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Aerospace Medicine

RECREATIONAL WATERS AND MISSION TRAINING POOLS

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This publication implements requirements of AFPD 48-1, Aerospace and Operational Medicine Enterprise. It provides guidance and procedures on the operation and maintenance of swimming pools, mission training pools, hot tubs and spas, splash pads, therapeutic pools, and natural bathing areas under Air Force (AF) jurisdiction. It applies to individuals at all levels who operate, maintain, and monitor swimming pools, mission training pools, hot tubs and spas, splash pads, therapeutic pools, and natural bathing areas AF-wide, including the Air Force Reserve and Air National Guard (ANG), except where noted herein. This publication may be supplemented at any level, but all supplements must be routed to the Office of Primary Responsibility (OPR) listed above for coordination prior to certification and approval. Refer recommended changes and questions about this publication to the OPR listed above using the AF Form 847, Recommendation for Change of Publication; route AF Forms 847 from the field through the functional chain of command. The authorities to waive wing or unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See AFI 33-360, Publications and Forms Management, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the functional chain of command to the appropriate Tier waiver approval authority, or alternately, to the requestors commander for non-tiered compliance items. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual 33-363, Management of Records, and disposed of in accordance with Air Force Records Information Management System Records Disposition Schedule. The use of the name or mark of any specific manufacturer, commercial product, commodity, training curricula, facility standards, or service in this publication does not imply endorsement by the Air Force.

SUMMARY OF CHANGES

This document has been substantially revised and must be completely reviewed. Major changes include: changed publication title; converted from an Air Force Instruction to an Air Force Manual; updated water quality monitoring requirements and technical details to align with United States Department of Health and Human Services Centers for Disease Control Model Aquatic Health Code; and added specific requirements for swimming pools used for mission training purposes.

Chapter 1

PROGRAM OVERVIEW

1.1. Overview. This publication establishes guidance and procedures for identifying, analyzing, and controlling health and safety risks for aquatic venues such as swimming pools, mission training pools, hot tubs and spas, therapeutic pools, splash pads, and natural bathing areas on AF installations. There is no federal regulation to govern the water quality of these aquatic venues, or to prohibit swimming in natural bathing areas. This instruction outlines the minimum requirements for guidance, extracted from the United States Department of Health and Human Services Centers for Disease Control Model Aquatic Health Code, 3rd Edition and the Environmental Protection Agency (EPA) criteria identified in Title 40, Code of Federal Regulations (CFR) Part 131, Water Quality Standards. These procedures require collaboration among Bioenvironmental Engineering (BE), the Base Civil Engineer (CE), Force Support Squadron (FSS), Public Health (PH), and Occupational Safety (SEG).

1.2. Safety and Health Risk. Swimming pools, mission training pools, hot tubs and spas, splash pads, therapeutic pools, and natural bathing areas can present multiple safety risks, such as drowning, slips and falls, and accidents with ladders, ropes, or drains. In addition, these facilities present health risks that include infectious disease, excess combined chlorine, and other contaminants which may be transmitted to humans via the water.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. The Assistant Secretary of the Air Force for Installations, Environment, and Energy (SAF/IEE). The Assistant Secretary of the Air Force for Installations, Environment, and Energy (SAF/IEE) shall provide guidance, direction, and oversight for Environment, Safety, and Occupational Health Programs.

2.2. The Air Force Surgeon General (AF/SG):

2.2.1. Ensures AF swimming pools, mission training pools, hot tubs and spas, splash pads, therapeutic pools, and natural bathing areas are properly surveyed, sampled, analyzed, and monitored to provide a healthy and safe swimming, bathing, and workplace environment.

2.2.2. Establishes resources for health oversight of AF swimming pools, mission training pools, hot tubs and spas, splash pads, therapeutic pools, and natural bathing areas to protect public health.

2.2.3. Develops AF implementation standards to promote a clean, healthful, and safe swimming environment and workplace.

2.2.4. Advocates for funding or oversees budgeting, programming, and execution of AF/SG responsibilities for swimming pools, mission training pools, hot tubs and spas, therapeutic pools, and natural bathing areas.

2.3. The United States Air Force School of Aerospace Medicine (USAFSAM). The United States Air Force School of Aerospace Medicine (USAFSAM) provides technical guidance and consultative support for water quality and health risk assessments for AF swimming pools, mission training pools, hot tubs and spas, therapeutic pools, and natural bathing areas. (T-1)

2.4. The Air Force Civil Engineer Center (AFCEC). The Air Force Civil Engineer Center (AFCEC) provides technical assistance on environmental regulatory requirements and design and maintenance requirements related to swimming pools, mission training pools, hot tubs and spas, splash pads, therapeutic pools, and natural bathing areas.

2.5. The Air Force Safety Center (AFSEC). The Air Force Safety Center (AFSEC) provides technical assistance on safety issues related to swimming pools, hot tubs and spas, splash pads, therapeutic pools, and natural bathing areas.

2.6. The Air Force Services Activity (AFSVA). The Air Force Services Activity (AFSVA) develops policy and guidance related to day to day operation of AF swimming pools, mission training pools, hot tubs and spas, splash pads, and natural bathing areas.

2.7. Major Commands (MAJCOM). Major Commands (MAJCOM) provide technical assistance and policy guidance to installations to ensure the recreational water and mission training pool programs conform to this instruction.

2.8. Installation Commander shall:

2.8.1. Oversee overall operation and maintenance of swimming pools, mission training pools, hot tubs and spas, splash pads, therapeutic pools, and natural bathing areas under Air Force jurisdiction.

2.8.2. Approve locations of all natural bathing areas, with input from the medical group commander or director. Natural bathing area approvals shall be based on the considerations in **Attachment 4**. (T-1)

2.9. The Installation Civil Engineer (CE) shall:

2.9.1. Construct and maintain swimming pools, mission training pools, hot tubs and spas, therapeutic pools, and splash pads as outlined in this manual, AFI 32-1022 *Planning and Programming Nonappropriated Fund Facility Construction Projects*; AFMAN 32-1084 *Facility Requirements*; Unified Facilities Criteria (UFC) 3-230-02 *Operation & Maintenance: Water Supply Systems;* United Facilities Guide Specifications GS 22-00-00 *Plumbing, General Purpose;* Public Law 110-140, *Energy Independence and Security Act of 2007*; and Title 15 United States Code Sections 8001-8008, *Virginia Graeme Baker Pool and Spa Safety Act*. (T-0)

2.9.2. Designate a pool treatment plant manager and ensure that he or she maintains and operates the pool equipment and keeps records as outlined in this instruction and in accordance with UFC 3-230-02 (T-0)

2.9.3. In coordination with Force Support Squadron, address access and suitability of natural bathing areas for swimming and other outdoor recreation activities in the Integrated Natural Resources Management Plan. (T-2)

2.10. Installation Occupational Safety (SEG). Installation Occupational Safety (SEG). Installation Occupational Safety (SEG). Installation Occupational Safety (SEG) shall provide consultation and advice related to safety issues for swimming pools, mission training pools, hot tubs and spas, therapeutic pools, and natural bathing areas. (T-1)

2.11. Installation Public Health shall:

2.11.1. Perform epidemiological monitoring for potential disease outbreaks associated with bathing areas according to AFI 48-105, *Surveillance, Prevention, and Control of Disease and Conditions of Public Health or Military Significance,* and report potential recreational water illness (RWI) outbreaks to the appropriate offices. (T-1)

2.11.2. Provide oversight of sanitation practices for swimming pools, mission training pools, hot tubs and spas, therapeutic pools, natural bathing areas, showers, and toilets. (T-1)

2.12. Installation BE (BE) shall:

2.12.1. Identify, analyze, and recommend controls for any occupational and environmental health (OEH) hazards due to daily operations, processes, and locations of pools, mission training pools, hot tubs and spas, and natural bathing areas. (T-1)

2.12.2. Provide water quality oversight, including review of AF Form 708, *Swimming Pool Operational Log*, of swimming pools, mission training pools, hot tubs and spas, splash pads, therapeutic pools, and natural bathing areas under Air Force jurisdiction. (T-1)

2.12.3. Provide bacteriological monitoring in support of specific requests attributable to disease outbreaks. (T-1)

2.12.4. Review engineering designs for new or modified swimming pools, mission training pools, hot tubs and spas, splash pads, therapeutic pools, and associated equipment and

facilities to ensure adequacy of sanitary processes and controls. See **Attachment 2** for potential considerations when reviewing bathing facility designs. (T-3)

2.13. The Outdoor Recreation Manager shall:

2.13.1. Oversee the day-to-day operation of public bathing facilities in accordance with AFI 34-110, *Air Force Outdoor Recreation Programs,* to provide patrons with sanitary and safe conditions and employees with a safe, healthful workplace. (T-1)

2.13.2. Appoint certified (where applicable) bathing facility personnel. (T-1)

2.13.3. Train and equip bathing facility personnel (i.e., lifeguards or other outdoor recreation personnel) to perform required routine chemical testing as indicated in **Table 4.1**, and to document these measurements on AF Form 708. (T-1)

2.13.4. Retain documentation of training required in **paragraph 2.16.3**. (T-3)

2.13.5. Obtain approval of BE and CE before purchasing chemical testing equipment and implementing training required in **paragraph 2.1.4.3**.(T-3)

2.13.6. Ensure all bathing facility personnel are properly trained in cleaning up body fluid spills on pool surfaces. (T-1)

2.13.7. Ensure one biohazard kit per pool or waterfront is available to clean up blood or other potentially infectious material from pool decks or locker rooms, in accordance with AFI 34-110. (T-1)

2.13.8. Coordinate pre-opening and semi-annual facility inspections with appropriate agencies.

2.13.9. For installation swimming pools shared for use by mission training, establish a signed agreement with the mission training point of contact, to specify how and when water quality monitoring is accomplished by the mission training organization. (T-1)

2.13.10. Ensure routine chemical measurements outlined in this instruction are performed by lifeguards or other qualified bathing facility personnel. (T-1)

2.14. Lifeguards shall:

2.14.1. Enforce healthful and safe pool practices and rules. (T-3)

2.14.2. Hold current lifesaving, first aid, and cardiopulmonary resuscitation (CPR) certifications in accordance with AFI 34-110. (T-1)

2.14.3. Notify outdoor recreation manager when biohazard kit is used and needs replacement. (T-3)

2.14.4. Perform routine chemical measurements outlined in this instruction. (T-1)

2.14.5. Complete AF Form 708 or equivalent, daily, and as indicated by **Table 4.1**. (T-1)

2.14.6. Contact Base Civil Engineer and BE immediately when water quality parameters fall outside acceptable ranges. (T-1)

Chapter 3

GENERAL OPERATION AND MAINTENANCE

3.1. Safety.

3.1.1. Rules and Signs. The outdoor recreation manager shall establish rules in coordination with Installation Public Health and Occupational Safety. Rules must include, at a minimum, the rules in **Attachment 3**. (T-1)

3.1.1.1. The rules shall be posted so they are clearly visible to patrons entering the pool area or sitting in the hot tub or spa. (T-1)

3.1.1.2. A copy of these rules and this instruction shall be posted at the facilities for the bathing facility staff, pool operators, and patrons. (T-2)

3.1.2. Natural Bathing Areas. The outdoor recreation manager, in coordination with Public Health, Occupational Safety, and CE shall jointly establish safety and warning guidelines for hazards particular to the bathing area. For example, marine bathing beaches shall warn swimmers of the possible presence of rip tides, jellyfish, stingrays, or other potentially dangerous aquatic life. Also, post a sign indicating that swimming with no lifeguard present is at the bather's own risk. If the area is to be marked, clearly define and mark swimming areas and mark the outermost limits at regular intervals with buoys or similar devices, bearing signs warning all watercraft to keep out. Post signs on offshore floats or rafts indicating whether or not diving is permitted. Clearly post a sign at a dedicated emergency phone, indicating emergency telephone numbers. (T-1)

3.1.2.1. If diving from offshore rafts or floats is permitted, pre-operational or semiannual inspections should include an underwater survey for hazards and minimum safe water depth.

3.1.3. Pool Opening. The outdoor recreation manager and mission training pool manager shall coordinate with BE, Public Health, CE, and Occupational Safety to conduct a pre-opening inspection of seasonal swimming pools, mission training pools, hot tubs and spas, splash pads, and natural bathing areas no later than three weeks before swimming season starts. (T-1)

3.1.3.1. The outdoor recreation manager, mission training pool manager, and pool treatment plant manager shall ensure all chemical operational parameters are in acceptable limits no later than 7 days prior to opening. (T-3)

3.1.3.2. The outdoor recreation manager shall approve the opening based upon the recommendations provided during the inspection. (T-1)

3.1.3.3. For facilities open year-round, semi-annual inspections and approvals are required. (T-1)

3.1.4. Pool Closure. The outdoor recreation manager and mission training pool manager shall immediately close the swimming pool, mission training pool, spa or hot tub, therapeutic pool, or splash pad if any of the following water quality conditions occur:

3.1.4.1. The water fails clarity test; (T-1)

3.1.4.2. The pH, disinfectant residual (i.e., free available chlorine), combined chlorine, or oxidation reduction potential (ORP) level is outside acceptable range identified in **Table 4.1** (T-1)

3.1.4.3. Fecal or vomit accident in the pool. (T-1)

3.1.5. Emergency Preparedness. The outdoor recreation manager shall prepare for emergencies by implementing the following requirements:

3.1.5.1. Maintain the required safety and rescue equipment in accordance with AFI 34-110. (T-1)

3.1.5.2. When feasible, ensure the availability of an Automatic External Defibrillator (AED). When available, the location of the AED shall be clearly marked and readily available for use in the event of an emergency. Follow procedures outlined in AFI 44-177, *Public Access Defibrillator Program*, for AED use. (T-3)

3.1.6. Adverse Weather Conditions. The outdoor recreation manager shall follow procedures in AFMAN 91-203, *Air Force Occupational Safety, Fire, and Health Standards,* when lightning or other adverse weather conditions are present. (T-1)

3.1.7. Pump Room and Chemical Storage Areas. The outdoor recreation manager shall maintain a safe pump room and chemical storage area by implementing the following requirements:

3.1.7.1. Lighting. The pump room area shall be well-lighted. (T-1)

3.1.7.2. Supervisors, who have personnel handling chemicals, will follow the requirements found in AFMAN 91-203 **Chapter 14**, Personal Protective Equipment (PPE). (T-1)

3.1.7.3. All openings and holes in the floor shall be covered by a covering that will not become dislodged unintentionally. It is permissible to install posts with chains, or similar devices, which will prevent accidental entry in the opening. Drains shall be covered with an appropriate drain cover. (T-1)

3.1.7.4. Chemicals shall only be stored with compatible chemicals. Dry chemicals shall be stored on a pallet or other device that prevents contact with the ground. (T-1)

3.1.7.5. Chemicals shall be stored in appropriate containers, which are in good repair and free of leaks. (T-1)

3.1.7.6. Containers, storage cabinets, and rooms containing chemicals shall be labeled or placarded in accordance with all applicable federal laws and regulations, as well as installation policies and guidelines. (T-1)

3.1.7.7. Entry points to rooms in which containers of five (5) or more gallons of a liquid chemical are stored in a single container shall have the appropriate National Fire Protection Association placard posted. (T-1)

3.1.7.8. All containers, including spray bottles, containing chemicals, not filled by the chemical manufacturer, shall be properly labeled with a National Fire Protection Association label and have the chemical name and manufacturer name clearly written on the label or bottle. (T-1)

3.1.7.9. Cabinets that are used for chemical storage shall have the appropriate National Fire Protection Association placard indicating the hazards presented by the contents. (T-1)

3.1.7.10. Equipment Storage. Excess equipment and supplies being stored shall be done in a manner that does not create a tripping or other safety hazard. When possible, items shall be stored on shelving or in containers that are resistant to corrosion. (T-1)

3.1.7.11. Proper footwear shall be worn in all pump rooms and chemical storage rooms. (T-1)

3.1.7.12. Pump rooms and chemical storage areas should be locked when not accessed by outdoor recreation manager and/or delegated officials. (T-3)

3.2. Sanitation. The outdoor recreation manager shall maintain a sanitary environment by implementing the following requirements:

3.2.1. Clean toilets, shower facilities, and dressing rooms in accordance with AFI 48-117, *Public Facility Sanitation.* (T-1)

3.2.2. Drain and clean recirculation filter pools, spas, and hot tubs in accordance with **paragraph 4.1.5**. Coordinate draining with designated Base Civil Engineer personnel. (T-2)

3.2.3. Clean pools daily with a suction cleaner or other bottom-cleaning device. (T-2)

3.2.4. Drain and clean non-circulation wading pools with a 50 parts per million (ppm) chlorine solution daily. Note: To mix a 50 ppm chlorine solution, add one teaspoon of household bleach to each gallon of water. (T-2)

3.2.5. Ensure pools and hot tubs and spas equipped with overflow gutters are overflowed each day to remove scum and surface debris. Maintain the water in pools equipped with only surface skimmers at a level such that the skimmer continuously operates. (T-2)

3.2.6. Ensure pool deck and area surrounding a spa or hot tub are free of debris. Furthermore, when pooling of water occurs on pool deck and if matting is used over a concrete surface (such as ventilated plastic matting), routinely clean the surface with a 50 ppm chlorine solution. (T-2)

3.2.7. Establish and follow cleaning and maintenance (e.g., raking) schedules for managed beach areas. (T-3)

3.2.8. Designate picnic areas near the beach and provide waste receptacles. Prohibit picnicking and bottles and cans for food and drink on the beach proper. (T-3)

3.3. Pool treatment plant operation. (Note: Explanations of the different types of swimming pool treatment are found in the Centers for Disease Control and Prevention *2018 Annex to the Model Aquatic Health Code, 3rd Edition.*)

3.3.1. The pool treatment plant manager shall maintain a piping diagram of water and sewer lines and post a copy near the pool chemical equipment. (T-1)

3.3.2. During months that pools are open, the pool treatment plant manager shall complete the monthly operating checklist for swimming pools, as written in the current edition of the UFC 3-230-02. (T-0)

3.3.3. The pool treatment plant manager shall ensure excess pool water is discharged to the local sanitary sewer in compliance with 40 CFR 122, *EPA Administered Permit Programs: The National Pollutant Discharge Elimination System*, and local treatment works ordinances and dechlorination requirements. (T-0)

Chapter 4

WATER QUALITY AND MONITORING

4.1. Swimming Pools, Hot Tubs and Spas, and Splash Pads.

4.1.1. Source Water. The pool, hot tub, spa, and splash pad treatment plant manager shall ensure the pool, hot tub, spa, and splash pad water comes from an approved drinking water source. (T-1)

4.1.2. Chemical Operational Parameters. The pool, hot tub, spa, and splash pad treatment plant manager shall measure for parameters indicated in **Table 4.1** at intervals specified, making corrective actions to meet the guidelines or informing the facility manager of additional treatments recommended. (T-1)

4.1.2.1. Detailed information on parameters can be found in the Centers for Disease Control and Prevention 2018 Annex to the Model Aquatic Health Code, 3rd Edition at **https://www.cdc.gov/mahc/editions/index.html**.

4.1.2.2. The lifeguard or other bathing facility personnel shall measure for parameters indicated in **Table 4.1** at intervals specified. (T-1)

4.1.2.3. All samples shall be obtained from a location with the following qualities:

4.1.2.3.1. At least 18 inches (45.7 centimeters) below the surface of the water.

4.1.2.3.2. A pool water depth of between 3 and 4 feet (91.4 centimeters to 1.2 meters) when available.

4.1.2.3.3. A location between water inlets. (T-2)

4.1.2.3.4. Sampling locations shall rotate around the shallow end of the pool. (T-2)

4.1.2.3.5. Sampling locations shall include a deep end sample in the water sampling rotation once per week. (T-2)

4.1.2.4. The values shall be recorded on the AF Form 708 or equivalent. If results are outside the acceptable range indicated in **Table 4.1**, immediately contact BE and the pool, hot tub, spa, or splash pad treatment plant manager. (T-1)

4.1.2.5. Quality Check. BE shall perform quality checks of the lifeguard or bathing facility personnel's and mission pool manager's pH and disinfectant residual measuring proficiency. These quality checks will occur at least once every 30 days while the pool, hot tub, spa, or splash pad is operating, and applies to both indoor and outdoor pools, hot tubs and spas, and splash pads. BE will measure the pH and disinfectant residual levels, enter the results on the AF Form 708 or equivalent, and compare the results to the lifeguard, bathing facility personnel, or mission pool manager's readings. If the readings are inconsistent with the lifeguard, bathing facility personnel, or mission pool manager results, BE shall determine the cause of the discrepancy and ensure the lifeguards, bathing facility personnel, or mission pool managers are following the correct measurement procedures. BE shall increase the frequency of quality checks if needed to ensure that discrepancies are corrected. (T-1)

4.1.2.6. Increased Risk Aquatic Venues. Water quality monitoring and chemical operational parameters for therapeutic pools, splash pads, and wading pools shall be the same as defined for swimming pools in **Table 4.1**. (T-1) Requirements for mission training pools are defined in **Chapter 5**.

4.1.2.7. The Medical Group Commander may establish more stringent or specific monitoring requirements than outlined in this instruction.

Table 4.1. Water Quality Requirements for Swimming Pools, Hot Tubs, Spas, Splash Pads.

Parameter	Acceptable Range	Ideal	Applicability	Monitoring Frequency	Responsible Organization
Free available chlorine (FAC)*	1.0 – 4. 0 ppm*		Pools and splash pads	Prior to opening & every 2 hours (manual disinfectant system); Prior to opening & every 4 hours (automated disinfectant system)	Outdoor recreation manager, lifeguard, or other bathing facility personnel
	3.0 – 5.0 ppm		Hot tubs and spas		
Bromine	3.0 – 8.0 ppm		Pools and splash pads	Every 2 hours	Outdoor recreation manager, lifeguard, or other bathing facility personnel
	4.0 – 8.0 ppm		Hot tubs and spas	Every hour	
pH	7.2 -7.8		Pools, splash pads, hot tubs and spas	Every 2 hours	Outdoor recreation manager, lifeguard, or other bathing facility personnel
Total alkalinity	60 – 180 ppm		Pools and splash pads	Once per week	Outdoor recreation manager, lifeguard, or other bathing facility
			Hot tubs and spas	Weekly	

Parameter	Acceptable Range	Ideal	Applicability	Monitoring Frequency	Responsible Organization
					personnel
Calcium hardness	Not to exceed (NTE) 2,500 ppm	200 – 400 ppm	Pools and splash pads	Monthly	Pool Treatment Plant Manager
		100 – 200 ppm	Hot tubs and spas		
Total Dissolved Solids (TDS)	NTE 1500 ppm above the concentration in the fill water		Pools, splash pads, hot tubs and spas	Quarterly	Pool Treatment Plant Manager
Clarity	The bottom of the pool at its deepest point must be clearly visible and sharply defined from any point on the deck up to 30 ft. away in a direct line of sight. Perform this test when water is in a non-turbulent state.		Pools and splash pads	Daily	Outdoor recreation manager, lifeguard, or other bathing facility personnel
	The bottom of the spa at its deepest point shall be clearly visible. Perform this test when water is in a non-turbulent state and bubbles have dissipated.		Pools, splash pads, hot tubs and spas		Outdoor recreation manager, lifeguard, or other bathing facility personnel
Cyanuric Acid (CYA)	Ideal concentration is between 25-50 ppm, but must not exceed 90 ppm		Pools, splash pads, hot tubs and spas using CYA as a stabilizer	Monthly unless the pool utilizes stabilized chlorine as its primary disinfectant, then it shall be tested every two weeks. It	Base Civil Engineer personnel, if used

Parameter	Acceptable Range	Ideal	Applicability	Monitoring Frequency	Responsible Organization
				shall be tested 24 hours after the addition of CYA to the pool; for salt water pools, monitoring may be required more frequently - consult the manufacturers' instructions for appropriate frequency	
Oxidation Reduction Potential (ORP)	Greater than 720 mV if using a silver or silver chloride electrode; Greater than 680 mV if using a calomel electrode		Not a required parameter; however may supplement direct measurement of disinfectant residual as indicator of water quality	Not a required parameter; if used, recommend at least daily readings at same time FAC and pH readings are performed	Base Civil Engineer personnel, if used
Salt			Pools, splash pads, hot tubs and spas using in-line electrolytic chlorinators	At least weekly, or per the manufacturer’s instructions	Base Civil Engineer personnel, if used
Temperature	Maximum 104°F		Pools, splash pads, hot tubs and spas	Prior to opening and every two hours (manual disinfectant system) or every four hours (automated disinfectant system) at the same time the FAC and pH	Outdoor recreation manager, lifeguard, or other bathing facility personnel

Parameter	Acceptable Range	Ideal	Applicability	Monitoring Frequency	Responsible Organization
				tests are performed	
Algae	No visible algae in water or on pool surfaces when open to swimmers		Pools, splash pads, hot tubs and spas	Continuous	Outdoor recreation manager, lifeguard, or other bathing facility personnel
Combined chlorine	0 – 0.4 ppm	0 ppm	Pools, splash pads, hot tubs and spas	Every 2 hours	Outdoor recreation manager, lifeguard, or other bathing facility personnel
Saturation Index	-0.3 to +0.3		Pools, splash pads, hot tubs and spas	Monthly	Base Civil Engineer personnel
Copper or Silver	Per manufacturer's recommendations		Pools, splash pads, hot tubs and spas utilizing copper or silver systems	Daily	Outdoor recreation manager, lifeguard, or other bathing facility personnel
	*Pools using cyanuric acid shall maintain a minimum FAC concentration of 2.0 ppm				

4.1.3. Test Kits.

4.1.3.1. Water quality testing devices and kits shall be stored and maintained as specified by the manufacturer's instructions. Failure to properly store water quality testing devices will result in incorrect readings. (T-1)

4.1.3.2. Water quality testing devices shall be listed and labeled to NSF (NSF International, formerly National Sanitation Foundation)/ANSI (American National Standards Institute) 50 by an ANSI-accredited certification organization. (T-2)

4.1.3.3. A hazardous chemical list shall be maintained on site to provide a list of the chemicals used in the swimming pool and surrounding deck, in accordance with AFI 90-821, *Hazard Communication (HAZCOM) Program*. These records shall include the expiration date for water quality chemical testing reagents. (T-1)

4.1.4. The pool treatment plant manager shall superchlorinate the pool as necessary to correct poor water quality and shall annotate each instance of superchlorination on AF Form 708 or equivalent. (T-3)

4.1.5. Water Replacement. Many contaminants enter pool and spa water from the environment, from the bathers themselves, and from byproducts of chemicals used to treat the water. Although filtration and oxidation are effective in removing many of these contaminants, many of them remain and accumulate in the water. In pools and hot tubs and spas, water replacement is generally the only practical way to correct for excessive contaminants, calcium hardness, total dissolved solids, and cyanuric acid. Water replacement can be accomplished by periodic draining or continuous dilution; however, continuous dilution does not preclude the need for periodic draining and thorough cleaning of the pool or spa.

4.1.6. Turnover Rate. The turnover rate is the time taken for all of the water in a pool to be circulated through the pump-filter system. The turnover rate is calculated by the following formula: *Turnover rate (hours) = Pool volume (gal) ÷ Flow rate (gal/min) ÷ 60 (min/hour)*. To determine the flow rate required to achieve a turnover rate of 6 hours, use the following formula: *Flow rate (gal/min) = Pool volume (gal) ÷ 360 min*.

4.1.6.1. Turnover rate for swimming pools shall not exceed 6 hours, or 360 minutes. (T-2)

4.1.6.2. The turnover rate for wading pools and baby pools shall be one hour. (T-1)

4.1.6.3. The turnover rate for splash pads shall be 30 minutes. (T-1)

4.1.6.4. The turnover rate for hot tubs and spas, therapeutic pools, and mission training pools shall be four hours or less. (T-1)

4.1.7. Troubleshooting. Refer to UFC 3-230-02 for a troubleshooting checklist for swimming pools. The UFC are maintained on the Whole Building Design Guide website, at **www.wbdg.org**.

4.2. Natural Bathing Areas.

4.2.1. Risk-Based Sampling. BE shall perform water quality sampling at natural bathing areas based on risk. Risk factors to consider include, but are not limited to, proximity to suspected pollution sources, frequency of bathing area use, historical water quality data, and occurrence of sewage spills or other pollution events. If local or state regulatory agencies have current data, those data may be used and BE can determine what, if any, additional parameters need to be evaluated. If BE decides not to sample at natural bathing areas, the rationale behind the decision shall be documented. This documentation must be reviewed and updated at least annually. (T-2)

4.2.2. Sampling Methods. If bacteriological sampling is conducted, refer to 40 CFR 131.41, *Bacteriological criteria for those states not complying with Clean Water Act section 303(i)(1)(A)*. for guidance. E.coli and Enterococci shall be used as the indicator organisms for evaluating the microbiological suitability of the water in freshwater natural bathing areas. Enterococci shall also be used as the indicator organism in marine (i.e., salt) waters, and Enterolert® or any equivalent method that measures viable criteria, as indicated in 40 CFR Part 136, *Guidelines establishing test procedures for the analysis of pollutants,* shall be used. For E.coli, Colilert® or any equivalent method that measures viable criteria, as indicated in 40 CFR Part 136 shall be used. All sampling shall follow guidance in *Standard Methods for the Examination of Water and Wastewater*, current edition. The use of certified laboratories for bacteriological analyses is not required if BE adheres to Standard Methods. (T-0)

4.2.3. Additional Sampling. Additional sampling shall be conducted when: (T-1)

4.2.3.1. A bacterial concentration exceeds the applicable water quality standard identified in 40 CFR 131.41.

4.2.3.2. A storm, sewage spill, or pollution event occurs that could affect the natural bathing area.

4.3. Bacteriological Monitoring for Swimming Pools, Hot Tubs and Spas, and Natural Bathing Areas. BE will provide bacteriological monitoring only in support of specific requests attributable to disease outbreaks. (T-3) If sampling is performed, and bacteriological water quality of pools, hot tubs and spas, or natural bathing areas does not meet standards, BE shall:

4.3.1. Recommend closure of the pool, spa, hot tub, or natural bathing area until the area meets standards. (T-1)

4.3.2. Collect repeat sample from the points of previous collection. (T-1)

4.3.3. Conduct an immediate investigation to determine if any unusual conditions such as repairs to facilities, storms, spills, etc. might have caused a problem. For pools and hot tubs and spas, Base Civil Engineer personnel shall determine if the filtration and disinfection systems have been operating properly. (T-1)

4.3.4. Ensure pH and disinfectant residuals are within acceptable ranges for pools and hot tubs and spas. (T-1)

4.3.5. Notify Public Health whenever conditions are encountered which may pose a health hazard to patrons. (T-1)

4.3.6. If the results of the re-sample again exceed standards, hyperchlorination of pools and spas and hot tubs may be required. (T-1).

4.3.7. Public Health shall take any measures deemed necessary to initiate surveillance or investigate the occurrence of illnesses associated with unhealthy water quality. (T-1)

4.4. Responding to a Fecal, Vomit, or Blood Incident. Fecal and vomit incidents in the pool require hyperchlorination to disinfect the pool because of the risk of contamination by Giardia and Cryptosporidium organisms, which may be present in stool but are resistant to chlorine. The risk posed by potential bloodborne pathogens is greatly diminished by dilution and normal free available chlorine levels; therefore blood contamination of a properly maintained pool does not require hyperchlorination, and does not pose a public health risk to swimmers.

4.4.1. Procedures. Respond in accordance with sections 6.5.2. - 6.5.3 of the United States Department of Health and Human Services Centers for Disease Control and Prevention *Model Aquatic Health Code, 3rd Edition, July 2018*.[1]

4.4.2. Surface Contamination Cleaning and Disinfection. If a bodily fluid, such as feces, vomit, or blood, has contaminated a surface in or around a pool, spa, or hot tub, complete remediation procedures in section 6.5.4. of the *Model Aquatic Health Code, 3rd Edition, July 2018.*

4.4.3. Recordkeeping**.** Outdoor recreation managers shall document each incident by recording date and time of the event, whether it involved vomit, blood, formed stool or diarrhea, and the free chlorine and pH levels at the time of observation of the event. Before reopening the pool, record the free chlorine and pH levels and the procedures followed in response to the incident (including the process used to increase chlorine levels if necessary). An example log is at **Attachment 5**. These records shall be kept for a minimum of 3 years. (T-1)

[1] United States Department of Health and Human Services Centers for Disease Control and Prevention. *Model Aquatic Health Code*, 3rd Edition, July 2018. https://www.cdc.gov/mahc/editions/current.html

Chapter 5

MISSION TRAINING POOLS

5.1. Overview. Mission training operations require frequent and extensive training in aquatic environments. Special considerations are required due to the unique nature of activities occurring in the mission training pool. Trainees wear clothing or battle gear while in the pool, remain in the pool for extended periods of time, and practice a variety of vigorous movements in the pool. There are also times when high numbers of trainees are in the pool at one time. These factors can lead to an increased risk of unhealthy levels of some water quality parameters in the pool, especially combined chlorine. Combined chlorine forms when organic material in the water (e.g., dirt, perspiration, urine) reacts with the free chlorine in the pool. Excess combined chlorine can lead to strong objectionable odors and respiratory problems, as well as eye, mucous membrane, and skin irritation.

5.2. Mission Training Pool Managers shall:

5.2.1. Operate, maintain, and ensure water quality monitoring of pools used only for mission training. (T-1)

5.2.2. Perform routine chemical measurements outlined in this instruction. (T-1)

5.2.3. Complete AF Form 708, or equivalent, daily, and as indicated by **Table 5.1**. (T-1)

5.2.4. Contact Base Civil Engineer personnel and BE immediately when water quality parameters fall outside acceptable ranges. (T-1)

5.2.5. Participate in all safety inspections of the facility. (T-1)

5.2.6. Ensure that uniforms and boots are hosed clean of all visible debris prior to pool entry with fresh water. (T-1)

5.2.7. Provide necessary equipment (such as basins and brushes) to clean boots in the shower room prior to pool entry. (T-1)

5.2.8. Require periodic rest breaks to allow trainees to exit the pool to use the restroom. This should preclude any accidental urination in the pool. (T-1)

5.3. Odor Complaints and Breathing Difficulties. When complaints regarding odor or respiratory health occur:

5.3.1. Use a diethyl-p-phenyleneldiamine (DPD) test kit to monitor combined chlorine, then sample again hourly and document pool usage. (T-1)

5.3.2. If a reading exceeds 0.2 ppm combined chlorine, notify BE, and superchlorinate the pool if possible. Remove all personnel before superchlorinating. Swimmers may not re-enter the pool until the free available chlorine level drops to the acceptable range indicated in **Table 5.1**. (T-1)

5.3.3. If a reading exceeds 0.5 ppm combined chlorine, remove all personnel immediately and superchlorinate. Swimmers may not re-enter the pool until the free available chlorine level drops to the acceptable range indicated in **Table 5.1**. (T-1)

5.4. Maintenance. Mission training pool managers shall ensure pool maintenance is accomplished as recommended by manufacturer to prevent algae buildup and increased turbidity and to maintain optimal performance and safety for mission training. (T-1)

5.5. Construction. Mission training pools shall be constructed of materials which are impervious and permanent. When funds permit, tile is the best option, followed by pebble or quartz or plaster finished in white or light colors (light blue, blue-green or turquoise). Ensure pumps, filters, and water lines are sized appropriately to sustain water quality and temperature as specified in this AFMAN. (T-1)

5.5.1. Military platforms shall be constructed in accordance with Naval Medical Command (NAVMED) P-5010-4, *Manual of Naval Preventive Medicine, Swimming Pools and Bathing Places*. (T-1)

5.5.2. Indoor mission training pool facilities must be ventilated at all times to remove excess combined chlorine vapors. Design, construction, and installation of indoor mission training pool facilities' air handling systems shall comply with the *2015 ASHRAE Handbook – HVAC Applications* and ASHRAE Standard 62.1, *Ventilation for Acceptable Indoor Air Quality*. (T-1)

Table 5.1. Water Quality Requirements for Mission Training Pools.

	Acceptable Range	**Ideal**	**Applicability**	**Monitoring Frequency**	**Responsible Organization**
Free available chlorine (FAC)	1.0 – 4. 0 ppm*	2.0-3.0 ppm	Mission Training Pool	Prior to opening & every 2 hours (manual disinfectant system); Prior to opening & every 4 hours (automated disinfectant system)	Mission Training Pool Manager
Ozone UVC Germicidal Lights	Less than 0.1 ppm		Mission Training Pool	Every 2 hours	Mission Training Pool Manager
			Mission Training Pool	Every hour	
pH	7.2 -7.8	7.6	Mission Training Pool	Prior to opening & every 2 hours	Mission Training Pool Manager
Total alkalinity	60 – 180 ppm	80-100 ppm	Mission Training Pool	Weekly	Mission Training Pool

	Acceptable Range	Ideal	Applicability	Monitoring Frequency	Responsible Organization
					Manager
Calcium hardness	NTE 2,500 ppm	200 – 400 ppm	Mission Training Pool	Monthly	Mission Training Pool Manager
Total Dissolved Solids (TDS)	NTE 1500 ppm above the concentration at startup		Mission Training Pool	Quarterly	Mission Training Pool Manager
Clarity	The bottom of the deep water tank at its deepest point must be clearly visible and sharply defined from any point on the deck.		Mission Training Pool	Daily	Mission Training Pool Manager
	The bottom of the shallow water tank at its deepest point shall be clearly visible.		Mission Training Pool		Mission Training Pool Manager
Cyanuric Acid	Ideal concentration is between 25-50 ppm, but must not exceed 90 ppm		Mission Training Pool using CYA as a stabilizer	Monthly; for salt water pools monitoring may be required more frequently - consult the manufacturers' instructions for appropriate frequency	Mission Training Pool Manager
Oxidation Reduction Potential (ORP)	Greater than 720 mV if using a silver or silver		Not a required parameter; however may supplement	Not a required parameter; if used, recommend at	Mission Training Pool Manager

	Acceptable Range	**Ideal**	**Applicability**	**Monitoring Frequency**	**Responsible Organization**
	chloride electrode; Greater than 680 mV if using a calomel electrode		direct measurement of disinfectant residual as indicator of water quality	least daily readings at same time FAC and pH readings are performed	
Salt			Mission training pool using in-line electrolytic chlorinators	At least weekly, or per manufacturer's instructions	Mission Training Pool Manager
Temperature	78°F - 86°F	83°F - 84°F	Low demand pool training, e.g. knot tying	Every 2 hours	Mission Training Pool Manager
	76°F - 82°F	78°F - 80°F	High Demand training activities, e.g. fin training		
Algae	No visible algae when open to swimmers		Mission Training Pool	Continuous	Mission Training Pool Manager
Combined chlorine	0 – 0.4 ppm	0 ppm	Mission Training Pool	Every 2 hours	Mission Training Pool Manager
Air Temp for Indoor Mission Training Pools	1-5°F warmer than water temp in winter	3°F warmer than water temp in winter	Mission Training Pool	2 hours prior to start of training and every 2 hours during training	Mission Training Pool Manager or
	1-10°F warmer than water temp in summer	8°F warmer than water temp in summer	Mission Training Pool	2 hours prior to start of training and every 2 hours during training	Mission Training Pool Manager or
*Pools using cyanuric acid shall maintain a minimum FAC concentration of 2.0 ppm					

DOROTHY A. HOGG
Lieutenant General, USAF, NC
Surgeon General

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFPD 48-1, *Aerospace and Operational Medicine Enterprise,* 7 June 2019

AFI 33-360, *Publications and Forms Management,* 1 December 2015

AFMAN 33-363, *Management of Records,* 1 March 2008

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AFI 32-1022 *Planning and Programming Nonappropriated Fund Facility Construction Projects*, 30 December 2015

AFMAN 32-1084, *Facility Requirements*, 26 Feb 2016

UFC 3-230-02, *Operation and Maintenance: Water Supply Systems*, 10 July 2001

UFGS 22-00-00, Plumbing, General Purpose, November 2015

Public Law 110-140, *Energy Independence and Security Act of 2007*

15 USC § 8001-8008, *Virginia Graeme Baker Pool and Spa Safety Act*

AFI 48-105, *Surveillance, Prevention, and Control of Disease and Conditions of Public Health or Military Significance,* 15 July 2014

AFI 34-110, *Air Force Outdoor Recreation Programs*, 29 Aug 2018

AFI 44-177, *Public Access Defibrillator Program,* 5 Jun 2014

AFMAN 91-203, *Air Force Occupational Safety, Fire, and Health Standards*, 11 December 2018

AFI 48-117, *Public Facility Sanitation*, 11 September 2018

Centers for Disease Control and Prevention. *Annex to Model Aquatic Health Code, 3rd Edition. July 2018*

40 CFR 122, *EPA Administered Permit Programs: The National Pollutant Discharge Elimination System.*

AFI 90-821, *Hazard Communication (HAZCOM) Program*, 27 Jan 2014

40 CFR Part 136. *Guidelines establishing test procedures for the analysis of pollutants.*

Department of the Navy, Bureau of Medicine and Surgery. NAVMED P-5010-4, *Manual of Naval Preventive Medicine, Swimming Pools and Bathing Places.* 6 Jun 2002

ASHRAE. *2015 ASHRAE Handbook - HVAC Applications.* 2015

ASHRAE Standard 62.1, *Ventilation for Acceptable Indoor Air Quality*. 2016

Prescribed Forms

AF Form 708, *Swimming Pool Operational Log*

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

Environmental Protection Agency. *2012 Recreational Water Quality Criteria,* December 2012

Abbreviations and Acronyms

AED—Automated External Defibrillator

AF—Air Force

AFCEC—Air Force Civil Engineer Center

AFMAN—Air Force Manual

AFMSA—Air Force Medical Support Agency

AFPD—Air Force Policy Directive

AFSVA—Air Force Services Activity

AFSEC—Air Force Safety Center

ANG—Air National Guard

ANSI—American National Standards Institute

ASHRAE—American Society of Heating, Refrigeration, and Air Conditioning Engineers

BE—Bioenvironmental Engineering

CDC—Centers for Disease Control and Prevention

CFR—Code of Federal Regulations

CE—Civil Engineer

CPR—Cardiopulmonary Resuscitation

CYA—Cyanuric Acid

DPD—Diethyl-p-phenyleneldiamine

EPA—Environmental Protection Agency

FAC—Free Available Chlorine

FSS—Force Support Squadron

MAJCOM—Major Command

mV—millivolts

NAVMED—Naval Medical Command

NSF—NSF International (formerly National Sanitation Foundation)

NTE—Not to Exceed

PH—Public Health

ppm—Parts per million (equivalent to milligrams per liter)

OEH—Occupational and Environmental Health

OPR—Office of Primary Responsibility

ORP—Oxidation Reduction Potential

PPE—Personal Protective Equipment

RWI—Recreational Water Illnesses

SEG—Occupational Safety

UFC—Unified Facilities Criteria

UFGS—Unified Facilities Guide Specifications

USAFSAM—United States Air Force School of Aerospace Medicine

UV—Ultraviolet

TDS—Total Dissolved Solids

Terms

Breakpoint Chlorination—Occurs when there is enough extra chlorine to completely consume the contaminants in the pool water. Any excess chlorine left over will become free available chlorine.

Bromine—An acceptable disinfecting chemical used in some swimming pools.

Calcium Hardness—The amount of dissolved calcium (plus some other minerals like magnesium) in the water. Water containing high concentrations of calcium and magnesium is said to be "hard water."

Chlorine—The most common disinfectant used in pool and spa treatment. In this method, chlorine in a liquid, powder, tablet, or gas form is added to the pool water. Chlorine generators are an alternative method of chlorination. Instead of adding chlorine directly, chlorine generators use salt and an electrolytic cell to produce chlorine in the pool.

Clarity—A term describing the clearness of the water. Water clarity is important to identify swimmers in distress, and for swimmers to see potential underwater hazards.

Combined Chlorine—Compounds that form when free chlorine reacts with ammonia (from perspiration and urine) in water. These compounds can cause eye, mucous membrane, and skin irritation and have strong objectionable chlorine-type odors. Combined chlorine concentrations are obtained by subtracting the measured free available chlorine from the measured total chlorine concentration.

CT Inactivation Value—A representation of the concentration of the disinfectant (C) multiplied by time in minutes (T) needed for inactivation of a particular contaminant. The concentration and time are inversely proportional; therefore, the higher the concentration of the disinfectant, the shorter the contact time required for inactivation.

Cyanuric Acid—A chemical that forms a weak bond with free chlorine in outdoor pools, protecting the chlorine from the sun's ultraviolet rays to reduce chlorine loss. Cyanuric acid will reduce the overall effectiveness of chlorine, so it may not be used in indoor pools.

DPD Test—A method of testing for chlorine levels in the pool water. DPD testing allows determination of total and free available chlorine levels which through subtraction gives combined chlorine levels.

E.coli—Bacteria used as indicators of fecal contamination in fresh water.

Enterococci—Bacteria used as indicators of fecal contamination in both fresh and marine waters.

Filter—A device or structure for removing solid or suspended material from water, in order to improve water clarity.

Free Available Chlorine—The portion of total chlorine that is not combined chlorine and is available as disinfectant in the water. A free chlorine residual must be maintained for adequate disinfection. With a DPD test kit, one determines free available level, then total available. The difference, if any, is the level of combined chlorine.

Hyperchlorination—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.

Inlet—A wall or floor fitting where treated water is returned to the pool.

Mission Training Pool—A swimming pool used for operational mission training (e.g., Battlefield Airmen). Mission pools are often shared for public use, or vice versa.

Mission Training Pool Manager—Unit that organizes and executes mission training in a mission-training-only pool.

Natural Bathing Area—Coastal waters, rivers, or lakes used for recreational activities such as swimming and diving.

NSF/ANSI 50—NSF/ANSI 50: *Equipment for Pools, Spas, Hot Tubs and Other Recreational Water Facilities* specifies precision and accuracy requirements for measuring pH, free & total chlorine, and free & total bromine.

Oxidation Reduction Potential—Measures the effectiveness of disinfectant in the swimming pool water by providing an indication of the capacity of the disinfectant to oxidize or sanitize organic contaminants. ORP is measured in units of millivolts (mV) with a handheld meter. The ORP value corresponds to an approximate level of oxidizing disinfectant such as chlorine or bromine.

Ozone Disinfection—A secondary disinfection system using ozone gas to kill microorganisms.

pH—A measure of the acidity or basicity of an aqueous solution. The numeric value of pH ranges from 0 to 14; the pH of pure water is 7.0. Water is said to be basic, or alkaline, if its pH is higher than 7.0. If its pH is lower than 7.0, the water is acidic.

Saturation Index—An estimate of the point where swimming pool water will hold no more chemicals or minerals.

Secondary Disinfection—Disinfection system or process installed in addition to the standard systems required on all swimming pools, spas, and hot tubs; usually required for aquatic venues at a greater risk for microbial contamination.

Superchlorination—The addition of large quantities of chlorine-based chemicals to kill algae, destroy odors, or improve the ability to maintain a disinfectant residual. Also called "shocking." This process is different from hyperchlorination, which is a prescribed amount to achieve a specific CT inactivation value whereas superchlorination is the raising of free chlorine levels for water quality maintenance.

Total Alkalinity—A measure of water's resistance to change in pH.

Total Chlorine—The sum of combined and free available chlorine levels. With a DPD test kit, one determines free available level, then total available. The difference, if any, is the level of combined chlorine.

Total Dissolved Solids—A measure of the overall quantity of all matter dissolved in water.

Ultraviolet Disinfection—A secondary disinfection system using ultraviolet light to kill microorganisms.

Attachment 2

CONSIDERATIONS FOR REVIEWING BATHING FACILITY DESIGNS

A2.1. Drains sized to prevent entrapment (including hair) and avoid suction injuries.

A2.2. Circulation equipment sized to ensure the proper turnover rate as described in **paragraph 4.1.6**.

A2.3. Filters sized to accommodate proper turnover rate.

A2.4. Pool, hot tub, or spa sized to accommodate expected bather load. Bather load shall be based on square footage of surface water or, if no standing water is present, the surface area of an aquatic venue. Bather load for all aquatic venues shall be calculated as:

A2.4.1. Flat water: 20 square feet (sq. ft.) per bather. This calculation includes water slides (runout area and exposed water as equivalent surface water), plunge pools, and aquatic venues without standing water (calculate the perimeter deck area for bather load).

A2.4.2. Agitated water: 15 sq. ft. per bather.

A2.4.3. Hot water: 10 sq. ft. per bather.

A2.5. For increased risk aquatic venues such as spray pads, wading pools, mission training pools, and therapy pools: supplemental, optimally-designed in-line disinfection, e.g., ozone or UV light, which can inactivate *Cryptosporidium*, and *Colilert* and potentially improve water quality.

A2.6. Automatic chemical feeders to improve the uniformity of chemical addition.

A2.7. Filters that are sized and optimized for particle and microbe removal.

A2.8. Dedicated filters for wading pools and baby pools, to prevent cross-contamination of other pools.

A2.9. Wading pool and baby pool turnover rates that decrease the length of time swimmers are exposed to germs and include safety considerations for avoiding drain entrapment (including hair) and suction injuries.

A2.10. Adequate ventilation for indoor facilities to decrease exposure to chloramines and other pool-water byproducts. See ASHRAE Standard 62.1, *Ventilation for Acceptable Indoor Air Quality* and *2015 ASHRAE Handbook - HVAC Applications* for guidance. The latter document has specific design information regarding indoor pools, also known as natatoriums. AF personnel can download these publications from the online Whole Building Design Guide, at **http://www.wbdg.org**.

A2.11. Adequate numbers of easily located, close, and safe restrooms, diaper changing areas, and shower facilities to promote good swimmer hygiene. See UFC 3-420-01, Table 403-5 for guidance. AF personnel can download a copy of this standard from the online Whole Building Design Guide, at **http://www.wbdg.org**.

A2.12. Diaper changing and hand washing facilities near children’s pools to promote good hygiene and diaper changing practices among parents.

A2.13. Reference the Centers for Disease Control and Prevention *Model Aquatic Health Code, 3rd Edition, July 2018*, Chapter 4.0 Aquatic Facility Design Standards and Construction, at: **https://www.cdc.gov/mahc/editions/index.html**

Attachment 3

SAFETY AND HEALTH RULES

A3.1. Swimming Pools.

A3.1.1. Clearly state hours of operation and peak occupancy.

A3.1.2. In case of emergency, dial 911 or on base equivalent. (State the location of the nearest telephone.)

A3.1.3. Children 10 or younger shall be under the direct supervision of an adult.

A3.1.4. Children 11 - 13 shall pass a swim test or be supervised by an adult.

A3.1.5. Children not toilet trained shall wear swim diapers.

A3.1.6. No diving into shallow water.

A3.1.7. No breath-holding or prolonged underwater swimming contests.

A3.1.8. Food, beverages, chewing gum, smoking, chewing tobacco and snuff prohibited in pool and on pool apron.

A3.1.9. Glass containers prohibited in pool area.

A3.1.10. Individuals experiencing the following conditions shall be prohibited from entering the pool: diarrhea, skin disease, open sores or lesions, including live immunizations, sore or inflamed eyes, nasal or ear discharge.

A3.1.11. No pets are allowed in the pool area. (Service dogs escorting persons with disabilities shall be permitted on the pool apron and in restrooms. Also, working dogs accompanied by handlers shall be permitted in swimming pool areas as required.)

A3.1.12. Showers are required before entering pool.

A3.1.13. Lifeguards will clear pools or beach areas during electrical storms and at other times deemed necessary in the interest of safety.

A3.1.14. Personal flotation devices should be United States Coast Guard approved.

A3.1.15. During recreational swim, a rope or cable with floats or buoys shall divide the deep end and the shallow parts of the pool, in the open area of the pool. It is recommended that there is at least one (1) float or buoy per 5 feet of rope or cable.

A3.1.16. Each qualified lifeguard conducting patron surveillance shall have a rescue tube on his/her person.

A3.1.17. Appropriate attire must be worn in all aquatic venues. Nude bathing areas are not allowed.

A3.2. Hot Tubs and Spas.

A3.2.1. Use applicable rules listed above and add:

A3.2.2. Pregnant women, elderly persons, and persons suffering from heart disease, diabetes, or high or low blood pressure shall not enter the spa without prior medical consultation and permission from their doctor.

A3.2.3. Do not use the spa while under the influence of alcohol, tranquilizers, or other drugs that cause drowsiness or that raise or lower blood pressure.

A3.2.4. Do not use at water temperatures above 104°F.

A3.2.5. Do not use alone.

A3.2.6. Unsupervised use by children prohibited.

A3.2.7. Children under five years old are not permitted in hot tubs and spas.

A3.2.8. Enter and exit slowly.

A3.2.9. Observe reasonable time limits (10-15 minutes), then leave the water and cool down before returning; long exposure may result in nausea, dizziness, or fainting.

A3.2.10. Appropriate attire must be worn in all aquatic venues. Nude bathing areas are not allowed.

Attachment 4

CONSIDERATIONS FOR SITING OF NATURAL BATHING AREAS

A4.1. Site Location. Consider effects of point and nonpoint pollution sources. Sources of potentially dangerous contamination include (but are not limited to) waste discharges from communities, agriculture, industries, marine craft, local animal populations, and water fowl.

A4.2. Type of Bottom. These areas should have floors which slope gently and uniformly toward deep water; have no holes or sudden step-offs; be free of hidden or submerged obstructions such as rocks, stumps, snags, and sunken logs; be composed of firm sand, small-sized gravel, or shale; have no silt, quicksand, shell patches, sharp and broken rock, or debris in depths of 5 feet (1.5 meters) or less.

A4.3. Physical Water Quality. Consider the depth and turbidity of the water, presence of currents, rip tides, and dangerous aquatic flora and fauna.

A4.4. Common Diseases. Natural bodies of water located in areas where schistosomiasis (bilharziasis), leptospirosis, or primary amoebic meningoencephalitis are endemic shall not be approved for recreational purposes without the concurrence of the public health or preventive medicine officer. PH shall be consulted to determine if there are threats from other microorganisms, including those endemic to the local area.

A4.5. Sensitive Natural Resources. Natural bathing areas shall not be located in areas indicated in the installation Integrated Natural Resources Management Plan as restricted for swimming due to the presence of sensitive natural resources or wildlife hazards.

A4.6. Attire. Appropriate attire must be worn in all aquatic venues. Nude natural bathing areas are not allowed.

Attachment 5

WATER CONTAMINATION RESPONSE RECORDKEEPING

Figure A5.1. Sample Water Contamination Response Log.

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

Attachment 6

SUPERCHLORINATION AND HYPERCHLORINATION

A6.1. Superchlorination. Combined chlorine forms when contaminants such as perspiration and urine in the pool water react with, or consume, the free available chlorine. Superchlorination reduces the combined chlorine in the pool, and is accomplished by adding 10 times the level of combined chlorine currently in the water. This achieves "breakpoint chlorination," which means there is enough extra chlorine to completely consume the contaminants. Any excess chlorine left over will become free available chlorine. All persons must be removed from the pool before superchlorination begins, and may not re-enter the pool until the free available chlorine is within accepted parameters as described in this manual.

A6.2. Hyperchlorination. Fecal accidents in the pool increase the risk of contamination by chlorine-tolerant parasites such as Giardia, Cryptosporidium, or Colilert. To disinfect the water following a fecal accident, the free chlorine concentration of the pool water must be hyperchlorinated, i.e., raised to a high concentration for a long period of time. Section 6.5.3. of the United States Department of Health and Human Services Centers for Disease Control and Prevention *Model Aquatic Health Code, 3rd Edition, July 2018* prescribes free available chlorine concentrations and time periods required to disinfect after different contamination scenarios. This information can also be found at **https://www.cdc.gov/healthywater/swimming/pdf/fecal-incident-response-guidelines.pdf** . All persons must be removed from the pool before hyperchlorination begins, and may not re-enter the pool until the free available chlorine is within accepted parameters as described in this manual.

Table A6.1. Time to Kill or Inactivate Germs in Chlorinated Water.

(Applicable for water conditions of 1 ppm free available chlorine, pH 7.5 or less, and temperature 77°F or more)	
Germ	**Time**
E. coli O157:H7	Less than 1 minute
Hepatitis A	Approximately 16 minutes
Giardia	Approximately 45 minutes
Cryptosporidium	Approximately 15,300 minutes (10.6 days)
Note: These values are only for pools that do not use a chlorine stabilizer such as cyanuric acid. Disinfection times would be longer in the presence of a stabilizer.	