

# 2018 Model Aquatic Health Code

## *Code Language*

### Mini-MAHC: Preventing Pool Chemical Injuries



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

Extracted from the 2018 MAHC

CS295591-A

# Mini-MAHC Code

## Preventing Pool Chemical Injuries

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

1. Code Language (3<sup>rd</sup> Edition, 2018)
2. Annex/ Rationale (3<sup>rd</sup> 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 for patrons and staff and references content from the 2018 MAHC Code Language (3<sup>rd</sup> Edition). For MAHC language on preventing in-line production of toxic chlorine gas go to the Preventing In-line Production of Toxic Chlorine Gas Mini-MAHC.

This Mini-MAHC Code focuses on preventing pool chemical injuries caused by chemical spills, leaks, or operator error during handling of pool chemicals. Environmental health practitioners and pool operators will find code on:

- Safe equipment room and chemical storage area design and construction since some pools combine areas.
- Pool chemical safety training for aquatics staff that promotes the proper use of personal protective equipment (PPE).
- Safe chemical storage and handling.
- Chemical spill procedures and emergency response.

The Mini-MAHC Code references content from the 2018 MAHC Code Language (3<sup>rd</sup> Edition).

### About Pool Chemical Injuries

- Operators add pool\* chemicals to water to:
  - kill disease-causing germs
  - improve water quality, and ensure swimmer comfort,
  - stop corrosion and scaling of equipment, and
  - protect against algal growth.
- Pool chemical injuries lead to 3,000–5,000 annual emergency department (ED) visits in the United States.
  - Almost half of the ED patients are less than 18 years old.
  - Poisoning and skin and eye injury are the leading ED diagnoses caused by exposure to pool chemicals.
- Injury data indicate pool chemical injuries occur when operators use pool chemicals without PPE or they do not secure pool chemicals away from children. The data also indicate human error is the leading factor contributing to releases of pool chemicals.

### **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.

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\* The word “pool” refers to all treated recreational water venues, such as pools, hot tubs/spas, and interactive water play venues (water playgrounds).

- 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 (3<sup>rd</sup> Edition).

<sup>A</sup> = denotes where information is further supplemented in the MAHC Annex (Rationale).

## 1.0 Preface *Note: Section numbers with superscript "A" (e.g., 1.0<sup>A</sup>) denote a corresponding discussion in the Annex to the Model Aquatic Health Code.*

## 3.0 Glossary of Acronyms, Initialisms, Terms, Standards, Codes, and Laws Used in the MAHC Code

### 3.2 Glossary of Terms Used in the MAHC Code

**“Aquatic Facility”** means a physical place that contains one or more aquatic venues and support infrastructure.

**“Aquatic Venue”** means an artificially constructed structure or modified natural structure where the general public is exposed to water intended for recreational or therapeutic purpose and where the primary intended use is not watering livestock, irrigation, water storage, fishing, or habitat for aquatic life. Such structures do not necessarily contain standing water, so water exposure may occur via contact, ingestion, or aerosolization. Examples include swimming pools, wave pools, lazy rivers, surf pools, spas (*including spa pools and hot tubs*), therapy pools, waterslide landing pools, spray pads, and other interactive water venues.

- **“Increased Risk Aquatic Venue”** means an aquatic venue which due to its intrinsic characteristics and intended users has a greater likelihood of affecting the health of the bathers of that venue by being at increased risk for microbial contamination (*e.g., by children less than 5 years old*) or being used by people that may be more susceptible to infection (*e.g., therapy patients with open wounds*). Examples of increased-risk aquatic venues include spray pads, wading pools and other aquatic venues designed for children less than 5 years old as well as therapy pools.

**“Automated Controller”** means a system of at least one chemical probe, a controller, and auxiliary or integrated component that senses the level of one or more water parameters and provides a signal to other equipment to maintain the parameters within a user-established range.

**“Bather”** means a person at an aquatic venue who has contact with water either through spray or partial or total immersion. The term bather as defined, also includes staff members, and refers to those users who can be exposed to contaminated water as well as potentially contaminate the water.

**“Increased Risk Aquatic Venue”** See *“Aquatic Venue.”*

**“Breakpoint Chlorination”** means the conversion of inorganic chloramine compounds to nitrogen gas by reaction with Free Available Chlorine. When chlorine is added to water containing ammonia (*from urine, sweat, or the environment, for example*), it initially reacts with the ammonia to form monochloramine. If more chlorine is added, monochloramine is converted into dichloramine, which decomposes into nitrogen gas, hydrochloric acid and chlorine. The apparent residual chlorine decreases since it is partially reduced to hydrochloric acid. The point at which the drop occurs is referred to as the “breakpoint”. The amount of free chlorine that must be added to the water to achieve breakpoint chlorination is approximately 10 times the amount of combined chlorine in the water. As additional chlorine is added, all inorganic combined chlorine compounds disappear, resulting in a decrease in eye irritation potential and “chlorine odors.”

**“Certified, Listed, and Labeled”** means equipment, materials, products, or services included in a list published by an ANSI accredited certification organization where said equipment, material, product, or service is evaluated against specific criteria and whose listing either states that it meets identified standards or has been tested and found suitable for a specified purpose. In sections of this code where equipment, materials, products, or services are referred to with terms such as “approved”, “verified” or similar terms to a referenced standard, these terms also mean “certified, listed, and labeled.”

**“Chemical Storage Space”** means a space in an aquatic facility used for the storage of pool chemicals such as acids, salt, or corrosive or oxidizing chemicals.

**“Chlorine”** means an element that at room temperature and pressure is a heavy greenish yellow gas with a characteristic penetrating and irritating smell; it is extremely toxic. It can be compressed in liquid form and stored in heavy steel tanks. When mixed with water, chlorine gas forms hypochlorous acid (HOCl), the primary chlorine-based disinfecting agent, hypochlorite ion, and hydrochloric acid. HOCl dissociation to hypochlorite ion is highly pH dependent. Chlorine is a general term used in the MAHC which refers to HOCl and hypochlorite ion in aqueous solution derived from chlorine gas or a variety of chlorine-based disinfecting agents.

**“Available Chlorine”** means the amount of chlorine in the +1 oxidation state, which is the reactive, oxidized form. In contrast, chloride ion ( $Cl^-$ ) is in the -1 oxidation state, which is the inert, reduced state. Available Chlorine is subdivided into Free Available Chlorine and Combined Available Chlorine. Pool chemicals containing Available Chlorine are both oxidizers and disinfectants. Elemental chlorine ( $Cl_2$ ) is defined as containing 100% available chlorine. The concentration of Available Chlorine in water is normally reported as mg/L (*ppm*) “as  $Cl_2$ ”, that is, the concentration is measured on a  $Cl_2$  basis, regardless of the source of the Available Chlorine.

**“Free Chlorine Residual”** OR **“Free Available Chlorine”** means the portion of the total available chlorine that is not “combined chlorine” and is present as HOCl or hypochlorite ion ( $OCl^-$ ). The pH of the water determines the relative amounts of HOCl and hypochlorite ion. HOCl is a very effective bactericide and is the active bactericide in pool water.  $OCl^-$  is also a bactericide, but acts more slowly than HOCl. Thus, chlorine is a more effective bactericide at low pH than at high pH. A free chlorine residual must be maintained for adequate disinfection.

**“Combustion Device”** means any appliance or equipment using fire. These include, but may not be limited to, gas or oil furnaces, boilers, pool heaters, domestic water heaters, etc.

**“Corrosive Materials”** means pool chemicals, fertilizers, cleaning chemicals, oxidizing cleaning materials, salt, de-icing chemicals, other corrosive or oxidizing materials, pesticides, and such other materials which may cause injury to people or damage to the building, air-handling equipment, electrical equipment, safety equipment, or fire-suppression equipment, whether by direct contact or by contact via fumes or vapors, whether in original form or in a foreseeably likely decomposition, pyrolysis, or polymerization form. Refer to labels and SDS forms.

**“EPA Registered”** means all products regulated and registered under the Federal Insecticide, Fungicide, and Rodenticide Act (*FIFRA*) by the EPA; <https://www.epa.gov/laws-regulations/summary-federal-insecticide-fungicide-and-rodenticide-act>). EPA registered products will have a registration number on the label (*usually it will state “EPA Reg No.” followed by a series of numbers*). This registration number can be verified by using the EPA National Pesticide Information Retrieval System (<http://ppis.ceris.purdue.edu/#>).

**“Equipment Room or Area”** means a space intended for the operation of pool pumps, filters, heaters, and controllers. This space is not intended for the storage of hazardous pool chemicals.

**“Free Chlorine Residual”** OR **“Free Available Chlorine”** See “Chlorine.”

**“Hyperchlorination”** means the intentional and specific raising of chlorine levels for a prolonged period of time to inactivate pathogens following a fecal or vomit release in an aquatic venue as outlined in MAHC 6.5.

**“Indoor Aquatic Facility”** means a physical place that contains one or more aquatic venues and the surrounding bather and spectator/stadium seating areas within a structure that meets the definition of “Building” per the 2012 International Building Code (*IBC*). It does not include equipment, chemical storage, or bather hygiene rooms or any other rooms with a direct opening to the aquatic facility. Otherwise known as a natatorium.

**“Interior Space”** means any substantially enclosed space having a roof and having a wall or walls which might reduce the free flow of outdoor air. Ventilation openings, fans, blowers, windows, doors, etc., shall not be construed as allowing free flow of outdoor air.

**“mg/L”** means milligrams per liter and is the equivalent metric measure to parts per million (*ppm*).

**“Monitor”** means the regular and purposeful observation and checking of systems or facilities and recording of data, including system alerts, excursions from acceptable ranges, and other facility issues. Monitoring includes human or electronic means.

**“Oxidation”** means the process of changing the chemical structure of water contaminants by either increasing the number of oxygen atoms or reducing the number of electrons of the contaminant or other chemical reaction, which allows the contaminant to be more readily removed from the water or made more soluble in the water. It is the “chemical cleaning” of pool water. Oxidation can be achieved by common disinfectants (*e.g., chlorine, bromine*), secondary disinfection/sanitation systems (*e.g. ozone*) and oxidizers (*e.g. potassium monopersulfate*).

**“Oxidation Reduction Potential” (ORP)** means a measure of the tendency for a solution to either gain or lose electrons; higher (*more positive*) oxidation reduction potential indicates a more oxidative solution.

**“pH”** means the negative log of the concentration of hydrogen ions. When water ionizes, it produces hydrogen ions ( $H^+$ ) and hydroxide ions ( $OH^-$ ). If there is an excess of hydrogen ions the water is acidic. If there is an excess of hydroxide ions the water is basic. pH ranges from 0 to 14. Pure water has a pH of 7.0. If pH is higher

than 7.0, the water is said to be basic, or alkaline. If the water's pH is lower than 7.0, the water is acidic. As pH is raised, more HOCl ionization occurs and chlorine disinfectants decrease in effectiveness.

**“Purge”** means to introduce a large volume of outdoor air to flush the interior space.

**“Re-entrainment”** means a situation where the exhaust(s) from a ventilated source such as an indoor aquatic facility is located too close to the air handling system intake(s), which allows the exhausted air to be re-captured by the air handling system so it is transported directly back into the aquatic facility.

**“Safety”** (*as it relates to construction items*) means a design standard intended to prevent inadvertent or hazardous operation or use (*i.e., a passive engineering strategy*).

**“Safety Plan”** means a written document that has procedures, requirements and/or standards related to safety which the aquatic facility staff shall follow. These plans include training, emergency response, and operations procedures.

**“Safety Team”** means any employee of the aquatic facility with job responsibilities related to the aquatic facility's emergency action plan.

**“Supplemental Treatment Systems”** means those disinfection processes or systems which are not required on an aquatic venue for health and safety reasons. They may be used to enhance overall system performance and improve water quality.

## 4.0<sup>A</sup> Aquatic Facility Design Standards and Construction

The provisions of MAHC Chapter 4 (*Aquatic Facility Design Standards and Construction*) apply to construction of a new AQUATIC FACILITY or AQUATIC VENUE or SUBSTANTIAL ALTERATION to an existing AQUATIC FACILITY or AQUATIC VENUE, unless otherwise noted.

### 4.1 Plan Submittal

#### 4.1.2 Content of Design Report

##### 4.1.2.2 Plans and Specifications

**4.1.2.2.4 Aquatic Venue Recirculation and Treatment Design** Detailed scaled and dimensional drawings for each individual AQUATIC VENUE shall contain a flow diagram showing the location, plan, elevation, and schematics of:

- 1) Filters,
- 2) Pumps,
- 3) Chemical feeders and interlocks
- 4) Chemical controllers and interlocks,
- 5) SECONDARY DISINFECTION SYSTEMS, if required,
- 6) Supplemental DISINFECTION systems, if installed,
- 7) Ventilation devices or AIR HANDLING SYSTEMS,
- 8) Heaters,
- 9) Surge tanks, including operating levels,
- 10) BACKFLOW prevention assemblies and air gaps,
- 11) Valves,
- 12) Piping,
- 13) Flow meters,
- 14) Gauges,
- 15) Thermometers,
- 16) Test cocks,
- 17) Sight glasses, and
- 18) Drainage system for the disposal of AQUATIC VENUE water and filter wastewater.

**4.1.2.2.5 Equipment Room Design** Detailed scaled and dimensional drawings for each individual AQUATIC VENUE shall contain a schematic layout of the AQUATIC VENUE EQUIPMENT ROOM (*or EQUIPMENT AREA if permitted by the local AHJ*) showing accessibility for installation and maintenance.

**4.1.2.2.6 Chemical Storage Space Design** Detailed scaled and dimensional drawings for each individual AQUATIC VENUE shall contain a schematic layout of the AQUATIC FACILITY CHEMICAL STORAGE SPACE(S).

##### 4.1.2.3 Technical Specifications

**4.1.2.3.10 Safety Equipment Specifications** The technical specifications for each AQUATIC FACILITY shall include information on all aquatic SAFETY equipment.

### 4.2 Materials

#### 4.2.2 Indoor Aquatic Facility

##### 4.2.2.3 Mechanical Systems

**4.2.2.3.1 Equipment Rooms** For EQUIPMENT ROOMS, see MAHC 4.9.1.

**4.2.2.3.2**            **Chemical Storage Spaces** For CHEMICAL STORAGE SPACES, see MAHC 4.9.2.

**4.2.2.3.3<sup>A</sup>**            **Indoor Aquatic Facility Air Pressure** AQUATIC FACILITY AIR HANDLING SYSTEM design, construction, and installation shall comply with the 2011 ASHRAE Applications Handbook on Natatorium Design ASHRAE Standard 62.1, *Ventilation for Acceptable Indoor Air Quality*, and/or applicable local CODES with additional requirements as stated in section MAHC 4.6.2.

**4.2.2.3.3.1**            **Chemical Storage Space Air Pressure** AIR HANDLING SYSTEM design for CHEMICAL STORAGE SPACES shall conform to the International Mechanical Code or Uniform Mechanical Code, and either the International Fire Code or the NFPA 1 Fire Code, and any applicable local CODES.

## 4.6 Indoor / Outdoor Environment

### 4.6.2<sup>A</sup> Indoor Aquatic Facility Ventilation

#### 4.6.2.7 Performance Requirements for Air Handling Systems

**4.6.2.7.9**            **Re-Entrainment of Exhaust** AIR HANDLING SYSTEM outdoor air intakes shall be placed to minimize RE-ENTRAINMENT of exhaust air from building systems back into the facility.

**4.6.2.7.9.1**            **System Exhaust** AIR HANDLING SYSTEM exhaust from CHEMICAL STORAGE SPACES, mechanical, toilet, SHOWER, and dressing rooms shall not be directed into the AQUATIC FACILITY.

## 4.7 Recirculation and Water Treatment

### 4.7.3<sup>A</sup> Disinfection and pH Control

#### 4.7.3.1 Chemical Addition Methods

**4.7.3.1.1**            **Disinfection and pH** DISINFECTION and pH control chemicals shall be automatically introduced through the RECIRCULATION SYSTEM.

**4.7.3.1.1.1**            **Controller Used** A chemical controller, as specified in MAHC 4.7.3.2.8 shall be provided and used for MONITORING and control of DISINFECTANT and pH feed equipment.

**4.7.3.1.1.2**            **Feeder** DISINFECTION and pH control chemicals shall be added using a feeder that meets the requirements outlined in MAHC 4.7.3.2.

#### 4.7.3.2 Feed Equipment

##### 4.7.3.2.1<sup>A</sup> General

**4.7.3.2.1.1**            **Required** Chemical feeders shall be required in new or existing AQUATIC FACILITIES upon adoption of this CODE.

**4.7.3.2.1.2.1**            **Specified by Manufacturer** Flow-through chemical feeders shall only be used with the chemical (*formulation, brand, size, and shape*) specified by the chemical feeder manufacturer.

**4.7.3.2.1.4.1**            **Protective Cover** A physical BARRIER shall be installed between chemical feed pumps supplying acid or liquid hypochlorite solution and other POOL components to shield staff and equipment from chemical sprays from leaking connections.

##### 4.7.3.2.7<sup>A</sup> Feeders for pH Adjustment

**4.7.3.2.7.1**            **Provided** Feeders for pH adjustment shall be provided on all AQUATIC VENUES upon adoption of this CODE as in MAHC 4.7.3.2.1.2.

## 4.8 Decks and Equipment

### 4.8.6 Barriers and Enclosures

#### 4.8.6.1 General Requirements

**4.8.6.1.1 Enclosed** All AQUATIC FACILITIES, CHEMICAL STORAGE SPACES, and AQUATIC VENUE mechanical spaces shall be enclosed to prevent unauthorized entry.

**4.8.6.1.1.1 Barriers** The ENCLOSURE may consist of any combination of building envelopes, site walls, or fencing as provided for in this section.

**4.8.6.1.1.2 Patron Accessibility** BARRIERS shall be provided between CHEMICAL STORAGE SPACES, POOL, mechanical spaces, and areas accessible to the public, in accordance with local building CODES.

## 4.9 Filter/Equipment Room

### 4.9.1 Equipment Room

#### 4.9.1.1<sup>A</sup> General Requirements

**4.9.1.1.1 Nonabsorbent Material** The EQUIPMENT AREA or ROOM floor shall be of concrete or other suitable material having a smooth slip resistant finish.

**4.9.1.1.1.1 Positive Drainage** The EQUIPMENT AREA or ROOM floor shall have positive drainage, including a sump drain pump if necessary.

**4.9.1.1.2 Floor Slope** Floors shall have a slope toward the floor drain and/or sump drain pump adequate to prevent standing water at all times.

**4.9.1.1.3 Opening** The opening to the EQUIPMENT ROOM or area shall be designed to provide access for all anticipated equipment.

**4.9.1.1.4 Hose Bibb** At least one hose bibb with BACKFLOW preventer shall be located in the EQUIPMENT ROOM or be accessible within an adequate distance of the EQUIPMENT ROOM so that a hose can service the entire EQUIPMENT ROOM.

#### 4.9.1.2<sup>A</sup> Construction

**4.9.1.2.1 Size** The size of the EQUIPMENT ROOM or area shall provide working space to perform routine operations and equipment service.

**4.9.1.2.1.1 Adequate Storage Space** EQUIPMENT ROOMS also intended for STORAGE shall have adequate space provided for such STORAGE, without reducing the working spaces.

**4.9.1.2.2 Lighting** EQUIPMENT ROOMS or areas shall be lighted to provide 30 foot candles (323 lux) of illumination at floor level in accordance with IESNA guidelines.

#### 4.9.1.4<sup>A</sup> Ventilation

**4.9.1.4.1 Code Conformance** EQUIPMENT ROOM ventilation shall address:

- 1) COMBUSTION requirements,
- 2) Heat dissipation from equipment,
- 3) Humidity from surge or balance tanks,
- 4) Ventilation to the outside, and
- 5) Air quality.

#### 4.9.1.5<sup>A</sup> Markings

**4.9.1.5.1 Piping Identified** All piping in the EQUIPMENT ROOM shall be permanently identified by its use and the AQUATIC VENUE and AQUATIC FEATURE it serves.

**4.9.1.5.1.1 Components to Identify** Identification shall be provided for:

- 1) Main drains and SKIMMERS,
- 2) Filtered water,
- 3) Make-up water,
- 4) Backwash water,
- 5) CHLORINE (*or DISINFECTION*) feeds,
- 6) Acid (*or pH*) feeds,
- 7) Compressed air lines,
- 8) Gutters,
- 9) Chemical sample piping, and
- 10) POOL heating lines.

**4.9.1.5.2 Piping Marked** All piping shall be marked with directional arrows as necessary to determine flow direction.

**4.9.1.5.3 Valves Identified** All valves shall be clearly identified by number with a brass tag, plastic laminate tags, or permanently affixed alternate.

**4.9.1.5.3.1 Valves Described** Valves shall be described as to their function and referenced in the operating instruction manual.

**4.9.1.5.3.2 Piping Diagram** A water-resistant, easily read, wall-mounted piping diagram shall be furnished and installed inside the EQUIPMENT ROOM.

**4.9.1.6<sup>A</sup> Equipment Rooms Containing Combustion Equipment [N/A]4.9.1.7<sup>A</sup> Separation from Chemical Storage Spaces****4.9.1.7.1 Equipment**

**4.9.1.7.1.1<sup>A</sup> Contaminated Air** Combustion equipment, air-handling equipment, and electrical equipment shall not be exposed to air contaminated with CORROSIVE chemical fumes or vapors.

**4.9.1.7.1.2<sup>A</sup> Equipment Restrictions** Spaces containing combustion equipment, air handling equipment, and/or electrical equipment and spaces sharing air distribution with spaces containing such equipment shall not be used as CHEMICAL STORAGE SPACES at the same time.

**4.9.1.7.1.2.1 Certified, Listed, and Labeled Exception:** Equipment CERTIFIED, LISTED, AND LABELED for use in that atmosphere shall be acceptable, where approved by the AHJ. **4.9.1.7.1.3<sup>A</sup>**

**Isolated** Spaces containing combustion equipment, air-handling equipment, and/or electrical equipment and spaces sharing air distribution with spaces containing such equipment shall be isolated from CHEMICAL STORAGE SPACE air.

**4.9.1.7.2 Doors and Openings**

**4.9.1.7.2.1<sup>A</sup> Between Equipment and Chemical Storage** A door or doors shall not be installed in a wall between such EQUIPMENT ROOMS and an interior CHEMICAL STORAGE SPACE.

**4.9.1.7.2.2<sup>A</sup> No Openings** There shall be no ducts, grilles, pass-throughs, or other openings connecting such EQUIPMENT ROOMS to CHEMICAL STORAGE SPACES, except as permitted by the fire CODE.

**4.9.1.7.2.3<sup>A</sup> Indoor Aquatic Facility Air** Spaces containing combustion equipment, air-handling equipment, and/or electrical equipment and spaces sharing air distribution with spaces containing such equipment shall be isolated from INDOOR AQUATIC FACILITY air.

**4.9.1.7.2.3.1 Certified, Listed, and Labeled Equipment Exception:** Equipment CERTIFIED, LISTED, AND LABELED for the atmosphere shall be acceptable.

**4.9.1.7.2.4<sup>A</sup> No Openings** There shall be no ducts, grilles, pass-throughs, or other openings connecting such spaces to an INDOOR AQUATIC FACILITY.

**4.9.1.7.2.4.1** **Air Handlers** Ducts which connect the INDOOR AQUATIC FACILITY to the duct connections of air handlers shall not be construed as connecting the air-handler space to the INDOOR AQUATIC FACILITY.

**4.9.1.7.2.4.2** **HVAC Equipment Exception:** HVAC equipment which is rated for INDOOR AQUATIC FACILITY atmosphere and which serves only that INDOOR AQUATIC FACILITY shall be acceptable.

**4.9.1.7.2.5<sup>A</sup>** **Openings / Gaps** Where building construction leaves any openings or gaps between floors and walls, or between walls and other walls, or between walls and ceilings, such gaps shall be permanently sealed against air leakage.

#### **4.9.1.7.3** **Indoor Aquatic Facility Access**

**4.9.1.7.3.1<sup>A</sup>** **Floor Slope** Where a door or doors must be installed in a wall between an EQUIPMENT ROOM and an INDOOR AQUATIC FACILITY, the floor of the EQUIPMENT ROOM shall slope per local building requirements back into the EQUIPMENT ROOM in such a way as to prevent any equipment-room spills from running under the door into the INDOOR AQUATIC FACILITY.

**4.9.1.7.3.1.1** **Four Inches Exception:** This requirement may be met by a floor all of which is at least 4 inches (10.2 cm) below the level of the nearest part of the INDOOR AQUATIC FACILITY floor.

**4.9.1.7.3.1.2** **Dike Exception:** This requirement may be met by a continuous dike not less than 4 inches (10.2 cm) high located entirely within the EQUIPMENT ROOM, which will prevent spills from reaching the INDOOR AQUATIC FACILITY floor.

**4.9.1.7.3.1.3** **Floor Drains** Equipment-room floor drains may be required by the AHJ.

**4.9.1.7.3.2<sup>A</sup>** **Automatic Closer** Such door or doors between an EQUIPMENT ROOM and an INDOOR AQUATIC FACILITY shall be equipped with an automatic closer.

**4.9.1.7.3.2.1** **Maintained to Close Reliably** The door, frame, and automatic closer shall be installed and maintained so as to ensure that the door closes completely and latches without human assistance.

**4.9.1.7.3.3<sup>A</sup>** **Automatic Lock** Such door or doors between an EQUIPMENT ROOM and an INDOOR AQUATIC FACILITY shall be equipped with an automatic lock.

**4.9.1.7.3.3.1<sup>A</sup>** **Restrict Access** Such lock shall require a key or combination to open from the INDOOR AQUATIC FACILITY side.

**4.9.1.7.3.3.2** **One Hand** Such lock shall be so designed and installed as to be opened by one hand from the inside of the room under all circumstances, without the use of a key or tool.

**4.9.1.7.3.4** **Warning Sign** Such doors shall be equipped with permanent signage warning against unauthorized entry.

**4.9.1.7.3.5** **Gasket** All sides of such doors shall be equipped with a gasket.

**4.9.1.7.3.5.1** **Prevent Air Passage** The gasket shall be so installed as to prevent the passage of air, fumes, or vapors when the door is closed.

**4.9.1.7.3.6** **Not Relief** This section shall not be construed as granting relief from MAHC 4.9.1.7.2.1.

#### **4.9.1.8** **Other Equipment Room Guidance**

**4.9.1.8.1<sup>A</sup>** **Access Space** Where ventilation, air filtration, or space dehumidification, heating, or cooling for an INDOOR AQUATIC FACILITY is by mechanical equipment located in an EQUIPMENT ROOM, adequate access space shall be provided to allow for inspection and service.

**4.9.1.8.1.1<sup>A</sup>** **Size Requirements** The access spaces shall be the greater of:

- 1) Those required by OSHA, NEC, National Fuel Gas Code, or other official requirements; or
- 2) The equipment-manufacturers' recommendations.

**4.9.1.8.2<sup>A</sup>** **Adequate Space** Where ventilation, air filtration, or space heating or cooling for an

INDOOR AQUATIC FACILITY is beside mechanical equipment located in an EQUIPMENT ROOM, adequate space for required straight lengths of duct shall be provided as the greater of those described in AMCA 201, SMACNA Duct Manual, ACCA Manual SPS Sec. 13, or the equipment manufacturer's recommendations.

**4.9.1.8.3<sup>A</sup>** **Minimize Hazards** Where an EQUIPMENT ROOM contains equipment requiring regular service or maintenance, the room shall be so designed and constructed as to minimize the hazards of such maintenance and service.

**4.9.1.8.3.1** **Ladder Installed** Where a ladder will be required for service or maintenance of equipment, other permanently installed equipment shall not be so located as to interfere with the use of the ladder.

**4.9.1.8.3.2** **Alternative Access** Where a ladder cannot be safely or practically used to service equipment where any serviceable component is more than 6.5 feet (2.0 m) above the floor, a mezzanine floor, platform, or other arrangement for safe access shall be provided.

**4.9.1.8.3.2.1** **Exception** *Exception:* Where otherwise specifically allowed by OSHA.

**4.9.1.8.3.2.2** **Stricter Requirements** *Exception:* Where OSHA or other applicable CODES or STANDARDS have stricter requirements, those stricter requirements shall prevail.

**4.9.1.8.4<sup>A</sup>** **Refrigeration Equipment** Where refrigeration equipment such as an air-conditioner or dehumidifier is located indoors in a building intended for occupation, arrangements for refrigerant relief (*if any*) shall be according to the applicable mechanical CODE or other applicable CODE.

**4.9.2<sup>A</sup>** **Chemical Storage Spaces** Nothing in this section shall be construed as providing relief from applicable requirements of fire CODES, mechanical CODES, electrical CODES, etc.

#### **4.9.2.1** **Outdoor / Indoor Storage**

**4.9.2.1.1** **Stored Outdoors** If POOL chemicals, acids, salt, oxidizing cleaning materials, or other CORROSIVE or oxidizing chemicals are STORED outdoors, they shall be stored in a well-ventilated protective area with an installed BARRIER to prevent unauthorized access as per MAHC 4.9.2.3.

**4.9.2.1.2** **Minimize Vapors** Where such materials must be stored in a building intended for occupancy, the transfer of chemical fumes and vapors from the CHEMICAL STORAGE SPACE to other parts of the building shall be minimized.

**4.9.2.1.3<sup>A</sup>** **Dedicated Space** At least one space dedicated to CHEMICAL STORAGE SPACE shall be provided to allow safe STORAGE of the chemicals present.

**4.9.2.1.4<sup>A</sup>** **Eyewash** In all CHEMICAL STORAGE SPACES in which POOL chemicals will be STORED, an emergency eyewash station shall be provided.

**4.9.2.1.4.1<sup>A</sup>** **AHJ Requirements** If more stringent requirements are dictated by the AHJ, then those shall govern and be applicable.

#### **4.9.2.2<sup>A</sup>** **Construction**

**4.9.2.2.1** **Foreseeable Hazards** The construction of the CHEMICAL STORAGE SPACE shall take into account the foreseeable hazards.

**4.9.2.2.2** **Protected** The construction of the CHEMICAL STORAGE SPACE shall, to the extent practical, protect the STORED materials against tampering, wild fires, unintended exposure to water, etc.

**4.9.2.2.3<sup>A</sup>** **Floor** The floor or DECK of the CHEMICAL STORAGE SPACE shall be protected against substantial chemical damage.

**4.9.2.2.4** **Minimize Fumes** The construction and operation of a CHEMICAL STORAGE SPACE shall minimize the transfer of chemical fumes into any INTERIOR SPACE of a building intended for occupation.

**4.9.2.2.5** **Surfaces** Any walls, floors, doors, ceilings, and other building surfaces of an interior CHEMICAL STORAGE SPACE shall join each other tightly.

**4.9.2.2.6<sup>A</sup>** **No Openings** There shall be no permanent or semi-permanent opening between a CHEMICAL STORAGE SPACE and any other INTERIOR SPACE of a building intended for occupation unless compliant with MAHC 4.9.2.4.3, 4.9.2.4.4, and 4.9.2.4.5.

#### **4.9.2.3<sup>A</sup>** **Exterior Chemical Storage Spaces**

**4.9.2.3.1** **Outdoor Equipment** Equipment listed for outdoor use may be located in an exterior CHEMICAL STORAGE SPACES as permitted.

**4.9.2.3.2<sup>A</sup>** **Fencing** Exterior CHEMICAL STORAGE SPACES not joined to a wall of a building shall be completely enclosed by fencing that is at least 6 feet (1.8 m) high and meets the non-climbability requirements of MAHC 4.8.6.2.1.

**4.9.2.3.3** **Gate** Fencing shall be equipped with a self-closing and self-latching gate having a permanent locking device.

#### **4.9.2.4<sup>A</sup>** **Chemical Storage Space Doors**

**4.9.2.4.1<sup>A</sup>** **Signage** All doors opening into CHEMICAL STORAGE SPACES shall be equipped with permanent signage:

- 1) Warning against unauthorized entry, and
- 2) Specifying the expected hazards, and
- 3) Specifying the location of the associated SDS forms, and
- 4) Product chemical hazard NFPA chart.

**4.9.2.4.2<sup>A</sup>** **Emergency Egress** Where a single door is the only means of egress from a CHEMICAL STORAGE SPACE, the door shall be equipped with an emergency-egress device.

**4.9.2.4.3<sup>A</sup>** **Interior Door** Where a CHEMICAL STORAGE SPACE door must open to an INTERIOR SPACE, spill containment shall be provided to prevent spilled chemicals from leaving the CHEMICAL STORAGE SPACE.

**4.9.2.4.4<sup>A</sup>** **Equipment Space** Where a CHEMICAL STORAGE SPACE door must open to an INTERIOR SPACE, the door shall not open to a space containing combustion equipment, air-handling equipment, or electrical equipment.

**4.9.2.4.4.1<sup>A</sup>** **Corrosive** Such door shall be acceptable where all equipment thus exposed is listed for the CORROSIVE atmosphere.

**4.9.2.4.5** **Interior Opening** Where a CHEMICAL STORAGE SPACE door must open to an INTERIOR SPACE, such door shall have all of the following requirements outlined from MAHC 4.9.2.4.5.1 to 4.9.2.4.5.7.2.

**4.9.2.4.5.1** **Corrosion-Resistant** Such doors shall be constructed of corrosion-resistant materials.

**4.9.2.4.5.2<sup>A</sup>** **Automatic Lock** Such doors shall be equipped with a corrosion-resistant, automatic lock to prevent unauthorized entry.

**4.9.2.4.5.2.1** **Key or Combination** Such lock shall require a key or combination to open from the outside into the CHEMICAL STORAGE SPACE.

**4.9.2.4.5.2.2** **Opened** Such lock shall be so designed and installed as to be capable of being opened by one hand from the inside of the CHEMICAL STORAGE SPACE without the use of a key or tool.

**4.9.2.4.5.3** **Supported** Such doors shall be supported on corrosion-resistant hinges, tracks, or other supports.

**4.9.2.4.5.4** **Air Leakage** Such doors shall be equipped with suitable gaskets or seals on the top and all sides to minimize air leakage between the door and the door frame.

**4.9.2.4.5.5** **Floor** Such doors shall be equipped with a floor or threshold seal to minimize air

leakage between the door and the floor or threshold.

**4.9.2.4.5.6 Automatic Closer** Such doors shall be equipped with an automatic door closer that will completely close the door and latch without human assistance.

**4.9.2.4.5.6.1 Air Pressure** The door closer shall be able to close the door completely against the specified difference in air pressure.

**4.9.2.4.5.7 Limit Switch** Such doors shall be equipped with a limit switch and an alarm that will sound if the door remains open for more than 30 minutes.

**4.9.2.4.5.7.1 Alarm** This alarm shall have a minimum output level of 85 dbA at 10 feet (3.0 m).

**4.9.2.4.5.7.2 Loss of Air Pressure** Where an open door will result in loss of air-pressure difference, this requirement can be met by the audible alarm required under MAHC 4.9.2.5.2.4.

#### **4.9.2.5<sup>A</sup> Interior Chemical Storage Spaces**

**4.9.2.5.1<sup>A</sup> No Air Movement** There shall be no transfer grille, pass-through grille, louver, or other device or opening that will allow air movement from the CHEMICAL STORAGE SPACE into any other INTERIOR SPACE of a building intended for occupancy or into another CHEMICAL STORAGE SPACE.

**4.9.2.5.2<sup>A</sup> Electrical Conduit System** Interior CHEMICAL STORAGE SPACES that share any building surface (*wall, floor, ceiling, door, etc.*) with any other INTERIOR SPACE shall be equipped with a ventilation system that operates continuously and ensures that all air movement is from all other INTERIOR SPACES and toward the CHEMICAL STORAGE SPACE.

**4.9.2.5.2.1 Additional Interior Space** Interior CHEMICAL STORAGE SPACES that share an electrical conduit system with any other INTERIOR SPACE shall be equipped with a ventilation system that operates continuously and ensures that all air movement is from all other INTERIOR SPACES and toward the CHEMICAL STORAGE SPACE.

**4.9.2.5.2.2<sup>A</sup> Pressure Difference** This pressure difference shall be maintained by a continuously operated exhaust system used for no other purpose than to remove air from that one CHEMICAL STORAGE SPACE.

**4.9.2.5.2.3 Separate Exhaust System** Where more than one CHEMICAL STORAGE SPACE is present, a separate exhaust system shall be provided for each CHEMICAL STORAGE SPACE.

**4.9.2.5.2.3.1 Airflow Rate** The exhaust airflow rate shall be the greater of the:

- 1) OSHA requirements for working in such enclosed spaces, or
- 2) Amount needed to maintain the concentration of vapors or fumes below the PEL for the expected exposure time (*defined by 29 CFR 1910.1000 (OSHA)*) for each stored chemical, or
- 3) Amount specified by International Mechanical Code, or
- 4) Amount specified by the Uniform Mechanical Code, or
- 5) Amount needed to maintain the specified pressure difference.

**4.9.2.5.2.4<sup>A</sup> Alarm** The function of this exhaust system shall be MONITORED continuously by an audible differential-pressure alarm system which shall sound if the specified differential air pressure is not maintained for a period of thirty minutes.

**4.9.2.5.2.4.1 Minimum Output** This alarm shall have a minimum output level of 85 dbA at 10 feet (3.0 m).

**4.9.2.5.2.4.2 Manual Reset** The specified alarm shall require manual reset to silence it.

#### **4.9.2.6 Air Ducts in Interior Chemical Storage Spaces**

**4.9.2.6.1<sup>A</sup> No Air Movement** No duct shall allow air movement from the CHEMICAL STORAGE SPACE into any other INTERIOR SPACE of a building intended for occupation or into any other CHEMICAL STORAGE SPACE.

**4.9.2.6.2** **Chemical Storage** Air ducts shall not enter or pass through an interior CHEMICAL STORAGE SPACE.

**4.9.2.6.2.1** **Corrosion-Resistant Exception:** A corrosion-resistant duct used for no other purpose than to exhaust air from the CHEMICAL STORAGE SPACE shall be acceptable.

**4.9.2.6.2.1.1** **Building Exterior** This corrosion-resistant duct shall exhaust to the exterior and must end at a point on the exterior of the building, at least 20 feet (6.1 m) from any air intake for breathing air, cooling air, or combustion air.

**4.9.2.6.2.2** **Makeup Air Exception:** A duct used for no other purpose than to supply makeup air to the CHEMICAL STORAGE SPACE shall be acceptable.

**4.9.2.6.2.2.1** **Building Exterior** This makeup air supply duct shall end at a point on the exterior of the building, at least 20 feet (6.1 m) from any air intake for breathing air, cooling air, or combustion air.

**4.9.2.6.2.3** **Other Ducts Exception:** Any other ducts specifically allowable by applicable building and mechanical CODES where such ducts are corrosion-resistant and joint-free to the extent feasible shall be acceptable.

#### **4.9.2.7** **Pipes and Tubes in Interior Chemical Storage Spaces**

**4.9.2.7.1** **Not Enter** Pipes and tubes shall not enter or pass through an interior CHEMICAL STORAGE SPACE.

**4.9.2.7.1.1** **Service Exception:** As required to service devices integral to the function of the CHEMICAL STORAGE SPACE, such as pumps, vessels, controls, freeze protection, and SAFETY devices.

**4.9.2.7.1.2** **Automatic Fire Suppression Exception:** As required to allow for automatic fire suppression where required.

**4.9.2.7.1.3** **Drainage Exception:** As required for drainage.

**4.9.2.7.2** **Devices** Piping, tubes, drain bodies, grates, and attachment and restraint devices shall be corrosion-resistant and rated for the chemical environment(s) present including floor drain bodies and grates.

**4.9.2.7.3** **Wall Penetrations** All wall penetrations shall be sealed air-tight.

**4.9.2.7.3.1** **Rating** All wall penetrations shall be commensurate with the rating of the wall assembly.

**4.9.2.7.3.2** **Sealing Materials** Sealing material(s) shall be compatible with the wall assembly and the chemical environment(s) present.

#### **4.9.2.8<sup>A</sup>** **Combustion Equipment in Interior Chemical Storage Spaces**

**4.9.2.8.1** **Installed** No COMBUSTION DEVICE or appliance shall be installed in a CHEMICAL STORAGE SPACE, or in any other place where it will be exposed to the air from a CHEMICAL STORAGE SPACE.

**4.9.2.8.1.1** **Exception Exception:** A COMBUSTION DEVICE or appliance which meets all of the following requirements shall be acceptable:

- 1) The device or appliance is required for one or more processes integral to the function of the room, such as space heat; and
- 2) The device is listed for such use; and
- 3) The device as installed is acceptable to the AHJ.

**4.9.2.9** **Electrical Equipment in Chemical Storage Spaces** Electrical equipment and wiring methods used for or in CHEMICAL STORAGE SPACES shall comply with MAHC 4.9.2.

#### **4.9.2.10** **Ozone Rooms**

**4.9.2.10.1** **Only Ozone Equipment** An ozone EQUIPMENT ROOM shall not be used for STORAGE of

chemicals, solvents, or any combustible materials, other than those required for the operation of the recirculation and ozone generating equipment.

**4.9.2.10.2**        **Emergency Ventilation** Rooms which are designed to include ozone equipment shall be equipped with an emergency ventilation system capable of six air changes per hour.

**4.9.2.10.2.1**        **Exhaust Intake** The exhaust intake shall be located approximately 6 inches (15.2 cm) from the floor, on the opposite side of the room from the make-up air intake.

**4.9.2.10.2.2**        **On Command** The emergency ventilation system shall be so arranged as to run on command of an ozone-leak alarm or on command of a manual switch.

**4.9.2.10.2.3**        **Manual Switch** The manual emergency ventilation switch shall be located outside the room and near the door to the ozone room.

**4.9.2.10.3**        **Below Grade** Ozone rooms which are below grade shall be equipped with forced-draft ventilation capable of six air changes per hour.

**4.9.2.10.3.1**        **Exhaust Intake** The exhaust intake shall be located approximately 6 inches (15.2 cm) from the floor, on the opposite side of the room from the make-up air intake.

**4.9.2.10.3.2**        **Arranged** Such ventilation system shall be so arranged as to:

- 1) Run automatically concurrent with the ozone equipment and for at least a time allowing for 15 air changes after the ozone equipment is stopped,
- 2) Run upon activation of the ozone detection and alarm system, and
- 3) Run on command of a manual switch.

**4.9.2.10.3.3**        **Manual Ventilation Switch** The manual ventilation switch shall be located outside the room and near the door to the ozone room.

**4.9.2.10.4**        **Signage** In addition to the signs required on all CHEMICAL STORAGE AREAS, a sign shall be posted on the exterior of the entry door, stating "DANGER - GASEOUS OXIDIZER – OZONE" in lettering not less than 4 inches (10.2 cm) high.

**4.9.2.10.5**        **Alarm System** Rooms containing ozone generation equipment shall be equipped with an audible and visible ozone detection and alarm system.

**4.9.2.10.5.1**        **Requirements** The alarm system shall consist of both an audible alarm capable of producing at least 85 decibels at 10 feet distance (3.0 m), and a visible alarm consisting of a flashing light mounted in plain view of the entrance to the ozone-EQUIPMENT ROOM.

**4.9.2.10.5.2**        **Sensor** The ozone sensor shall be located at a height of 18-24 inches (45.7-61.0 cm) above floor level.

**4.9.2.10.5.2.1**        **Measuring** The ozone sensor shall be capable of measuring ozone in the range of 0-2 ppm.

**4.9.2.10.5.3**        **Ozone Concentration** The alarm system shall alarm when the ozone concentration equals or exceeds 0.1 ppm in the room.

**4.9.2.10.5.4**        **Activation** Activation of the alarm system shall shut off the ozone generating equipment and turn on the emergency ventilation system.

**4.9.2.11<sup>A</sup>**        **Gaseous Chlorination Space** As per MAHC 4.7.3.2.4.1, use of compressed CHLORINE gas shall be prohibited for new construction and after SUBSTANTIAL ALTERATION to existing AQUATIC FACILITIES.

**4.9.2.11.1**        **Existing Facilities** MAHC 4.9.2.11 shall apply to existing facilities using compressed CHLORINE gas.

**4.9.2.11.2**        **Adequate Size** A gaseous-chlorination space shall be large enough to house the chlorinator, CHLORINE STORAGE tanks, and associated equipment as required.

**4.9.2.11.3**        **Secure Tanks** A gaseous-chlorination space shall be equipped with facilities for

securing tanks.

**4.9.2.11.4** *Not Below Grade* A gaseous-chlorination space shall not be located in a basement or otherwise be below grade.

**4.9.2.11.5** *Compressed-Chlorine Gas* Where installed indoors, compressed-CHLORINE gas STORAGE containers and associated chlorinating equipment shall be in a separate room constructed to have a fire rating of not less than 1-hour.

**4.9.2.11.6** *Entry Door* The entry door to an indoor gaseous-CHLORINE space shall open to the exterior of the building or structure.

**4.9.2.11.6.1** *Pool or Deck* The entry door to an indoor gaseous-CHLORINE space shall not open directly towards a POOL or DECK.

**4.9.2.11.7** *Inspection Window* An indoor gaseous-CHLORINE space shall be provided with a shatterproof gas-tight inspection window.

**4.9.2.11.8** *Ventilation* Indoor gaseous-chlorination spaces shall be provided with a spark-proof ventilation system capable of 60 air changes per hour.

**4.9.2.11.8.1** *Exhaust-Air Intake* The exhaust-air intake of the ventilation system shall be taken at a point within 6 inches (15.2 cm) of the floor, and on the opposite side of the room from the makeup-air intake.

**4.9.2.11.8.2** *Discharge Point* The exhaust-air discharge point shall be:

- 1) Outdoors, and
- 2) Above adjoining grade level, and
- 3) At least 20 feet (6.1 m) from any operable window, and
- 4) At least 20 feet (6.1 m) from any adjacent building.

**4.9.2.11.8.3** *Make-Up Intake* The make-up air intake shall be within 6 inches (15.2 cm) of the ceiling of the space.

**4.9.2.11.8.3.1** *Open Outdoors* The make-up air intake shall open directly to the outdoors.

**4.9.2.11.8.4** *Personal Protective Equipment Available* PPE, consisting of at least a gas mask approved by NIOSH for use with CHLORINE atmospheres, shall be stored directly outside one entrance to an indoor gaseous-chlorination space.

**4.9.2.11.8.5** *SCBA Systems* A minimum of two SCBA systems shall be on hand at all times and two QUALIFIED OPERATORS are to be involved in the changing of the tanks.

**4.9.2.11.8.6** *Stationed Outside* One of the QUALIFIED OPERATORS should be stationed outside of the chemical room where the QUALIFIED OPERATOR inside can be seen at all times.

**4.9.2.11.8.7** *Emergency Telephone* An emergency direct line telephone shall be located by the door.

## **4.9.2.12** *Windows in Chemical Storage Spaces*

**4.9.2.12.1<sup>A</sup>** *Not Required* Windows in CHEMICAL STORAGE SPACES shall not be required by this CODE.

**4.9.2.12.2<sup>A</sup>** *Requirements* Where a window is to be installed in an interior wall, ceiling, or door of a CHEMICAL STORAGE SPACE, such window shall have the following components:

- 1) Tempered or plasticized glass,
- 2) A corrosion-resistant frame, and
- 3) Incapable of being opened or operated.

**4.9.2.12.3** *Exterior Window* Any CHEMICAL STORAGE SPACE window in an exterior wall or ceiling shall:

- 1) Be mounted in a corrosion-resistant frame, and
- 2) Be so protected by a roof, eave, or permanent awning as to minimize the entry of rain or snow in the event of window breakage.

#### 4.9.2.13 Sealing and Blocking Materials

**4.9.2.13.1 Minimize Leakage** Materials used for sealing and blocking openings in an interior CHEMICAL STORAGE SPACE shall minimize the leakage of air, vapors, or fumes from the CHEMICAL STORAGE SPACE.

**4.9.2.13.2 Compatible** Materials used for sealing and blocking openings in an interior CHEMICAL STORAGE SPACE shall be compatible for use in the environment.

**4.9.2.13.3 Fire Rating** Materials used for sealing and blocking openings in an interior CHEMICAL STORAGE SPACE shall be commensurate with the fire rating of the assembly in which they are installed.

### 4.12.10<sup>A</sup> Floatation Tanks

**4.12.10.1<sup>A</sup> Design and Construction** Only the Design and Construction provisions contained in MAHC 4.12.10.1 thru 4.12.10.11 apply to construction of a new FLOATATION TANK facility or FLOATATION TANK or SUBSTANTIAL ALTERATION to an existing FLOATATION TANK facility or FLOATATION TANK, unless otherwise noted.

#### 4.12.10.1.3 Plans and Specifications

**4.12.10.1.3.5 Floatation Tank Recirculation and Treatment Design** Detailed scaled and dimensional drawings for each individual FLOATATION TANK shall contain a flow diagram showing the location, plan, elevation, and schematics of:

- 1) Filters,
- 2) Pumps,
- 3) DISINFECTION systems,
- 4) Supplemental DISINFECTION systems, if installed,
- 5) Ventilation devices or AIR HANDLING SYSTEMS,
- 6) Heaters,
- 7) BACKFLOW prevention assemblies and air gaps,
- 8) Valves,
- 9) Piping,
- 10) Flow meters,
- 11) Gauges,
- 12) Thermometers,
- 13) Test cocks,
- 14) Sight glasses, and
- 15) Drainage system for the disposal of FLOATATION TANK water and filter wastewater.

**4.12.10.1.3.6 Equipment Room Design** Detailed scaled and dimensional drawings for each individual FLOATATION TANK shall contain a schematic layout of the FLOATATION TANK EQUIPMENT ROOM (or EQUIPMENT AREA if permitted by the local AHJ) showing accessibility for installation and maintenance.

**4.12.10.1.3.7 Chemical Storage Space Design** Detailed scaled and dimensional drawings for each individual FLOATATION TANK shall contain a schematic layout of the FLOATATION TANK facility CHEMICAL STORAGE SPACE(S).

#### 4.12.10.8<sup>A</sup> Disinfection

**4.12.10.8.1 Disinfection Types** DISINFECTION shall be provided by either:

- 1) Ozone treatment system; or

2) UV treatment system.

**4.12.10.8.2** *Ozone and UV Disinfection Systems* Ozone and UV DISINFECTION systems when used as the primary DISINFECTION system, shall meet the 3-log reduction of influent bacteria DISINFECTION efficacy as tested in accordance with the criteria specified in Annex H.1 of NSF/ANSI Standard 50-2016 at the design filtration flow rate.

**4.12.10.8.3** *Ozone Disinfection* When an Ozone DISINFECTION system is used, the criteria for ozone level and ozone production testing specified in Annex H.2 and H.3 respectively, of NSF/ANSI Standard 50-2016 must be met.

**4.12.10.8.3.1** *Ozone Levels* Ozone levels in the FLOATATION TANK SOLUTION shall not exceed 0.1 ppm (mg/L).

#### **4.12.10.9<sup>A</sup> Ventilation**

**4.12.10.9.1** *Room Air Handling System* AIR HANDLING SYSTEM(S) shall be provided when necessary for the room containing FLOATATION TANK(S) and shall be designed, constructed, and installed to support the health and SAFETY of the FLOATATION TANK facility PATRONS.

**4.12.10.9.2** *Tank Air Quality* Ventilation serving the FLOATATION TANK shall be provided when necessary to ensure acceptable air quality for human health within the FLOATATION TANK.

## 5.0<sup>A</sup> Aquatic Facility Operation and Maintenance

The provisions of Chapter 5 apply to all AQUATIC FACILITIES covered by this CODE regardless of when constructed, unless otherwise noted.

*Note: Section numbers with superscript “A” (e.g., 5.0<sup>A</sup>) denote a corresponding discussion in the Annex to the Model Aquatic Health Code.*

### 5.6 Indoor / Outdoor Environment

#### 5.6.2<sup>A</sup> Indoor Aquatic Facility Ventilation

**5.6.2.1 Purpose** AIR HANDLING SYSTEMS shall be maintained and operated by the owner/operator to protect the health and SAFETY of the facility’s PATRONS.

**5.6.2.2 Original Characteristics** AIR HANDLING SYSTEMS shall be maintained and operated to comply with all requirements of the original system design, construction, and installation.

**5.6.2.3 Indoor Facility Areas** The AIR HANDLING SYSTEM operation and maintenance requirements shall apply to an INDOOR AQUATIC FACILITY including the AQUATIC VENUES, and the surrounding BATHER and spectator/STADIUM SEATING area.

**5.6.2.3.1 Does Not Include** The AIR HANDLING SYSTEM operation and maintenance requirements does not include:

- 1) Mechanical rooms,
- 2) Bath and locker rooms, and
- 3) Any associated rooms which have a direct opening to the AQUATIC FACILITY.

**5.6.2.4 Ventilation Procedures** THE INDOOR AQUATIC FACILITY owner/operator shall develop and implement a program of STANDARD AIR HANDLING SYSTEM operation, maintenance, cleaning, testing, and inspection procedures with detailed instructions, necessary equipment and supplies, and oversight for those carrying out these duties, in accordance with the AIR HANDLING SYSTEM design engineer and/or manufacturer’s recommendations.

**5.6.2.4.1 System Operation** The AIR HANDLING SYSTEM shall operate continuously, including providing the required amount of outdoor air.

**5.6.2.4.1.1 Operation Outside of Operating Hours Exception:** During non-use periods, the amount of outdoor air may be reduced by no more than 50% as long as acceptable air quality is maintained.

**5.6.2.5 Manuals/Commissioning Reports** The QUALIFIED OPERATOR shall maintain a copy of the AIR HANDLING SYSTEM design engineer and/or manufacturer original operating manuals, commissioning reports, updates, and specifications for any modifications at the facility.

**5.6.2.6 Ventilation Monitoring** The QUALIFIED OPERATOR shall MONITOR, log and maintain AIR HANDLING SYSTEM set-points and other operational parameters as specified by the AIR HANDLING SYSTEM design engineer and/or manufacturer.

**5.6.2.7 Air Filter Changing** The QUALIFIED OPERATOR shall replace or clean, as appropriate, AIR HANDLING SYSTEM air filters in accordance with the AIR HANDLING SYSTEM design engineer and/or manufacturer’s recommendations, whichever is most frequent.

**5.6.2.8<sup>A</sup> Combined Chlorine Reduction** The QUALIFIED OPERATOR shall develop and implement a plan to minimize combined CHLORINE compounds in the INDOOR AQUATIC FACILITY from the operation of AQUATIC VENUES.

**5.6.2.9 Building Purge Plan** The QUALIFIED OPERATOR shall develop and implement an air quality action plan with procedures for PURGING the INDOOR AQUATIC FACILITY for chemical emergencies or other indicators of poor air quality.

**5.6.2.10 Records** The owner shall ensure documents are maintained at the INDOOR AQUATIC FACILITY to be available for inspection, recording the following:

- 1) A log recording the set points of operational parameters set during the commissioning of the AIR HANDLING SYSTEM and the actual readings taken at least once daily;
- 2) Maintenance conducted to the system including the dates of filter changes, cleaning, and repairs;
- 3) Dates and details of modifications to the AIR HANDLING SYSTEM; and
- 4) Dates and details of modifications to the operating scheme.

## 5.7 Recirculation and Water Treatment

### 5.7.1 Recirculation Systems and Equipment

#### 5.7.1.1<sup>A</sup> General

**5.7.1.1.1 Continuous Operation** All components of the filtration and RECIRCULATION SYSTEMS shall be kept in continuous operation 24 hours per day.

**5.7.3 Water Treatment Chemicals and Systems** Treatment chemicals shall be CERTIFIED, LISTED, AND LABELED to either NSF/ANSI Standard 50 or NSF/ANSI Standard 60 by an ANSI-accredited certification organization, and/or have an EPA FIFRA registration and be used only in accordance with the manufacturer's instructions.

**5.7.3.1 Primary Disinfectants** Only the primary DISINFECTANTS outlined in MAHC 5.7.3 shall be acceptable for use in AQUATIC VENUES.

#### 5.7.3.1.1<sup>A</sup> Chlorine (Hypochlorites)

**5.7.3.1.1.1 EPA Registered** Only CHLORINE products that are EPA-REGISTERED for use as SANITIZERS or DISINFECTANTS in AQUATIC VENUES or SPAS in the United States are permitted.

#### 5.7.3.1.2 Bromine

**5.7.3.1.2.1<sup>A</sup> EPA Registered** Only bromine products that are EPA-REGISTERED for use as SANITIZERS or DISINFECTANTS in AQUATIC VENUES or SPAS in the United States shall be permitted.

**5.7.3.1.2.1.1 Disinfectants** Bromine-based DISINFECTANTS may be applied to AQUATIC VENUES and SPAS through the addition of an organic bromine compound (1,3-Dibromo-5,5-dimethylhydantoin (DBDMH) or 1-bromo-3-chloro-5,5-dimethylhydantoin (BCDMH)).

**5.7.3.1.4<sup>A</sup> Compressed Chlorine Gas** As per MAHC 4.7.3.2.4.1, use of compressed CHLORINE gas shall be prohibited for new construction and after SUBSTANTIAL ALTERATION to existing AQUATIC FACILITIES.

**5.7.3.1.4.1 Safety Requirements** Facilities using compressed CHLORINE gas shall provide SAFETY precautions per the following MAHC sub-sections.

**5.7.3.1.4.1.1 Separate Enclosure** The chlorinators and any cylinders containing CHLORINE gas used therewith shall be housed in an ENCLOSURE separated from other EQUIPMENT ROOMS, including the swimming POOL, corridors, dressing rooms and other space

**5.7.3.1.4.1.1.1 Door** The chlorinators and any cylinders containing CHLORINE gas used therewith shall be housed in an ENCLOSURE with a door so installed as to prevent gas leakage and equipped with an inspection window.

- 5.7.3.1.4.1.2 Secured** CHLORINE cylinders shall be secured from falling.
- 5.7.3.1.4.1.3 Cylinders in Use** Cylinders in use shall be secured on a suitable platform scale.
- 5.7.3.1.4.1.4 Vent to Exterior** A separate vent opening to the exterior shall be provided.
- 5.7.3.1.4.1.5 Fan** An electric motor-driven fan shall take suction from near the floor level of the ENCLOSURE and discharge at a suitable point to the exterior above the ground level.
- 5.7.3.1.4.1.5.1 Fan Switch** The fan switch shall be able to be operated from outside of the ENCLOSURE.
- 5.7.3.1.4.1.6 Trained Operator** Any person who operates such chlorinating equipment shall be trained in its use.
- 5.7.3.1.4.1.7 Stop Use** Facilities shall stop the use of CHLORINE gas if specific SAFETY equipment and training requirements, along with local CODE considerations, cannot be met.
- 5.7.3.1.5<sup>A</sup> Salt Electrolytic Chlorine Generators, Brine Electrolytic Chlorine or Bromine Generators**
- 5.7.3.1.5.1 Pool Grade Salt** Only POOL grade salt that has been CERTIFIED, LISTED, AND LABELED to either NSF/ANSI Standard 50 or NSF/ANSI Standard 60 by an ANSI-accredited certification organization, and/or have an EPA FIFRA registration shall be used.
- 5.7.3.2<sup>A</sup> Secondary or Supplemental Treatment Systems**
- 5.7.3.2.2 Ozone**
- 5.7.3.2.2.1 Log Inactivation** Ozone systems shall be operated and maintained according to the manufacturer's instructions to maintain the required design performance.
- 5.7.3.2.2.2 Residual Ozone Concentration** Residual ozone concentration in the AQUATIC VENUE water shall remain below 0.1 ppm (*mg/L*).
- 5.7.3.2.2.3 Free Available Chlorine and Bromine Levels** Use of ozone does not modify any other water quality requirements.
- 5.7.3.2.2.4 Standard Operating Manual** A printed STANDARD operating manual shall be provided containing information on the operation and maintenance of the ozone generating equipment, including the responsibilities of workers in an emergency.
- 5.7.3.2.2.5 Employees Trained** All employees shall be properly trained in the operation and maintenance of the equipment.
- 5.7.3.2.2.6 Response to Interruption in Operation** Any interruptions in ozone system operations that are triggered by an interlock per MAHC 4.7.3.2.5.6.2 shall be evaluated as possible evidence for low flow state of the AQUATIC VENUE pumps, prompting BATHER evacuation according to MAHC 5.7.3.5.1.2.1 and BATHER re-entry according to MAHC 5.7.3.5.1.2.2.
- 5.7.3.2.3<sup>A</sup> Copper / Silver Ions**
- 5.7.3.2.3.1 EPA Registered** Only those systems that are EPA-REGISTERED for use as SANITIZERS or DISINFECTANTS in AQUATIC VENUES or SPAS in the United States are permitted.
- 5.7.3.2.3.2 Concentrations** Copper and silver concentrations shall not exceed 1.3 ppm (*mg/L*) for copper and 0.10 ppm (*mg/L*) for silver for use as DISINFECTANTS in AQUATIC VENUES and SPAS in the United States.
- 5.7.3.2.3.3 Free Available Chlorine and Bromine Levels** FAC or bromine levels shall be maintained in accordance with MAHC 5.7.3.1.1 or 5.7.3.1.2, respectively.
- 5.7.3.3<sup>A</sup> Other Sanitizers, Disinfectants, or Chemicals** Other SANITIZERS, DISINFECTANTS, or chemicals used shall:

1) Be EPA-REGISTERED under FIFRA if they are pesticides as defined by EPA and,

- 2) Not create a hazardous condition or compromise DISINFECTANT efficacy when used with required bromine or CHLORINE concentrations, and
- 3) Not interfere with water quality measures meeting all criteria set forth in this CODE.

**5.7.3.3.1<sup>A</sup>**        **Chlorine Dioxide** CHLORINE dioxide shall only be used for remediation for water quality issues when the AQUATIC VENUE is closed and BATHERS are not present.

**5.7.3.3.1.1**        **Safety Considerations** Safety training and safety precautions related to use of CHLORINE dioxide shall be in place.

**5.7.3.3.2<sup>A</sup>**        **Clarifiers, Flocculants, Defoamers** Clarifiers, flocculants, and defoamers shall be used per manufacturer's instructions.

**5.7.3.3.2.1**        **Certified, Listed, and Labeled** Clarifiers, flocculants, and defoamers shall CERTIFIED, LISTED, AND LABELED to either NSF/ANSI Standard 50 or NSF/ANSI Standard 60 by an ANSI-accredited certification organization, and/or have an EPA FIFRA registration.

#### **5.7.3.4<sup>A</sup>**        **pH**

**5.7.3.4.1**        **pH levels** The pH of the water shall be maintained at 7.2 - 7.8.

**5.7.3.4.2**        **Approved Substances** Approved substances for pH adjustment shall include but not be limited to muriatic (*hydrochloric*) acid, sodium bisulfate, carbon dioxide, sulfuric acid, sodium bicarbonate, and soda ash.

**5.7.3.4.2.1**        **Certified, Listed, and Labeled** Chemicals used for pH adjustment shall be CERTIFIED, LISTED, AND LABELED to either NSF/ANSI Standard 50 or NSF/ANSI Standard 60 by an ANSI-accredited certification organization, and/or have an EPA FIFRA registration.

#### **5.7.3.5<sup>A</sup>**        **Feed Equipment**

**5.7.3.5.1**        **Acceptable Chemical Delivery** Acceptable DISINFECTANT and pH control chemicals shall be delivered through an automatic chemical feed system upon adoption of this CODE.

**5.7.3.5.1.1**        **Dedicated and Labeled Components** All chemical feed system components shall be dedicated to a single chemical and clearly labeled to prevent the introduction of incompatible chemicals.

**5.7.3.5.1.4**        **Maintained** All chemical feed equipment shall be maintained in good working condition.

**5.7.3.5.2**        **Chemical Feeders** Chemical feeders shall be installed such that they are not over CHEMICAL STORAGE containers, other feeders, or electrical equipment.

**5.7.3.5.3**        **Dry Chemical Feeders** Chemicals shall be kept dry to avoid clumping and potential feeder plugging for mechanical gate or rotating screw feeders.

**5.7.3.5.6**        **Liquid Solution Feeders** For liquid solution feeders, spare feeder tubes (*or tubing*) shall be maintained onsite for peristaltic pumps.

**5.7.3.5.7**        **Checked Daily** All chemical tubing, connections, support, and double containment piping shall be checked on a daily basis for leaks.

**5.7.3.5.7.1**        **Routed** All chemical tubing that runs through areas where staff work shall be routed in PVC piping to support the tubing and to prevent leaks.

**5.7.3.5.7.1.1**        **Size** The double containment PVC pipe shall be of sufficient size to allow for easy replacement of tubing.

**5.7.3.5.7.1.2**        **Turns** Any necessary turns in the piping shall be designed so as to prevent kinking of the tubing.

## 5.9<sup>A</sup> Filter/Equipment Room

### 5.9.1 Chemical Storage

**5.9.1.1<sup>A</sup> Local Codes** CHEMICAL STORAGE shall be in compliance with local building and fire CODES.

**5.9.1.2<sup>A</sup> OSHA and EPA** Chemical handling shall be in compliance with OSHA and EPA regulations.

**5.9.1.3<sup>A</sup> Safety Data Sheets** For each chemical, STORAGE, handling, and use of the chemical shall be in compliance with the manufacturer's SDS and labels.

**5.9.1.4 Access Prevention** AQUATIC VENUE chemicals shall be stored to prevent access by unauthorized individuals.

**5.9.1.5<sup>A</sup> Protected** AQUATIC VENUE chemicals shall be stored so that they are protected from getting wet.

**5.9.1.6<sup>A</sup> No Mixing** AQUATIC VENUE chemicals shall be stored so that if the packages were to leak, no mixing of incompatible materials would occur.

**5.9.1.6.1 Safety Data Sheets Consulted** SDS shall be consulted for incompatibilities.

**5.9.1.7<sup>A</sup> Ignition Sources** Possible ignition sources, including but not limited to gasoline, diesel, natural gas, or gas-powered equipment such as lawn mowers, motors, grills, POOL heaters, or portable stoves shall not be stored or installed in the CHEMICAL STORAGE SPACE.

**5.9.1.8 Smoking** Smoking shall be prohibited in the CHEMICAL STORAGE SPACE.

**5.9.1.9<sup>A</sup> Lighting** Lighting shall be at minimum 30 footcandles (*323 lux*) to allow operators to read labels on containers throughout the CHEMICAL STORAGE SPACE and pump room.

**5.9.1.10<sup>A</sup> Personal Protective Equipment** PPE shall be available as indicated on the chemical SDSs.

**5.9.1.11 Storage** Chemicals shall be stored away from direct sunlight, temperature extremes, and high humidity.

**5.9.1.12 Single Container** A single container of a particular chemical that has been opened and that is currently in use in the pump room may be kept in a staging area of the pump room only if the chemical(s) will be protected from exposure to heat and moisture.

**5.9.1.13 Separate** The CHEMICAL STORAGE SPACE shall be separate from the EQUIPMENT ROOM.

**5.9.1.13.1 Waiver** For AQUATIC FACILITIES that do not currently have a CHEMICAL STORAGE SPACE separate from the EQUIPMENT ROOM, this requirement may be waived at the discretion of the local public health and/or fire officials if the chemicals are protected from exposure to heat and moisture and no imminent health or SAFETY threats are identified.

**5.9.1.14 Warning Signs** Warning signs in compliance with NFPA or HMIS ratings shall be posted on CHEMICAL STORAGE SPACE doors.

### 5.9.2 Chemical Handling

**5.9.2.1 Identity** Containers of chemicals shall be labeled, tagged, or marked with the identity of the material and a statement of the hazardous effects of the chemical according to OSHA and/or EPA materials labeling requirements.

**5.9.2.1.1 Labeling** All AQUATIC VENUE chemical containers shall be labeled according to OSHA and/or EPA materials labeling requirements.

**5.9.2.2 NSF Standard** The chemical equipment used in controlling the quality of water shall be CERTIFIED, LISTED, AND LABELED to NSF/ANSI 50 by an ANSI-accredited certification organization and used only in accordance with the manufacturer's instructions.

**5.9.2.3 Measuring Devices** Chemicals shall be measured using a dedicated measuring device where

applicable.

**5.9.2.3.1** *Clean and Dry* These measuring devices shall be clean, dry, and constructed of material compatible with the chemical to be measured to prevent the introduction of incompatible chemicals.

#### **5.9.2.4** Chemical Addition Methods

**5.9.2.4.1** *Automatically Introduced* DISINFECTION and pH control chemicals shall be automatically introduced through the RECIRCULATION SYSTEM.

**5.9.2.4.1.1** *Manual Addition* SUPERCHLORINATION or shock chemicals and other POOL chemicals other than DISINFECTION and pH control may be added manually to the POOL.

**5.9.2.4.1.2** *Absence of Bathers* Chemicals added manually directly into the AQUATIC VENUE shall only be introduced in the absence of BATHERS.

**5.9.2.4.2** *Safety Requirements* Treatment chemicals shall be added in strict adherence to the manufacturer's use instructions to ensure levels in the water are safe for human exposure. Refer to MAHC 5.7.3.

**5.9.2.4.2.1** *Diluted* Whenever required by the manufacturer, chemicals shall be diluted (*or mixed with water*) prior to application and as per the manufacturer's directions.

**5.9.2.4.2.2** *Added* Chemicals shall be added to water when diluting as opposed to adding water to a concentrated chemical.

**5.9.2.4.2.3** *Mixed* Each chemical shall be mixed in a separate, labeled container.

**5.9.2.4.2.3.1** *Never Mixed Together* Two or more chemicals shall never be mixed in the same dilution water.

## 6.0<sup>A</sup> Policies and Management

The provisions of Chapter 6 shall apply to all AQUATIC FACILITIES covered by this CODE regardless of when constructed, unless otherwise noted.

**Note:** Section numbers with superscript “A” (e.g., 6.0<sup>A</sup>) denote a corresponding discussion in the Annex to the Model Aquatic Health Code.

**6.0.1 Staff Training** All QUALIFIED OPERATORS, RESPONSIBLE SUPERVISORS, maintenance staff, QUALIFIED LIFEGUARD staff, or any others who are involved in the STORAGE, use, or handling of chemicals shall receive training prior to access of chemicals, and receive at least an annual review of procedures thereafter for the following topics discussed in MAHC 6.0.1.1 to 6.0.1.5.

**6.0.1.1 Storage and Handling** Procedures for CHEMICAL STORAGE and handling outlined in this CODE.

**6.0.1.2 Personal Protective Equipment Procedures** STANDARD precautions, PPE, and other measures to minimize exposure to chemicals as required by OSHA. This shall include staff training in PPE and respiratory protective devices when required.

**6.0.1.3 Spill Procedures** Spill Procedures and Emergency Response outlined in this CODE.

**6.0.1.4 OSHA Requirements** Federal OSHA Requirements: Hazard Communication Standard (*Employee Right-to-Know*) and SDS. Know the location and availability of STANDARD and the written program.

**6.0.1.5 Chemical and Safety Data Sheets Lists** Know workplace chemicals list and SDS.

**6.0.1.6 Training Plan** Employers shall have a training plan in place and implement training for employees on chemicals used at the AQUATIC FACILITY before their first assignment and whenever a new hazard is introduced into the work area.

**6.0.1.6.1<sup>A</sup> Training Topics** The training shall include at a minimum:

- 1) How to recognize and avoid chemical hazards;
- 2) The physical and health hazards of chemicals used at the facility;
- 3) How to detect the presence or release of a hazardous chemical;
- 4) Required PPE necessary to avoid the hazards;
- 5) Use of PPE;
- 6) Chemical spill response; and
- 7) How to read and understand the chemical labels or other forms of warning including SDS sheets.

## 6.1 Qualified Operator Training

### 6.1.2<sup>A</sup> Essential Topics in Qualified Operator Training Courses

**6.1.2.1 Course Content** All operator training courses recognized by the AHJ shall include, at a minimum, the following teaching elements:

- 1) Water DISINFECTION,
- 2) Water chemistry,
- 3) Mechanical systems, and
- 4) Health and SAFETY operations.

**6.1.2.1.1<sup>A</sup> Water Disinfection** Water DISINFECTION including:

- 1) Water DISINFECTION,
- 2) CT or Concentration X Time values,
- 3) CHLORINE,
- 4) CYA,

- 5) Bromine,
- 6) Breakpoint,
- 7) SUPERCHLORINATION,
- 8) HYPERCHLORINATION,
- 9) Combined CHLORINE,
- 10) SECONDARY DISINFECTION, and
- 11) SUPPLEMENTAL TREATMENT.

#### **6.1.2.1.1.1 Disinfectants** DISINFECTANT types including:

- 1) Descriptions of different types of DISINFECTANTS,
- 2) Their unique physical (*e.g., shape or state [solid, liquid, or gas]*) and chemical properties (*e.g., how it reacts with acids or bases*),
- 3) How they DISINFECT and impact water chemistry and MONITORING systems,
- 4) How to calculate dosing,
- 5) How they are used safely, and
- 6) The advantages or disadvantages of using each DISINFECTANT.

#### **6.1.2.1.1.3 Bromine** Bromine including:

- 1) Definition of bromine as an element,
- 2) Its use as a residual DISINFECTANT and OXIDIZER in water,
- 3) Bromine chemistry,
- 4) The DISINFECTION role of HOBr,
- 5) On site generation,
- 6) pH meter requirements to prevent false readings, and
- 7) Bromine reuse.

#### **6.1.2.1.1.4 Chlorine** CHLORINE including:

- 1) Definition of CHLORINE as an element,
- 2) Its use as a residual DISINFECTANT and OXIDIZER in water,
- 3) CHLORINE chemistry and the role of PH,
- 4) The DISINFECTION role of HOCl,
- 5) Unstabilized products (*sodium hypochlorite, calcium hypochlorite, lithium hypochlorite, and CHLORINE gas*),
- 6) Stabilized products (*sodium dichloro-s-triazinetrione and trichloro-s-triazinetrione*),
- 7) Safe chemical handling, and
- 8) On-site CHLORINE generation.

#### **6.1.2.1.1.5 Cyanuric Acid** CYA and stabilized CHLORINE product use including:

- 1) Description of CYA and how CHLORINE is bound to it;
- 2) Description of CYA use via addition of stabilized CHLORINE compounds or addition of CYA alone;
- 3) Response curves showing the impact of CYA on stabilization of CHLORINE RESIDUALS in the presence of UV;
- 4) Dose response curves showing the impact of CYA on CHLORINE kill rates including the impact of CYA concentrations on diarrheal fecal incident remediation procedures;
- 5) Strategies for controlling the concentration of CYA; and
- 6) Strategies for reducing the concentration of CYA when it exceeds the maximum allowable level.

#### **6.1.2.1.1.6 Breakpoint/ Super-Chlorination** BREAKPOINT CHLORINATION including how to achieve it through calculation of chemical dosing to reach the desired free CHLORINE level and its relationship

to reducing and controlling formation of combined CHLORINE including guidance for how to perform BREAKPOINT CHLORINATION in INDOOR AQUATIC FACILITIES.

**6.1.2.1.1.7**                    **Hyperchlorination** HYPERCHLORINATION including procedures for implementation of fecal/vomit/blood CONTAMINATION RESPONSE.

**6.1.2.1.1.8**                    **Combined Chlorine** Combined CHLORINE including:

- 1) How different combined CHLORINE and DBPs are formed in the water and air;
- 2) The maximum acceptable level of combined CHLORINE;
- 3) How methods such as water replacement, BREAKPOINT CHLORINATION, UV light, ozone, ventilation, and use of other OXIDIZERS can reduce combined CHLORINE level;
- 4) The advantages and disadvantages of each; and
- 5) Possible health effects of combined CHLORINE products in the air, particularly in INDOOR AQUATIC FACILITIES.

**6.1.2.1.1.9**                    **Secondary Disinfection** SECONDARY DISINFECTION SYSTEMS including:

- 1) How ozone and UV DISINFECTANTS are used in conjunction with residual DISINFECTANTS to inactivate pathogens, and
- 2) Sizing guidelines/dosing calculations, safe use, and advantages and disadvantages of each method.

**6.1.2.1.1.10**                    **Supplemental Treatment** SUPPLEMENTAL TREATMENT including other DISINFECTION chemicals or systems on the market and their effectiveness in water treatment.

**6.1.2.1.2**                    **Water Chemistry** Course work for water chemistry shall include:

- 1) Source water,
- 2) Water balance,
- 3) SATURATION INDEX,
- 4) Water clarity,
- 5) pH,
- 6) Total alkalinity,
- 7) Calcium hardness,
- 8) Water temperature,
- 9) Total dissolved solids,
- 10) Water treatment systems, and
- 11) Water testing.

**6.1.2.1.2.2**                    **Water Balance** Water balance including:

- 1) Effect of unbalanced water on DISINFECTION, AQUATIC FEATURE surfaces, mechanical equipment, and fixtures; and
- 2) Details of water balance including pH, total alkalinity, calcium hardness, temperature, and TDS.

**6.1.2.1.2.3**                    **Saturation Index** SATURATION INDEX including calculations, ideal values, and effects of values which are too low or too high.

**6.1.2.1.2.5**                    **pH** pH including:

- 1) How pH is a measure of the concentration of hydrogen ions in water;
- 2) Effects of high and low pH on BATHERS and equipment;
- 3) Ideal pH range for BATHER and equipment;
- 4) Factors that affect pH;
- 5) How pH affects DISINFECTANT efficacy; and
- 6) How to decrease and increase pH.

**6.1.2.1.2.6**                    **Total Alkalinity** Total alkalinity including:

- 1) How total alkalinity relates to pH;
- 2) Effects of low and high total alkalinity;
- 3) Factors that affect total alkalinity;
- 4) Ideal total alkalinity range; and
- 5) How to increase or decrease total alkalinity.

**6.1.2.1.2.7 Calcium Hardness** Calcium hardness including:

- 1) Why water naturally contains calcium;
- 2) How calcium hardness relates to total hardness and temperature;
- 3) Effects of low and high calcium hardness;
- 4) Factors that affect calcium hardness;
- 5) Ideal calcium hardness range; and
- 6) How to increase or decrease calcium hardness.

**6.1.2.1.2.8 Temperature** Water temperature including:

- 1) How low and high water temperatures increase the likelihood of corrosion and scaling, respectively;
- 2) Effect on DISINFECTION, its health effects, and other operational considerations;
- 3) Health effects; and
- 4) Other operational considerations.

**6.1.2.1.2.9 Total Dissolved Solids** TDS including:

- 1) Why the concentration of TDS increases over time;
- 2) Association with conductivity and organic CONTAMINANTS; and
- 3) Key TDS levels as they relate to starting up an AQUATIC FACILITY and galvanic corrosion.

**6.1.2.1.2.10 Water Treatment Systems** Water treatment systems including:

- 1) Descriptions of system use, MONITORING, calibration, and maintenance of automatic controllers;
- 2) Descriptions of common types of liquid, dry chemical, and gas mechanical feeders;
- 3) CHLORINE, bromine, and ozone generators;
- 4) UV light systems;
- 5) Unique features of feeders, generators, and systems;
- 6) How to generally operate and maintain them;
- 7) Advantages and disadvantages of different feeders, UV light systems, and ozonator types; and
- 8) Alternate treatment methods.

**6.1.2.1.4 Health and Safety** Course work for health and SAFETY shall include:

- 1) Recreational water illness,
- 2) RWI prevention,
- 3) Risk management,
- 4) Record keeping,
- 5) Chemical SAFETY,
- 6) Entrapment prevention,
- 7) Electrical SAFETY,
- 8) Rescue equipment,
- 9) Injury prevention,
- 10) Drowning prevention,
- 11) Barriers,
- 12) Signage and depth markers,

- 13) Facility sanitation,
- 14) Emergency response, and
- 15) Surveillance and supervision.

**6.1.2.1.4.4 Risk Management** Risk management including techniques that identify hazards and risks and that prevent illness and injuries associated with AQUATIC FACILITIES open to the public.

**6.1.2.1.4.5 Record Keeping** Record keeping including the need to keep accurate and timely records of the following areas:

- 1) Operational conditions (*e.g., water chemistry, water temperature, filter pressure differential, flow meter reading, and water clarity*);
- 2) Maintenance performed (*e.g., backwashing, change of equipment*);
- 3) Incidents and response (*e.g., fecal incidents in the water and injuries*); and
- 4) Staff training and attendance.

**6.1.2.1.4.6<sup>A</sup> Chemical Safety** Chemical SAFETY including steps to safely store and handle chemicals including:

- 1) How to read labels and SDS;
- 2) How to prevent individual chemicals and inorganic and organic CHLORINE products from mixing together or with other substances (*including water*) or in chemical feeders; and
- 3) Use of PPE.

**6.1.2.1.4.15 Emergency Response Plan** Emergency response plan including:

- 1) Steps to respond to emergencies (*at a minimum, severe weather events, drowning or injury, contamination of the water, chemical incidents*); and
- 2) Communication and coordination with emergency responders and local health department notification as part of an EAP.

**6.1.2.1.5<sup>A</sup> Operations** Course work for operations shall include:

- 1) Regulations,
- 2) The role of local and state health departments,
- 3) Aquatic facility types,
- 4) Daily/routine operations,
- 5) Preventive maintenance,
- 6) Weatherizing,
- 7) AQUATIC FACILITY renovation and design,
- 8) Heating,
- 9) Air circulation, and
- 10) SPA and THERAPY POOL issues.

**6.1.2.1.5.4<sup>A</sup> Daily/Routine Operations** Daily/routine operations including listing and describing the daily inspection and maintenance requirements of an AQUATIC FACILITY including, but not limited items listed:

- 1) Walkways/DECK and exits are clear, clean, free of debris;
- 2) Drain covers, vacuum fitting covers, SKIMMER equalizer covers, and any other suction outlet covers are in place, secure, and unbroken;
- 3) SKIMMER baskets, weirs, lids, flow adjusters, and suction outlets are free of any blockage;
- 4) INLET and return covers and any other fittings are in place, secure, and unbroken;
- 5) SAFETY warning signs and other signage are in place and in good repair;
- 6) Entrapment prevention systems are operational;
- 7) Recirculation, DISINFECTION systems, controller(s), and probes are operating as required;

- 8) SECONDARY DISINFECTION SYSTEMS and/or SUPPLEMENTAL TREATMENT SYSTEMS are operating as required;
- 9) Underwater lights and other lighting are intact with no exposed wires or water in lights;
- 10) Slime and biofilm has been removed from accessible surfaces of AQUATIC VENUE, SLIDES, and other AQUATIC FEATURES;
- 11) Doors to nonpublic areas (*CHEMICAL STORAGE SPACES, offices, etc.*) are locked;
- 12) First aid supplies are stocked;
- 13) Emergency communication equipment and systems are operational;
- 14) Fecal/vomit/blood incident CONTAMINATION RESPONSE protocols, materials, and equipment are available;
- 15) AQUATIC FEATURES and amenities are functioning in accordance with the manufacturer's recommendations;
- 16) Fencing/BARRIERS, gates, and self-latching or other locks are tested and are intact and functioning properly, and BARRIERS do not have nearby furniture to encourage climbing;
- 17) Drinking fountains are clean and in functional condition;
- 18) Electrical devices are in good working condition and meet the requirements specified in the NEC and MAHC;
- 19) Alarms, if required, are tested and functioning properly;
- 20) Assessing glare conditions throughout operating hours to assess whether the bottom and objects in the POOL are clearly visible;
- 21) Play structures and diving boards are in good condition;
- 22) SAFETY equipment as required by this CODE is in good condition, properly secured, accessible for intended use, and shall include at a minimum:
  - a. Emergency instructions and phone numbers,
  - b. Rescue tubes,
  - c. Resuscitation masks with one-way valve,
  - d. First aid kits,
  - e. AEDs,
  - f. Emergency oxygen,
  - g. Backboard, head immobilizer, straps, and
  - h. Lifeguard stands;
- 23) Emergency shut-off systems (*SLIDES, water features, pumps, etc.*) function properly;
- 24) Depth markings are clearly visible;
- 25) Lifelines and buoys are in place and in good working order;
- 26) Ladders are non-slip and rungs secured tightly;
- 27) WATERSLIDES are in functional, safe condition;
- 28) Moveable fulcrum is adjusted properly to control spring in the board as necessary;
- 29) Moveable starting platforms are properly stored;
- 30) Access to permanent starting platforms is restricted or controlled when not in use by swim teams and prohibited when not in use by competitive swimming or swimming practice that is under direct supervision of an instructor or coach;
- 31) Railings are secure;
- 32) SVRS is functioning according to manufacturer's guidelines;
- 33) SKIMMER baskets and covers are clean and in place;
- 34) Water quality and clarity is MAHC compliant;
- 35) Water level is appropriate;
- 36) Pumps retain the appropriate pressure;

- 37) Play structures are secure (*consider water velocity and reference manufacturers recommended levels*);
- 38) Verify required documentation and records are in place and signed by the appropriate personnel; and
- 39) Soap dispensers in lavatories and SHOWERS are functional and supplied with soap.

#### **6.1.2.1.5.5 Preventive Maintenance** Preventive maintenance including how to develop:

- 1) A preventive maintenance plan,
- 2) Routine maintenance procedures, and
- 3) Record keeping system needed to track maintenance performed.

#### **6.1.2.1.5.9 Air Circulation** Air circulation including:

- 1) AIR HANDLING SYSTEM considerations for an INDOOR AQUATIC FACILITY,
- 2) The importance of regulating humidity,
- 3) The need to maintain negative pressure,
- 4) How poor indoor air quality can affect PATRONS and staff, and
- 5) How to balance air change and energy efficiency.

## **6.3 Facility Staffing**

**6.3.3<sup>A</sup> Safety Plan** All AQUATIC FACILITIES shall create and implement a SAFETY PLAN to include, but not be limited to the following elements:

- 1) Staffing Plan,
- 2) EAP,
- 3) Biohazard action plan,
- 4) Pre-Service Training Plan, and
- 5) In-service Training Plan.

**6.3.3.1<sup>A</sup> Code Compliance Staff Plan** Staffing plans shall designate person(s) as members of the SAFETY TEAM and person(s) for the following responsibilities:

- 1) Identifying and communicating health and SAFETY hazards;
- 2) Mitigating health and SAFETY hazards and closing the facility if needed;
- 3) Interfacing with the AHJ related to the requirements of this CODE;
- 4) Maintaining water quality and, if required, air quality;
- 5) Enforcing the AQUATIC FACILITY rules and regulations;
- 6) Responding to reported emergencies;
- 7) Supervising the SAFETY TEAM;
- 8) Conducting pre-service evaluations; and
- 9) Conducting in-service training.

**6.3.3.2<sup>A</sup> Emergency Action Plan** EAPs and operating procedures shall include but not be limited to:

- 1) Outline types of emergencies and IMMINENT HEALTH HAZARDS, as per MAHC 6.6.3;
- 2) Outline the methods of communication between responders, emergency services, and PATRONS;
- 3) Identify each anticipated responder;
- 4) Outline the tasks of each responder;
- 5) Identify required equipment for each task; and
- 6) Emergency closure requirements.

**6.3.3.3 Pre-Service Requirements**  
**6.3.3.3.1<sup>A</sup> Safety Team EAP Training** Prior to active duty, all members of the SAFETY TEAM shall be trained on, and receive a copy of, and/or have a copy posted and always available of the specific policies and procedures for the following:

- 1) Staffing Plan,

- 2) EAP,
- 3) Emergency closure, and
- 4) Fecal, vomit, or blood contamination on surfaces and in the water as outlined in MAHC 6.5.

**6.3.3.3.2<sup>A</sup>** *Safety Team Skills Proficiency* Prior to active duty, all members of the SAFETY TEAM shall demonstrate knowledge and skill competency specific to the AQUATIC FACILITY for the following criteria:

- 1) Understand their responsibilities and of others on the AQUATIC FACILITY SAFETY TEAM;
- 2) Ability to execute the EAP;
- 3) Know what conditions require closure of the facility; and
- 4) Know what actions to take in response to a fecal, vomit, or blood contamination on a surface and in the water as outlined in MAHC 6.5.

## 6.3.4 Staff Management

### 6.3.4.5 Emergency Response and Communications Plans

**6.3.4.5.1<sup>A</sup>** *Emergency Response and Communication Plan* AQUATIC FACILITIES shall create and maintain an operating procedure manual containing information on the emergency response and communications plan including an EAP, Facility Evacuation Plan, and Inclement Weather Plan.

**6.3.4.5.2** *Emergency Action Plan* A written EAP shall be developed, maintained, and updated as necessary for the AQUATIC FACILITY.

**6.3.4.5.3** *Annual Review and Update* The EAP shall be reviewed with the AQUATIC FACILITY staff and management annually or more frequently as required when changes occur with the dates of the review recorded in the EAP.

**6.3.4.5.4** *Available for Inspection* The written EAP shall be kept at the AQUATIC FACILITY and available for emergency personnel and/or AHJ upon request.

**6.3.4.5.5<sup>A</sup>** *Training Documentation* Documentation from employees trained in current EAP shall be available upon request.

**6.3.4.5.6** *Components* The EAP shall include at a minimum:

- 1) A diagram of the AQUATIC FACILITY;
- 2) A list of emergency telephone numbers;
- 3) The location of first aid kit and other rescue equipment (*BVM, AED, if provided, backboard, etc.*);
- 4) An emergency response plan for accidental chemical release; and
- 5) A fecal/vomit/blood CONTAMINATION RESPONSE PLAN as outlined in MAHC 6.5.1.

**6.3.4.5.6.1** *Accidental Chemical Release Plan* The accidental chemical release plan shall include procedures for:

- 1) How to determine when professional HAZMAT response is needed,
- 2) How to obtain it,
- 3) Response and cleanup,
- 4) Provision for training staff in these procedures, and
- 5) A list of equipment and supplies for clean-up.

**6.3.4.5.6.2** *Remediation Supplies* The availability of equipment and supplies for remediation procedures shall be verified by the operator at least weekly.

**6.3.4.5.7** *Facility Evacuation Plan* A written Facility Evacuation Plan shall be developed and maintained for the facility.

**6.3.4.5.7.1** *Evacuation Plan Components* This plan shall include at a minimum:

- 1) Actions to be taken in cases of drowning, serious illness or injury, chemical handling accidents, weather emergencies, and other serious incidents; and
- 2) Defined roles and responsibilities for all staff.

**6.3.4.5.8**            **Communication Plan** A communication plan shall exist to facilitate activation of internal emergency response centers and/or community 911/EMS as necessary.

**6.3.4.5.8.1**            **Communication Plan Components** At a minimum, this plan shall include:

- 1) Provision and use of readily accessible, appropriate communication devices such as telephones, call boxes, and mobile devices;
- 2) Signage;
- 3) Procedures to be followed during staffed and unstaffed time periods;
- 4) Acceptable alternative communication during loss of power; and
- 5) Training of all personnel.

**6.3.4.5.8.2<sup>A</sup>**            **Notification Procedures** The communication plan shall include a plan for notification to Federal, State, and local agencies in case of a chemical spill that exceeds the EPA reportable quantity.

## **6.4<sup>A</sup> Aquatic Facility Management**

### **6.4.1 Operations**

#### **6.4.1.1 Operations Manual**

**6.4.1.1.1<sup>A</sup>**            **Develop** Each AQUATIC FACILITY shall develop an operations manual to keep at the AQUATIC FACILITY in both printed and electronic formats.

**6.4.1.1.2<sup>A</sup>**            **Include** The manual shall at minimum include, but not be limited to the following items:

- 1) AQUATIC VENUE and AQUATIC FEATURE description(s) and locations,
- 2) Facility communication,
- 3) List of chemicals and system information,
- 4) Fecal/vomit/blood CONTAMINATION RESPONSE protocols,
- 5) Preventive maintenance plan, and
- 6) Any other STANDARD operation and maintenance policies and instructions or applicable information for each AQUATIC VENUE and AQUATIC FEATURE at the facility.

**6.4.1.3**            **Safety and Maintenance Inspection and Recordkeeping** The QUALIFIED OPERATOR or RESPONSIBLE SUPERVISOR shall ensure that SAFETY and preventive maintenance inspections are done at the AQUATIC FACILITY during seasons or periods when the AQUATIC FACILITY is open and that the results are recorded in a log or form maintained at the AQUATIC FACILITY.

**6.4.1.3.1**            **Daily Inspection Items** The QUALIFIED OPERATOR or RESPONSIBLE SUPERVISOR shall ensure that a daily AQUATIC FACILITY preventive maintenance inspection is done before opening and that it shall include:

- 1) Walkways/DECK and exits are clear, clean, free of debris;
- 2) Drain covers, vacuum fitting covers, SKIMMER equalizer covers, and any other suction outlet covers are in place, secure, and unbroken;
- 3) SKIMMER baskets, weirs, lids, flow adjusters, and suction outlets are free of any blockage;
- 4) INLET and return covers and any other fittings are in place, secure, and unbroken;
- 5) SAFETY warning signs and other signage are in place and in good repair;
- 6) SAFETY equipment as required by this CODE are in place and in good repair, including emergency instructions and phone numbers;
- 7) Entrapment prevention systems are operational;

- 8) **Recirculation, DISINFECTION systems, controller(s), and probes are operating as required;**
- 9) **SECONDARY DISINFECTION SYSTEMS and/or SUPPLEMENTAL TREATMENT SYSTEMS are operating as required;**
- 10) Underwater lights and other lighting are intact with no exposed wires or water in lights;
- 11) Slime and biofilm has been removed from accessible surfaces of AQUATIC VENUES, SLIDES, and other AQUATIC FEATURES;
- 12) **Doors to nonpublic areas (CHEMICAL STORAGE SPACES, offices, etc.) are locked;**
- 13) First aid supplies are stocked;
- 14) Emergency communication equipment and systems are operational;
- 15) Fecal/vomit/blood incident CONTAMINATION RESPONSE protocols, materials, and equipment are available;
- 16) Water features and amenities are functioning in accordance with the manufacturer's recommendations;
- 17) Fencing/BARRIERS, gates, and self-latching or other locks are tested and are intact and functioning properly, and BARRIERS do not have nearby furniture to encourage climbing;
- 18) Drinking fountains are clean and in functional condition;
- 19) Electrical devices are in good working condition and meet the requirements specified in the NEC and MAHC;
- 20) Alarms, if required, are tested and functioning properly; and
- 21) Assessing water clarity such that the bottom and objects in the POOL are clearly visible.

**6.4.1.5 Chemical Inventory Log** A chemical inventory log shall be maintained on site to provide a list of chemicals used in the AQUATIC VENUE water and surrounding DECK that could result in water quality issues, chemical interactions, or PATRON exposure.

**6.4.1.5.1 Expiration Dates** These records shall include the expiration date for water quality chemical testing reagents.

## 6.6 AHJ Inspections

### 6.6.3 Imminent Health Hazards

**6.6.3.1<sup>A</sup> Violations Requiring Immediate Correction or Closure** Any of the following violations are IMMEDIATE HEALTH HAZARDS which shall require immediate correction or immediate POOL closure:

- 1) Failure to provide supervision and staffing of the AQUATIC FACILITY as prescribed in MAHC 6.3.4.1;
- 2) Failure to provide the minimum DISINFECTANT residual levels listed in various sections of this CODE;
- 3) pH level below 6.5;
- 4) pH level above 8.0;
- 5) Failure to continuously operate the AQUATIC VENUE filtration and DISINFECTION equipment;
- 6) Use of an unapproved or contaminated water supply source for potable water use;
- 7) Unprotected overhead electrical wires within 20 feet horizontally of the AQUATIC VENUE;
- 8) Non GFCI protected electrical receptacles within 20 feet of the inside wall of the AQUATIC VENUE;
- 9) Failure to maintain an emergency lighting source;
- 10) Absence of all required lifesaving equipment on DECK;
- 11) AQUATIC VENUE bottom not visible;
- 12) Total absence of or improper depth markings at an AQUATIC VENUE;
- 13) Plumbing CROSS-CONNECTIONS between the drinking water supply and AQUATIC VENUE water or between sewage system and the AQUATIC VENUE including filter backwash facilities;
- 14) Failure to provide and maintain an ENCLOSURE or BARRIER to inhibit unauthorized access to the AQUATIC FACILITY or AQUATIC VENUE when required;
- 15) **Use of unapproved chemicals or the application of chemicals by unapproved methods to the**

**AQUATIC VENUE water;**

- 16) Broken, unsecured, or missing main drain grate or any submerged suction outlet grate in the AQUATIC VENUE;
- 17) Number of BATHERS/PATRONS exceeds the THEORETICAL PEAK OCCUPANCY;
- 18) Broken glass or sharp objects in AQUATIC VENUE or on DECK area; or
- 19) Any other item determined to be a public health hazard by the AHJ.