2018 Annex to the Model Aquatic Health Code

Scientific Rationale

Mini-MAHC: Preventing In-line Production of Toxic Chlorine Gas Events






U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Extracted from the 2018 MAHC

CS295591-A

Mini-MAHC - Annex

Preventing In-line Production of Toxic Chlorine Gas Events

CDC's Model Aquatic Health Code (MAHC) consists of two guidance documents:

1. Code Language (3rd Edition, 2018)
2. Annex/ Rationale (3rd Edition, 2018)

Purpose:

Specific public health issues addressed in the MAHC are often spread across multiple chapters. Mini-MAHCs make the MAHC more accessible by summarizing the code and annex language addressing a specific public health issue into a single, concise document. Environmental health practitioners and pool operators can use Mini-MAHCs to quickly find relevant MAHC guidelines and rationale to promote health and safety of patrons and staff and references content from the 2018 MAHC Code Language and Annex (3rd Edition). For MAHC language on general pool chemical safety, go to the Preventing Pool Chemical-Associated Health Events Mini-MAHC.

This Mini-MAHC Annex supports guidance focusing on preventing in-line production of toxic chlorine gas events. Chemical feeders add chlorine to recirculation systems, add then add a pH-adjusting chemical, typically acid further along the recirculation system. This allows chemical dilution to occur so chlorine and acid are safely mixed. If there is no, or low, water flow in the recirculation system (e.g., because the recirculation pump shuts down or pump speeds are reduced) and the chemical feeders continue running, concentrated chlorine and acid mix. Consequently, toxic chlorine gas is generated within the recirculation system. When full water flow is restored to the recirculation system (e.g., the recirculation pump is restarted), toxic chlorine gas enters the aquatic venue and surrounding area. Toxic chlorine gas release and patron exposure usually requires immediate evacuation and can injure scores of patrons and staff. However, they can be prevented by automatic deactivation of chemical feeders in the event of no, or low, flow in the recirculation system.

The Mini-MAHC Annex references content from the 2018 MAHC Code Language and Annex (3rd Edition).

IMPORTANT

Unless otherwise noted,

- Provisions in Chapter 4 (Aquatic Facility Design Standards and Construction) apply only to new construction or substantial alteration to an existing aquatic facility or venue.
- Provisions in Chapter 5 (Operation & Maintenance) apply to all aquatic facilities covered by the MAHC regardless of when constructed.
- Provisions in Chapter 6 (Policies & Management) apply to all aquatic facilities covered by the MAHC regardless of when constructed.

Citations were removed to condense the Mini-MAHCs. A list of references are in the complete version of the 2018 MAHC Annex (3rd Edition).

4.0 Aquatic Facility Design Standards and Construction

4.7 Recirculation and Water Treatment

4.7.3 Disinfection and pH Control

Disinfection and Indoor Air Quality

To provide for a healthy and safe swimming environment in INDOOR AQUATIC FACILITIES, it is important to consider a number of issues that could impact health. Proper ventilation and humidity control are important in removing excess heat, moisture, noxious odors, and harmful DBPS.

Proper Chemical Use

In addition, improper usage of chemicals and inadequate ventilation can also decrease the quality of the indoor air environment and cause affect health.

High Chloramines

High levels of chloramines and other volatile compounds in the air can increase the possibility of health effects such as upper respiratory illnesses and irritation of the mucous membranes including eyes and lungs. Furthermore, these CONTAMINANTS can also cause metal structures and equipment to deteriorate.

Shock Oxidizer

While proper ventilation is critical for INDOOR AQUATIC FACILITIES, water chemistry also can dramatically affect air quality. Levels of chloramines and other volatile compounds can be minimized by reducing CONTAMINANTS that lead to their formation *(e.g., urea, creatinine, amino acids, and personal care products)*, as well as by supplemental water treatment. Effective filtration, water replacement, and improved BATHER hygiene can reduce CONTAMINANTS and chloramine formation. Research has shown that the use of non-CHLORINE shock OXIDIZERS is selective in OXIDATION and may not prevent nor reduce inorganic chloramines though they may reduce some organic chloramines. The EPA final guidelines state that manufacturers of "shock OXIDIZERS" may advertise that their "shock OXIDIZER" products "remove," "reduce," or "eliminate" organic CONTAMINANTS. Shock dosing with CHLORINE can destroy inorganic chloramines that are formed. SECONDARY DISINFECTION SYSTEMS such as ozone and UV light may effectively destroy inorganic as well as some organic chloramines.

Swimmer Education

In addition, swimmers should be educated that their behavior *(e.g., failing to SHOWER, urinating in the POOL)* can negatively impact air quality by introducing nitrogen-containing CONTAMINANTS that form volatile compounds.

Reduce and Minimize Impact

These steps can help reduce the chemical role in creating poor indoor air quality, and help maintain an environment that minimizes health effects on BATHERS as well as decrease deterioration of AQUATIC FACILITIES and equipment.

4.7.3.2 Feed Equipment

4.7.3.2.1 General

If recirculation pumps stop but chemical feed pumps continue to pump chemicals into the return lines it can result in a high concentration of acid and CHLORINE being mixed so that eventually when concentrated solutions of CHLORINE and acid are mixed, CHLORINE gas will be formed. The CHLORINE gas could then be released into the AQUATIC VENUE when the recirculation pump is turned on again or in the pump room if there is an opening in the line as has been documented in CDC's Waterborne Disease and Outbreak Surveillance System. To prevent the hazardous release of CHLORINE gas, the chemical feed system shall be designed so that the CHLORINE and pH feed pumps will be deactivated when there is no or low flow in the RECIRCULATION SYSTEM.

4.7.3.2.7 Feeders for pH Adjustment

It is recommended that the solution's reservoir supply be sized to hold a minimum of 1 week's supply.

4.7.3.2.8 Automated Controllers

Constant and regular MONITORING of key water quality parameters such as the DISINFECTANT level and pH are critical to prevent recreational water illness and outbreaks. AUTOMATED CONTROLLERS are more reliable as a

MONITORING device than personnel and hand feeding chemical. Automated chemical controllers are therefore required for use on every AQUATIC VENUE with a time of 1 year built in for facilities to become compliant after adoption of this requirement. The use of AUTOMATED CONTROLLERS does not negate the requirements for regular water testing. Automated units require verification of proper function and the probes do fail or slip out of calibration. This can only be detected by MONITORING the water quality.

5.0 Aquatic Facility Operation and Maintenance

5.7 Recirculation and Water Treatment

5.7.1 Recirculation Systems and Equipment

5.7.1.1 General

The MAHC does not allow shut down of the RECIRCULATION SYSTEM during closure times since uncirculated water would soon become stagnant and loose residual DISINFECTANT likely leading to biofilm proliferation in pipes and filters. This would likely compromise water quality and increase the risk to BATHERS. MAHC 4.7.1.10.5 describes turndown system design. The flow turndown system is intended to reduce energy consumption when AQUATIC VENUES are unoccupied without compromising water quality. A turbidity goal of less than 0.5 NTU has been chosen by a number of United States state CODES *(e.g., Florida)* as well as the PWTAG and WHO. The maximum turndown of 25% was selected to save energy while not necessarily compromising the ability of the RECIRCULATION SYSTEM to remove, treat, and return water to the center and other extremities of the POOL. Additional research in this area could identify innovative ways to optimize and improve this type of system and that more aggressive turndown rates are acceptable.

5.7.2 Filtration

5.7.2.2 Granular Media Filters

5.7.2.2.4 Backwashing Frequency

Backwashing frequency is important for multiple reasons. First, solids attach more strongly to the filter media over time and can be more difficult to remove following infrequent backwashing. Secondly, the organic particles *(e.g., skin cells)* held in the filter in contact with FREE CHLORINE can break down over time and produce DBPS and/or combined CHLORINE. The potential to form "mudballs" also increases with solids loading inside of a filter and can cause filter failures. The preceding items are the rationale for requiring backwashes at manufacturer-prescribed pressure losses through the filter. Some data suggests tainted backwash water remains inside of the filter at the conclusion of the backwash procedure and therefore should be wasted to drain for at least the first 2 minutes after restarting.

5.7.2.2.4.1 Backwash Scheduling

Backwashing while PATRONS are in the water is not recommended. First, the MAHC requires that RECIRCULATION SYSTEMS are running at all times that an AQUATIC VENUE is open for BATHER use. Second, with no interlock in place, stopping recirculation while inadvertently continuing chemical feed pumps can cause a build-up of acid and CHLORINE product in the lines that leads to CHLORINE gas production. When the RECIRCULATION SYSTEM is turned back on, the risk increases dramatically for a CHLORINE gas plume being delivered into the AQUATIC VENUE causing injury to BATHERS and initiating an emergency response. As a result, there have been frequent occurrences of CHLORINE gas exposure following the restart of the recirculation pump while BATHERS are in the POOL. This underscores the need for BATHER evacuation of the AQUATIC VENUE prior to restart of recirculation, and waiting 5 minutes to check for potential gas release before allowing BATHERS in to the water, to prevent potential exposure to CHLORINE gas. Exceptions to this would be if an AQUATIC VENUE has multiple filters and an individual filter can be taken off line without shutting down the RECIRCULATION SYSTEM and there is no chance of overfeeding chemicals that may lead to outgassing events or other chemical mixing emergencies.

5.7.3 Water Treatment Chemicals and Systems

Certification, listing, and labeling is required to ensure chemicals used in recreational water treatment have been evaluated including analysis for potential CONTAMINANTS of the product.

5.7.3.1 Primary Disinfectants

5.7.3.1.1 Chlorine (Hypochlorites)

Although CHLORINE and bromine are the only primary DISINFECTANTS allowed at this time, future research may produce other acceptable primary DISINFECTANTS.

5.7.3.4 pH

There are three reasons to maintain pH:

- Efficacy of the CHLORINE,
- BATHER comfort, and
- Maintenance of balanced water.

Each of these reasons are discussed briefly below:

Efficacy of Chlorine

The efficacy of CHLORINE/HOCl is dramatically impacted by pH and therefore pathogen inactivation can be severely affected by higher pH levels where only a small percentage of FREE CHLORINE is active. Lower pH levels below this range allow a greater percentage of FREE CHLORINE to be "active". Further data are needed to ensure that lower levels *(e.g., 6.8 to 7.2)* do not adversely impact membranes, particularly eyes. The present practice of maintaining the pH between 7.2 and 7.8 has been developed by coupling physical chemistry with empirical observations. There is no definitive peer-reviewed study that extensively covers the subject of pH in POOL and SPA water except those showing the titration of HOCl and the importance of pH for assuring maximal efficiency. The best general authority is the 1972 edition of the Handbook of Chlorination by Geo. Clifford White. The 1972 edition of this widely recognized authority on CHLORINE chemistry is the only edition that has a chapter especially on POOLS. Much, but not all, of the POOL chemistry chapter can be found in subsequent editions. Copies of the 1972 edition are difficult to locate in libraries but are available for sale on the internet as of July 2009. The discussion on efficacy and BATHER comfort is a summary of the 1972 edition discussion on pH. CHLORINE used in POOLS refers to HOCl, a weak acid that readily dissociates to form hypochlorite *(OCl-)* and hydrogen ion *(H+)*. The mid-point of the dissociation *(the pKa)* is at pH 7.5. Functionally, this means that at pH of 7.5, 50% of the FREE CHLORINE present will be in the form of HOCl and 50% will be in the form of hypochlorite. As the pH decreases below 7.5, the proportion of HOCl increases and proportion of hypochlorite ion decreases. The opposite occurs as the pH increases above 7.5. Numerous investigators have reported that HOCl is approximately 100 times more effective at killing microorganisms than the hypochlorite ion. Thus from a public health perspective, it is desirable to maintain the pH so as to maximize the portion of HOCl portion of the FREE CHLORINE present in the water.

Bather Comfort

As BATHERS enter the water, their skin and eyes come into direct contact with the water and its constituent components. In general, the eyes of BATHERS are more sensitive to irritation than the skin. Studies on the sensitivity of BATHERS' eyes to pH changes in the water show wide variations in tolerance limits. The tolerance of the eye to shifts in pH is also impacted by the concentration of FREE CHLORINE, combined CHLORINE, and alkalinity. Under normal POOL conditions, the optimum limits for BATHER comfort appears to be from pH 7.5 to 8.0.

Potential for Lowering pH in the Future

During the review of the data, the MAHC had a broad interest in lowering the minimum pH. This would increase the efficacy of the CHLORINE by increasing the proportion of HOCl *(at the expense of hypochlorite)* and thus increase DISINFECTION efficacy. This was not recommended because of the lack of data on the impact on BATHERS, particularly the eyes. If additional information on the impact of lower pH on BATHERS' skin and eyes is developed, the MAHC suggests that the acceptable range for pH be reexamined. As part of the reexamination, consideration should also be made concerning how this change will impact the water balance and any possible negative impact on the facility. In addition, many manufacturers include a pH range on equipment use so that lowering the pH may void the warranty.

5.7.3.5 Feed Equipment

The Chlorine Institute has checklists and guidance for working with compressed CHLORINE gas at: http://chlorineinstitute.org/stewardship/ci-checklists.cfm.

5.7.3.5.1.2 Installed and Interlocked

Periodic visual inspections of the electrical interlock system should be performed to determine if the system appears to be installed per manufacturer's instructions and has not been altered.

5.7.3.5.1.2.2 Bather Re-entry

The 5-minute wait period after turning the RECIRCULATION SYSTEM back on before allowing BATHERS to reenter the AQUATIC VENUE is to ensure the system did not overfeed chemicals into the recirculation lines that could potentially expose BATHERS. If such an event did occur, the wait period will allow staff to determine if a gas release does occur, which will prevent BATHER exposure to dangerous CHLORINE gas that potentially formed during the pause in recirculation pump flow if chemical feed pumps continued to pump chemicals into the system. This short delay and check could prevent many of the exposures that occur during these events in addition to interlocks on the recirculation and chemical feed systems.

6.0 Policies and Management

6.0.1 Staff Training

6.0.1.6.1 Training Topics

Special attention should be given to recognition of symptoms of acute exposure to CHLORINE gas per the Safety Data Sheet (SDS) [cough; throat irritation; choking; eye irritation with watering, pain, or redness; shortness of breath, skin irritation, vomiting, delirium], ozone if used at facility as a SECONDARY DISINFECTANT [throat irritation; nasal dryness or irritation; shortness of breath; cough; eye irritation; nausea; headache; drowsiness; chest pain], or any other chemicals used for DISINFECTION.

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%)*.

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%)*.

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. 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. 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.

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 RWI.

6.1.2 Essential Topics in Qualified Operator Training Courses

See MAHC 6.1.1 for discussion.

6.1.2.1 Course Content

6.1.2.1.4 Health and Safety

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. 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 for preventing injuries 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.

6.3 Facility Staffing

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.

6.3.3.2 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.

6.3.3.3 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.

6.3.4 Staff Management

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.

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 EPA 550-B-01-003 at https://www.epa.gov/sites/production/files/2015-03/documents/list_of_lists.pdf

6.4 Facility Management

6.4.1 Operations

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.