VENUES, it is important to identify these additional responsibilities that may not be apparent if the zone were strictly a flat-water POOL.

An AQUATIC FACILITY may have more than one AQUATIC VENUE and for each AQUATIC VENUE, may have multiple zones of PATRON responsibility. These zones may overlap in some areas and it is important to show there are not unassigned areas. The MAHC does not speak to a time STANDARD for identification of an incident versus the response time, as there are too many variables in the circumstances leading to an incident.

#### 6.3.3.1.2 Rotation Procedures

Studies have documented the effect of critical and non-critical signals on maintaining vigilance in tasks; these may be useful in understanding lifeguarding duties. Jerison and Pickett demonstrated that a high number of critical signals could be processed by the lifeguard for up to 60 minutes with tolerable effects on vigilance.[489] However, the study found that low numbers of critical signals indicated that detrimental effects on vigilance occurred after only 20 minutes. This study also referenced the Mackworth Clock Test, commissioned in 1950 by the British Royal Navy, which found that optimal vigilance cannot be maintained for more than 30 minutes.[490] Researcher N.H. Mackworth developed the visual sensitivity loss model. Using classic clock-task experiments, signal detection performance often declined during the first half hour of the watch. Later experiments found five- to 10-minute breaks reset the vigilance level to its original point.[491]

489 Jerison HJ, et al. Vigilance: The Importance of the Elicited Observing Rate. Science. 1964;143(3609):970-1.
490 Mackworth NH. Researches in the measurement of human performance. MRC spec. Report 268 HMSO, 1950.
491 Lichstein KL, et al. The Mackworth Clock Test: a computerized version. J Psychol. 2000 Mar;134(2):153-61.

The SAFETY PLAN should specify how breaks or changes in duties will be instituted into the rotation plan without reducing the number of QUALIFIED LIFEGUARDS on PATRON surveillance.

For single QUALIFIED LIFEGUARD AQUATIC FACILITIES, the plan needs to address procedures for keeping PATRONS out of the water while the QUALIFIED LIFEGUARD is on break or performing other alternation of task activities. Other AQUATIC FACILITY staff may need to be at poolside to ensure that PATRONS stay out of the water, unless all PATRONS leave the AQUATIC VENUE and it is appropriately secured against entry. The "off-duty" QUALIFIED LIFEGUARD cannot be responsible for this activity as it does not meet the intent, which is to accomplish a reset of the vigilance level.

Having a sound lifeguard rotation plan and procedures is crucial to the ability of the QUALIFIED LIFEGUARDS to be effective in PATRON surveillance. During the rotation of QUALIFIED LIFEGUARDS there can potentially be a lapse of PATRON surveillance if not done correctly. Because of this, the rotation system must be practiced and evaluated as to eliminate or minimize the lapse of PATRON surveillance time.

Heat, humidity, and high BATHER COUNTS are stresses for QUALIFIED LIFEGUARDS, which may warrant more frequent breaks. Note that DECK areas are part of the zone of PATRON surveillance for some lifeguard stations to prevent incidents from occurring *(e.g., stop running on DECK, stop diving from DECK to shallow water, and otherwise enforcing rules)*.

#### 6.3.3.2 Emergency Action Plan

The MAHC agreed that there needs to be an emergency closure policy that is retained and available for review by the AHJ.

Training agencies educate lifeguards to expect a written EAP created by the AQUATIC FACILITY where they will work that addresses the reasonably foreseeable emergencies that could occur.

There is a need to identify how emergencies are communicated within the AQUATIC FACILITY and external to the AQUATIC FACILITY. The types of emergencies that could occur in AQUATIC FACILITIES include but are not limited to: chemical spills, submersion events/drowning, fire, violent acts, lost children, contamination *(fecal incidents and water clarity)*, and inclement weather.

AQUATIC FACILITY staff will likely be the persons to observe any imminent hazards and should be empowered to close POOLS or other areas of the AQUATIC FACILITY should those hazards be present. In particular, fecal incidents, water clarity, and inclement weather may be encountered more often and the AQUATIC FACILITY staff should know procedures for dealing with those imminent hazards and their authority to close the AQUATIC FACILITY.

##### *6.3.3.2.1 Coordination of Response*

The EAP identifies the individuals available and expected to respond. The goal of an EAP for a life-threatening emergency should be to activate EMS and provide for other

individuals to assist the QUALIFIED LIFEGUARD with the actions identified in the EAP *(such as CPR if needed)* as soon as possible. Performing effective compressions is difficult to maintain for more than a few minutes, and the presence of at least one person to take over compressions creates a cycle of rest.

In AQUATIC FACILITIES where there are multiple QUALIFIED LIFEGUARDS and/or other staff persons such as desk or maintenance personnel who are always closely available when the AQUATIC FACILITY is open, it is feasible for many persons who are trained in CPR/AED and first aid to respond within three minutes. Having a person who is CPR trained who can respond within minutes greatly improves survivability.[492]

At an AQUATIC FACILITY with a single QUALIFIED LIFEGUARD, the SAFETY PLAN should identify the options for obtaining assistance, which is likely to include use of bystanders. If bystanders are part of the EAP, pre-service and in-service training should include how to direct bystanders in an emergency.

#### 6.3.3.3 Pre-Service Requirements

##### *6.3.3.3.1 Safety Team EAP Training*

The MAHC agreed that there needs to be a SAFETY PLAN specific to each AQUATIC VENUE. Training agencies, ANSI STANDARDS for public swimming POOLS, and AQUATIC FACILITIES all speak to having plans written, rehearsed, and reviewed for emergency action.

It is imperative that EAP training take place before the staff begins their work as an emergency can happen at any time.

Providing a copy or posting a copy for staff ensures staff has access to the information at any time.

##### *6.3.3.3.2 Safety Team Skills Proficiency*

Responding to emergencies may require more specific skills and physical abilities, which once learned, must be maintained as emergencies can occur at any time. This demonstration of skill and/or knowledge verifies the staff person is ready to fulfill their role.

##### *6.3.3.3.3 Qualified Lifeguard Emergency Action Plan Training*

The QUALIFIED OPERATOR is required to prepare the SAFETY PLAN as a set of policies for the AQUATIC FACILITY. It is imperative that the employees be aware of their responsibilities and have access to the information at all times the AQUATIC FACILITY is open, so they may refresh their memory or seek further information. Training during pre-service will allow the QUALIFIED LIFEGUARD to become trained in the SAFETY PLAN of the AQUATIC FACILITY.

##### *6.3.3.3.4 Qualified Lifeguard Skills Proficiency*

492 Ritter G, et al. The effect of bystander CPR on survival of out-of-hospital cardiac arrest victims. Am Heart J. 1985 Nov;110(5):932-7.

It is imperative that all lifeguards hired are currently able to perform effectively in the workplace. AQUATIC FACILITIES need to assess the lifeguard's ability to perform the job skills necessary to be a QUALIFIED LIFEGUARD at the AQUATIC FACILITY, including at any AQUATIC VENUES within the AQUATIC FACILITY where the lifeguard may be assigned, before allowing the lifeguard to be on duty.

When first hired, lifeguarding skills should be assessed during pre-service training prior to the first duty assignment. In-service training should assess skills on a regular basis to determine ability for ongoing duty assignments. Training agencies require that employees have training, knowledge and the proper equipment to protect the employee and the PATRON against disease transmission. This level of awareness must be in place before active PATRON surveillance takes place.

All lifeguard training agencies require lifeguards to be able to perform a combined rescue skill with equipment to receive completion certification. All lifeguard training agencies train their lifeguards that they must be able and ready to recognize, respond, rescue, and resuscitate a victim as quickly as possible. The employer should verify that the lifeguard maintains these skills in the workplace.

#### *6.3.3.3.6 Documentation of Pre-Service Training*

Documentation provides a method for the AHJ to verify compliance. An example of the type of documentation required is a skills check-off form with a participant attendance sheet.

### 6.3.3.4 In-Service Training

#### *6.3.3.4.1 Documentation of In-Service Training*

All lifeguard training agencies support the need for ongoing in-service training. Both ANSI/APSP -1 and -9 state that certain topics be covered in this training. These in-service trainings should include all the SAFETY PLANS and in and out of water rescue skills for lifeguards.

The USLSC final report[493], the scientific review by the ARC[494] and the MAHC agree that lifeguarding skills need to be refreshed as often as possible. The Texas State Pool Code requires at least 4 hours of in-service a month. Other states require that in-service training be documented and signed. The MAHC agrees that all AQUATIC FACILITIES should have an ongoing in-service program for their SAFETY TEAM members.

The term "periodic" is to offer flexibility to the QUALIFIED OPERATOR based on their seasonality, staff scheduling, and the training agency requirements.

493 United States Lifeguard Standards Coalition. United States Lifeguard Standards: An Evidence-Based Review and Report. Int J Aquatic Res Edu. 2011;5(1):61-129.
494 American Red Cross. CPR Skill Retention review. Accessed at http://www.instructorscorner.org/media/resources/SAC/Reviews/CPR%20Skill%20Retention.pdf.

Much of in-service training is focused on skill building and maintenance as well as competency demonstration and testing so it is clear that those aspects should be delivered by qualified personnel (e.g., lifeguard instructors). However, in addition to the required in-service training in the MAHC, instruction from individuals that may not be lifeguard instructors but that have particular skill sets, training, or unique qualifications that would enhance a lifeguard's skills over and above the in-service training requirements of the MAHC can be provided. For instance, ancillary qualified persons such as EMS personnel, health inspectors, police officers, certified counselors, teachers, public health officials, and others could provide in-service training that could enhance the abilities and knowledge of a lifeguard. In addition to providing the required in-service training, lifeguard supervisors and managers should be able to draw upon subject matter experts with expertise in areas that, in their professional opinion, would provide instruction related to the lifeguard's responsibilities and duties.

#### 6.3.3.4.2 In-Service Documentation

Documentation is maintained at the AQUATIC FACILITY to provide a method for the AHJ to verify compliance during an inspection. Documentation is crucial to prove that the in-service training took place, and this documentation should include a list of the topics covered, who was in attendance, and the date and time of the training.

#### 6.3.3.4.3 In-Service Training Plan

Requiring QUALIFIED LIFEGUARDS to have the ability to respond to a victim and complete a rescue is critical. To not specify this requirement would allow a QUALIFIED LIFEGUARD to demonstrate the individual skills but not necessarily have the ability to do all the skills in consecutive order to complete the whole rescue.

Physical fitness is a critical part of performance when conducting a rescue. QUALIFIED LIFEGUARDS who are newly certified must maintain their physical fitness and skill proficiency throughout the term of their certificate as those skills can be called upon at any time. The required level of physical fitness can be determined by several means.

Schultz and colleagues showed that in order to do CPR at 80 compressions a minute *(training now requires 100 compressions a minute)* over a 10 minute period of time, the METS required to perform this task was 4.6 ± 0.7[495]. One would expect this number to increase using the current protocol for CPR. The following logic and calculations was developed by Dr. Timothy Lightfoot[496] using METS values for a variety of activities that lifeguards might be expected to perform.[497,498,499] If someone swims 500 yards *(457 m)* in

495 Shultz JJ, et al. Comparison of exertion required to perform standard and active compression-decompression cardiopulmonary resuscitation. Resuscitation. 1995 Feb;29(1):23-31.
496 Dept. of Health and Kinesiology. Texas A&M University. College Station, TX 77845-4243.
497 Ainsworth BE, et al. 2011 Compendium of Physical Activities: a second update of codes and MET values. Med Sci Sports Exerc. 2011 Aug;43(8):1575-81.
498 Dafoe WA. Appendix: table of energy requirements for activities of daily living, household tasks, recreational activities, and vocational activities. In: Pashkow FJ, Dafoe WA, editors. Clinical cardiac rehabilitation: a cardiologist's guide. Baltimore, MD: Williams and Wilkins, 1993; 359-376.
499 Jetté M, et al. Metabolic equivalents (METS) in exercise testing, exercise prescription, and evaluation of functional capacity. Clin Cardiol. 1990 Aug;13(8):555-65.

10 minutes, they exert 8 METs/min *(so, almost double the CPR cost discussed above)*; Similar levels of exertion are given by:

- Running at 5 mph on a level grade *(running one mile in 12 min or 0.8 mile in 10 minutes)*
- Riding a bicycle at 14 mph on level grade *(riding 2.3 miles in 10 minutes)*

If the metabolic cost of doing CPR is about 4.75 METS, then lifeguards that are able to do the above tasks, should be able to do CPR almost indefinitely BECAUSE *(and this is important)*, the metabolic cost of doing CPR is only 60% of the cost of the above exercise. Importantly, this means that when doing CPR, the metabolic cost is not so intense that they will be doing effort that will increase the amount of lactate in their blood *(i.e. they won't go above lactate threshold)* and if they stay below lactate threshold *(60-65% max intensity)* they should be able to do CPR a long time.

The United States national average response time for a BLS ambulance is 10 minutes. Paramedics are 12-15 minutes. For this reason, QUALIFIED LIFEGUARDS should be fit enough to do the rescue and do CPR for at least this time frame.

#### *6.3.3.4.5 Competency Demonstration*

The point of this section is to have the skills performed consecutively and not individually as they may be done in some training classes. If all of these skills cannot be done consecutively, it is difficult to expect a successful rescue. This is not intended to preclude scenario-based activities that accomplish the same.

### 6.3.3.5 AHJ Authority to Approve Safety Plan

Some jurisdictions will have the resources to review the SAFETY PLAN and others may not. These line items allow for that flexibility but as a matter of enforcement, the submittal of the SAFETY PLAN is required in either scenario. Should an incident occur in which the jurisdiction is investigating, the SAFETY PLAN on file would be a good point of reference. The MAHC agreed that there needs to be an SAFETY PLAN that is retained and available for review by the AHJ as a point of reference detailing the intended operation to compare to the operation observed in the field.

#### *6.3.3.5.1 Safety Plan on File*

The SAFETY PLAN itself should be a tool for facility staff to utilize and as such should be present at the AQUATIC FACILITY and not merely a book sitting on a shelf in an administrative office.

#### *6.3.3.5.2 Safety Plan Implemented*

These MAHC sections are written to be performance-based and since each AQUATIC FACILITY is different, each SAFETY PLAN may be different. The SAFETY PLAN is developed to be a written document that establishes the processes the AQUATIC FACILITY will employ to be compliant with the CODE. It is important to also put in the CODE that those processes, although written, are also practiced and in evidence for the AHJ to see and compare the operation to what is written in the SAFETY PLAN and therefore compliant with the CODE.

During routine inspections, the AHJ may want to see the SAFETY PLAN for the AQUATIC FACILITY as a point of reference but also to enforce a requirement of the CODE to have a plan.

## 6.3.4 Staff Management

### 6.3.4.3 Lifeguard Staff

#### *6.3.4.3.1 Minimum Number of Lifeguards*

Parts of POOLS or additional POOLS within the same AQUATIC FACILITY may not be open at all times during any given day. For example, only three lanes of a large POOL may be open during early morning lap swim. All zones of PATRON surveillance must be staffed unless the AQUATIC FACILITY can effectively limit access to only the lap lanes. A potential problem arises though, when the entire POOL is not under surveillance because a PATRON in the open section may move to a section/zone not intended to be open. Without surveillance, it may go unnoticed. So, the ability to restrict access and monitor or otherwise assure that no one enters the un-opened section/zone must be able to be effectively addressed and those details must be included in the SAFETY PLAN.

#### *6.3.4.3.2 Lifeguard Responsibilities*

QUALIFIED LIFEGUARDS are the front line personnel at an AQUATIC FACILITY to witness most of the situations in which an AQUATIC FACILITY or AQUATIC VENUE should be closed. The QUALIFIED LIFEGUARD must be aware of these emergency closure issues in order to enforce them – examples include an inability to see the bottom or main drains, fecal accidents, severe weather, and others developed by the MAHC.

The MAHC agreed that since there is no established guideline for vision needed for the job of a QUALIFIED LIFEGUARD that if the individual QUALIFIED LIFEGUARD has corrected vision via lenses that they should wear them while conducting PATRON surveillance. Further research needs to be done in this area. Some professions require a minimum vision STANDARD non-corrected while others accept corrected vision to a certain level.

#### *6.3.4.3.3 Shallow Water Certified Lifeguards*

If a training agency issues a shallow water certification, the shallow water lifeguard is not qualified to be stationed in a zone that has a water depth greater than that identified for the certification. If any part of the zone has a depth of water greater than that depth, the shallow water lifeguard is not qualified to be assigned to that zone.

#### *6.3.4.3.4 Direct Surveillance*

The factors of recognition, intrusion, and distraction have been identified as major contributor to drowning in guarded venues. Nothing should be allowed to interfere with a lifeguard's duty to perform PATRON surveillance. The MAHC agreed that QUALIFIED LIFEGUARDS performing PATRON surveillance should not be doing other tasks that could distract them.

When on duty, a QUALIFIED LIFEGUARD should scan and supervise the AQUATIC VENUE with no other distracting activities such as cleaning, water testing, and minimize unnecessary conversing with PATRONS.

#### 6.3.4.3.5 Distractions

When QUALIFIED LIFEGUARDS are engaged in conversations while performing PATRON surveillance activities, their attention is distracted from surveillance. As a parallel, research has shown that even hands-free cell phone conversations can cause drivers to be distracted.[500]

### 6.3.4.4 Supervisor Staff

#### 6.3.4.4.1 Lifeguard Supervisor Required

The LIFEGUARD SUPERVISOR fulfills the role of making QUALIFIED LIFEGUARDS accountable for performing well and making sure the rotations are conducted properly. It is critical that QUALIFIED LIFEGUARDS perform their duties as trained and that the risk factors that affect the QUALIFIED LIFEGUARD'S ability to perform have been mitigated. In addition, someone should be responsible for maintaining equipment and knowing when an AQUATIC FACILITY should close and how to mitigate hazards. This level of skill is different from that of the QUALIFIED LIFEGUARD, and each of these skills is important to have on-site anytime the AQUATIC FACILITY is open.

The MAHC considered requiring a LIFEGUARD SUPERVISOR for all AQUATIC FACILITIES; but for a single guard facility, there is no requirement, as a QUALIFIED LIFEGUARD doubling as a supervisor would be a redundancy. The SAFETY PLAN should address the means of providing oversight and direction to QUALIFIED LIFEGUARDS at single guard facilities.

#### 6.3.4.4.2 Designated Supervisor

For any AQUATIC FACILITY, someone must be designated to make decisions and provide oversight of expected performance. When an AQUATIC FACILITY is required to have two or more QUALIFIED LIFEGUARDS, one of the QUALIFIED LIFEGUARDS may be designated as the LIFEGUARD SUPERVISOR as long as they comply with the training requirements. The QUALIFIED LIFEGUARD cannot fulfill LIFEGUARD SUPERVISOR duties while on scanning duty. For small AQUATIC VENUES, the MAHC was sensitive to requiring an additional person simply to be the LIFEGUARD SUPERVISOR. In this scenario, one of the QUALIFIED LIFEGUARDS is designated as the LIFEGUARD SUPERVISOR to make decisions when appropriate.

### 6.3.4.5 Emergency Response and Communications Plans

#### 6.3.4.5.1 Emergency Response and Communication Plan

CHEMICAL STORAGE and EAP/evacuation info also must be filed with local fire/hazmat agency according to quantities and chemical types stored.

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500 Olson RL, et al. Driver distraction in commercial operations. U.S. Department of Transportation Technical report FMCSA-RRR-09-042. September 2009. Report is accessible at http://www.distraction.gov/downloads/pdfs/driver-distraction-commercial-vehicle-operations.pdf.

#### 6.3.4.5.5 Training Documentation

It is recommended that EAP Drills are conducted with the staff on a quarterly basis as specified by the American Heart Association; however each operation is unique. Some operations may only be open during specific seasons, etc.

#### 6.3.4.5.8 Communication Plan

##### 6.3.4.5.8.2 Notification Procedures

Refer to the "Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act titled (EPCRA) and Section 112(r) of the Clean Air Act" at:

- http://emergencymanagement.wi.gov/EPCRA/forms/EPA_List_of_Lists1.pdf

#### 6.3.4.5.9 Inclement Weather Plan

It is recommended that employees monitor real time weather sources along with other techniques recommended by organizations such as NOAA. Also, include guidance on securing equipment in preparation for inclement weather. Consider having an evacuation plan to relocate PATRONS to a safe location during the storm. Be prepared by MONITORING weather and closing the AQUATIC FACILITY in time to evacuate.

### 6.3.4.6 Remote Monitoring Systems

Remote MONITORING systems may be used as an additional tool to help protect health and SAFETY but are not to replace or substitute for aquatics staff or their duties.

#### 6.3.4.6.1 Lifeguard-Based

A remote SAFETY MONITORING system is an added value but should not be a substitute for having a lifeguard present when conditions deem that a lifeguard is necessary.

The following excerpts from YMCA guidance provide an overview and discussion of lifeguard-based remote SAFETY MONITORING systems:

- "Speed is critical in recognizing and responding to aquatic emergencies. Time lost in the recognition phase of an Emergency Action Plan can prevent lifeguards from quickly reaching a swimmer in trouble and reduces the likelihood of a positive outcome. Appropriate protocols, combined with aquatic SAFETY technology, such as a surveillance system or alarms, may save valuable time during an emergency.
- "The following are types of aquatic SAFETY technology currently available on the market:
    - **Video Camera Surveillance Systems:** Underwater and surface video MONITORING systems can help analyze activity in the AQUATIC VENUE and be used to assist lifeguards in MONITORING swimmers. Some systems can alert the lifeguard when a swimmer is in trouble.
    - **Wireless Alarm or Water Activated Alarms Systems:** A water-activated alarm or wireless sensor button is a portable aquatic emergency summoning device. Such a device allows the lifeguard and/or others to be

notified almost immediately to a potential aquatic emergency. Lifeguards can immediately respond, rather than having to first travel to the emergency call button and counselors and day care staff can immediately notify lifeguards of an unintentional submersion.

- "These technology systems DO NOT replace the need for continuous lifeguard surveillance, but they can assist a lifeguard in their surveillance duties. Use of these systems requires assessment and evaluation of current emergency protocols to incorporate the system within your Emergency Action Planning. Integration of technology requires new approaches to lifeguard in-service training programs to emphasize recognition, surveillance, and prevention of over reliance on technology. Additionally, plans to address power outages or other system failures should be developed."[501]

#### *Operator-Based*

Operator-based remote water quality MONITORING systems can be useful in conjunction with but should not be used instead of manual testing of the AQUATIC VENUE.

#### 6.3.4.7 Employee Illness and Injury Policy

Open wounds may become entry points for pathogens and are the greatest risk to the wounded person. Water-related work could be allowed with healthcare provider approval or if the wound is covered with an occlusive, waterproof bandage.

## 6.4 Facility Management

Facility management is critical in preventing illness and injury as summarized in this section. The CDC identifies the most frequently reported contributing factors to the spread of infectious pathogens that cause RWIs, in particular gastroenteritis. Another report identified the most frequently reported type of RWI outbreak as gastroenteritis, the incidence of which is increasing.[502] Prevention of RWIs at treated venues requires POOL operators to:

- Maintain appropriate disinfectant concentration and pH to maximize disinfectant effectiveness, and
- Ensure optimal water circulation and filtration.

A study of POOL inspection data underscored the need for improved maintenance.[503] A total of 4,873 *(11.6%)* of 42,161 inspections identified serious violations that threatened the public's health and resulted in immediate POOL closure. Of 40,585 inspections, 3,549 *(8.7%)* identified disinfectant concentration violations; of 38,247 inspections, 4,506 *(11.8%)* identified pH violations. Automated chemical feeder violations were documented during 2,260 *(6.3%)* of 36,137 inspections.

501 YMCA. Aquatics Safety & Risk Reduction Document, Topic: Aquatic Safety Technology. 2009.
502 Hlavsa MC, et al. Outbreaks of Illness Associated with Recreational Water — United States, 2011–2012. MMWR. Morb Mortal Wkly Rep. 20145;64(24):668-72.
503 CDC. Immediate closures and violations identified during routine inspections of public aquatic facilities - network for aquatic facility inspection surveillance, five states, 2013. MMWR Surveill Summ. 2016 May 20;65(5):1-26.

only one (6%) of 16 included data on aquatic facility setting; almost all pool (99.5% [55,622/55,913]) and hot tub/spa (99.1% [20,259/20,449]) inspection records were missing data on aquatic facility setting. Use of the setting algorithm increased the number of inspection records with setting data; however, after the setting algorithm was run, 75.6% (42,249/55,913) of pool and 84.2% (17,213/20,449) of hot tub/spa inspection records still were missing aquatic facility setting data, thus no analyses stratified by setting were conducted. The process of submitting, reformatting, standardizing, and analyzing these data highlighted several areas where the collection and storage of aquatic facility inspection data could be improved. To optimize collection and analysis of aquatic facility inspection data and thus utility in informing program planning, implementation and evaluation, a collaboration of federal, state, and local partners from different disciplines is needed. This collaboration should include environmental health practitioners with technical knowledge about the operation and maintenance of public aquatic facilities and with inspection experience, epidemiologists skilled in conducting surveillance and data analysis, and information technology specialists with expertise in database construction. This collaboration could provide input on identifying public aquatic facility code elements deemed critical to protecting public health and on the creation of needed resources (e.g., standard inspection forms, training for inspectors, criteria for the construction of databases, and of tools to analyze data). The Council for the Model Aquatic Health Code (CMAHC; http://www.cmahc.org), a national clearinghouse for MAHC change requests to be relayed back to CDC (Appendix B), could facilitate this collaboration and development of resources.

Fifteen (94%) of 16 data sets included data on aquatic venue type, and 12 (75%) of 16 included data on pool category. Kiddie/WADING POOL inspections had the highest percentage of immediate closures *(21.6%)*. Inspections of kiddie/wading POOLS identified the highest percentage of disinfectant concentration violations *(19.2%)*, followed by inspections of interactive water play venues *(10.1%)*.

Drowning and falling, diving, chemical use, and suction injuries continue to be major public health injuries associated with AQUATIC VENUES. Drowning is a leading cause of injury death for young children 1-4 years of age, and the fifth leading cause of unintentional injury death for people of all ages.[504] From 2008 through 2010, an average of 5,100 POOL- or SPA-related emergency department *(ED)*-treated submersion injuries occurred each year. For 2006-2008, 383 POOL- or SPA-related fatalities involved children younger than 15 years of age. Approximately 45% of the estimated injuries for 2008 through 2010 and 28% of the fatalities for 2006 through 2008 involving children younger than 15 occurred in a public setting.[505]

For 2007-2008, 32 POOL chemical-associated health events that occurred in a public or residential setting were reported to CDC by Maryland and Michigan. These events resulted in 48 cases of illness or injury; 26 *(81.3%)* events could be attributed at least

504 CDC. Wide-ranging OnLine Data for Epidemiologic Research (WONDER) [online]. (2010) Available from URL: http://wonder.cdc.gov/mortsql.html.
505 Gipson K. Pool or Spa Submersion: Estimated Injuries and Reported Fatalities, 2011 Report. U.S. Consumer Product Safety Commission, May 2011. Available online at http://www.cpsc.gov/LIBRARY/FOIA/FOIA11/os/poolsub2011.pdf.

partially to chemical handling errors *(e.g., mixing incompatible chemicals)*. ATSDR's HSEESS received 92 reports of hazardous substance events that occurred at AQUATIC FACILITIES. More than half of these events *(55 [59.8%])* involved injured persons; the most frequently reported primary contributing factor was human error. Estimates based on CPSC's NEISS data indicate that 4,876 *(95% confidence interval [CI]: 2,821–6,930)* emergency department *(ED)* visits attributable to POOL chemical-associated injuries occurred in 2012; the most frequent diagnosis was poisoning *2,167 ED visits [95% CI: 1,219–3,116])*.[506]

The information identified in this report, along with existing recreational water injury data and first hand inspector experience, drove the development of the critical risk factors for recreational water injury and illness at treated AQUATIC VENUES. The eight broad critical risk factors for recreational water illness and injury are:

- Management; supervision; training; operation;
- Lifeguard services;
- Disinfectant residual;
- pH *(low or hi)*;
- Water clarity;
- Facility ENCLOSURE / entry protection;
- Entrapment protection; and
- Water supply / waste disposal.

Low concentration or absent disinfectant lead to reduced inactivation of pathogens and these conditions have been associated with infectious disease outbreaks.[507] Low pH has been associated with loss of dental enamel[508,509,510]. Dental erosion begins to occur below pH 6.0 and rapidly accelerates as the pH drops. High pH reduces the efficacy of CHLORINE-based DISINFECTION by reducing the amount of molecular HOCl, the active form that is available for DISINFECTION. At pH 7.0, about 70% of the HOCl is molecular, at pH 7.5 about 50% is molecular, at pH 8.0 about 20% is molecular, and at pH 8.5 only 10% is molecular. As a result, the MAHC decided to set upper and lower limits for pH (recommended pH range 7.2–7.8) as an IMMINENT HEALTH HAZARD.

## 6.4.1 Operations

### 6.4.1.1 Operations Manual

#### *6.4.1.1.1 Develop*

506 CDC. Pool Chemical–Associated Health Events in Public and Residential Settings — United States, 2003–2012, and Minnesota, 2013. MMWR Morb Mortal Wkly Rep. 2014;63(19):427-30.
507 CDC. Pool chemical–associated health events in public and residential settings — United States, 1983-2007. MMWR Morb Mortal Wkly Rep. 2009;58(18):489-493.
508 Centerwall BS, et al. Erosion of dental enamel among competitive swimmers at a gas-chlorinated swimming pool. Am J Epidemiol. 1986;123(4):641-7.
509 Dawes C, et al. Rapid and severe tooth erosion from swimming in an improperly chlorinated pool: case report. J Can Dent Assoc. 2008;74(4):359-61.
510 Geurtsen W. Rapid general dental erosion by gas-chlorinated swimming pool water. Review of the literature and case report. Am J Dent. 2000;13(6):291-3.

The facility design consultant can provide valuable assistance with preparation of a manual based on their knowledge of the physical system. The facility owner/operator must provide their preferences for operation and maintenance activities, based on location, climate, programs, budget, etc.

#### 6.4.1.1.2 Include

A manual for the operation of AQUATIC FACILITIES should be kept at the facility, in both printed and digital formats. The manual should include basic information, chemical data, and operation and maintenance instructions about each POOL, SPA and INTERACTIVE WATER PLAY FEATURE at the facility. The manual should be updated on a regular basis to include added features, renovation work, and new CODE requirements.

##### Safety Related Info

PATRON and staff SAFETY are paramount to responsible operation of an AQUATIC FACILITY. Provide SAFETY related information in the operations manual including, but not limited to the following:

- Diving, drowning and electrocution hazards and risk reduction procedures;
- SAFETY signage locations and message information;
- Chemicals *(type and quantity stored, SDS information, delivery procedures);*
- Chemical SAFETY equipment and procedures;
- Emergency procedures for staff;
- Emergency procedures for PATRONS;
- Inventory of PATRON SAFETY equipment *(first aid kit, back board, head restraints, rescue tubes, throw ropes, rescue pole, etc.);*
- Fire SAFETY equipment locations, operation and Public Safety Department notification plan *(fire extinguishers, hydrants, sprinkler system);*
- Staff training and practice drill schedule and procedures;
- Electrical system, controls, and GFCI's;
- Lighting and ventilation system description and controls;
- Vehicle and pedestrian accessibility;
- Lightning and storm evacuation plan;
- Emergency phone location and access;
- Emergency plan for evacuation and area notification; and
- Injury log

##### Aquatic Venue Info

Key criteria for each AQUATIC VENUE should be summarized including, but not necessarily limited to the following:

- Basin materials *(wall and floor structures, gutter system);*
- Coating materials;
- Flotation protection *(underdrain system, sump pump, hydrostatic relief valves, etc.);*

- Surface area *(square feet of water or PERIMETER DECK for INTERACTIVE WATER AQUATIC VENUES);*
- Volume *(gallons);*
- TURNOVER period *(TURNOVERS per day);*
- Recirculation rate *(GPM);*
- Filter loading rate *(GPM per square foot of filter surface area);* and
- Special features flow rates *(GPM for SLIDES, sprays, LAZY RIVERS, current channels, vortex areas, surf features, play features, etc.).*

### Chemical Data

The operations manual should also provide chemical data for each chemical system in the facility. This includes but is not necessarily limited to the following:

- Description of chemicals provided for primary disinfectant, pH adjustment, alkalinity adjustment, stabilizer, SUPERCHLORINATION, coagulant, filter aid, etc.;
- SECONDARY DISINFECTION SYSTEM description, if provided *(UV, ozone, other);*
- Type of chemical feed equipment and rated capacities;
- Discussion of water treatment goals and range of chemical targets;
- Description of chemical testing equipment;
- Testing frequency and location for each test;
- Chemical controller information, probe cleaning, and calibration procedures;
- Water testing log forms for chemical results; and
- Chemical supplies *(STORAGE quantity, providers, SAFETY procedures).*

### Facility Operation Info

The operations manual should also provide instructions for AQUATIC FACILITY operations. These instructions should include, but not necessarily be limited to the following:

- Filter backwash or cleaning schedule and procedure;
- Periodic vacuuming and cleaning schedule and procedures;
- Seasonal cleaning procedures;
- SUPERCHLORINATION basis and procedure;
- Controller sensor maintenance *(if applicable);*
- Preventive maintenance tasks and schedule;
- Winterizing procedures; and
- Start-up and closing procedures.

### Maintenance Instructions

The operations manual should provide instruction for proper maintenance for the facility. Both daily and seasonal or periodic maintenance will be required for the AQUATIC FACILITY. Available time and budget must always be balanced with the maintenance need. Regardless of whether the facility is large or small, frequent maintenance is more effective and more efficient than waiting until a larger problem occurs.

- Provide an inventory of available maintenance equipment and materials;

- Develop a daily maintenance schedule;
- Develop a schedule for periodic or seasonal maintenance; and
- Create a maintenance log with date and activity for future planning and budgeting.

### Office Management

The operations manual also provides office management information for the facility. This manual should include, but not be limited to following:

- Active and inactive records and general file information;
- Forms for water test results and filter cleaning frequency;
- Forms for inventory of chemicals, equipment, cleaning supplies, etc.;
- Maintenance inspection forms for facility, equipment, and structures;
- Maintenance work forms;
- Requisition forms for purchasing based on facility policies;
- Staff evaluation forms log;
- POOL operation log *(water quality, attendance, weather, open hours, injuries, complaints, equipment issues, etc.); and*
- Security *(opening and closing, underwater lighting, overhead lighting, doors, windows, alarms, bank deposits, etc.)*.

### Personnel Records

Accurate records should be maintained for all personnel.

The options for this category are varied and numerous. The following list of personnel items is offered as an outline and a starting point for developing an operations manual including, but not limited to the following:

- Staff qualifications and job descriptions;
- Payroll procedures;
- Facility policies;
- Schedules and work attendance;
- Vacation and sick leave;
- Benefits;
- Conferences and education;
- Training programs;
- Termination basis, and
- Accident prevention.

### Budget Considerations

An accurate and feasible budget is critical for ongoing AQUATIC FACILITY operation. Budget considerations should be included, but not limited to the following:

- Program fees and policies;
- Rental rates and policies;
- Staff wages and benefits;

- Facility expenditures for utilities, chemicals, concession supplies, equipment, training and program supplies, repairs and maintenance, insurance and office administration; and
- Financial report including monthly and annual summaries, projections and trends.

#### 6.4.1.4 Illness and Injury Incident Reports

Aquatic injuries and illnesses can occur after normal office working hours; therefore, a 24/7 system for reporting and responding to injury and illnesses at AQUATIC VENUES must be maintained. Early reporting and intervention could reduce the spread of illness or prevent additional injury.

##### *6.4.1.4.3 Notify the AHJ*

The POOL owner/operator should immediately report to the permit issuing official any injuries resulting in death or that require emergency medical response, resuscitation or transport to medical facility, or any illness suspected of being associated with bathing water quality or use of the AQUATIC FACILITY. The POOL owner/operator will have posted and available for use the routine phone numbers and after hours phone numbers necessary for reporting to the permit issuing official. This will facilitate a rapid investigation of the incident and could result in limiting further spread of infectious pathogens that cause disease and additional injuries.

Most jurisdictions have some reporting requirements. This section is more comprehensive than the existing reporting requirements of many jurisdictions. Prompt reporting of significant injuries or waterborne illness allows for the permit issuing agency to immediately assess the conditions at the AQUATIC VENUE to determine if it can continue to operate safely or must be closed. Prompt reporting and investigation also allows for more accurate investigations to determine the causes of injury and illness. This information can be used to prevent future injuries or illness.

- For more information on the Virginia Graeme Baker Pool and Spa Safety Act, please see: http://poolsafely.gov/state-local-officials/pool-spa-safety-act-requirements/.
- Also see the CPSC Staff guidance in interpreting the act at: http://poolsafely.gov/pool-spa-safety-act/interpretations-guidelines/.

##### *6.4.1.4.3 Lifeguard Rescue Records*

The POOL owner/operator shall keep accurate records of all lifeguard rescues. A rescue is helping a BATHER that would not be able to get to the POOL surface or to the DECK without lifeguard intervention and/or would result in activation of the EAP. An assist occurs when a guest is helped by the lifeguard in the water or from the DECK while the lifeguard still maintains surveillance of their assigned zone. The EAP is not activated for an assist. Reports and records of assists are not required to be kept.

#### 6.4.1.6 Daily Water Monitoring and Testing Records

These duties include but are not limited to:

- Measure and record *(or supervise and ensure the measurement and recording of)* all information as required by MAHC operations, testing, MONITORING, and reporting requirements;
- Maintain the filtration and RECIRCULATION SYSTEM as required to maintain minimum flow rates required by MAHC 4.7.1;
- Backwash the filtration system when the filter gauge pressure differential reaches a level specified by the equipment manufacturer or as specified in the MAHC 4.7.2;
- Maintain disinfectant residuals according MAHC 4.7.3;
- Maintain water chemistry according to MAHC 5.7.3;
- Monitor water temperature to ensure it is within range specified in MAHC 5.7.4.7;
- Clean accessible POOL surfaces as necessary to remove slime/biofilm accumulation (see MAHC 5.10.5.4 for further explanation);
- Add replacement water as needed to meet all MAHC requirements; and
- Ensure HYGIENE FACILITIES are clean, sanitary, and supplies needs for swimmer hygiene such as toilet paper and soap or hand SANITIZER are available for use as per MAHC 5.10.

#### 6.4.1.8 Body Fluids Remediation Log

See the Fecal, Vomit, and Blood Provisions in MAHC 6.5 for specific STANDARDS. For the CDC protocol for cleaning body fluid spills from POOL DECKS, see the document entitled "Cleaning up Body Fluid Spills on Pool Surfaces" which can be found on the CDC Healthy Swimming/Recreational Water website at http://www.cdc.gov/healthywater/swimming/pools/cleaning-body-fluid-spills.html.

##### *6.4.1.8.1 Contamination Incidents*

The Body Fluid Contamination Response Log is an important part of the administrative procedures for the venue and will document, in the case of a subsequent fecal, vomit, or blood contamination incident, that an appropriate response was conducted. A sample Body Fluid Contamination Response Log is provided below:

| ***Body Fluid Contamination Response Log*** | |
|---|---|
| **Person Carrying out Contamination Response** | |
| **Supervisor on Duty** | |
| **Date of Contamination Response** *(mm/dd/yyyy)* | |
| **Time of Response** | |
| **Location Contaminated** | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Number of People in Water** *(if applicable)* | | | | | | |
| **Type/Form of Contamination:** *Fecal Accident (Formed Stool or Diarrhea), Vomit, Blood* | | | | | | |
| **Time that Contaminated Area was Closed** | | | | | | |
| **Is Stabilizer Used in Water Feature** *(Yes/No) (if applicable)* | | | | | | |
| *If Yes, Stabilizer Concentration at Time of Contamination Response* | | | | | | |
| *Columns 1-4 are measurements spread evenly through the closure time.* | **Water Quality Measurements** | | | | | |
| | Level at Closure | 1 | 2 | 3 | 4 | Level Prior to Reopening |
| **Free Residual Chlorine** | | | | | | |
| **pH** | | | | | | |
| **Date that Contaminated Area was Reopened** *(mm/dd/yyyy)* | | | | | | |
| **Time that Contaminated Area was Reopened** | | | | | | |
| **Total Contact Time** *Time from when disinfectant reached target level to when disinfectant levels were reduced prior to opening* | | | | | | |
| **Remediation Procedure(s) Used and Comments/Notes** | | | | | | |

## 6.4.2 Patron-Related Management Aspects

### 6.4.2.1 Bather Count

#### *6.4.2.1.1 User Guidelines*

Overcrowding can interfere with visual surveillance, the ability to quickly evacuate, and response times. Maximum capacities are established for AQUATIC VENUES. Knowing and enforcing capacities minimizes overcrowding. MAHC 6.4.2.2.3 and 6.4.2.2.3.5 allow larger multiple attraction facilities to address individual aquatic attraction capacities in their signage.

#### 6.4.2.2 Signage

The purpose of these requirements is to limit injuries and the spread of communicable disease. The wording used is not prescriptive since it is the intent that must be covered; this allows managerial creativity to be used as long as the intent of the wording is conveyed. Healthy swimming messages can also be put on posters to be hung in bathroom stalls, at the AQUATIC FACILITY entrance, on the back of ticket stubs, and in group-event contracts. Ideally, signage should be provided to encourage BATHERS to take a second SHOWER after using the toilet before reentering the AQUATIC VENUE. While this requirement may be difficult to enforce, the posting of such signs may encourage compliance or, at a minimum, raise awareness about the importance of BATHER hygiene. Consider the needs of clients and provide effective communication which could include signs in more than one language, Braille, etc.

##### *6.4.2.2.3 Sign Messages*

Need for adult supervision: The American Academy of Pediatrics, Policy Statement-Prevention of Drowning[511] states: Whenever infants and toddlers (or weak swimmers) are in or around water, be it in a pool or an open body of water, a supervising adult with swimming skills should be in the water, within an arm's length, providing "touch supervision." With older children and better swimmers, the eyes and attention of the supervising adult should be constantly focused on the child, and the adult should not be engaged in other distracting activities that can compromise this attention, such as talking on the telephone, socializing, tending chores, or drinking alcohol.

The MAHC needs to further discuss the term and implications of requiring "touch supervision". Although it may be appropriate for some children at some AQUATIC FACILITIES, it may not be appropriate at other AQUATIC FACILITIES. Regardless of whether the term is used, it is good practice for each AQUATIC FACILITY to set a minimum age under which parental/caregiver supervision is required.

Suggested content for WATERSLIDES should also include content on their signs to comply with the manufactures recommendations. Minimum content should include:

- Rider position,
- Number of riders allowed at a time,
- Dispatch instructions,
- Water depth at SLIDE exit,
- Weight limit as established by manufacturer, and
- Height requirement if specified by manufacturer.

###### 6.4.2.2.3.7 Spa Signs

511 American Academy of Pediatrics. Committee on Injury, Violence, and Poison Prevention. Prevention of Drowning. Icon Pediatrics. 2010;126(1):178-85.

See discussion on temperature and relevant data pertaining to SPA temperatures in MAHC 5.7.4.7.2. These data have been used to support wording for SPA venue signs regarding use by young children and pregnant women.

#### Suggested Spa Sign Content

- Post signs with suggested time limits *(15 minutes);*
- It is recommended that all SPAS have the following statement included on the signage. "Depth of spa is variable. Enter with caution;"
- Other suggested SPA and SAFETY equipment;
- Place time clocks with numbers large enough to read from a distance on a nearby wall in clear view of all users;
- Place a thermometer on the wall with numbers large enough to read from a distance or place the thermometer in the SPA itself;
- Place a 15-minute timer on the water jets. The reset button should be placed at least 10 feet *(3 m)* from the tub so users must physically leave the tub to turn the water jets on again.

#### Infants and Toddlers

Infants and toddlers are not recommended in a SPA. Small children are still developing internal temperature regulations, and infants in particular have a small body mass compared to body surface area. HOT WATER also could cause hyperthermia, and a SPA seat is not designed for a small child to sit properly to keep their head above water.

For more information on infants, see the CDC Guidance titled "Breastfeeding in Pools & Hot Tubs/Spas":

- http://www.cdc.gov/healthywater/swimming/protection/breastfeeding-in-pools.html

##### *6.4.2.2.5 Diaper-Changing Station Signage*

Signage requirements were adapted from the diapering procedure laid out in CFOC[512].

### 6.4.2.3 Swimmer Empowerment Methods

##### *6.4.2.3.1 Public Information and Health Messaging*

The MAHC felt strongly that public education and health communication with users should be required at any INDOOR AQUATIC FACILITY. This messaging should make clear the responsibility of the user to shower before entering the POOL and that they should not urinate in the POOL. It is known that urine and sweat contribute nitrogen to the POOL resulting in chloramines. By actively limiting the introduction of urine and sweat, the result should be fewer chloramines in the POOL and the air. A summary of health and exposure

512 American Academy Of Pediatrics, et al. (2002). Caring for Our Children: National Health and Safety Performance Standards; Guidelines for Out-of-Home Child Care Programs, 2nd edition. Elk Grove Village, IL: American Academy of Pediatrics and Washington, DC: American Public Health Association. Available at http://nrckids.org.

data can be found in **MAHC Appendix 1: Summary of Health and Exposure Data for Chemical and Biological Contaminants**.

#### *6.4.2.3.2 Post Inspection Results*

There are only a relatively small number of municipal organizations that require public or web-based disclosure of inspection reports. However, as inspection activity is tax-payer supported, there is a growing trend toward requiring public disclosure. One recent example is the Beaches Environmental Assessment and Coastal Health *(BEACH)* Act of 2000, a Federal Act that requires public disclosure of coastal beach closings. Additionally, DeKalb County, Georgia requires the public posting of inspection results for AQUATIC FACILITIES as well as posting them on the internet, which is similar to the ever expanding requirement for posting inspection results at food service establishments. The posting of inspections at AQUATIC FACILITIES will increase public awareness of aquatic SAFETY and health and encourage aquatic operators to comply with all CODE requirements.

Most jurisdictions require the permit to be conspicuously posted. This is to inform the public that the facility has met the minimum SAFETY STANDARDS required by law.

## 6.5 Fecal/Vomit/Blood Contamination Response

The following discussion gives the rationale behind the remediation recommendations. Fecal contamination of recreational water is an increasing problem in the United States and other countries. Since the mid-1980s, the number of outbreaks of diarrheal illness associated with recreational water has been increasing in the United States.[513] Of these outbreaks, disinfected, man-made swimming venues, the target of the MAHC, have had the greatest increase. These outbreaks are usually a result of people swimming while they have infectious, pathogen-containing diarrhea caused by pathogens such as *Cryptosporidium*, *Giardia*, *Shigella*, *Salmonella*, or *E. coli* O157:H7. Contamination of swimming water by infected persons and subsequent swallowing of contaminated water by other swimmers continues the spread of infectious pathogens that cause diarrheal illness.

Diarrheal illness is common in the United States with surveys indicating that 7.2-9.3% of the general public have had diarrhea in the previous month.[514] Additional studies demonstrated that people routinely have a mean of 0.14 grams *(range = 0.1 to 10 grams)* of fecal contamination on their buttocks and peri-anal surface.[515] The increase in outbreaks, the high prevalence of diarrheal illness in the public, and likelihood of frequent fecal contamination of POOLS by BATHERS raised the question of how to respond to overt fecal releases, particularly formed stools that were more visible, in POOLS. The need to develop a response plan was amplified by the emergence of the CHLORINE-tolerant parasite *Cryptosporidium* as the leading cause of disinfected venue-associated outbreaks of diarrheal illness. First, formed stools were thought to be a significantly lower risk for

513 Hlavsa MC et al. Outbreaks of Illness Associated with Recreational Water — United States, 2011–2012. MMWR Morb Mortal Wkly Rep. 2015;64(24):668-72.
514 Jones TF, et al. A population-based estimate of the substantial burden of diarrhoeal disease in the United States; FoodNet, 1996–2003. Epidemiol Infect (2007); 135:293–301.
515 Gerba CP. Assessment of enteric pathogen shedding by bathers during recreational activity and its impact on water quality. Quant Microbiol (2000); 2:55-68.

spreading illness compared to diarrhea, since most pathogens are shed in the greatest numbers in diarrhea. As the highest risk material, diarrhea was considered the worst case contamination scenario that could potentially contain *Cryptosporidium*. As a result, a response should require the extreme treatment conditions needed to inactivate *Cryptosporidium*. Formed stool was assessed as a lower risk than diarrhea but several questions remained. Should formed stools be treated as potentially infectious materials? If so, then should the stool be treated as a potential *Cryptosporidium* contamination event like diarrhea *(i.e., longer inactivation time)* or could it be treated to inactivate all other pathogens other than *Cryptosporidium (i.e., shorter inactivation time)*.

To collect data relevant to answering the questions above, a study to collect fecal releases from POOLS in the United States was conducted in 1999. POOL staff volunteers from across the United States collected almost 300 samples from fecal incidents that occurred at water parks and POOLS.[516] The CDC then tested these samples for *Cryptosporidium* and *Giardia*. *Giardia* was chosen as a representative surrogate for moderately-CHLORINE resistant pathogens like hepatitis A virus and norovirus. Using conditions to inactivate *Giardia* would inactivate most pathogens other than *Cryptosporidium*. None of the sampled feces tested positive for *Cryptosporidium*, but *Giardia* was found in 4.4% of the samples collected. These results suggested that formed fecal incidents posed only a very small *Cryptosporidium* threat but should be treated as a risk for spreading other pathogens such as *Giardia*. As a result of these data and the discussion above, it was decided to treat formed stools as potential *Giardia* contamination events, and liquid stool as potential *Cryptosporidium* contamination events.

It was thought that norovirus contamination posed the greatest threat from vomit contamination and that the virus would be inactivated by a formed stool response using *Giardia* inactivation times as discussed above. Further assessment also suggested that blood contamination of POOL water posed little health risk due to the sensitivity of bloodborne pathogens *(e.g., viruses, bacteria)* to environmental exposure, dilution in the water, and chlorination. In addition, POOL water exposures would lack the requisite bloodborne exposure routes needed to spread the pathogens to other people.

### 6.5.1 Contamination Response Plan

The Fecal/Vomit/Blood CONTAMINATION RESPONSE PLAN is a vital part of the administrative procedures for the venue. All staff associated with the operation of the POOL should be aware of the response plan and trained in implementation procedures. At least one responder should be available on- site during all hours of operation.

#### 6.5.1.2 Contamination Training

##### *6.5.1.2.1 Minimum*

A staff member trained in fecal/vomit/blood contamination response should be on site during all operational hours. OSHA discusses occupational issues related to potential

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

bloodborne pathogen exposure in the Bloodborne Pathogens Standard, 29 CFR 1910.1030[517] with further discussion under General Guidance[518] and the OSHA Fact Sheet: OSHA's Bloodborne Pathogens Standard[519].

## 6.5.2 Aquatic Venue Water Contamination Response

### 6.5.2.2 Physical Removal

#### *6.5.2.2.2 No Vacuum Cleaners*

Questions are often received concerning the MAHC recommendation to **NOT VACUUM** fecal material from the POOL. When the material is drawn through the vacuum, the vacuum itself is then contaminated and must be disinfected. At the present time, the MAHC is not aware of any manufacturer that has a decontamination protocol for disinfecting fecal-, vomit-, or blood-contaminated POOL vacuum units.

### 6.5.2.3 Treated

Many conventional test kits cannot measure FAC levels up to 20 mg/L. Operators should use, in order of preference, a FAS-DPD titration test kit with or without dilutions using CHLORINE-free water, or use test strips that measure FAC in a range that includes 20 mg/L. The inactivation time should only be started once testing indicates that the intended FREE CHLORINE level *(20 ppm or other FREE CHLORINE concentration based on inactivation time in table above)* has been reached in the POOL.

FAS-DPD should be used instead of a color comparator DPD test.

It is important that the operator use a non-stabilized CHLORINE product when raising the FREE CHLORINE RESIDUAL particularly when raising to high levels such as 40 mg/L. If a stabilized product such as dichlor or trichlor were used, a high level of CYA would remain in the POOL after the HYPERCHLORINATION process. The CYA level in POOL water can only be lowered by dilution of POOL water with make-up water. Since CHLORINE products degrade over time, it is not recommended that non-stabilized CHLORINE products be stored in case of a fecal incident. The operator could either purchase a non-stabilized product at a POOL supply store or buy unscented household bleach *(sodium hypochlorite)* product that has a label indicating it is EPA-REGISTERED for use as a drinking water disinfectant.

## 6.5.3 Aquatic Venue Water Contamination Disinfection

### 6.5.3.1 Formed-Stool Contamination

For ***formed-stool contamination***, a free CHLORINE value of 2 mg/L was selected to keep the POOL closure time to approximately 30 minutes. Other CHLORINE concentrations or closure times can be used as long as the CT INACTIVATION VALUE is kept constant. The CT

517 OSHA. Bloodborne pathogens and needlestick prevention standards. Available at: http://www.osha.gov/SLTC/bloodbornepathogens/standards.html. Accessed: 4/25/2016.
518 OSHA. Bloodborne pathogens and needlestick prevention. Available at: http://www.osha.gov/SLTC/bloodbornepathogens. Accessed: 4/25/2016.
519 OSHA. Fact Sheet: OSHA's bloodborne pathogen standards. Available at: http://www.osha.gov/OshDoc/data_BloodborneFacts/bbfact01.pdf. Accessed: 4/25/2016.

INACTIVATION VALUE is the concentration *(C)* of FAC in mg/L multiplied by time *(T)* in minutes: *(CT INACTIVATION VALUE = C x T)*.

For formed-stool contaminated water the CT INACTIVATION VALUE for *Giardia (45)* is used as a basis for calculations:

**Table 6.5.3.1: Giardia Inactivation Time for Formed-Stool Contamination**

| Chlorine Levels (mg/L) | Disinfection Time* |
|---|---|
| 1.0 | 45 minutes |
| 2.0 | 25 minutes |
| 3.0 | 19 minutes |
| **These closure times are based on a 99.9% inactivation of Giardia cysts by chlorine, pH 7.5, 77°F (25°C). The closure times were derived from the Environmental Protection Agency (EPA) Disinfection Profiling and Benchmarking Guidance Manual. They do not take into account "dead spots" and other areas of poor pool water mixing.* | |

#### 6.5.3.1.1 Pools Containing Chlorine Stabilizers

CHLORINE stabilizers such as CYA slow DISINFECTION; therefore, higher CHLORINE levels are likely necessary to reach the CT INACTIVATION VALUE for *Giardia* inactivation in POOLS using CHLORINE stabilizers. However, at this time there is no standardized protocol to compensate for CHLORINE stabilizers and no data determining how the inactivation of *Giardia* is affected by CHLORINE stabilizers under POOL conditions. A SAFETY value of 2 has been incorporated until these data can be gathered.

### 6.5.3.2 Diarrheal-Stool Contamination

For ***diarrheal-stool contamination***, inactivation times are based on *Cryptosporidium* inactivation times. The CT INACTIVATION VALUE for *Cryptosporidium* is 15,300. If a different CHLORINE concentration or inactivation time is used, an operator must ensure that the CT INACTIVATION VALUES remain the same.

For example, to determine the length of time needed to disinfect a POOL at 20 mg/L after a diarrheal accident, use the following formula: ***C x T = 15,300***.

Solve for time: T= 15,300 ÷ 20 mg/L = 12.75 hours.

Therefore, it would take 12.75 hours to inactivate *Cryptosporidium* at 20 mg/L. See table below:

**Table 6.5.3.2: Cryptosporidium Inactivation Time for Diarrheal Contamination**

| Chlorine Levels (mg/l) | Disinfection Time |
|---|---|
| 1.0 | 15,300 minutes (255 hours) |
| 10.0 | 1,530 minutes (25.5 hours) |
| 20.0 | 765 minutes (12.75 hours) |

The $CT_{3log}$ used is for a 3-log inactivation to achieve a decrease in the concentration of OOCYSTS below one infectious dose per volume of water swallowed *(1 OOCYST/100 mL)*. Similar to the assumptions made for secondary DISINFECTION *(See MAHC 4.7.3.3.2.5)*, this calculation assumes a single contamination event *(e.g. diarrheal incident)* of ~100 mL could introduce $10^8$ *Cryptosporidium* OOCYSTS into the water[520,521]. This allows for a SAFETY factor to include smaller volume venues and still achieve the required concentration. An additional SAFETY factor not included is the impact of the filtration system since filter OOCYST removal efficacy varies widely. This may be more quantifiable in the future so that it could be included in the calculation. Volume calculations indicate that small volume AQUATIC VENUES like splash pads should be able to achieve this goal by using the CT INACTIVATION VALUE cited:

$10^8$ OOCYSTS / 10,000 gallons =

$10^8$ OOCYSTS / (10,000 gallons X 3785.4 mL/gallon) =

2.64 OOCYSTS/mL = 264 OOCYSTS / 100 mL

With the 3-log inactivation, this volume will contain 0.264 OOCYSTS per 100 mL which is below the required one OOCYST/100 mL and larger volume facilities will exceed this requirement.

#### 6.5.3.2.1 Pools Containing Chlorine Stabilizers

CHLORINE stabilizers such as CYA slow DISINFECTION (see MAHC Annex 5.7.3.1.3.1 for more discussion) therefore, higher CHLORINE levels are necessary to reach the CT INACTIVATION VALUE for *Cryptosporidium* inactivation in POOLS that use CHLORINE stabilizers.[522] As the stabilizer concentration rises, parasite inactivation is inhibited to the point where inactivation is similar to natural decay of the parasite.[523] As a result, higher levels of stabilizer must be reduced to reach 3-log inactivation levels using HYPERCHLORINATION.

Recent data show that 3-log inactivation of *Cryptosporidium* is possible with CYA concentrations of 15-16 ppm or less.[524] A 3-log inactivation could not be achieved with 50 ppm or 100 ppm CYA. A 1-log inactivation of OOCYSTS was achieved with 50 ppm cyanurate concentrations after an average contact time of 61.9 hours with 20 ppm FREE CHLORINE RESIDUAL, for an average estimated CT INACTIVATION VALUE for 1-log inactivation of 76,500 mg min/L. With 40 ppm FREE CHLORINE RESIDUAL and 50 ppm CYA, a 1-log inactivation of OOCYSTS was achieved after an average contact time of 17.2 hours, giving

520 Chappell CL, et al. *Cryptosporidium parvum*: intensity of infection and oocyst excretion patterns in healthy volunteers. J Infect Dis. 1996 Jan;173(1):232-6.
521 Goodgame RW, et al. Intensity of infection in AIDS-associated cryptosporidiosis. J Infect Dis. 1993 Mar;167(3):704-9.
522 Shields JM, et al. The effect of cyanuric acid on the disinfection rate of Cryptosporidium parvum in 20-ppm free chlorine. J Water Health. 2009 Mar;7(1):109-14. doi: 10.2166/wh.2009.008.
523 Murphy JL, et al. Effect of cyanuric acid on the inactivation of *Cryptosporidium parvum* under hyperchlorination conditions. Environ Sci Technol. 2015;49(12):7348-55.
524 Murphy JL, et al. Effect of cyanuric acid on the inactivation of *Cryptosporidium parvum* under hyperchlorination conditions. Environ Sci Technol. 2015;49(12):7348-55.

an average estimated CT INACTIVATION VALUE for 1-log inactivation of 40,000 mg min/L. Increasing the concentration to 100 ppm CYA showed even more limited OOCYST inactivation, which did not differ much from natural decay curves for *Cryptosporidium* in water.

Because 3-log OOCYST inactivation was achieved with 16 ppm CYA and was not achieved with 50 ppm CYA, the remediation protocol must be conducted in water with ≤15 ppm CYA. If the CYA concentration is above 15 ppm, the POOL will need to be partially drained to reduce the concentration. Alternate methods of reducing the CYA concentration are acceptable, as long as test data shows that the CYA concentration is at or below 15 ppm.

Along with the pH level and FREE CHLORINE RESIDUAL, the CYA level should be checked and adjusted if necessary prior to reopening the POOL. Temperature is a critical parameter of measuring a CT INACTIVATION VALUE. Although pH changes with temperature, the more critical aspect is that inactivation of pathogens is well documented to decrease with falling temperature. As a result, the limited data available for pools requires the protocol to be conducted at the temperature where the data was collected, or above, as higher temperatures are known to speed inactivation. Most inactivation research on *Cryptosporidium* has been conducted to aid drinking water treatment. As a result, the data are at lower temperatures (e.g., 41ºF [5ºC] to simulate winter conditions) and pH values (e.g., pH 6), which are more typical of real-life drinking water conditions but of little benefit to AQUATIC FACILITY operation. Any data to document how a 5ºC drop in temperature would impact the 3 log CT INACTIVATION VALUE at pH 7.5 is not currently available and, due to the difficulties, time, and cost of such research, may never be collected.

AQUATIC VENUES with SECONDARY DISINFECTION SYSTEMS could be closed and allowed to circulate for the length of time calculated in MAHC 4.7.3.3.2 to reduce the level of *Cryptosporidium* below one OOCYST/100mL. Other AQUATIC VENUES without SECONDARY DISINFECTION SYSTEMS may choose to completely drain the water from the AQUATIC VENUE and replace with fresh water if they are unable to reduce the stabilizer level or hyperchlorinate.

#### 6.5.3.3 Vomit-Contamination

For ***vomit contamination***, the CT INACTIVATION VALUE for norovirus is thought to be in the same range as *Giardia,* so the same CT INACTIVATION VALUES are used as for a formed stool contamination.[525]

Table 6.5.3.3: *Giardia* Inactivation Time for Vomit Contamination

| *Chlorine Levels (mg/L)* | *Disinfection Time** |
|---|---|
| 1.0 | 45 minutes |
| 2.0 | 25 minutes |
| 3.0 | 19 minutes |
| **These closure times are based on a 99.9% inactivation of Giardia cysts by chlorine, pH 7.5, 77°F (25°C). The closure times were* | |

525 Shin GA, et al. Inactivation of norovirus by chlorine disinfection of water. Water Res. 2008 Nov;42(17):4562-8.

*derived from the Environmental Protection Agency (EPA) Disinfection Profiling and Benchmarking Guidance Manual. They do not take into account "dead spots" and other areas of poor pool water mixing.*

#### 6.5.3.4 Blood-Contamination

If the CHLORINE or bromine residual and pH are in a satisfactory range, there is no public health reason to recommend closing a POOL due to blood contamination. Data suggest that the risk posed by potential bloodborne pathogens is greatly diminished by dilution and normal FREE CHLORINE RESIDUAL levels. However, the operator may wish to temporarily close the POOL for aesthetic reasons or to satisfy PATRON concerns.

#### 6.5.3.5 Procedures for Brominated Pools

There are no inactivation data for *Giardia* or *Cryptosporidium* for bromine or any developed protocols for how to hyperbrominate a swimming POOL and inactivate pathogens that may be present in fecal matter or vomit. Therefore, POOL operators should use CHLORINE in their DISINFECTION procedures. It should also be noted that DPD test kits cannot differentiate between CHLORINE and bromine. This is because DPD undergoes the same chemical reaction with both CHLORINE and bromine. Therefore, it is important that the POOL'S bromine residual be measured <u>before</u> CHLORINE is added to the POOL. This bromine residual should be taken into consideration when determining that the FREE CHLORINE RESIDUAL necessary for the type of contamination has been met *(i.e., the FREE CHLORINE RESIDUAL measured minus the bromine residual should be equal to or greater than the intended FREE CHLORINE RESIDUAL)*. If a DPD test kit with a CHLORINE comparator is used; the total bromine residual can be determined by multiplying the FREE CHLORINE RESIDUAL by a factor of 2.2.

### 6.5.4 Surface Contamination Cleaning and Disinfection

#### 6.5.4.1 Limit Access

Body fluids, including blood, feces, and vomit are all considered potentially contaminated with pathogens. Therefore, spills of these fluids on the POOL DECK should be cleaned up immediately. Visible contamination should be removed first, followed by DISINFECTION of the contaminated surfaces.

#### 6.5.4.2 Clean Surface

The CDC protocol for cleaning body fluid spills from POOL DECKS entitled "Cleaning up Body Fluid Spills on Pool Surfaces" can be found on the CDC Healthy Swimming/Recreational Water website at:

- http://www.cdc.gov/healthywater/swimming/pools/cleaning-body-fluid-spills.html .

These procedures are based on hospital infection control guidelines.[526]

526 CDC. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR (2003);52 (No.RR-10.)

#### 6.5.4.3 Contaminant Removal and Disposal

Currently, there are no standardized procedures for removing CONTAMINANTS, particularly those found in biofilms/slime layers, in piping, or AQUATIC FEATURES that spray or dump water. All water features should be well drained and disinfected per manufacturer's instructions. Development of appropriate guidelines deserves further investigation and data gathering.

#### 6.5.4.4 Disinfect Surface

The efficacy of disinfectants is greatly impacted by the organic load on the surface to be disinfected. Reducing the organic load as much as possible through cleaning and removal of all visible contamination ***BEFORE*** adding disinfectant is critical to successful DISINFECTION. Contact times apply only if all visible organic material has been removed before DISINFECTION.

## 6.6 AHJ Inspections

### 6.6.1 Inspection Process

The AHJ has the authority to enter the facility for both routine inspections and to investigate reports of illness and injury. At the time of investigation, all records and facility personnel required for interviews must be available.

### 6.6.2 Publication of Inspection Forms

### 6.6.3 Imminent Health Hazard Violations

#### 6.6.3.1 Violations Requiring Immediate Correction or Closure

IMMINENT HEALTH HAZARD violations must be corrected at the time of inspection or the POOL must be closed until the violations are corrected. Whenever a POOL is closed due to a public health violation, signage must be posted stating that the facility is closed due to an IMMINENT HEALTH HAZARD. Before removing the closure sign and reopening in the feature, a follow-up inspection or other evidence of correction of the violations is required to ascertain correction and re-open the POOL.

The factors being considered IMMINENT HEALTH HAZARDS cover known risk areas:

- Low or absent disinfectant levels lead to reduced inactivation of pathogens and these conditions have been associated with infectious disease outbreaks.
- Low pH has been associated with loss of dental enamel. Dental erosion begins to occur below pH 6.0 and rapidly accelerates as the pH drops.[527,528,529] High pH reduces the efficacy of CHLORINE-based DISINFECTION by reducing the amount of

527 Centerwall BS, et al. Erosion of dental enamel among competitive swimmers at a gas-chlorinated swimming pool. Am J Epidemiol. 1986;123(4):641-7.
528 Dawes C, et al. Rapid and severe tooth erosion from swimming in an improperly chlorinated pool: case report. J Can Dent Assoc. 2008;74(4):359-61.
529 Geurtsen W. Rapid general dental erosion by gas-chlorinated swimming pool water. Review of the literature and case report. Am J Dent. 2000;13(6):291-3.

molecular HOCl, the active form that is available for DISINFECTION. At pH 7.0, about 70% of the HOCl is molecular, at pH 7.5 about 50% is molecular, at pH 8.0 about 20% is molecular, and at pH 8.5 only 10% is molecular. As a result, the MAHC decided to set upper and lower limits for pH (recommend pH range: 7.2–7.8) as an IMMINENT HEALTH HAZARD.

- Injuries/deaths occur to persons using equipment such as vacuums and reach poles at swimming POOLS when this equipment contacts overhead wires which are too close to the POOL.
- Clearance in any direction from the water, edge of POOL, etc. is to protect people using rescue and service equipment at POOLS, which are typically aluminum.
- Clearance in any direction to the diving platform, tower, WATERSLIDE or other fixed POOL related structure is to protect a swimmer using these items.
- Follow-up procedure for observance of electrical lines within 20 feet *(6.1 m)* of a swimming POOL during an inspection:
    - Determine whether the electrical lines are owned by the utility company or by the owner/operator of the swimming POOL/property.
    - If they are owned by the utility company, the operator should obtain a letter from the utility company stating that these lines are in compliance with NEC 680 STANDARDS.
    - If the lines are owned by the owner/operator, and there is no waiver or variance, it is a public health hazard.
    - This requirement does not apply to wiring inside walls/ceilings, etc. at an indoor POOL.

### 6.6.4 Enforcement

### 6.6.5 Enforcement Penalties

This is meant to apply to an AQUATIC FACILITY not making a good faith effort to correct recognized problem(s). This is not meant to apply to a closed AQUATIC FACILITY that is working on correcting an IMMINENT HEALTH HAZARD or other violation *(e.g., parts on order, maintenance scheduled)*. It is up to the AHJ to determine if an AQUATIC FACILITY is making such an effort.