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Manual of Naval Preventive Medicine

Chapter 4

RECREATIONAL WATER FACILITIES

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NAVMED P-5010-4

Chapter 4
Manual of Naval Preventive Medicine
Recreational Water Facilities

30 June 2020

To: Holders of the Manual of Naval Preventive Medicine

1. Purpose. This revision reflects the latest swimming pool, spa, and natural recreational water facility safety and water quality recommendations of the National Swimming Pool and Spa Institute, the National Swimming Pool Foundation the Centers for Disease Control and Prevention (CDC), the U.S. Environmental Protection Agency (EPA), and applicable government and industry standards organizations.

2. Background. This manual serves as a guide to Medical Department personnel assigned responsibilities for sanitary controls, surveys, and inspections of U.S. Navy and Marine Corps training and recreational aquatic venues.

3. Action. Replace entire Chapter 4 with this version.

G. D. SHAFFER
Acting

Releasability and distribution:
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CHAPTER 4
RECREATIONAL WATER FACILITIES

SECTION I. INTRODUCTION

4-1. Introduction

1. The primary purpose of this chapter is to serve as a guide to Medical Department personnel assigned responsibilities for sanitary controls, surveys, and inspections of U.S. Navy and Marine Corps training and recreational aquatic venues.

2. The main concern of the inspector is the health and safety of the users of training and recreational water venues. Without enforcement, codes and regulations have little value. Enforcement begins with the approval of the original construction design. This oversight continues with regular on-site inspections of the facility operations.

3. This chapter provides a general overview of the regulations and standards that apply to training and recreational water venues and their operations. It is not intended to provide legal advice. Medical personnel who inspect Navy and Marine Corps training and recreational aquatic venues should understand the broad responsibilities of the facility staff and how facilities are designed and operated.

4. Continued developments in the aquatic industry have resulted in advances in disinfection and recirculation technology. The introduction of unique programming and design elements, the passing of the Virginia Graeme Baker (VGB) Act, development of the Model Aquatic Health Code (MAHC), development of the International Swimming Pool and Spa Code as part of the International Building Code, and the development of Department of Defense (DoD) Unified Facilities Criteria (UFC) for Aquatic Facilities are all relevant to Navy and Marine Corps training and recreational aquatic venues and incorporated in this chapter. The use of copyright and trademark names in this publication does not imply endorsement by the Department of Navy (DON) but is intended only to assist in identifying specific products.

4-2. Applicability

1. This chapter applies to all U.S. Navy and Marine Corps training and recreational aquatic venues, operated on U.S. Navy and Marine Corps installations. This includes Navy and Marine Corps lodging and other Morale, Welfare and Recreation (MWR) facilities that have swimming pools and hot tubs. It also applies to over-the-side swimming from U.S. Navy ships and submarines. Privatized facilities that are not regulated or monitored by the state or local health department and are operated on Navy or Marine Corps installation are also accountable to the requirements delineated in this chapter.

2. Training and recreational aquatic venues will have 1 year from the publication date of this chapter to correct all non-critical violations resulting from new or revised standards identified in this chapter. If a facility is unable to correct any non-critical violations within that period, they must notify the local preventive medicine authority in writing, describing the violation and why it cannot be corrected. The preventive medicine authority will consult with the Navy and Marine Corps Public Health Center (NAVMCPUBHLTHCEN) as necessary.

3. At joint-bases, the lead and tenant agencies should develop a memorandum of agreement (MOA) establishing which agency is responsible for public health surveillance, ensuring safe and sanitary operation at all joint-base training and recreational aquatic venues.

4-3. Responsibilities

1. Per reference (a), Commander, Navy Personnel Command (PERS-6) is responsible for supervision, policy guidance, technical, and administrative direction of the Navy-wide Recreational Service Program, which include pool and inland/surf beach operations.

2. Per reference (b), Chief, Bureau of Medicine and Surgery (BUMED) is responsible for developing and promulgating health standards to protect the health and well-being of Navy and Marine Corps personnel.

3. Per references (b), (c), and (d), Commander, Navy Installations Command (CNIC) is responsible for all recreational aquatic venues on Navy installations and the Deputy Commandant, Manpower and Reserve Affairs is responsible for all recreational aquatic venues on Marine Corps installations worldwide, as well as the implementation and administration of the MWR and Marine family programs, which are responsible for the safe and sanitary operation of most of the recreational aquatic venues on Navy and Marine Corps installations.

4. Naval Facility Engineering Command (NAVFAC) is responsible for design, construction drawings and specifications, construction, major repairs, and maintenance standards for training and recreational aquatic venues.

5. Per references (c) and (d), the installation commanding officer (CO) is responsible for the safe and sanitary operation and of training and recreational aquatic venues on the installation.

6. Per references (c) and (d), the aquatic coordinator, swimming pool manager, or facility supervisor is assigned responsibility for management and operation of training and recreational aquatic venues. This includes the proper selection and training of personnel.

7. As described in this chapter, the cognizant preventive medicine authority is responsible for surveillance of those aspects of operations, maintenance, and laboratory practice that pertain to health protection, and for making pertinent recommendations to the CO. Construction plans will be reviewed for new and renovated pools in collaboration with all other stakeholders (i.e. NAVFAC, installation safety, program manager, etc.) to ensure all sanitary and safety issues are adhered to. The preventive medicine authority will investigate any suspected or known waterborne illness outbreaks.

8. The public works officer (PWO) is responsible for the maintenance of all swimming pool facilities.

9. Additional installation personnel typically involved in the management and operation of training and recreational aquatic venues should refer to Appendix G of this chapter, and all other applicable sanitary, safety and training requirements.

4-4. References. Appendix A contains a list of references used in this document and other helpful resources. The publication date of the code or standard is not included in this document. In general, the latest available issuance of the reference is used.

4-5. List of Acronyms, Terms, and Definitions. A list of acronyms and abbreviations is provided in Appendix B, and a list of terms used in this chapter with their definitions is provided in Appendix C.

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SECTION II. TYPES OF POOLS AND SPAS

4-6. Recirculation Swimming Pools with Filters. A recirculation pool is an artificial structure used to impound water either above or below the ground surface with a treatment system that recirculates water to provide for such uses as swimming, diving, wading, spraying, sliding, floating, rafting, or other similar usage. Water is taken from the pool, filtered, treated, and then returned to the pool.

4-7. Spray Pads. Spray pads are primarily used by children and supervising adults. A spray pad must be independently operated (that is, its recirculation system is separate from that of another pool). An aquatic recreation area that typically has ground nozzles that spray water upwards out of the spray pad's rain deck. There may also be other water features such as a rainbow (semicircular pipe shower), a mushroom shower, or a tree shower. Some spray pads feature movable nozzles like those found on fire trucks to allow users to spray others. The showers and ground nozzles are often controlled by a hand activated-motion sensor, to run for limited time. Typically, the water is either freshwater, or recycled and treated water, which is treated to at least the same level of quality as swimming pool water standards. These spray pads are often surfaced in textured non-slip concrete or in crumb rubber.

a. The recirculation system must operate on a 24-hour basis and must completely turn over the entire pool volume in 1 hour or less.

b. Spray pad water must drain away freely as it sprays over the area. Water quality and wall and floor construction must meet the same requirements specified for recirculation pools. The minimum slope for the bottom of the pad must be one-quarter of an inch per foot and will not exceed five-eighths of an inch per foot toward waste outlets.

c. In spray pads, treated water is sprayed onto a pad and then drained or recycled into a filtration system. Unlike a wading pool, potentially contaminated water is not allowed to accumulate; therefore, a spray pad’s sanitation is easier to control. Improperly designed wading pools can be converted to spray pads so they can be operated in a sanitary manner.

d. Water from a spray pad must not be discharged into a swimming pool.

e. Spray pad area play features must be four feet or greater in height, and drains and operational equipment must be flush with the deck to prevent obstructions on which children may fall or become injured.

Figure 4-7.1 Spray Pad

4-8. Aquatic Play Features

1. Water park aquatic play features are becoming increasingly popular as interactive swimming activities. However, they present more challenges than conventional swimming pools in many respects.

a. Aquatic play features cannot be operated in the same manner as traditional pools. Many water features include special effects, such as water moving at high velocity, pulsating or surging water, or the use of pressurized air to expel water.

b. A greater degree of automation is required to operate the various water features, creating the need for a more specialized operation and maintenance staff.

c. The aquatic play features have more complicated designs, can cover large areas, and tend to attract high numbers of swimmers. These factors can make it more difficult to treat, filter, and circulate the water. See the National Swimming Pool Foundation® (NSPF®) Aquatic Play Feature™ Handbook. National Swimming Pool Foundation® and NSPF® are registered trademarks of the National Swimming Pool Foundation®, Colorado Springs, Colorado; Aquatic Play Feature™ is a trademark of the National Swimming Pool Foundation®, Colorado Springs, Colorado.

2. A wide variety of aquatic play features are currently being built and operated, all of which require the same levels of disinfection, but the turnover rates vary depending on the facility. Turnover is described in article 4-52. If multiple features are present on a single system, the most conservative (that is, fastest) turnover value is applied.

a. Wave pools, which simulate ocean swimming, generally cover large areas. This type of pool typically features a zero-depth entry that becomes progressively deeper; waves are generated periodically. Surf pools generate waves dedicated to the activity of surfing on a surfboard or analogous surfing devices and intended for sport as opposed to general play intent for wave pools. The required turnover depends on the volume of the aquatic play features (see table 4-52.1).

b. Activity pools or play parks are usually shallow and equipped with attractions/devices, such as small slides, floats, or decorative waterfalls, which encourage physical exertion. Circulation dead spots can be a problem at these aquatic play features. The required turnover depends on the volume of the facility (see table 4-52.1).

c. Catch pools (or landing pools) are the basins of water at the end of a water slide. They are used to terminate swimmers' momentum from a slide and provide an exit to the deck or walkway area. The required turnover is 1 per hour.

d. Water slides produce the water that feeds the catch pools. The required turnover is 1 per hour if they are on a standalone system from the catch pool.

e. Interactive play systems are water-based-play devices whose water flow volumes, pressures, or patterns are intended to be actuated by the swimmer. The water depth of these systems is generally 12 inches or less. Circulation/filtration must be installed, and the required turnover is 1 per 0.5 hours.

f. Lazy rivers are water features that mimic a natural river. Swimmers are transported (usually on flotation tubes) at a maximum current speed of 3 miles per hour throughout a loop that may include various water features or play devices. Lazy rivers are usually at a constant depth and use pumps to provide a river-like flow.

g. Action rivers are water slides that mimic a mountain stream (such as rapids, whirlpools, or quiet water pools). The required turnover for these features depends on the volume of the aquatic play features (see table 4-52.1).

3. Vortex™ pools are circular pools with return jets pointed in the same direction on the walls to provide a current that transports bathers around the pool. The required turnover depends on the volume of the aquatic play features (see table 4-52.1). (Vortex™ is a trademark of Pool Heating Distributors, Sarasota, Florida.)

4-9. Flow-Through Swimming Pools

1. In flow-through swimming pools, a continuous supply of fresh or chlorinated water enters at one end of the pool, and an equal amount of used water flows out the other end.

2. Construction of flow-through pools after 1993 has been prohibited because control over the quality of water in such pools is very limited. Existing flow-through pools are not authorized for use unless a recirculation system meeting current requirements has been installed.

4-10. Special Use Pool. A special use pool is a pool designed and used exclusively for a single purpose such as wading, instruction, diving, competition or medical treatment where a licensed professional in the healing arts in attendance. Design and construction should be carefully planned to ensure the intended use is met.

4-11. Wading Pools

1. A shallow body of water intended for use by children and supervising adults. The recirculation system must operate independently from that of another pool.

2. Wading Pools will be:

a. No deeper than 24 inches (measured as water depth) at the deepest point.

b. The bottom must have a minimum slope of not less than one-fourth inch per foot and no more than five-eighths inch per foot toward waste outlets or main drains.

c. Constructed of the same material as recirculation pools.

d. Provide a continuous flow to treated water to accomplish a complete turnover of water in 1 hour or less.

e. Designed so that each outlet grate is sized to accommodate 100 percent of the recirculation flow, and the velocity through the open area of the grate is no greater than one foot per second. When the outlet fittings are of the anti-vortex type, maximum entrance velocities may be increased to 6 feet per second.

f. Separated from the shallow area of adjacent swimming pools by a minimum deck width of 6 feet.

g. Controlled so that no water is discharged into adjacent swimming pools.

4-12. Spas

1. Spas are basins, chambers, or tanks of cold or heated water designed for recreational use and physiological and psychological relaxation where extended exposure is not intended. Spas are:

a. Made of cement, Gunite®, tile, plastic, or fiberglass. (Gunite® is a registered trademark of Gunite Corporation, Rockford, Illinois.)

b. Shallow in depth, not to exceed 4 feet as measured from the water line.

c. Of varying sizes and capacities to accommodate one or several patrons at one time.

2. Hot tubs are similar to spas, but they are usually made of wood and may not be equipped with underwater jets or bubblers.

3. A spa or hot tub may be located in the same room or area in which a swimming pool is located but not in the same area in which a wading or spray pool is located. If the spa or hot tub is located in the same room or area as a swimming pool:

a. Do not directly connect or physically attach the spa to the swimming pool.

b. Do not discharge any water from the spa into the swimming pool.

c. Provide a minimum of two inlets and two main drains and at least one surface skimmer. Main drains should be located on the spa bottom floor and interconnected. Main drain spacing must not be greater than 20 feet or less than three 3 feet on center. Each drain sump or pot must be of adequate depth and design to provide uniform suction across the entire grate area and must be anchored with corrosion-resistant screws.

d. Provide a means of completely draining the contents of the spa or hot tub to waste without passing through the filter. This may be accomplished by a gravity waste line that runs directly from the pool or by pumping, thus bypassing the filter.

e. A shower must be installed for patrons' use prior to their entering the spa.

4-13. Therapy Pools

1. Therapy pools are basins, chambers, or tanks designed for therapy or rehabilitation and are generally located at hospitals, sport therapy clinics, doctors' offices, or other medical facilities. These pools normally contain heated water and are used solely for therapy and rehabilitation purposes under the supervision of a physical therapist or other qualified medical personnel.

a. Higher temperatures are maintained in therapy pools to assist in rehabilitation and patron comfort. Because of this practice, stringent oversight of water quality parameters is necessary to ensure safe water conditions.

b. Therapy pools will be designed and constructed according to manufacturer specifications.

c. Therapy pools will be operated and maintained according to the Centers for Disease Control and Prevention (CDC) guidelines for controlling the spread of waterborne microorganisms in hydrotherapy tanks and pools (Guidelines for Environmental Infection Control in Health-Care Facilities). In addition, all applicable recreational water facility requirements in this chapter, as well as manufacturer recommendations, will apply.

4-14. Training Pools

Pools used for military training are highly customized for a variety of intensive training activities and aquatic simulations, including readiness training for surface and underwater missions and situations, rescue swim training, and aircraft submersion simulators for escape and survival training. These aquatic structures must meet all military health and safety standards to protect trainees. At training pools that are subject to introduction of contaminants via uniforms, footwear, and other military gear, increased sanitizer residuals are necessary in order to minimize the risk of injury or illness for personnel using the pool. When conducting aquatic training, the training command is responsible to ensure health and safety standards are met. The medical authority must be consulted to review plans and inspect these training venues.

4-15. Fill and Draw Swimming Pools. Fill and draw pools are NOT AUTHORIZED FOR USE. These pools are filled, used until the water is dirty, then emptied and refilled with clean water. Although some fill and draw pools are equipped to provide minimal water circulation, they are not to be confused with recirculating filter pools**.**

4-16. Aquatic Structure Location. Aquatic structures/venues should be located to prevent storm and other surface drainage from entering the pool. The deck should be well above the ground level and located at a site where dirt, dust, and debris will not be carried or blown into the pool. Trees and shrubbery may enhance the appearance of a pool, but they should be located so leaves and other organic material does not fall into the water. The pool area must be enclosed with a fence or wall as described in article 4-38.

SECTION III. CONSTRUCTION AND DESIGN

4-17. Plan Submission and Review

1. The public works office is responsible for submitting construction documents through the installation CO and the preventive medicine authority for review a minimum of 60 days prior to:

a. The construction of a new aquatic venue

b. The renovation of an existing aquatic venue.

2. The preventive medicine authority will review all concept designs and final plans for construction of swimming pools and spas with regard to sanitary control and safety prior to final acceptance of the plans and authorization for construction. The preventive medicine authority will submit a final report to the submitter of plans through their chain of command within 14 days of receipt of complete plans with required information.

3. The preventive medicine authority uses the criteria in subparagraphs 3a through 3e when evaluating new or renovated aquatic venue plans:

a. Intended use;

b. Anticipated bather loads;

c. Layout, mechanical schematics, construction materials, and finish schedules;

d. Proposed equipment types, manufacturers, model numbers, locations, dimensions, performance capacities, and installation specifications;

e. Other information as required.

4. Recirculating pools, spas, and other facilities must meet American National Standards Institute (ANSI)/National Spa and Pool Institute (NSPI)/International Code Council-1 current industry standards and manufacturer's recommendations. (Note: The NSPI became the Association of Pool and Spa Professionals® (APSP®) in 2007. The ANSI/NSPI/ICC-1 standard is also known as ANSI/APSP/ICC-1. Association of Pool and Spa Professionals® and APSP® are registered trademarks of the Association of Pool and Spa Professionals Corporation, Alexandria, Virginia.)

5. DoD facilities are currently directed to comply with the Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities, and the Architectural Barriers Act (ABA) Accessibility Guidelines (69 Federal Register (FR) 44084) adopted by DoD in 2008. All new DoD aquatic facilities should comply with references (e) and (f).

6. Water park facilities must meet design and construction standards found in American Society for Testing and Materials (ASTM) F2376-117a, and F2461-16e1, current industry standards, and manufacturer recommendations.

7. Competitive swimming or diving facilities will be constructed according to requirements and applicable Federation Internationale de Natation Amateur (FINA) Facilities Rules 2017-2021 standards.

8. The creation of new recreational water features is ongoing; therefore, all such features cannot be specifically mentioned in this document. To ensure patron safety, always follow the manufacturer's specifications and guidance.

4-18. Water Supply

1. The water supply serving all swimming pools, spas, and plumbing fixtures, including drinking fountains, lavatories, toilets, and showers, must meet all Navy, Marine Corps, Federal, state, and local applicable requirements for potable water (i.e., water that is fit for human consumption). Submit requests to use alternate water sources for aquatic venues, including saline or brackish water, through the installation chain of command, including PWO and the preventive medicine authority, to NAVMCPUBHLTHCEN via the service headquarters element.

2. Cross-connections are not permitted. Protect all portions of the water distribution system serving training and recreational aquatic venues and their auxiliary facilities against backflow.

3. Water introduced to a swimming pool or spa, either directly or through the circulation system, must be supplied through one of the configurations or its equivalent, to protect the public water supply:

a. An air-gap which is two times the diameter of the water supply outlet or pipe (American Society of Mechanical Engineers (ASME®) A112.1.2). ASME® is a registered trademark of the American Society of Mechanical Engineers.

b. A pipe-applied atmospheric vacuum breaker installed at least 6 inches above the highest downstream outlet and downstream of all valves and pumps ANSI/American Society of Sanitary Engineers (ASSE) 1001.

c. A pressure type anti-siphon vacuum breaker installed at least 12 inches above the highest downstream outlet (ANSI/ASSE 1020).

d. A reduced-pressure-principle backflow preventer (ANSI/ASSE 1013; American Water Works Association ^{SM} (AWWA) C511-07). (American Water Works Association ^{SM} is a service mark of the American Water Works Association, Inc., Denver, Colorado.)

4. Whenever an over-the-rim spout is used to introduce water into a pool or spa, shield it so it does not create a hazard by locating it adjacent to a ladder or under a handrail.

5. If the pool is equipped with a diving board, locate the over-the-rim spout under the diving board.

6. The open end of the spout will:

a. Have no sharp edges.

b. Protrude no more than 2 inches (preferably not more than 1 inch) beyond the edge of the pool or spa.

c. Be located above the rim of the swimming pool at a height of at least two diameters of the fill spout or at an above-the-rim supply to the surge tank, whereby no arrangements exist which would, under any condition, permit contaminated water to re-enter the potable water system**.**

4-19. Bather Load

1. Bather loads means the maximum number of persons allowed in the water of an aquatic venue. Bather load is not the same as occupant load which refers to the maximum aquatic facility loads. The bather load is calculated by dividing the surface area in ft^2 (aquatic venue surface area) of the aquatic venue by the density factor (D) that fits the specific aquatic venue being considered (BL= aquatic venue surface area/D). The density factors are:

a. Horizontal use water (see "Flat water" in Appendix C): Density factor = 20 ft^2 per person.

b. Vertical use water (see "Agitated water" in Appendix C): Density factor = 15 ft^2 per person.

c. Spas, Hot Tubs: Density factor = 10 ft^2 per person.

2. The bather load must be determined for every aquatic venue. The building occupant load (the total number of persons that might occupy the facility or a portion thereof) is determined by the fire department that services the facility.

4-20. Materials

1. Aquatic venues must be constructed of reinforced concrete or impervious and structurally sound material(s), which provide a smooth, easily cleaned, watertight structure capable of withstanding anticipated loads for full and empty conditions as required by applicable construction standards.

2. All materials must be insert, non-toxic and resistant to corrosion, impervious, enduring, and resistant to damages related to environmental conditions of the installation region (such as freezing).

3. Aquatic venues must be finished in light colors; the material should have greater than 55 percent reflectance value. This finish will be smooth, without cracks or joints, with the exception of structural expansion joints. Tiles, if smooth, are permissible on pool sides and bottom. Earth or sand pool bottoms are not permitted.

4. All aquatic structures with depths exceeding 18 inches must have at least one hydrostatic pressure relief valve (or other hydrostatic relief system) installed.

5. A minimum 6-inch glazed, frost-proof tile or other easily cleanable surface must be placed at the normal water line.

4-21. Bottom Slopes, Sidewalls, and Safety Ledges

1. Construct the bottom slope, as illustrated in figure 4-21.1, so that it is uniform and does not exceed:

a. One foot over a distance of 12 feet for the area of the pool with a depth less than 5 feet.

b. One foot over a distance of 3 feet for the area of the pool with a depth greater than 5 feet.

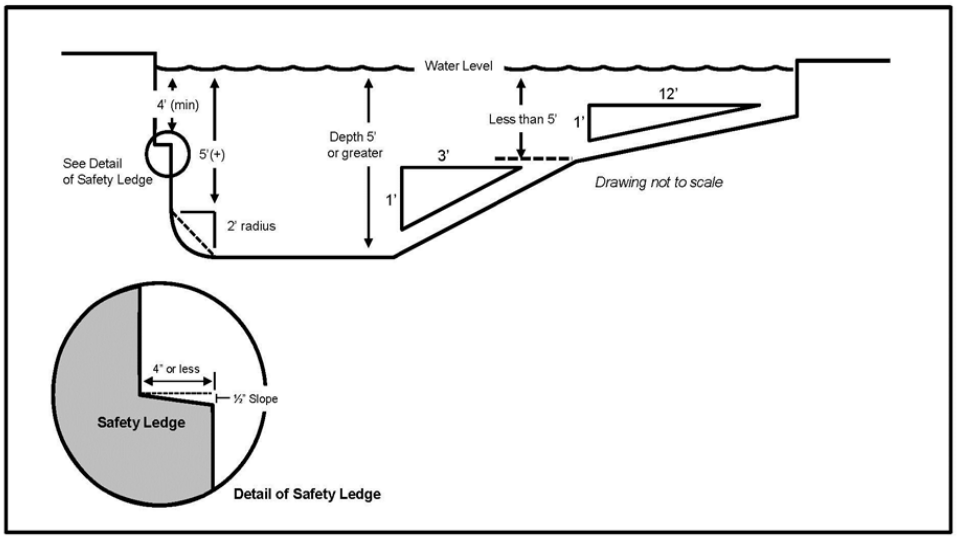

Figure 4-21.1. Profile showing bottom slope, side wall, and safety ledge dimensions

2. Construct the pool walls so that they are vertical to the depth of at least 5 feet below the water level and then curved to the bottom with a radius not greater than 2 feet. The arc of the radius will be tangent to the wall. Walls may be sloped to the bottom instead of curved, provided the sloped area does not intersect the area formed by a curve with a 2-foot radius.

3. Safety ledges, when provided on vertical walls in deep portions of the pool, will:

a. Be of a contrasting color.

b. Not be wider than 4 inches.

c. Be at least 4 feet below the water surface.

d. Slope ½ inch across the width of the ledge toward the center of the pool.

e. Are not permitted in training venues.

4-22. Steps and Ladders

1. Provide steps or ladders at the shallow end of a swimming pool. At a minimum, provide a means of exit for every 75 linear feet of pool wall. Provide ladders or recessed steps, one on each side, at the deep end of the swimming pool.

2. Ensure steps leading into pools are of a nonslip design and have a minimum tread width of 12 inches and a maximum rise of 12 inches.

3. Equip corrosion-resistant ladders with nonslip treads. Provide handholds and securely install them with a clearance of not more than 5 inches and not less than 3 inches between the ladder and pool wall.

4. If steps are inserted in the walls, or if step holes are provided, ensure that they are easily cleanable and arranged to drain into the pool to prevent the accumulation of dirt. Step holes must have a minimum width of 12 inches.

5. Where steps, step holes, or ladders are located within the pool, provide a handrail at the top of both sides extending over the edge of the deck. Handrails and ladders must be kept firmly secured to the deck and maintained in good repair. Locate steps and ladders where they will not interfere with racing lanes, if applicable. Install ladder bumpers as required.

6. Stairs must be recessed in pool areas where lap swimming or wave action occurs.

7. Ensure that the platform or diving board steps are corrosion-resistant, easily cleanable, and of a nonslip design.

8. Provide handrails at all steps and ladders leading to diving boards. Equip all platforms and diving boards with guardrails. The back and sides of each platform must be surrounded by guardrails, and 3-meter diving boards must have guardrails extending at least to the pool edge to prevent divers from falling onto the deck.

9. Additional protective measures may be necessary to prevent falls around diving boards and should be evaluated on a case-by-case basis.

4-23. Safety Line Connections. All connections for safety lines, lane markers, and similar items that attach to the structure's wall at appropriate location must be recessed in a manner that does not present a hazard to the bather.

4-24. Markings

1. Ensure markings and numerals are:

   a. A minimum of 4 inches in height.

   b. Colored to contrast with the pool sides and deck.

   c. Placed at intervals no greater than 25 feet.

   d. Plainly visible to persons in the swimming pool and on the deck.

2. Consider the effects of sunlight and glare in determining the proper position and color selection.

3. Plainly mark the water depth at or above the water surface in two places:

   a. On the vertical pool wall.

   b. At the edge of the deck next to the pool. If depth markers cannot be placed on the vertical walls of the pool above the water level, use other means of display such as signs on the walls. Also mark points of maximum and minimum depth, points of break between deep and shallow portions, and intermediate increments of water depth at increments of no more than 2 feet.

4. In areas where the water is less than 5 feet deep, place a caution sign prohibiting diving on the adjacent horizontal surface or pool deck (coping) and in other appropriate places.

5. All signs, except those on the adjacent horizontal surface or coping, should have letters of at least 4 inches in height that are colored to contrast with the background.

6. Children's activity pools that are part of a larger pool must be clearly distinguished from pool areas with water depths greater than 24 inches. Distinguishing markings must include a dark, nonslip tile transition line of high-contrasting color located on the bottom of the pool and extending along the entire 2-foot water depth contour. The minimum width of the transition line must be 2 inches.

7. According to recommendations from USA Swimming, at training and recreational aquatic venues, flush, non-slip targets shaped as a "T" or a cross and having the same width as lane bottom markers must be provided in the center of each lane on the end wall of the course. Targets must extend at least 3 feet 4 inches (1.0 meter) below the level of the water surface. It is recommended that the top edge of the deck be of a contrasting color to provide a visual target above water at the end of the course.

4-25. Accessible Means of Entry. Swimming pools, spas, catch pools, wading pools, and specialty pools where user access is limited to one area, such as wave action pools and lazy rivers, must meet ADA requirements. All pool lifts must be certified, listed and labeled per

UL60335-2-1000, and be installed and used per the manufacturer's installation instructions and ICC/ANSI A117.1. Each body of water must have at least two accessible means of entry, one must be a pool lift.

4-26. Decks and Adjacent Areas

1. Construct the pool deck per the requirements of reference (f), part 4.8, *Decks and Equipment*.

2. Ensure the surface of the paved walk or deck is a nonslip surface, is kept clean and free of puddles, and does not drain into the swimming pool or the overflow gutter. To prevent muddy, hazardous, or objectionable conditions, direct the drainage away from the pool area. If deck drains are provided, they will:

a. Have an inlet opening of at least 4 inches in diameter.

b. Be spaced and arranged so that not more than 100 square feet of area is tributary to each drain.

c. Not be spaced more than 25 feet apart.

3. Completely fence the swimming pool area as required in article 4-38 of this chapter, so that the only entrance and non-emergency exit to the pool are made via the bathhouse.

4. At outdoor pools, fence off the unpaved areas accessible to swimmers, and install a shower for swimmers to use prior to their reentry to the paved area of the pool.

5. Cracks in the pool decks will be repaired when determined to be a potential cause of leakage, a safety or tripping hazard, or a hygiene hazard.

4-27. Diving Boards and Area

1. Diving equipment should be kept firmly secured to the deck and maintained in good repair. For stability under the greatest possible load, install diving platforms, jump stands, and springboard supports that are rigidly constructed and properly anchored. These areas must also have a nonslip surface.

2. When instructional or supervised diving is not in progress, the diving board fulcrum should stay in the forward position, with the area roped off and signs posted prohibiting patron use.

3. Pools with diving equipment of 3 meters (9.84 feet) or greater in height, or pools designed for springboard or platform diving, will comply with the dimensional design requirements of the FINA Facilities Rules 2017-2021 or the appropriate sanctioning body.

4. Diving equipment at pools intended for public recreational swimming (that is, pools not intended for use in competitive aquatic events) must be installed per the FINA Facility Rules 2017-2021.

5. The use of starting blocks is prohibited except during competitive swimming or swimmer-related activities. Starting blocks should be equipped with protective equipment designed to prevent access, such as roping off the area around the blocks and posting signs prohibiting their use in non-competition activities. When the starting blocks are removed, the anchor sockets must be capped. Starting blocks:

a. Will be firmly secured when in use.

b. Will have nonslip top surfaces.

c. Will be installed at a water depth of 4 feet or greater.

6. Standard diving "spring" boards are 10 to 16 feet (3.0 to 4.9 cm) long and 20 inches (50.9 cm) wide. The standard distance for mounting the board is 3 feet 4 inches (1 m) or 9 feet 10 inches (3 m) above the water. Diving boards should be of aluminum or fiberglass construction with a nonslip surface. All diving boards should be well anchored to the deck and should be installed with a lockable fulcrum adjustable over a distance of 10 to 12 inches (25 to 31 cm). The front end of the board must be at least 5 feet (1.5 m) beyond the pool wall for 14- foot (4.3 m) boards, and 6 feet (1.8 m) for 16- foot (4.9 m) boards.

7. Indoor pools must be provided with at least 16 feet (5 m) of head room above the highest diving board.

8. The distance from the center line of diving boards to the pool side walls should be at least 10 feet (3.0 m) and 8.83 feet (2.69 m) clearance between diving boards.

9. The water depth adjacent to diving boards must conform to the safety standards in table 4-27.1:

Elevation of diving board above water	Minimum depth of water under end of board	Minimum length of the diving well
1.6 feet (0.5 m)	9.5 feet (2.9 m)	26 feet (7.92 m)
3.3 feet (1.0 m)	12 feet (3.7 m)	29.58 feet (9.02 m)
9.8 feet (3.0 m)	12.5 feet (3.8 m)	33.67 feet (10.26 m)

Table 4-27.1. Water Depth Standards for Diving Board Safety

4-28. Swimming Pool Slides and Flumes

1. Swimming pool slides (non-flume slides), which are similar in construction to playground slides, allow users to slide into a pool from an elevated height. They will be designed and constructed per Consumer Product Safety Act (sections 2051–2089 of Title 15 U.S. Code) (Public Law 92-573; 86 Stat. 1207, October 27, 1972), ASTM, and manufacturer specifications.

2. All slides will be installed and used per the manufacturer’s instructions.

3. The terminus end of the slide will be protected through the use of a float line, wing wall, or other similar impediment to prevent collisions with pool patrons.

4. Slides will be kept firmly secured to the deck and maintained in good repair.

5. Entry access points will be controlled such that unauthorized entrance is not permitted.

6. The use of pool slides will be monitored for safe operation and proper maintenance. Appendix D provides suggested rules specific to the use of pool slides.

7. Slides will be monitored and inspected per manufacturer specifications. Inspection and maintenance checklists must be kept onsite. Questions concerning the proper maintenance of pool slides should be directed to the manufacturer.

8. Flume slides are slides of various configurations that are characterized by deep riding channels, vertical and lateral curves, and high water flows; they can accommodate patrons using mats, tubes, rafts, and other water transport vehicles. Flume slides must comply with provisions of the reference (f), section 4.12.2, "Water Slides and Landing Pools."

9. Some slides and flumes have their own suction and wall covers to pump water to the top of the slide or flume. These covers and mechanisms must comply with the Virginia Graeme Baker Pool and Spa Safety Act, hereinafter referred to as the VGB Act (15 U.S.C. 8001) (see paragraph 5-4).

Figure 4-28.1. Flume Slide at aquatic facility

4-29. Military Training Platforms

1. Platforms used only for military training, e.g., abandon ship drills, etc., must be rigidly constructed, have non-slip surfaces, and be properly anchored to ensure stability. Such platforms must have a minimum of 15 feet of unobstructed headroom. Platforms must have a separation of 10 ft. (3.1 m) horizontally between itself and other platforms and side walls. The maximum safe elevation of platforms above the surface of the water in relation to the depth of the water is:

Height of Platform		Minimum water depth at end of platform		Minimum pool width at end of platform	
Feet	**Meters**	**Feet**	**Meters**	**Feet**	**Meters**
0 - 6	**0 -1.8**	**9**	**2.7**	**20**	**6**
6 – 10	**1.8 – 3**	**12**	**3.7**	**30**	**9.1**
More than 10	**3**	**12.5**	**3.8**	**30**	**9.1**

Table 4-29.1. Water Depth Standards for Military Training Platforms

2. All new construction will meet these requirements. All platforms must be clearly marked: "**NOT FOR RECREATIONAL USE**." Areas must be made inaccessible to recreational users. Entry to water from all platforms must be feet first. All operations will be under adequate supervision.

Note: Existing platforms that do not meet the requirements of table 4-29.1 above may be issued a waiver. Request a waiver through the preventive medicine authority to BUMED, via NAVMCPUBHLTHCEN, and services higher headquarters, providing pool dimensions, exact usage, and mishap history of pool.

4-30. Dressing Rooms

1. Aquatic facilities will provide separate dressing rooms for men and women. Dressing rooms should be located where they are easily accessible to the pool deck and check-in area. Dressing rooms should not lead to the pool deck in areas where the water depth is greater than 5 feet.

2. Dressing rooms should be designed and equipped as stated:

a. Floors that slope approximately ¼ inch per foot toward the deck drains.

b. Walls and partitions of smooth, impervious materials with no open cracks or joints. Walls and partitions made of wood or similar materials should be painted.

c. Partitions between dressing compartments should be either raised above the floor or placed on continuous raised masonry or concrete bases.

d. Well-ventilated lockers, if provided, located above the floor.

e. Furniture that is water resistant and easily cleaned.

f. A family changing room.

4-31. Showers

1. Each dressing room should be equipped with showers for customer personal hygiene use before and after swimming.

2. For design or renovation purposes, provide one shower head for every 40 persons of each gender, based on the maximum occupant load. Provide a minimum of two shower heads for each gender. Supply all showers with hot water and provide adequate amounts of soap in hand-operated dispensers. Shower valves and fixtures should prevent scalding; the maximum water temperature will not exceed 110 °F.

3. The showers at all pools constructed after 1993 must be located such that patrons must pass through the showers en-route from the bathhouse and toilets to the swimming pool.

4. Shower floors must be constructed of impervious nonslip material that is sloped at three-eighths of an inch per foot towards the drain.

5. Showers should be constructed with partitions for individual use.

4-32. Toilet Facilities

1. Toilets should be available for swimming customers in or near each respective dressing room area. Refer to UFC 3-420-01 and state and local codes for the quantity of toilets and urinals required per the overall size of each facility.

2. Public toilets for visitors should be available near the lobby and should be readily accessible to spectator viewing areas.

3. Accessible male and female restrooms should be available per ABA and ADA guidelines.

4-33. Footbaths. Footbaths are prohibited at Navy and Marine Corps training and recreational aquatic venues.

4-34. Utilities

1. Heating

a. Suggested temperatures for temperatures for training and recreational aquatic venues are an overall range of 75 to 90° F (24 to 32° C), with an ideal range of 78 to 86° F (25.5 to 30° C). Different uses may require different temperatures (such as instruction versus lap swimming).

b. Blowing steam directly into the pool or placing heating coils in the pool is prohibited.

c. Use a thermostatically-controlled heater designed to warm all or part of the recirculating water. Place one fixed thermometer in the recirculation line at the heater outlet and another near the pool outlet.

d. In pools designated for physical therapy use only, the water temperature may be maintained between 90 and 96 °F (32 and 35 °C) for patient comfort.

e. The potential for hypothermia increases as the temperature decreases. In pools without a means of temperature regulation (that is, outdoor pools), limit training and recreational swimming to a maximum of 25 minutes per hour when water is less than or equal to 75 °F (24° C). Discretion is left to pool operators in consultation with the medical authority regarding closure of pool facilities when concerns regarding hypothermia arise. Pool operators should consider wind chill and any other pertinent factors in addition to the ambient air temperature when considering hypothermia concerns.

f. Water temperatures in spas must not exceed 104 °F (40 °C). Temperature controls for hot water facilities must be locked or otherwise made inaccessible to users.

(1) Limit patrons to 15-minute exposures at 104 °F (40 °C).

(2) A directly accessible timer switch that automatically shuts off the hydrotherapy jets and air blowers must be located adjacent to the spa. The maximum amount of time allotted on the timer must not exceed 15 minutes, and the timer switch must not be accessible from within the spa.

(3) There is evidence that exposure to elevated temperatures of a spa or hot tub can have a damaging effect on the developing fetus. Pregnant women should not use spas or hot tubs; a sign must be posted at the spa or hot tub to warn pregnant women of this potential hazard.

(4) Alcoholic beverages are not allowed to be consumed before or during spa use. Appendix D contains additional rules for spa use.

2. Heating, Ventilation, and Air Conditioning (HVAC)

a. Aquatic facility building ventilation systems must be designed, constructed, and installed to protect the health of the building's occupants. The ventilation systems must be maintained and operated in compliance with all requirements of the original system design, construction, and installation.

b. PWO in tandem with the program manager who operates the indoor aquatic venue must develop and implement a ventilation system program of standing operating, maintenance, testing, and inspection procedures which provide detailed instructions, identify necessary equipment and supplies, and establish oversight for those performing these duties, per the aquatic facility ventilation system design engineers' or ventilation system manufacturer's recommendations.

c. PWO in tandem with the program manager who operates the indoor aquatic venue must monitor, log, and maintain ventilation system set-points and other operational parameters as specified by the aquatic facility ventilation system design engineer or the ventilation system manufacturer.

d. PWO in tandem with the program manager who operates the indoor aquatic venue must implement a ventilation system cleaning program to remove contaminants within the equipment per the aquatic facility ventilation system design engineers' or the ventilation system manufacturer's recommendations.

e. PWO in tandem with the program manager who operates the indoor aquatic venue must retain the ventilation system design engineer's original operating manuals and commissioning reports, any updates or modification specifications.

f. Ventilation rates at all indoor aquatic facilities must be per American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE, Inc.) Standard 62.1 (ANSI/ASHRAE Standard 62.1). The standard requires 0.48 cfm (cubic feet per minute) of outdoor air per square foot on pool and deck area (2.4 liters per second per square meter).

g. HVAC system serving the pool area must include a purge mode to quickly replace indoor air with outdoor air after chemical treatment process of super-chlorination of the pool as recommended by the reference (f); system must be designed with the capability to provide a minimum of 50 percent outside air during this operation.

h. Dressing rooms, toilet rooms, and shower rooms must be ventilated by natural or artificial means to prevent odors and to dry floors, walkways, benches, and other areas that become wet. A minimum ventilation rate of 0.5 cubic feet per minute per square foot (cfm/sq . ft.) is suggested to achieve proper ventilation.

i. Indoor pools must be ventilated to prevent the accumulation of moisture and condensation on cold surfaces. Sufficient ventilation will be provided to dry floors, decks, and other surfaces in less than 90 minutes.

(1) Relative humidity levels should be maintained between 40 percent and 60 percent.

(2) Fluctuations in relative humidity outside the 40 percent to 60 percent range can increase levels of bacteria, viruses, fungi and other factors that reduce indoor air quality.

(3) High relative humidity levels are destructive to building components.

j. The ventilation system design for chemical storage rooms must conform to the International Mechanical Code®, International Fire Code® and any applicable local codes. (International Mechanical Code® and International Fire Code® are registered trademarks of the International Code Council®, Washington, D.C.)

(1) Space must be kept at a negative pressure with dedicated exhaust air system meeting the requirements of reference (f).

(2) Exhaust air intakes within 6-inches (.03 meters) of the floor to capture chemical fumes heavier than air.

(3) Minimum flow rate should be the greater of 1.5 cfm per square foot or 10 air changes per hour, unless the SDS or manufacturer of the chemicals being stored requires a higher rate.

k. Indoor air temperature at the pool and wet deck should be maintained 2° to 4° F (-16.7° to -15.6° C) above the water temperature.

3. Lighting

a. Illumination standards for bathhouses and other interior pool facilities are provided in UFC 34-750-07F. Illumination for exterior swimming pool facilities must be provided based on standards of the Illuminating Engineering Society's current recommended practice for sports lighting.

b. Outdoor pool area floodlights must be located outside the deck of the pool to prevent light-attracted insects from dropping into the pool.

c. Underwater lights must allow an observer on the pool deck to clearly see all portions of the pool, including the bottom.

d. Adequate emergency lighting must be provided at pools where night swimming is allowed and at indoor pools where no natural light is present or where natural, daytime illumination is inadequate or presents a safety hazard.

e. Windows and lighting equipment must be adjusted to prevent glare and excessive reflection on the pool surface.

4. Electrical

a. Construct and install all electrical wiring and equipment to meet or exceed the most current requirements of the National Fire Protection Association (NFPA®) NFPA 70® standard (the National Electrical Code® (NEC®)), Article 680; NFPA 70E®, Standard for Electrical Safety in the Workplace. (NFPA®, NFPA 70®, and NEC® are registered trademarks of the National Fire Protection Association, Quincy, Massachusetts.)

b. The installation of ground-fault circuit interrupters (GFCI), where required, is critical to the safety of personnel at all pool facilities.

(1) Equip all electrical circuits located within 6 feet of a pool, wading pool, spray pool, or spa with GFCIs that conform to NFPA 70, Article 680.

(2) Equip bathhouses with GFCIs.

c. Overhead electrical wiring may not pass horizontally within 20 feet of the pool.

d. Portable electrical devices (such as announcing systems and radios) are prohibited within the reach of bathers.

e. All pumps, filters, and other mechanical and electrical equipment must be enclosed in such a manner as to be accessible to authorized persons only.

4-35. Spectator Areas. Ensure the spectator area does not overhang and is not located closer than 10 feet from the edge of the pool. This distance minimizes the possibility of spectators dropping food or other items into the pool.

4-36. Concession Areas

1. Concession areas may be designated at training and recreational aquatic venues. It is important to recognize that concession areas may present a problem in terms of sanitary control.

a. At pools, separate the concession area from decks and pool walkways.

b. Maintain concession areas in a sanitary manner by:

(1) Prohibiting glass in the area.

(2) Requiring patrons to dispose of trash (such as cans or wrappers) in the concession area prior to returning to the deck or pool area.

(3) Providing covered trash receptacles and ensuring they are emptied frequently.

c. All food service sanitary requirements pertaining to these facilities will apply per reference (g).

4-37. Landscaping

1. Design the area around outdoor training and recreational aquatic venues to prevent surface drainage from entering the facility.

2. Minimize the amount of dirt, dust, and debris carried or blown into the facility by ensuring the top of the facility is placed well above the surrounding ground level.

3. Do not plant trees and shrubbery in locations where leaves and blossoms can fall into the facility.

4-38. Fencing and Enclosures

1. Provide barriers to prevent drowning, near-drowning injuries, and the unauthorized use of aquatic venues. Fences and similar enclosures are effective in preventing these deaths and injuries, particularly among children.

2. Barriers must be constructed per the state or local building code, the references (e) and (f), or ASTM F1908-08, *Standard Guide for Fences for Residential Outdoor Swimming Pools, Hot Tubs and Spas*, as outlined in *Safety Barrier Guidelines for Residential Pools*, published in The Consumer Product Safety Commission (CPSC) publication number 362. The guidelines contained in CPSC publication 362 are considered minimum guidelines, not intended to supersede local codes or ordinances of a more restrictive nature.

3. Enclosures must be constructed in such a manner as to discourage climbing. Horizontal mid-rails are not permissible. Where a chain-link fence is provided, ensure the openings between links do not exceed 1¼ inch, or provide slats on the fence so the openings do not exceed 1¼ inch.

a. The top of the barrier should be at least 6 feet (1.8 m) above grade, measured on the side of the barrier that faces away from the pool. Barriers that are 8 feet (2.4 m) above grade or higher are preferred. The maximum clearance between grade and the bottom of the barrier is 4 inches (102 mm), unless the grade is a soft surface such as grass, in which case, it should be no more than 2 inches (51 mm) above grade.

b. Openings in the barrier (i.e. spacing between vertical members) should not allow passage of a 4-inch (10 cm) diameter sphere or disk (which is the approximate size of a child's head).

c. Barriers should not have any openings, external footholds or handholds, indentations or protrusions or horizontal members that would make it easy to climb.

4. Design or construct access gates to be:

a. Equal in height, at top and bottom, to the barrier of which they are a component.

b. Self-closing and self-latching from any open position.

(1) There should be no opening of greater than ½-inch (13 mm) within 18-inches (457 mm) of the latch mechanism.

(2) The release mechanism should be located on the pool side of the gate at least 3-inches (76 mm) below the top of the gate.

c. Installed to open outward, that is, away from the pool or spa.

d. Equipped to accommodate a lock.

5. When the pool is not supervised, the gate or door must be locked, and access to the pool must be prevented.

6. Propping open gates or doors is prohibited except in an emergency.

7. Construct all barriers around pools or spas so there are no footholds or other physical characteristics that would enable a child to climb over the barrier. Masonry and stone barriers may not contain indentions or protrusions except for normal construction tolerances.

8. When a wading pool is located adjacent to a pool:

a. Provide a toddler-proof barrier, such as a fence with a gate, to separate the two pools.

b. Design the wading pool fence to conform to the same fence requirements as those stated in the paragraphs above; however, the height of the fence may be reduced to no less than 48 inches (1.2 m) when located within the same fenced enclosure.

c. Equip fence gates or doors with self-closing and positive self-latching closure mechanisms and permanent locking devices.

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SECTION IV. DISINFECTION

4-39. Disinfection

1. Disinfection is accomplished when the transmission of infections between persons or from the water is kept to a minimum and algae and other nuisance organisms are controlled. Disinfection is the process of destroying microorganisms that might cause human disease.

2. Many factors affect the disinfection process in swimming pools and spas: the pH of the water, temperature, environmental wastes, and user contamination. As the level of waste and contamination increases, the proper level of disinfection becomes harder to maintain. Automation of pH levels and chlorine increases effectiveness and makes maintaining water balance and quality easier.

3. The term disinfectant is sometimes called sanitizer, while disinfection is called sanitization. In this chapter, the term disinfectant will be used. In some cases, water is referred to as sanitary, which would be a condition achieved by proper use of a disinfectant. Disinfectants eliminate nearly all pathogens. Sanitary water is free of almost all pathogens.

4-40. Types of Disinfectants

1. Although a number of disinfectants are available for the treatment of pool water, including chlorine, bromine, ozone, and others, chlorine and chlorine compounds are used most frequently due to their availability, high degree of effectiveness, ease of measuring residuals, relative ease of handling, and economy.

2. The disinfectants react with and kill or inactivate microorganisms and contaminants in the pool water. Besides the ability to kill pathogens and oxidize contaminants, a disinfectant must also maintain a concentration (residual) in the water for an extended period of time to account for additional pathogens or contaminants brought into the water by bathers or from the environment.

3. If the use of alternate disinfectant (that is, other than Chlorine or a Chlorine compound or bromine) is desired, requests for its approval must be submitted to the installation CO, as described in article 4-18.1. of this chapter. If an alternate disinfectant is to be used only as supplemental oxidation, installation CO approval is not required.

a. Requests for approval of alternate disinfectants are necessary due to the possibility of toxic effects occurring and because of the variations in their application and testing procedures. Consider these factors with regard to equipment and manpower capabilities.

b. The use of alternative disinfectants will be evaluated on a case-by-case basis.

4. There are two classes of chlorine-based disinfectants: unstabilized and stabilized. These chlorine-based disinfectants release hypochlorous acid (HOCl) and hypochlorite ions (OCl-) when dissolved in water. The combination of these two chemicals is measured in water as “free chlorine.”

a. Unstabilized chlorinating agents include sodium hypochlorite (liquid), calcium hypochlorite (solid), pure chlorine (gas), and lithium hypochlorite (solid).

b. Stabilized chlorine includes two solid chemical options that are often called isocyanurates. The two most common chemicals are trichloro-s-triazinetrione (Trichlor) or dichlor-s-triazinetrione (Dichlor). These chemicals are called "stabilized" because as they dissolve and release free chlorine into the water, they also release cyanuric acid. Cyanuric acid is called a stabilizer because it helps protect free chlorine from being degraded by sunlight. Cyanuric acid is covered further in article 4-45 of this chapter.

4-41. Disinfection of Aquatic Facility Water

1. Disinfect aquatic venue water by maintaining a bactericidal concentration of a residual disinfectant, such as chlorine, throughout the facility.

2. Essential equipment required for disinfection includes:

a. Pump(s)

b. A disinfection unit

c. An outlet system to bring water from the pool for disinfection

d. An inlet system to distribute the disinfected water uniformly throughout the pool.

3. Disinfection system components will be National Sanitation Foundation (NSF®) – certified. (NSF® is a registered trademark of NSF International, Ann Arbor, Michigan.)

a. NSF International is an independent testing agency that maintains a searchable listing of pool and spa equipment approved under NSF/ANSI Standard 50. The listing of NSF-certified equipment is available at https://www.nsf.org/certified-products-systems.

b. The NSF International mark affixed to the equipment indicates compliance with the standards of the organization.

4. At all new or substantially renovated aquatic venues, the introduction of disinfectant and pH control chemicals should be accomplished, monitored and controlled automatically via chemical feed equipment and automated controllers that are certified, listed and labeled to NSF/ANSI 50. The installation and use of chemical feeders must conform as stated:

a. Disinfectant residual levels and pH are monitored and controlled automatically by suitable devices measuring the oxidation reduction potential (ORP).

b. A continuous and effective residual of disinfectant within the water is provided 24 hours a day.

c. The design feed rate provides effective disinfection levels during peak demand conditions.

d. The feeder is capable of applying a dose equivalent capable of maintaining a concentration of at least one milligram per liter (mg/L) of free available chlorine (FAC) throughout the water during pool operating hours.

e. Chemical feed and control systems are installed and maintained per the manufacturer's specifications.

f. Chemical feed systems are designed so they cannot operate unless there is return flow to properly disburse the chemical throughout the pool. Systems are installed with direct wiring to the recirculation pumps to halt chemical addition with the recirculation flow stops.

g. The method of chemical addition must protect swimmers from contact with concentrated chemicals and must provide adequate distribution of the chemical throughout the pool.

h. Optimum disinfectant concentrations:

(1) Provide rapid destruction of all potential pathogenic microorganisms (such as bacteria, cysts, fungi, viruses, protozoa).

(2) Control algae

(3) Provide continual oxidation of organic impurities and ammonia nitrogen fractions.

(4) Do not cause eye irritation.

(5) Are maintained at an adequate, measurable residual to ensure continuing disinfection and algae control in the pool.

(6) Reduce the danger of disinfection byproducts (DBP) and chemical off-gassing.

i. Hand feeding of chemicals is not permitted during hours of operation or 30 minutes prior to opening.

5. Treatment chemicals must be certified, listed and labeled to either NSF/ANSI Standard 50 or NSF/ANSI Standard 60. Only chlorine products that are EPA-registered for use as sanitizers or disinfectants in aquatic venues or spas in the United States are permitted.

4-42. Oxidation Reduction Potential

1. All automated feed systems must have an ORP sensor to ensure proper balance is maintained and chemicals are not added unnecessarily.

2. The ORP measures the effectiveness of the disinfectant as an oxidizer. An increase in the concentration of oxidizers results in an increase in the ORP reading.

3. The ORP must be maintained within proper ranges with a minimum reading no less than 650 millivolts.

a. Measurements of the ORP must be taken in conjunction with routine monitoring of the FAC residual.

b. A drop in ORP readings may indicate that a corresponding drop in the disinfectant residual or a significant increase in pH has occurred.

c. pH and disinfectant residuals are continuously analyzed and controlled in pools. Disinfection residuals may be maintained at a higher level (up to 8 ppm or mg/L) to maintain proper ORP levels.

d. pH and disinfectant residuals are continuously analyzed and controlled in spas. Disinfection residuals may be maintained at a higher level (up to 10 ppm or mg/L) to maintain proper ORP levels.

4. Oxidation reduction potential systems have two probes, one for chlorine and one for pH.

a. The control unit uses readings from the probes to operate chemical feeder pumps, which maintain chlorine and pH within acceptable limits.

b. Probes are installed in the pressure line, or water may be diverted to the probes from the pressure line. The probe must be installed at a point prior to chemical injection.

5. The electrodes in the flow cell need to be cleaned and calibrated regularly in order for the controller to operate properly. Follow the directions in the owner's manual. Some ORP units may be monitored remotely; they alert the pool operator to make a service call when needed. If the controller does not alert operators remotely (such as an alarm sounding in the pump room or a notification sent to the operator's station), the PWO must keep a log of cleaning and calibration to ensure the manufacturer's recommendations are followed.

6. PWO must record the ORP levels when they record the disinfectant and pH levels.

4-43. Disinfection Using Chlorine

PUBLIC HEALTH HAZARD
The preventive medicine authority should verify that only approved chemicals are being used and that they are being handled and stored per the Safety Data Sheets (SDS) and all safety requirements.

1. A number of factors affect the bactericidal action of chlorine in swimming pool water. Among these are the pH of the water and the FAC residual.

a. When chlorine is added to water, hypochlorous acid (HOCl) and hypochlorite ions are produced. Hypochlorous acid is the compound that kills or inactivates pathogens and algae and oxidizes bather wastes. The pH of the water is an extremely important factor in determining the effectiveness of the HOCl (table 4-43.1). In general, as the pH rises, the HOCl becomes less effective. It is also important to note that the mucous membranes of the eyes, nose, and throat are least affected when the pH is 7.4.

b. Additional information on chlorine chemistry may be found in the National Swimming Pool Foundation® Pool and Spa Operator™ Handbook, Chapter 5, Disinfection.

pH	% Active HOCl
6.0	97
6.5	91
7.0	76
7.2	66
7.5	50
7.8	33
8.0	24

Table 4-43.1. Relative Concentration of HOCl at 86 degrees Fahrenheit (°F)

2. The minimum allowable FAC for aquatic venues is 1 mg/L (pools) and 3 mg/L (spas). When cyanuric acid is used in pools, the minimum allowable FAC must be 2 mg/L. Appendix E provides additional details for proper pool chemistry.

3. For those facilities using elemental chlorine in the compressed gaseous form:

a. The chlorinator must have an emergency cut-off device to prevent a gas discharge or an injection of gas during an electrical outage. A gas chlorine detection device with an alarm must also be provided.

b. The guidance provided in the National Swimming Pool Foundation® Pool and Spa Operator™ Handbook on safety precautions for chlorination facilities should be followed.

4. Due to safety and security concerns, gas chlorination may not be installed in facilities newly constructed or substantially renovated after 2013. Facilities constructed prior to 2013 that are equipped with gas chlorination should be converted to an alternate form of chlorination at the earliest opportunity possible.

5. When chlorine is added to water containing nitrogenous substances (such as ammonia, urine, and perspiration), the chlorine may combine with these substances to form chloramines. Chloramines are only 1/50 to 1/100 as effective as FAC. Figure 4-43.1 illustrates basic pool chlorine chemistry.

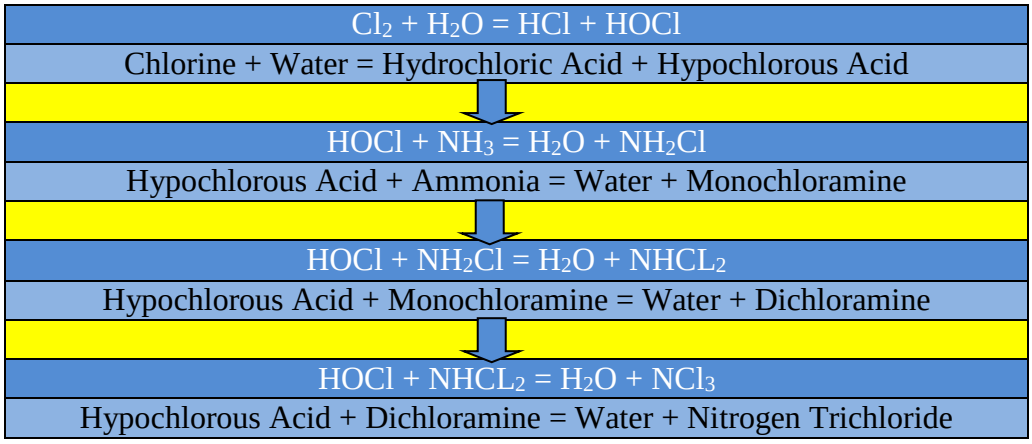

Figure 4-43.1. Basic Pool Chlorine Chemistry

6. The source water supplies (i.e. water that is fit for human consumption) at some Navy and Marine Corps installations may be disinfected with chloramines. A portion of the chloramines will be consumed by the routine addition of free chlorine. However, a certain level of the chloramines may remain in the pool water. A chloramine level above 0.4 mg/L can result in odors and eye irritation and should be avoided. The chloramine level, also referred to as combined available chlorine (CAC), is calculated by subtracting the FAC from the total available chlorine (TAC) in the water; figure 4-43.2 provides an example. Practicing breakpoint chlorination, that is, raising the FAC level to 10 times the measured chloramine level, will eliminate chloramines. This procedure may be used at all pools, spas, and aquatic play features where the chloramine level exceeds 0.4 mg/L. Breakpoint chlorination should be continuously maintained to eliminate the formation of chloramines.

FORMULA
TAC (mg/L) – **FAC** (mg/L) = **CAC** (mg/L)
CAC (mg/L) x **10** = FAC necessary to reach breakpoint
EXAMPLE
2 mg/L – 1.5 mg/L = 0.5 mg/L
CAC above 0.4 mg/L must be eliminated/reduced
0.5 mg/L x 10 = 5 mg/L
FAC must be raised to 5 mg/L to reach breakpoint
*mg/L is a unit of measure equal to ppm

Figure 4-43.2. Breakpoint Chlorination Example

7. Breakpoint chlorination should be implemented outside of normal pool operating hours due to the potential for respiratory irritation from gasses released during the process.

8. When breakpoint chlorination is achieved, the large amount of chlorine added to the pool water should be used up in the process. Free chlorine levels will return to normal operating levels, and chloramines will be eliminated. Pool staff must verify that the free chlorine is at the appropriate level before allowing swimmers into the pool.

9. Alternate technologies, such as granular activated carbon filters or ultraviolet (UV) light, may be used to reduce chloramine levels. The pool or spa must continue to meet all applicable water

quality standards (such as chlorine residual) when alternate chloramine reduction technologies are utilized.

4-44. Electrolytic Chlorine Generators

1. Electrolytic chlorine generators are often referred to as “salt water pools.” The four components of an electrolytic chlorine generators are the power supply, the electrolytic cell, a flow-protection device, and sodium chloride (salt), which is dissolved in the pool water. Salt is added to the water and passed through an electrolytic cell, producing chlorine gas, sodium hydroxide, and hydrogen gas.

2. Salt is added to the pool or spa at a concentration of 3,000 mg/L, which is approximately 7 percent of the salt level in sea water. During the electrolytic process, the salt continuously recycles itself so it is only necessary to add more salt approximately twice a year to replace the loss from bather carry-off, splash-outs, overflows, and filter backwashing maintenance. However, salt may be required more often based on different factors to include environmental influence and usage.

3. The electrolytic chlorine generators s can reduce the quantity of chemicals required to be maintained onsite. However, an additional cost is incurred from continuously running the electrodes at several hundred watts whenever the pool pump is on. Pumps are required to operate 24 hours a day, unless the facility has been winterized or is closed for an extended period of time.

4. Since pools using onsite chlorine generators are generally no different from conventionally chlorinated pools, the required disinfectant residuals and chemical testing are the same for both. However, the chloride levels of electrolytic chlorine generators -equipped pools must be monitored to determine if additional salt should be added. Salt levels must be checked at least weekly or more frequently, per manufacturer instructions.

5. Maintenance of an electrolytic chlorine generators will include cleaning the electrode plates per manufacturer specifications and periodically replacing them (the frequency depends on the water quality).

4-45. Cyanuric Acid

1. Because chlorine residuals are depleted very quickly in the presence of sunlight, it is difficult to maintain proper levels of disinfectant in outdoor pools. Cyanuric acid may be added to swimming pools to stabilize the chlorine residual or may be added in the form of chlorine that is already stabilized: dichloroisocyanuric acid (“dichlor”) or trichloroisocyanuric acid (“trichlor”).

2. The use of cyanuric acid has been found to reduce the effectiveness of HOCl as a disinfectant. Although this drop in effectiveness is not apparent in FAC monitoring, it is apparent in ORP readings. The ORP will drop as the cyanuric acid levels in the pool increase.

3. When cyanuric acid is used in pools, a minimum chlorine residual of 2 mg/L is required.

4. Ideally, a cyanuric acid concentration of 30 mg/L should be maintained to stabilize the FAC against the destructive action of sunlight; concentrations must never be greater than or equal to 90 mg/L.

5. Cyanuric acid or stabilized chlorines may not be used in spas or indoor pools.

4-46. Disinfection Using Bromine

1. Bromine belongs to the same chemical family as chlorine; they are both halogens. It is a disinfectant, has good algicidal properties and is an oxidizer. Unlike chlorine, which is a gas, elemental bromine (Br_2) is a heavy reddish-brown liquid.

2. Bromine is effective for disinfection of indoor pools and spas that are not exposed to direct sunlight. Bromine is rapidly displaced when exposed to sunlight and is ineffective for use at outdoor training and recreational aquatic venues.

3. When bromine is used as a disinfectant:

a. Feed the bromine continuously

b. Maintain a concentration of at least 3 mg/L bromine residual throughout the pool water at all times. The bromine residual must not exceed 8 mg/L at any time during pool use.

c. Maintain a concentration of at least 4 mg/L bromine residual in spas.

d. Use solid-stick or tablet-type bromine and NSF-certified feed equipment. A listing of NSF-certified equipment is available at the NSF International Web site: https://www.nsf.org/certified-products-systems.

e. Do not use bromine in conjunction with ozone or cyanuric acid.

4-47. Ozone Disinfection

1. Ozone is a gaseous molecule with three oxygen atoms and is slightly soluble in water. Ozone is a powerful oxidizer and disinfectant that can effectively inactivate bacteria, viruses, and chlorine-resistant protozoa such as *Cryptosporidium* and *Giardia*. An added benefit of ozone use is that it aids in the destruction of chloramines.

2. Ozone may only be used as a supplemental oxidizer since it does not provide a lasting residual in the water. Therefore, a chlorine-based disinfectant is still required.

3. Ozone must be properly applied per manufacturer specifications. At low concentrations, ozone is an irritant to swimmers, and it becomes toxic at higher concentrations. It is heavier than air and presents a risk of becoming concentrated at the surface of the water.

4. The Occupational Safety and Health Administration (OSHA) limit for ozone is a maximum of 0.1 mg/L in an 8-hour exposure. To ensure this limit is not exceeded, ozone systems are designed to apply the ozone in the recirculation system at a point before the circulation water is returned to the pool.

5. Ozone systems must be installed and used according to NSF/ANSI Standard 50.

4-48. Ultraviolet Disinfection

1. Ultraviolet light (UV) is a high-energy, low-wavelength light that provides a non-chemical method to disinfect water.

2. New studies suggest UV treatment devices can reduce chloramine levels as well as effectively inactivate pathogens (including *Cryptosporidium*). Unlike chemical disinfectants, UV inactivates pathogens with high energy. If the intensity of the light is high enough and the exposure is long enough, UV stops reproduction by damaging the DNA of the pathogens.

3. Since a UV treatment does not provide a disinfectant residual, it may only be used as a supplemental oxidizer in conjunction with a traditional disinfectant. Therefore, a chlorine or bromine-based disinfectant is still required.

4. Ultraviolet light has no effect on pH or color and has little effect on the chemical composition of the water. The color, turbidity, and chemical composition of water can, however, interfere with UV light transmission. Inactivation of microorganisms is dependent upon many factors, such as UV dosage, water quality, and contact time (flow rate through the device).

5. Ultraviolet lamps must be installed and operated according to manufacturer specifications and NSF/ANSI Standard 50, and located at a point after the filters and prior to chemical injection.

a. Ensure UV lamps are installed with a service bypass line and will treat the full flow of water from the filters.

b. Maintain UV systems per manufacturer specifications to prevent loss of effectiveness.

4-49. Disinfection Using Ion-Generating Devices

1. Copper and silver ionizers are electrical devices that release measured amounts of silver and copper ions into the pool or spa water.

2. Although silver ions inactivate bacteria, and copper ions are an effective algaecide, copper/silver ionizers are incapable of oxidizing bather organics. A sanitizer such as chlorine must be used to provide complete disinfection and oxidation. Residuals of at least 0.4 mg/L chlorine or 0.8 mg/L bromine must be provided as a supplementary sanitizer or oxidizer.

3. There is an increased probability of staining pool surfaces if the concentration of copper ion in pool water exceeds the manufacturer's recommended maximum.

4. Periodic testing is necessary to check and maintain the recommended ion concentrations. Copper test kits are normally supplied by the ionizer manufacturer. Silver ion concentrations are usually estimated by applying a conversion factor to measured copper.

4-50. Prohibited Disinfection Practices

1. Ultraviolet light and Hydrogen peroxide combination systems are prohibited for use as a disinfectant

2. Polyhexamethylene biguanide hydrochloride is prohibited for use as a disinfectant.

3. Chlorine dioxide is not permitted for use while swimmers are in the water.

SECTION V. RECIRCULATION

4-51. General. Swimming pool and spa water must always be maintained at proper disinfectant levels and kept free of harmful microorganisms, chemical consuming organics, and turbidity. For this to be accomplished, it is best to continuously circulate and filter the water. A proper circulation design will provide effective removal of surface water, which has the highest concentration of pollutants. There must also be a constant and uniform dilution of treated and filtered water returning into the pool.

4-52. Recirculation System Appurtenances

1. Recirculation systems consist of pumps, pipes, filters, and water conditioning and disinfection equipment. Components must be NSF-certified and must be operated continuously. A listing of NSF-certified equipment is available at the NSF International Web site: https://www.nsf.org/certified-products-systems.

2. The processes of filtration and chemical treatment occur during circulation before water is returned to the pool; however, only a fraction of the circulated water is actually filtered during each turnover. Turnover represents the number of times all of the water in the pool passes through the filter during a 24-hour period.

a. During the recirculation process, turbid (dirty) water is continuously withdrawn and replaced by filtered water. Specifically, each succeeding portion of withdrawn water consists of a decreasing proportion of turbid water mixed with an increasing proportion of clean water. This process, repeated enough times, helps reduce turbidity levels and achieve specified water quality standards. Figure 4-52.1 depicts the amount (percentage) of water that has been filtered after consecutive turnovers have occurred. It is only after six consecutive turnovers (the minimum required number of turnovers in a 24-hour period) that the amount of unfiltered water is reduced to one-half percent.

b. Turnover is calculated by dividing the total volume of water by the flow rate through the filtration process. For example, a pool containing 200,000 gallons of water with a flow rate of 750 gallons per minute (GPM) would have a turnover time of 4.44 hours (Turnover = 200,000 gal ÷ 750 gal/min ÷ 60 min/hour). This is discussed further in article 4-61 of this section. The maximum required turnover time varies based on the type of aquatic facility and play feature and the volume of water sustained by the venue (table 4-52.1).

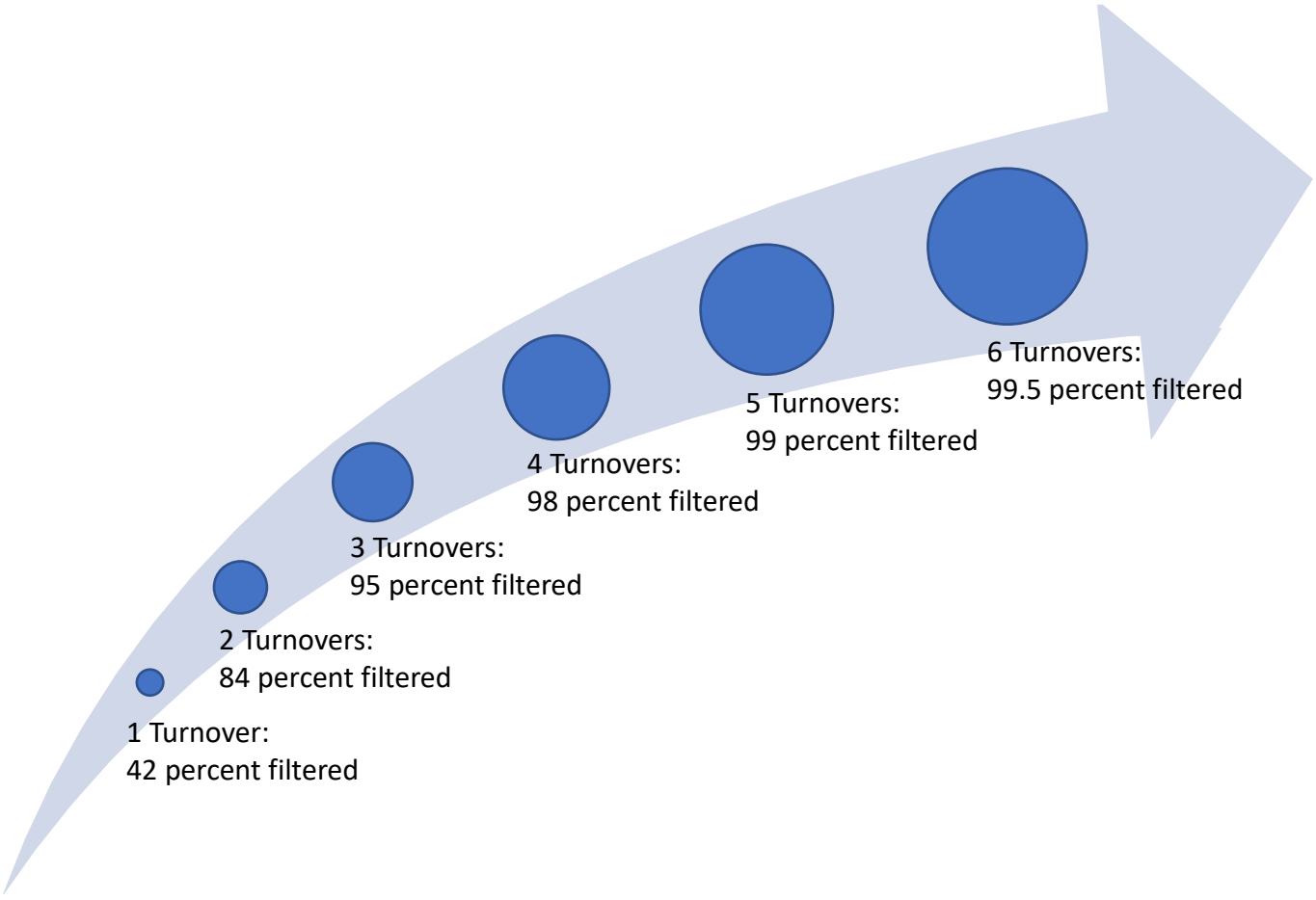

Figure 4-52.1. Amount (Percent) of Water Filtered from Consecutive Turnovers

Facility	Volume (Gallons)	Maximum Turnover Time (Hours)
Swimming Pool, Military Training Pool	ALL	6 hours or less
Wading Pool	ALL	1 hour or less
Spa	ALL	0.5 hour or less
Therapy Pool	ALL	3 hours or less
Catch or Plunge Pool	ALL	1 hour or less
Water Slide	ALL	1 hour or less
Spray Pad	ALL	0.5 hour or less
Action River; Vortex Pool	ALL	2 hours or less
Activity Pool	ALL	2 hours or less
Multi-Level Play Attractions	ALL	0.5 hour or less

Table 4-52.1. Required Turnover Times for Aquatic Facilities and Play Features

4-53. Inlets

1. Return inlets have the most significant influence on the circulation pattern of the water.

2. Locate inlets for makeup, fresh, or treated water to produce a uniform circulation of water and to facilitate the maintenance of a uniform disinfectant residual throughout the entire pool. Place inlets and skimmers to avoid producing short-circuiting of the recirculation water.

3. Place wall inlets around the entire perimeter of the pool at intervals no greater than 20 feet; place one inlet within 5 feet of each corner on each wall and one inlet in each recessed step area.

4. Place bottom inlets around the entire perimeter of the pool at intervals no greater than 20 feet; space rows of inlets no more than 15 feet from the walls.

5. Base the number of inlets on whichever of the calculations results in the greater number of inlets provided:

   a. One inlet per 600 square feet.

   b. One inlet per 15,000 gallons of pool capacity.

6. Each inlet must have an individual valve to permit adjustment of the water flow for the greatest amount of circulation.

4-54. Outlets or Main Drains

1. "Main drain" is a term that usually refers to a plumbing fitting installed on the suction side of the pump in pools and spas (that is, a suction outlet). Sometimes referred to as the drain, the main drain is normally located in the deepest area of the pool or spa. It does not literally drain the pool or spa as a sink drain would, but rather connects to the pump, allowing water to be drawn from the pool or spa for circulation and filtration.

2. A single main drain is a submerged suction outlet, with or without a skimmer, connected to a dedicated pool pump. A pool equipped with multiple suction outlets, each of which is connected to a dedicated pump, may have more than one single main drain. A group of connected suction outlets is considered a single main drain if the centers of the outlets are located within 3 feet of each other.

3. Multiple main drains consist of at least two fully submerged suction outlets per pump, with drain cover centers at least 3 feet apart. The connections between the outlets and the pump are important for proper operation and should be certified by a design professional and inspected by a licensed inspector to ensure hydraulic balance between the outlets and the main suction line to the pump.

4. Drain grates must be secured in place at all times and must be observed visually on a daily basis. If the drain grate is broken or missing, the pool will be closed immediately and remain so until the grate is repaired.

5. Cover outlet openings with a proper grating that is not readily removable by swimmers and meets the requirements of the Virginia Graeme Baker Pool and Spa Safety Act (VGB Act).

6. In 2007, the Consumer Product Safety Commission (CPSC) established new Federal standards for swimming pool and spa safety in the VGB Act. The primary focus of the rule is to prevent injuries and deaths related to entrapment. Public pools and spas may not operate unless they comply with VGB Act requirements. All pools constructed after 2008 must be equipped with multiple drains, a single unblockable drain, or no main drain. Single, blockable drains are not permitted in new construction.

7. The VGB Act specifies all pools and spas must have ANSI/APSP/ICC-7 and ANSI/APSP-16-compliant drain covers. Information stating that the cover or drain meets the ANSI/APSP/ICC-7 and ANSI/APSP-16 standard will be embossed on the drain cover and printed in the manufacturer's specifications. Covers marked by the manufacturer with a designated life-cycle expiration date must be replaced when expired. Covers will display:

a. Use (single or multiple).

b. Flow rate in gpm.

c. "Life" (number of years).

d. Type (wall- or floor-mounted).

e. Manufacturer's name.

f. Model number.

8. Drain cover manufacturers should provide a certification document with each drain cover stating that it complies with the requirements of the VGB Act. Such documents must be readily available and a copy kept on file at the facility manager's office; the original is maintained by PWO. If there is no such indication, or if the certification is in question, contact the manufacturer and ask for a copy of the certificate.

9. If drain covers are field-fabricated, a registered design professional or a licensed professional engineer must specify that the pre-existing grate or grates meet the ANSI/APSP/ICC-7 and ANSI/APSP-16 standard.

10. The VGB Act also specifies that all pools and spas with a single outlet must use one of the additional options:

a. Safety vacuum release system (SVRS) that complies with ASME A112.19.17 or ASTM F2387-04.

b. Gravity drainage system (figure 4-54.1).

c. Suction limiting vent system (figure 4-54.2).

d. Automatic pump shut-off.

e. Drain disablement.

f. Equivalent system that may be approved by the CPSC.

11. To ensure proper operation, all SVRS or equivalent devices must be routinely tested per the manufacturer's recommendations.

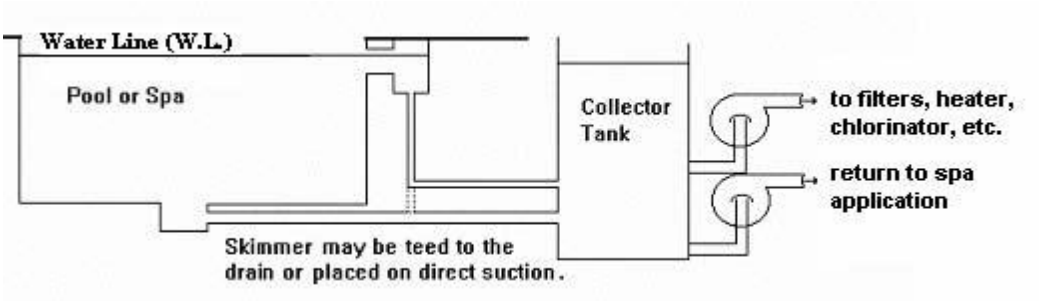

Figure 4-54.1. Gravity Drainage System – Direct Suction removed from the Pool

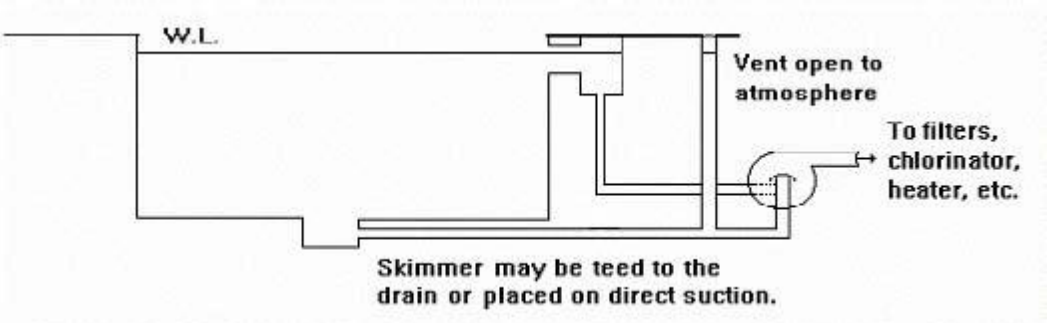

Figure 4-54.2. Suction-Limiting Vent system to Relieve Main Drain Suction

12. If the single outlet is an unblockable drain, an exception (the only exception) to paragraph 5-5.10 is permitted. The CPSC defines an unblockable drain as "all components, including the sump or body, cover or grate, and hardware such that its perforated (open) area cannot be shadowed by the area of the 18 inches x 23 inches Body Blocking Element of ANSI/ASME A112.19.8-2007 and that the rated flow through the remaining open area (beyond the shadowed portion) cannot create a suction force in excess of the removal force values in Table 1 of that Standard."

13. Do not connect drains to the storm or sewer system. Prior to draining the pool, PWO will notify the wastewater treatment plant to ensure the plant can accommodate the discharge of large volumes of water. The sanitary sewer system connection may require a National Pollutant Discharge Elimination System (NPDES) permit. When draining a recreational water facility, avoid illegal discharges, and ensure full compliance with environmental regulations.

14. Install appropriate backflow prevention devices or air gaps to pool drains connected to a sanitary sewer system to prevent sewage contamination of the pool.

15. Provide bottom outlets in pools whose width is greater than 60 feet.

16. Provide multiple outlets at or near one end of pools with deep water, at a maximum 20-foot interval and no more than 15 feet from sidewalls. A minimum of two interconnected main drains must be provided in all newly constructed pools, spas, hot tubs, wading pools, and other training and recreational aquatic venues equipped with recirculation systems. Main drains must be spaced a minimum of 3 feet apart.

4-55. Overflow Gutters

1. Gutters are trough-like designs that work on the principle of surface tension removal during periods of pool non-use. The water level must be carefully controlled to no more than ¼ inch (6 mm) above the lip of the gutter. In this manner, a surface tension draw of the top layer of the pool water is maintained. Surface debris and contamination are removed from the pool and filtered or oxidized.

2. During periods of use, user action creates a wave motion or a rolling effect. The surface water is trapped in the gutter and removed for processing.

3. When using overflow gutters instead of skimmers, install overflow gutters that:

a. Extend completely around the pool, except at steps or recessed ladders in the shallow portion.

b. Serve as a handhold.

c. Are hydraulically capable of continuously removing at least 125 percent of the recirculating water and returning it to the filter through a surge tank located near the filter.

d. Are designed to prevent entrapment of the swimmers' arms or legs.

4. Ensure the opening into the gutter beneath the coping (horizontal surface) is a minimum of 4 inches wide.

5. Ensure the interior of the gutter is a minimum of 3 inches wide, with a depth of at least 3 inches.

6. Provide the overflow outlets with outlet pipe at least 2 inches in diameter. The area of the grate opening must total at least 1½ times the cross-sectional area of the outlet pipe.

4-56. Skimmers

1. Skimmers are box-like openings in the pool wall, located at the surface. Per reference (f), where skimmers are used, at least one surface skimmer must be provided for each 500 square feet (46 square meters) of water surface area, or a fraction thereof. Skimmers are located to maintain effective skimming over the entire surface area of the pool.

2. Mounted at the entrance to the skimmer body or housing is a floating weir. This weir will always adjust to the level of the water, providing the skimming or sheeting action. The operation of the circulation pump draws water from the pool. The water flows through the pool wall opening and over the weir. The weir acts as a barrier for water and debris, not allowing a backwards motion into the pool.

3. Inside the skimmer housing is a basked for the collection of larger debris. The skimmer basked must be cleaned on a routine basis to maintain proper water flow.

4. Skimmers are to be used only in pools of 2,000 square feet or less and widths of less than 30 feet.

5. Skimmers should be installed in locations that:

a. Minimize interference with one another.

b. Allow proper skimming of the entire pool surface using a weir to ensure skimmer suction and performance.

c. Develop sufficient velocity on the water surface to induce floating oils and wastes into the skimmer from the entire pool area.

6. Ensure skimming devices:

a. Have an easily removable and easily cleanable screen through which all overflow water must pass to allow for removal of hair and other debris.

b. Have a mechanism to prevent air locks in the suction line. Provide adequate amounts of water in a surge tank or other device to ensure proper suction.

c. Are cleaned daily to prevent air locks in the suction line.

7. Recessed automatic surface skimmers will comply in all respects with the NSF International standards for pool equipment. The NSF International Mark affixed to pool or spa equipment indicates compliance with this requirement.

8. In the construction of new swimming pools or modification of existing pools, the prevailing summer wind direction should be considered in the placement of skimming devices. The wind may push floating oils and wastes to an area that does not contain a skimming device, thus requiring manual cleaning.

4-57. Pumps

1. The pump is the main part of the circulation system. It is the component that causes the water to move. Swimming pools use only one type of pump for circulation purposes: a centrifugal pump. A centrifugal pump has an impeller that rotates on an axis, creating a centrifugal force and displacement of the water.

2. Pumps will:

a. Have an adequate capacity to provide the required number of turnovers of pool water.

b. When possible, be located in a position that eliminates the need for priming.

c. Be capable of providing an adequate flow for backwashing of filters.

3. There should be a pressure gauge installed on the suction header as close to the pump inlet as possible.

4. Ensure that centrifugal pumps used for recirculation and filtration comply with NSF International standards.

4-58. Piping

1. Proportion and construct the piping system to permit cleaning or repair of any part of the system.

2. Ensure piping is nontoxic, resistant to corrosion, and capable of withstanding operating pressures.

3. Provide a backwash line at the lowest point of the system to permit removal of any accumulation of sediment or rust.

4. Provide outlets for obtaining water samples before and after treatment.

4-59. Strainer Baskets

1. A strainer basket will be included in the recirculation system to reduce the amount of hair, lint, and other filamentous material that may reach the filters.

2. The strainer basket consists of a metal or fiberglass chamber containing a cylindrical strainer; the water flows from the inside to the outside of the strainer. Ensure strainers are:

a. Corrosion-resistant with openings not more than 1/8 of an inch in size, providing a free-flow area at least 4 times the area of the pump suction line.

b. Readily accessible for frequent cleaning.

c. Equipped with a clear (see-through) top.

3. Ensure strainer baskets are located on the suction side of the pumps and are cleaned when necessary.

4-60. Vacuum Cleaners

1. When fixed hose connections are used for vacuuming pools, ensure they are:

a. No less than 3 inches in diameter.

b. Located between 6 and 18 inches below the water surface and flush-mounted in the pool walls.

c. Placed so all parts of the pool can be reached with a 50-foot hose.

d. Covered when not in use.

2. Instead of a fixed-suction system, clean the pool with a portable suction cleaner consisting of a low capacity pump with an engine or motor mounted on a small truck or dolly for wheeling around the pool. Do not operate this system during swimming hours; no swimmers are allowed in the pool while the vacuum is in the pool. The pump discharge may empty into the overflow gutter or deck drainage system and will not under any circumstances re-enter the pool prior to the point of filtration.

3. Portable electric suction cleaners will be Underwriters Laboratories (UL®)-rated and will be connected to a ground-fault circuit interrupter (GFCI)-protected electrical outlet. (UL® is a registered trademark of Underwriters Laboratories, Inc., Northbrook, Illinois.)

4-61. Flow Rate

1. Flow rate is measured with a flow meter installed on the return flow line downstream of all equipment and just before the water is returned to the pool. There must be sufficient flow to achieve the required turnover rate. The relationship between flow rate and turnover rate is:

Flow Rate = Pool Volume ÷ Turnover Rate ÷ 60 min/hour

2. Ensure that the indicator is:

a. Capable of measuring flows at least 1½ times the design flow rate.

b. Accurate to within 10 percent of true flow.

c. Easy to read.

d. Installed in the center of a long run of pipe to ensure accuracy.

3. PWO will monitor the water flow rates to ensure that a constant water flow is maintained at rates per the manufacturer's specifications and recommendations.

4. Obstructions to water flow result in decrease in flow rate. Simply cleaning the filter and removing debris from the skimmer or from hair and lint baskets will usually return the flow to the proper level.

SECTION VI. FILTRATION

4-62. Filtration. Pool water is physically cleansed by passing through a filter. The material doing the filtering is called the media and is comprised of either sand, fibrous cartridge or diatomaceous earth (D.E.). Filtration is a process where particles are captured in the media's pores or on the media's surface.

4-63. Standard Filter Requirements

1. Ensure all pressure filters:

a. Are sized appropriately and capable of providing the recommended turnover.

b. Are designed, manufactured, and installed to provide easy accessibility for cleaning, operating, maintaining, and servicing.

c. Include valves and pipes to completely drain the filter. For multi-filter units, the capability to isolate, backwash, or drain an individual filter for maintenance or repair is required.

d. Are positioned to provide adequate circulation of air beneath and around all sides of the filter to reduce corrosion and facilitate cleaning. If filter tanks are installed in the ground (that is, buried), ensure compliance with manufacturer recommendations to protect the tanks from corrosion.

e. Are equipped with an approved pressure gauge(s) with appropriate capacity. Install the gauge(s) so that pressure or vacuum readings, as appropriate, may be obtained on both the influent and effluent lines of the filter(s). The difference between the gauge readings for the influent and effluent is known as the head loss of the filter.

f. Are installed with an air-relief valve(s) located at or near the highest point of the filter(s).

g. Are designed and constructed per to the applicable provisions of NSF/ANSI Standard 50.

h. To discharge backwash water from these filters, it may be necessary to obtain an NPDES discharge permit from the U.S. Environmental Protection Agency (EPA) or the state, as applicable. A more thorough discussion of filtration is presented in Unified Facilities Criteria (UFC) 3-230-02.

4-64. Sand Filters

1. Sand filtration is the oldest type of pool water filtration, dating back to the very first pools. Sand filters may be either gravity or pressure type filters, rapid-rate or high-rate.

a. Filtration rates for rapid-rate sand filters must not exceed 3 gpm per square feet of filter surface area.

b. High-rate filters will be designed to operate at no more than 12 gpm per square foot.

c. Use higher-rate filtration units only after such units have been successfully tested against applicable NSF standards.

2. A sand filter intended for use in a swimming pool will be designed, constructed, and installed to filter backwash water at a rate not less than 15 gpm per square foot of filter surface area or at a rate recommended by the manufacturer. The filter backwash water must be discharged to the sanitary sewer system. A sight glass or other means of viewing the clarity of the backwash water must be provided.

3. Other sand filter media, such as zeolite, may be used only if the manufacturer's specifications are followed.

4. Sand media usually has a long life and is replaced about every 5 to 15 years.

4-65. Diatomaceous Earth Filters

1. Diatomaceous Earth (DE) removes the smallest particle size of any pool or spa filtration device. Tiny, fossilized skeletons of small sea plankton, or diatoms, are used to trap undissolved material. DE filtration is said to be in the two to six-micron range.

2. The DE is held against a grid device or septum by the movement of the water. The grid is covered in a cloth-like material and the DE forms a cake or coating on the cloth. Water passes through the DE with the suspended material trapped in the channels of the skeletal material. DE is considered to be a disposable filter media.

3. DE filters may be designed to operate either with or without continuous body-feed.

a. Filtration rates for DE filters that operate with continuous body feed must not exceed 3 gpm per square foot of filter area.

b. Filtration rates for DE filters that operate without continuous body feed must not exceed 2 gpm per square foot of filter area.

4. A DE filter intended for use in a pool will be designed, manufactured, and installed with provisions for cleaning by one or more of the methods provided:

a. Backwashing

b. Air Pump-assisted backwashing

c. Spray wash (either mechanical or manual)

d. Agitation

5. The water used in cleaning a DE filter must be discharged to the sanitary sewer system or in a manner approved by the appropriate authority.

4-66. Cartridge Filters

1. Cartridge filtration is the newest form of filtration. The filter media is either a spun-bonded polyester or treated paper in a cylindrical pleated arrangement. Cartridge filtration is said to be in the 10 to 25-micron range. Cartridge filters offer a compact design with a large filter area and a relatively small footprint.

2. Surface cartridge filters are designed for filtration rates not to exceed 0.30 gpm per square foot of the effective filter area.

3. Ensure swimming pool cartridges are designed, manufactured, and installed per the provisions and requirements for cleaning or replacement as recommended by the manufacturer.

4. One complete spare set of cartridges must be available at all times to facilitate cleaning.

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SECTION VII. WATER BALANCE

4-67. Balance Factors

1. Water is commonly called the universal solvent, and pool or spa water is no exception. Water containing minimal or no dissolved material (e.g., low in calcium and magnesium) will be very aggressive. Aggressive water tends to leach elements out of the structures it is in contact with (i.e. pipes, pumps and pool walls). The materials most commonly attacked are tile-line grout, cement pool wall material, and iron and copper materials found in pumps, heaters, piping and valves. When water is satisfied, and the proper mineral balance is achieved, it is no longer aggressive.

2. Water that contains too much dissolved material becomes balanced by dropping calcium carbonate out of the water (or solution). The resulting deposit is a hard, rough surfaced precipitate called calcium carbonate or scale. Scale can collect on surfaces of the pool or spa and can plug the filtration, heater and circulation piping.

3. Properly balanced water creates an environment that optimizes the disinfectant process. It also protects the pool or spa system components from chemical corrosion, thus increasing the useful operating life of equipment. Properly balanced water provides a more enjoyable swimming experience for pool or spa users.

4. The factors that contribute to the balance of water are pH, total alkalinity, calcium hardness, temperature and total dissolved solids.

4-68 Potens Hydrogen (pH)

1. pH stands for *potens hydrogen,* which is Latin for the power of hydrogen (ion). As a water balance factor, pH has the most impact on properly balanced water and user comfort.

2. Water is a weak electrolyte, a solution that conducts electricity; and that is easily ionized or converted to ions. Water is in equilibrium and the ionization equation is represented by:

$$H_2O \rightleftharpoons H^+ + OH^-$$

3. pH is a measurement of the hydrogen ion concentration in water. As the H^+ ion concentration increases, the OH^- ion concentration decreases so that the product remains constant. As the H^+ ions increase, the solution is said to be acidic. The smaller the pH unit, the more acidic the solution. Likewise, as the OH^- ions increase, the H^+ ions decrease, and the solution is said to be basic or alkaline.

4. Since the pH scale is logarithmic, a small change in pH actually represents a large change in acidity. Water that has a pH equal to six is 10 times more acidic than water that has a pH equal to seven. A pH of zero, close to the pH of muriatic acid is 10,000 times more acidic than water with a pH equal to seven.

5. The acceptable pH of pool or spa water is slightly alkaline (7.2 to 7.8). The pH of tears from the human eye is about 7.5. To assist in user comfort, the ideal range for pH is 7.4 to 7.6.

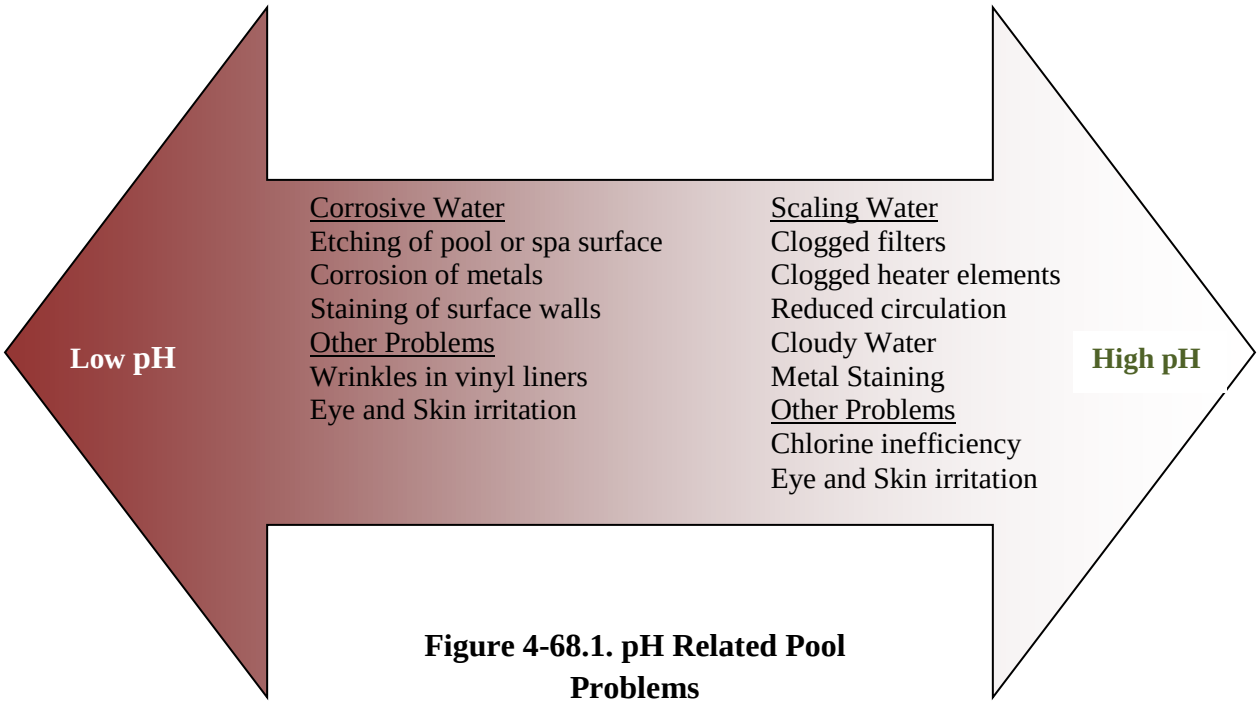

Figure 4-68.1. pH Related Pool Problems

6. There are many factors that influence the pH of pool or spa water, including user waste, disinfectants, source water, airborne debris, water balance chemicals, aeration and evaporation.

7. Control of pH:

a. Control of pH is important for the comfort of users, the efficiency of the disinfectant, and the protection of the pool system components. The method used to control pH is to maintain the proper level of total alkalinity, as discussed later in this section. Before making any pH change, test, and if necessary, correct the total alkalinity. When the alkalinity is correct, it is often found that the pH will be correct as well.

b. To lower pH:

(1) Acids such as muriatic acid or acid salts such as sodium bisulfate ($NaHSO_4$) are added to the pool or spa water. This causes an increase in the H^+ ion, lowering the pH. The most common liquid acid used in the pool and spa environment is muriatic acid (a.k.a. HCl or hydrochloric acid).

(2) Carbon dioxide (CO2) gas may be used to lower the pH at pools using sodium hypochlorite or calcium hypochlorite

(a) Pools using a water source with high alkalinity or hardness, and pools that use calcium hypochlorite should avoid using CO2 as it will further raise the alkalinity of the water

(b) Inject CO2 into the recirculation pipe at the same point at which the pH adjustment solutions would normally be added. The recirculation pipe must be of sufficient size and length to provide a minimum of 5 seconds of contact time prior to swimmer contact with the water.

c. To increase pH, a basic material is added, the most common being sodium carbonate, known as soda ash (Na_2CO_3). Other bases used for raising pH are sodium hydroxide (NaOH), sodium sesquicarbonate (Na_2CO_{3*} $NaHCO_{3*}$ $2H_2O$) and sodium bicarbonate ($NaHCO_3$). When a base is added, there is an increase in the OH^- ions and the pH.

4-69. Total Alkalinity

1. Total Alkalinity is the measure of the water's ability to resist changes in pH. It is a buffer, or an ionic compound that resists change in the water's pH. Total alkalinity is like an anchor for keeping pH where it should be.

2. Without proper buffering, pool water pH may swing dramatically from high to low. This is referred to as pH bounce. It is a rapid movement of pH up and down with the addition of even small amounts of chemicals. When this happens, water can become out of balance, affecting chlorine's ability to kill bacteria and causing corrosion, staining, scaling, or eye and skin irritation.

3. Total alkalinity is made up of bicarbonate (HCO_3^-), carbonate (CO_3^-), and hydroxide (OH^-) ions. Additionally, there may be interference from borates, phosphates, cyanurates, and silicates. When pools are operated in the acceptable range of 7.2 to 7.8 pH, the greatest contributor to total alkalinity is the bicarbonate ion.

4. In certain situations, the contribution that cyanuric acid makes to total alkalinity is significant. High cyanuric acid interference should be subtracted from total alkalinity before the saturation index is calculated. (Saturation index will be discussed later in this section).

5. The acceptable range for total alkalinity is 60 to 180 ppm (mg/L) as measured by the methyl-orange test. Use of high pH disinfectants or hypochlorites may require a total alkalinity level in the lower end of the range. Low pH disinfectants, such as dichlor, trichlor, bromine, or gas chlorine, require a total alkalinity in the higher end of the range. To reduce the corrosive action of low-alkalinity water or the scaling caused by high-alkalinity water, the water in swimming pools and spas should be chemically balanced as determined by the Saturation Index (article 4-73).

6. Low Total Alkalinity

a. When there are not enough bicarbonate ions to provide buffering of the pH, the pool or spa water will exhibit pH bounce. Acid rain or high user loads may cause pH to fluctuate.

b. Low alkalinity may result in water with a green tint if iron or copper are in the water.

c. Low alkalinity may also cause corrosion or etching of the pool/spa surfaces.

d. To increase total alkalinity**,** labels typically recommend adding sodium bicarbonate at the rate of 1.4 pounds per 10,000 gallons (670g per 40,000 liters) of water, for a 10 ppm (mg/L) increase.

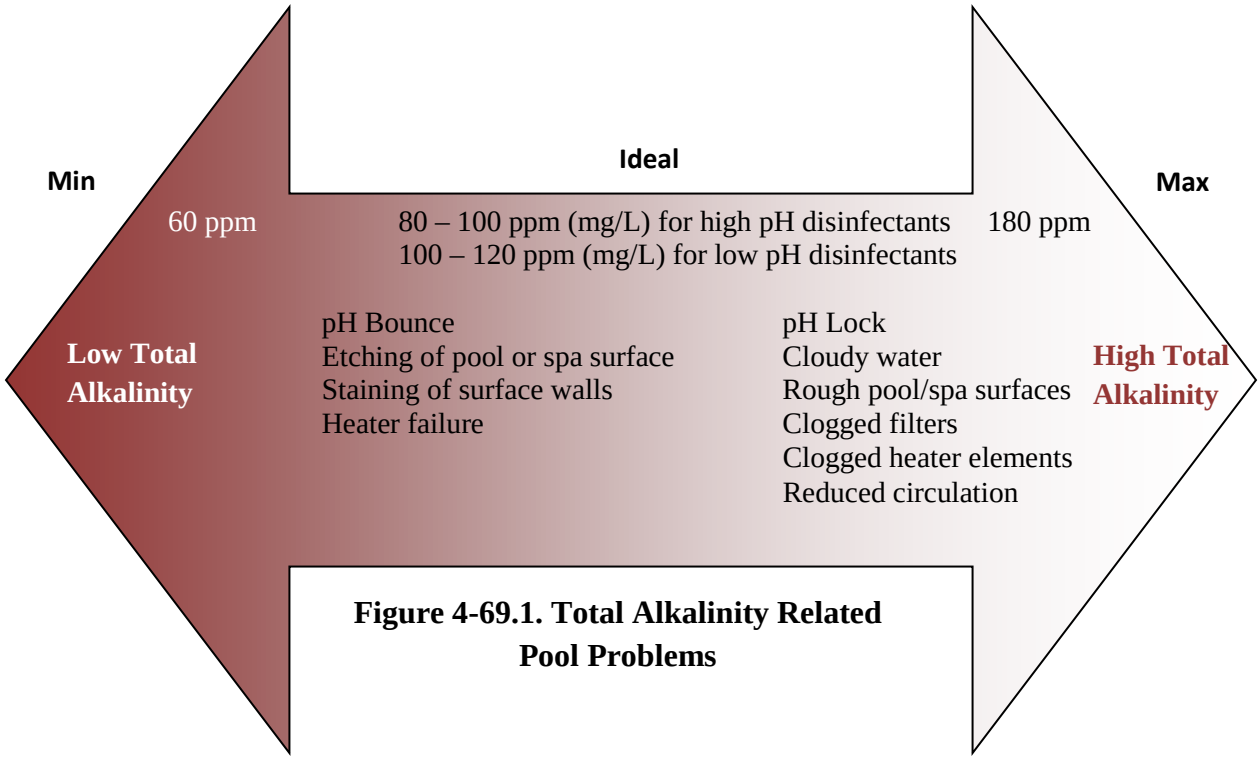

Figure 4-69.1. Total Alkalinity Related Pool Problems

7. High Total Alkalinity. At higher levels of total alkalinity, the pH is usually higher than ideal and becomes difficult to change. This is referred to as pH lock. This may result in cloudy water due to suspended calcium carbonate in the water. **To lower total alkalinity**, add either muriatic acid or sodium bisulfate.

4-70. Calcium Hardness

1. Calcium is present in water naturally, due to the leaching process that occurs in nature. As ground water comes into contact with rocks and soils containing calcium and magnesium, the water dissolves the minerals into solution. Bicarbonate, carbonate and sulfate are also included in this process.

2. In pools and spas, it is the calcium hardness, not total hardness that is important to achieve a balanced saturation index so that calcium carbonate is neither dissolved from plaster, gunite or grout, nor deposited as scale. Low calcium hardness is a contributor to foaming in spas.

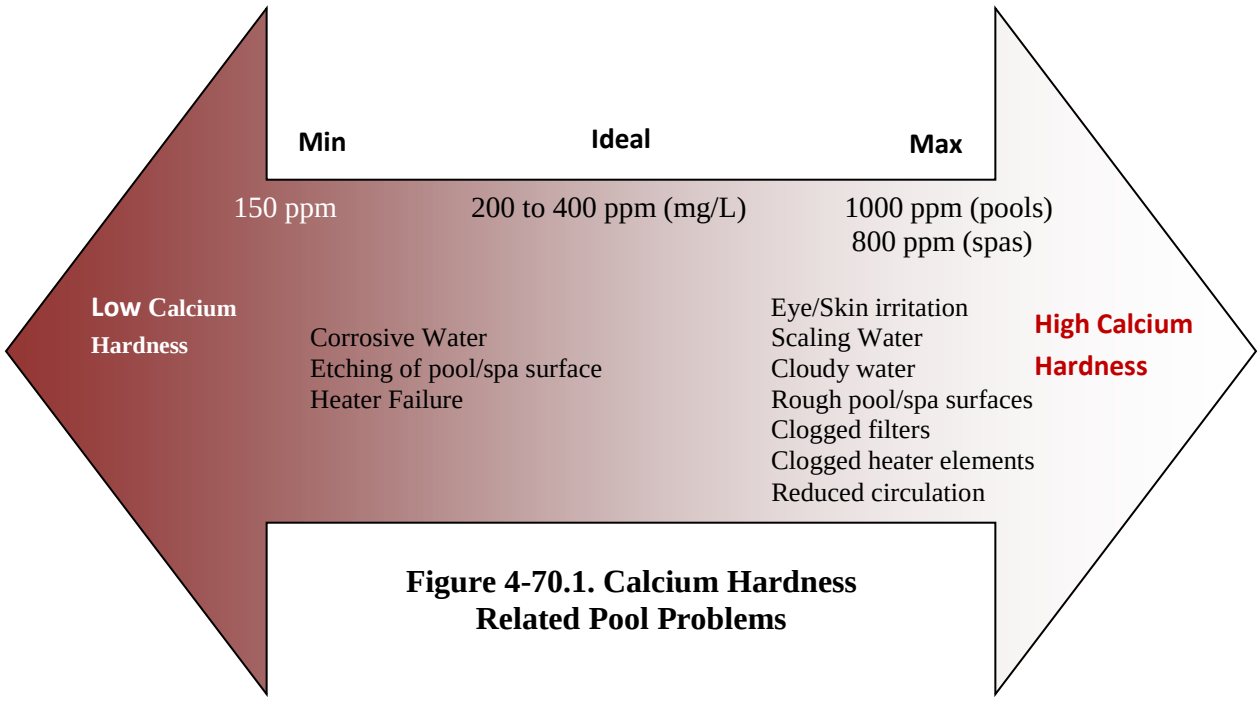

Figure 4-70.1. Calcium Hardness Related Pool Problems

3. Calcium hardness of pool or spa water is measured as calcium carbonate ($CaCO_3$). Calcium carbonate is not very soluble and easily drops out of solution unless water balance is maintained. At low pH and alkalinity, a low calcium hardness level disrupts the equilibrium of calcium carbonate, and the water becomes more corrosive.

4. The ideal level of calcium hardness is 200 to 400 ppm (mg/L). When calcium hardness approaches 1,000 ppm (mg/L), it is essentially impossible to maintain water balance, pH and total alkalinity in the proper ranges. At calcium hardness levels in excess of 500 ppm (mg/L), extreme care must be taken to maintain lower total alkalinity and pH levels to avoid scale, especially in hot water environments.

5. Low Calcium Hardness

CHEMICAL SAFETY PRECAUTION
It is important to follow label and SDS directions and remember to never add water to chemicals, especially with calcium chloride, because the water may boil, projecting steam and chemical.

a. Calcium chloride ($CaCl_2$) is used to increase calcium hardness. Calcium chloride comes in two forms: hydrated calcium chloride (77 percent strength), and anhydrous calcium chloride (100 percent strength). Both forms generate significant heat when added to water. It is generally a good practice to pre-dissolve the calcium chloride into a bucket of water, mix, and then slowly add to the deepest part of the pool or spa.

b. The 77 percent strength hydrated calcium chloride is added at the rate of 1.2 pounds per 10,000 gallons (575 g per 40,000 liters) of water to achieve an increase of 10 ppm (mg/L).

c. The 100 percent anhydrous calcium chloride is added at the rate of 0.9 pounds per 100,000 gallons (402 g per 40,000 liters) of water to achieve an increase of 10 ppm (mg/L).

6. High Calcium Hardness

a. Lowering calcium hardness is very difficult, except in spas due to the smaller volume of water. It generally involves partially draining and replacing the existing water with source water containing lower levels of hardness.

b. To maintain a balanced saturation index, the pH and total alkalinity can be lowered to compensate for higher calcium hardness levels. The lower alkalinity level will allow the pH to change more, and corrosive or scale conditions may quickly develop.

c. A sequestering agent may be used to keep calcium in solution. This method helps prevent scale by interfering with the development of calcium carbonate crystals.

4-71. Temperature. Temperature is the one balance factor that is not chemical – it is a physical factor. Only at extreme conditions does temperature play a significant role. At higher temperatures, there is an increasing tendency for scaling conditions, while at lower temperatures; there is an increasing tendency for corrosive conditions. Temperature is an important factor in the saturation index (see article 4-73 below) and for balancing the water. It is the one factor that cannot be manipulated.

4-72. Total Dissolved Solids

1. Total dissolved solids (TDS) is the total weight of all soluble matter in the water. The TDS concentration can be approximately derived by measuring the electrical conductivity of the water. Dissolved charged ions add to the water's conductivity. Contaminants that are not charged cannot be measured using the conductivity method. The lower the conductivity of the water, the more pure the water is.

2. All dissolved matter added to pool or spa water contributes to TDS, including salt, user waste, algaecides, metal and stain control chemicals, clarifiers, defoamers, enzymes, wind-borne debris, and water balance chemicals.

3. Chemical additions are not the only factor that increases the TDS. Evaporation removes pure water, leaving the dissolved solids behind. Replacement source water may contain as much as 400 ppm (mg/L) or more TDS. Over time, TDS climbs higher as a result of the replacement of evaporative losses.

4. As TDS increases, there is a greater risk of galvanic corrosion when there are dissimilar metals within the system. For example, if a pool has a copper heat exchanger and other metal parts in the plumbing, light fixtures, or metal pump impellers, then galvanic corrosion can occur.

5. It is commonly recommended that TDS not exceed 1,500 ppm (mg/L) higher than when the pool or spa was first opened. There is not a minimum or maximum TDS level. The only way to

reduce the amount of TDS in the water is to drain a portion of the pool water and add fresh water.

4-73. Saturation Index

1. The Saturation Index (SI), also known as the Langelier Index is a method of determining whether water will deposit calcium carbonate or maintain it in solution. The SI incorporates the five balance factors discussed in this section: pH, total alkalinity, calcium hardness, temperature and total dissolved solids.

2. When higher cyanuric acid levels (greater than 70 ppm or mg/L) are present in the water, the level must be reduced by draining a portion of the pool water and adding fresh water. The water then needs to be balanced.

3. Temperature, calcium hardness, total alkalinity, and total dissolved solids are expressed in the SI as factors Tf, Cf, Af, and TDSf respectively, as shown in Table 4-73.1 and Figure 4-73.1. The pH of the water is substituted directly into the index.

4. For pool and spa waters, the ideal result of performing this index is to have a result of zero, i.e., SI = 0. Balanced water is between -0.3 and +0.3. Corrosive water is -0.4 and lower. Scaling water is +0.4 and higher.

Temperature (Tf)			Calcium Hardness expressed as $CaCO_3$ (Cf)		Total Carbonate Alkalinity (Af)	
°F	**°C**	**Tf**	**ppm (mg/L)**	**Cf**	**ppm (mg/L)**	**Af**
32	0.0	0.0	25	1.0	25	1.4
37	2.8	0.1	50	1.3	50	1.7
46	7.8	0.2	75	1.5	75	1.9
53	11.7	0.3	100	1.6	100	2.0
60	15.6	0.4	125	1.7	125	2.1
66	18.9	0.5	150	1.8	150	2.2
76	24.4	0.6	200	1.9	200	2.3
84	28.9	0.7	250	2.0	250	2.4
94	34.4	0.8	300	2.1	300	2.5
105	40.6	0.9	400	2.2	400	2.6
			800	2.5	800	2.9

Table 4-73.1. Saturation Index Factors

Less than 1,000 ppm (mg/L)	1,000 ppm (mg/L) or greater
12.1	12.2

Figure 4-73.1. Total Dissolved Solids Factors

5. Calculating the Saturation Index.

a. To determine whether pool or spa water is properly balanced, a full water chemistry analysis is necessary. When calculating the SI, use the factors in Table 4-73.1 and Figure 4-73.1 above. If an actual measurement is not found on the chart, use the next greatest value. The measured pH is used directly in the formula. The Saturation Index formula is as stated:

$$SI = pH + Tf + Cf + Af - TDSf$$

Example #1.

Your pool water test readings are as stated:

pH	7.2
Temperature	84°F (28.9°C)
Calcium Hardness	200 ppm or mg/L
Total Alkalinity	100 ppm or mg/L
TDS	2,250 ppm or mg/L

SI = pH + Tf + Cf + Af - TDSf
SI = 7.2 + 0.7 + 1.9 + 2.2 - 12.2
SI = - 0.4

The water is slightly corrosive.

Example #2.

Your spa water test readings are as stated:

pH	7.7
Temperature	104°F (40°C)
Calcium Hardness	400 ppm or mg/L
Total Alkalinity	100 ppm or mg/L
TDS	3,500 ppm or mg/L

SI = pH + Tf + Cf + Af - TDSf
SI = 7.7 + 0.9 + 2.2 + 2.0 - 12.2
SI = 0.6

The water is scale forming.

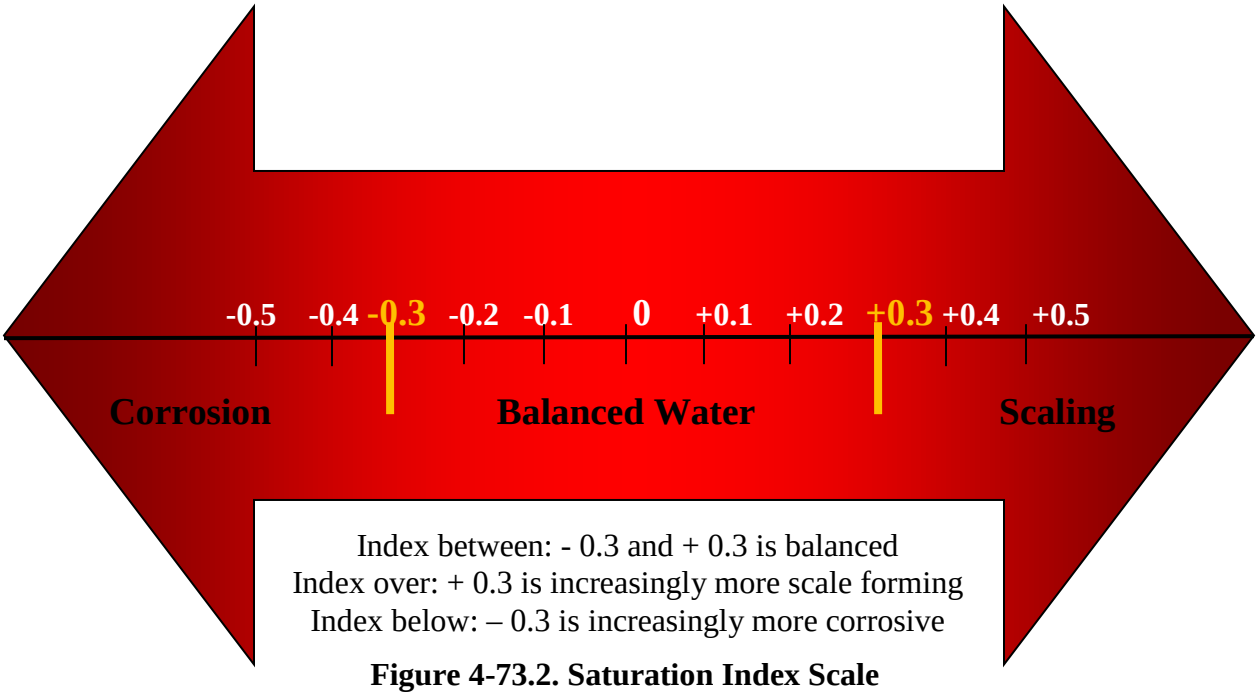

Figure 4-73.2. Saturation Index Scale

SECTION VIII. NATURAL AQUATIC AREAS

4-74. Beaches, Fresh, and Salt Water

1. This section applies to any body of water not contained within a structure, but which is under control of the Navy or Marine Corps for swimming, diving or recreational water activities. This includes seashore, natural lakes, reservoirs and impoundments, ponds, rivers, streams and associated buildings and equipment.

2. One of the primary requirements of natural swimming and aquatic areas is the protection of the health and safety of the users of these facilities, considering:

a. Physical characteristics

b. Support facilities

c. Water quality

d. Lifesaving and safety equipment

3. Planning and Review Considerations

a. A sanitary survey will be conducted by the medical department representative or preventive medicine authority responsible for the proposed natural aquatic area to establish the presence or absence of contamination and its source. Consultative survey support should be obtained from a Navy or Marine Corps Civil Engineer.

b. The survey should include a bacteriological study and an inspection for such safety hazards as strong currents, changes in depth, underwater obstructions, visibility, marine life, and temperature. Potential sources of contamination should be identified (e.g., sewer and industrial wastewater outfalls, storm water outfalls, and contaminated surface water runoff).

c. Consideration should be given to the possibility of the presence of endemic infectious agents transmitted indirectly through the water. Provisions for fit-for-human consumption water, wastewater disposal, and solid waste disposal must be included in the survey.

4-75. Diving Areas

Designated diving areas tend to enhance the use of natural aquatic areas. However, exercise care to prevent the creation of safety hazards.

1. Locate diving rafts or floats where the minimum depth of the water is 9 feet, extending a distance of at least 10 feet forward of the diving direction. The maximum allowable water depth of diving areas in natural aquatic areas is 17 feet.

2. If diving boards or platforms are installed 3 feet or less above the water, the minimum water depth is 10 feet, extending at least 12 feet beyond the diving surface.

3. If diving boards or platforms are installed at heights greater than 3 feet above the water, the minimum water depth at those locations must be 12 feet, extending a distance of 20 feet beyond the diving surface. Diving devices placed more than 10 feet above the water are not allowed.

4. If a raft or float is located where the water depth is less than 9 feet, post conspicuous and easy-to-read signs that prohibit diving (see figure 4-75.1).

Figure 4-75.1. Examples of "No Diving" signs

4-76. Support Facilities

1. Provide at least one dressing room shelter for each natural aquatic area. Whenever possible, combine dressing rooms with toilet facilities and showers.

a. Locate the facility approximately 200 feet from the water's edge, unless topography of area makes this unachievable. In such cases, the facility will be located as close to 200 feet from the water's edge as practical.

b. Design the floors of the bathhouse with an easy-to-clean material with a nonslip surface that is impervious to moisture and sloped to allow drainage of water.

c. An adequate number of toilet fixtures as determined by installation, local or State ordinances must be provided and maintained in a sanitary condition.

2. Refreshment stands provided at natural swimming and aquatic areas may range from a small vending machine to large snack bars. Sanitary control of food establishments and operations must be per reference (g).

3. Provide properly covered, leak-proof trash receptacles in the vicinity of the refreshment stands and, on the beach (as appropriate and will not create a barrier or safety hazard).

Figure 4-77.1. Over-the-Side swimming on a U.S. Navy submarine. U.S. Navy Photograph

4-77. Over-the-Side Swimming

1. Reference (h), chapter 5, article 5.1.58 authorizes COs to permit over-the-side swimming under certain conditions.

2. Depending on conditions, location and class of ship, the “swim-call” may be over-the-side, swimming in flooded well-decks, or swimming from beaches.

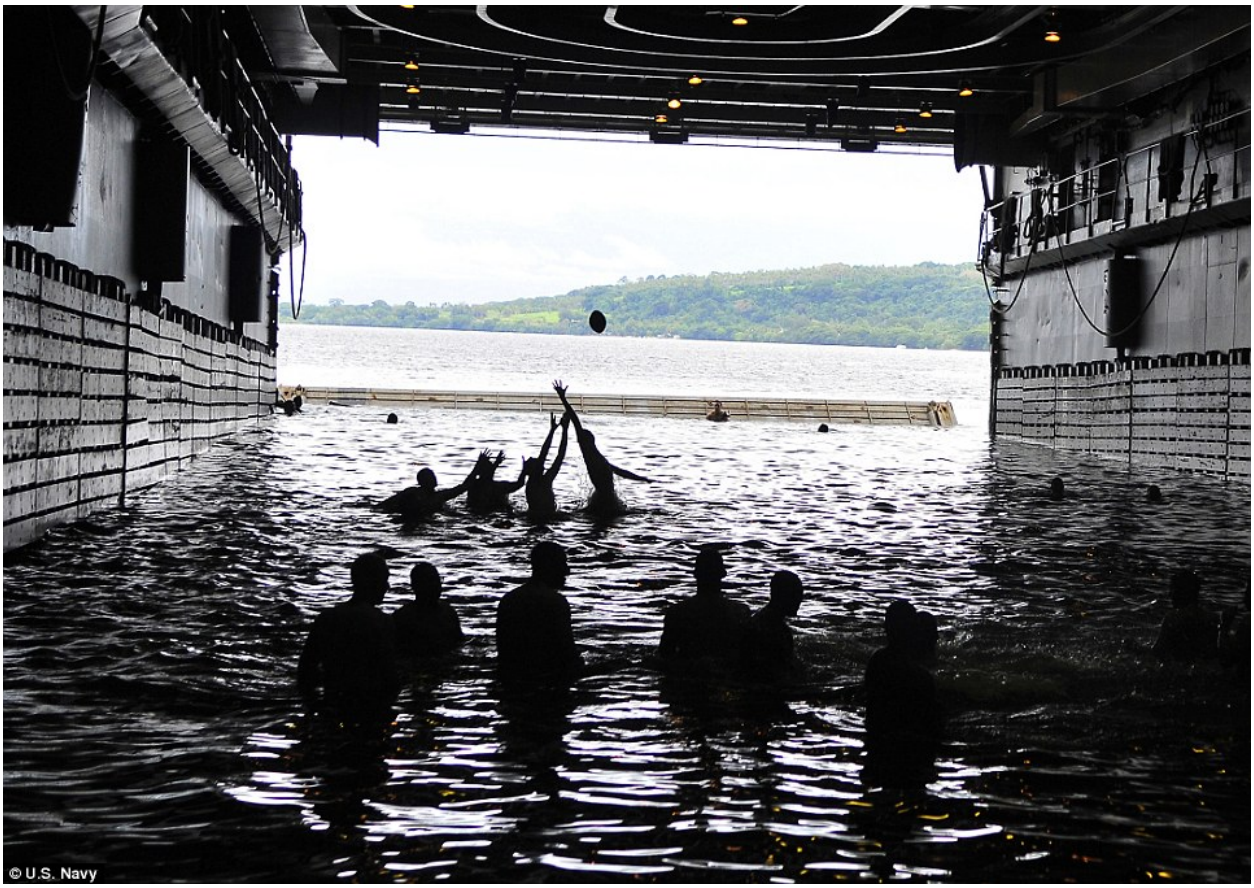

Figure 4-78.1. Flooded Well-Deck swimming on a U.S. Navy ship. U.S. Navy Photograph

4-78. Flooded Well-Deck Swimming

1. Although swimming in an enclosed well-deck may offer some measures of safety and protection that are not possible with over-the-side swimming, it is not without hazards of its own. The well-deck environment is designed for launching and recovering watercraft and amphibious vehicles. It has irregular surfaces, where oil, grease, cleaning solvents or other substances may be present, posing a health and safety risk to swimmers if not mitigated.

2. Medical Department personnel must be prepared to submit practical recommendations to COs concerning health hazards and safety precautions for these evolutions.

3. Health and safety considerations for natural swimming and aquatic areas are discussed in sections X and XII of this chapter.

SECTION IX. HEALTH CONSIDERATIONS IN POOLS AND SPAS

4-79. Sanitation and Disease Transmission

1. Swimming has historically been associated with exercise and health. Exercise that people receive from swimming and other aquatic activities provides a tremendous public health benefit to society. However, the water, and sometimes the air above the water can contribute to unhealthy conditions for the user unless proper water quality management is maintained.

2. Illnesses spread by water used for swimming, water activities and playing are called Recreational Water Illnesses (RWI). RWIs are spread by swallowing, breathing or having contact with contaminated water from swimming pools, spas, hot tubs, water parks, interactive fountains and other recreational water.

3. Current epidemiological evidence indicates that well-constructed, -operated, and -maintained training and recreational aquatic venues do not present major public health concerns. However, operating a facility without adequate regard for proper sanitary control and safety can and has resulted in injury, death, and the spread of disease.

4. Vigilance by all personnel involved in the operation, maintenance, and sanitary control of training and recreational aquatic venues is critical to preventing disease outbreaks and injuries and maintaining the facilities for their intended purpose.

5. Employees and users (patrons) must be free of infectious and communicable diseases.

6. Diseases and illnesses associated with training and recreational aquatic venues are classified into the broad categories provided:

a. Gastrointestinal diseases

b. Respiratory diseases

c. Diseases of the eye, ear, nose, or throat

d. Infections of the skin

e. Chemical toxicity

7. Efforts must be made to prevent unsanitary conditions that could lead to the spread of disease at training and recreational aquatic venues. For example:

a. Pets and other domestic animals are not permitted in the water, on the property, or in the buildings serving training and recreational aquatic venues. To prevent unsanitary conditions, discourage the presence of wildlife, to include the feeding of animals. An exception is provided for service animals that are controlled by the disabled person. Per the 2010 revised ADA requirements, when the particular service provided by such an animal is not obvious, only limited inquiries are allowed. Recreational water facility staff may ask two questions: (1) Is the

service animal required because of a disability, and (2) what work or task has the service animal been trained to perform? Staff may not inquire as to the person's disability and may not request medical documentation, a special identification card or training documentation for the animal, or that the animal demonstrate its ability to perform its assigned work or task. The service animal must be allowed to accompany the disabled individual to all areas of the facility where customers are permitted. Military working dogs may be permitted in the water in military training pools.

b. Water in the pool and residual or standing water on pool covers, pool equipment, and other surfaces must be treated in such a manner as to prevent algae growth and mosquito breeding.

c. If there is a suspicion that individuals may have contracted an illness as a result of exposure to a training and recreational aquatic venue, the preventive medicine authority will investigate immediately and implement remedial measures as appropriate (see paragraph 9-8). Such measures may include chemical and bacterial water sampling, adjustment of water quality parameters, disinfection of facilities, and temporary closure of the facility.

d. The illnesses, in particular, warrant immediate action if it appears a swimmer may have been sickened from training and recreational water facility use:

(1) Giardiasis

(2) Cryptosporidiosis (Crypto)

(3) *Pseudomonas aeruginosa* dermatitis or folliculitis

(4) *Staphylococcus aureus* infection

(5) *Legionella pneumophila* infection

(6) *Mycobacterium* spp. Infection

(7) *Acanthamoeba keratitis*

4-80. Fecal-Related Illnesses

1. When organisms such as Crypto, *Giardia*, *E. coli* O157:H7 and *Shigella* find their way into the water, it is most often through an accidental fecal release. These pathogens may be the reason why a person has diarrhea. When people infected with these diseases have a fecal release in the water and there is insufficient disinfectant to inactivate the pathogen, other users who ingest the water will swallow some of the germs and may become ill.

a. Protozoa

(1) Protozoa are single cell microscopic organisms that can be transmitted through food and water, and cause disease in humans.

(2) Once the protozoa are ingested, they live in the intestine, where they make their host ill, and are passed in the stool.

(3) Protozoa are larger than bacteria and viruses, though they cannot be seen by the naked eye.

(4) The two protozoan parasites most commonly involved in recreational water illnesses are Crypto and *Giardia*. In 2011 and 2012, Crypto and *Giardia* were responsible for 94 percent of the gastroenteritis outbreaks associated with treated swimming venues in the United States.

(a) Cryptosporidium

1. Ordinary water treatment methods cannot destroy Crypto.

2. Ultraviolet light, ozone and chlorine dioxide effectively inactivate Crypto.

(b) *Giardia*

1. Giardia has an outer shell that allows it to survive in harsh conditions, but it is not as resistant to chlorine disinfection as Crypto.

2. *Giardia* can be destroyed within 45 minutes at 1 ppm (mg/L) of free available chlorine at pH of 7.5 or less.

b. Bacteria

(1) Bacteria are single cell microorganisms that are smaller and less complex than protozoa. Bacteria can multiply in water with the proper nutrients.

(2) Bacteria such as *E. coli* O157:H7 and *Shigella* are sensitive to chlorine, so outbreaks appear to be a rare occurrence in chlorinated pools. However, outbreaks caused by lack of disinfection and heavy use of diaper-aged children still occur, highlighting the importance of proper operation and maintenance.

(a) *Shigella*

1. Is present in the diarrheal stools of infected persons while they are sick and for up to 2 weeks after the diarrhea ceases.

2. Most *Shigella* infections are the result of the fecal-oral route of transmission. Children, especially toddlers aged 2 to 4 are most likely to get shigellosis.

3. *Shigella* is quickly inactivated by the disinfectants used in swimming pools and spas.

(b) *Escherichia coli* O157:H7

1. Is one of hundreds of strains of the bacterium *Escherichia coli*. Most strains are harmless and live in the intestines of healthy humans and animals.

2. O157:H7 produces a powerful toxin that can cause severe illness.

3. These bacteria are easily inactivated by chlorine in water.

(c) *Pseudomonas aeruginosa*

1. Dermatitis, or an infection that causes the skin to become itchy and develop a bumpy rash, or folliculitis, an infection of hair follicles, are caused by contact with water contaminated by *Pseudomonas aeruginosa*. Because of its association with spas, the rash is sometimes called “hot-tub itch” or “hot-tub folliculitis”.

2. The same bacteria cause outer ear infections in pool users. Since the head and ears are not usually immersed in spa water as frequently, ear infections are rarely caused by spa water.

c. Viruses

(1) Viruses are smaller than protozoa and bacteria, and, unlike bacteria, cannot grow outside a person’s body. Viruses do not respond to antibiotics as bacteria do, although some vaccines are now available.

(a) Norovirus

1. Norovirus are a group of viruses that cause gastroenteritis and are found in the stool or vomit of infected people.

2. Symptoms include nausea, vomiting, diarrhea and some stomach cramping, sometimes accompanied by a low-grade fever, chills, headache, muscle aches and fatigue, and can appear as early as 12 hours following exposure.

3. Norovirus is highly contagious, spreading easily from person-to-person or from person-to-object-to-person.

(b) Adenovirus

1. Most commonly cause respiratory illness, but may also cause gastroenteritis, conjunctivitis and skin rashes.

2. Adenoviruses are usually resistant to chemical or physical agents and adverse pH conditions, allowing for prolonged survival outside of the body.

3. Adenoviruses are transmitted by direct contact, fecal-oral transmission and occasionally waterborne transmission.

4. Maintaining proper levels of chlorination is necessary for preventing swimming pool and spa-associated outbreaks of adenovirus.

(c) Hepatitis A

1. Infection with Hepatitis A virus leads to a contagious liver disease.

2. Hepatitis A can be easily inactivated in a properly maintained pool with free chlorine levels of 1 ppm (mg/L) within 16 minutes.

4-81. Fecal Incident Response Recommendations

1. It is important that a facility have a plan and that pool staff are properly trained for response to accidental fecal releases (AFR). Additional information is available at https://www.cdc.gov/healthywater/swimming/aquatics-professionals/fecalresponse.html.

2. All AFRs are not equal with regard to disease potential. A fully formed stool, while easily seen does not contain Crypto, based on a CDC study on 300 stool samples obtained from pools. Only a small portion of the formed stools contained *Giardia*.

3. The diarrheal AFR presents a much more serious problem and is less easily noticed.

4. The staff response will vary, depending upon the form of the AFR. Therefore, NSPF® recommends facilities follow the Centers for Disease Control and Prevention (CDC) fecal response procedure summarized:

a. For ANY type of AFR, direct all users to leave the pool. If the filtration system services more than one body of water, all of the affected pools must be closed. The pools must remain closed until all of the fecal response procedures have been completed.

b. For ANY type of AFR, manually remove as much of the material as possible. If the AFR is formed, remove it from the pool without breaking it apart, using a scoop or a net. Dispose of the material using the sanitary facilities. Vacuuming is prohibited.

c. Clean and disinfect the scoop and net.

d. Pools that contain chlorine stabilizers, such as cyanuric acid, dichlor, and trichlor may require higher free chlorine levels.

e. Formed Stool

(1) Raise the FAC level to 2 ppm (mg/L) and ensure the pH is 7.5 or less and the temperature is 77°F (25°C) or higher.

(2) Maintain the chlorine concentration for at least 25 minutes before opening the pool. If the pool contains cyanuric acid, the concentration and time (CT) inactivation time must be doubled.

(3) Ensure the filtration system is operating while the pool reaches and maintains the proper FAC concentration during the disinfection process.

f. Diarrheal Discharge

(1) Raise the FAC level to 20 ppm (mg/L). Maintain the pH at 7.5 or less and temperature at 77°F (25°C) or higher. Maintain the pH and chlorine level for 12.75 hours.

(2) If the pool contains cyanuric acid, the water must be treated by:

(a) Lowering the cyanuric acid concentration to less than or equal to 15 ppm by draining if necessary.

(b) Raising the FAC to 20 ppm (mg/L) for at least 28 hours; 30 ppm (mg/L) for at least 18 hours; or 40 ppm (mg/L) for at least 8.5 hours.

(3) The filtration system should be operating the entire disinfection time.

(4) Backwash the filter after the full disinfection time. The filter effluent should be directed to waste, and not back to the pool.

(5) Return the chlorine level to normal level as required by this chapter.

(6) Open the pool to normal user activities.

4-82. Vomit and Blood Contamination

1. Norovirus contamination is the most likely threat from vomit contamination of an aquatic venue. Blood contamination of pool water poses little health risk due to the sensitivity of blood borne pathogens to environmental exposure, dilution in the water and chlorination.

2. Vomiting while swimming is a common event. Often, vomiting is a result of swallowing too much pool water. In these cases, the vomit is probably not infectious. However, if the full contents of the stomach are vomited, respond to the incident using the CDC's formed fecal procedure, using *Giardia* inactivation times as discussed in article 4-81.4e.

3. Germs found in blood, such as Hepatitis B virus or HIV, are spread when infected blood gets into the body and bloodstream. There is no evidence that these germs have ever been transmitted from a blood spill in a pool. However, the pool operator may wish to close the pool temporarily for aesthetic reasons or to satisfy patron concerns.

4-83. *Legionella* Contamination

1. Aquatic venues (most likely hot tubs) that contain *Legionella* bacteria can cause outbreaks of disease. *Legionella* can cause Legionnaires' disease, a serious type of lung infection, and a milder infection called Pontiac Fever.

2. It is critical to collect water samples, then disinfect hot tubs linked to cases of Legionnaires' disease or Pontiac Fever.

3. There are currently no scientific studies to determine the best way to disinfect a hot tub that contains *Legionella*. Until more definitive procedures are developed, the CDC has posted its protocol for disinfection of hot tubs contaminated with *Legionella* on its Web site at https://www.cdc.gov/legionella/downloads/hot-tub-disinfection.pdf.

4-84. Bacteriological Water Quality

1. The basic purpose of a bacterial quality indicator of water in a swimming pool or spa is to confirm the accuracy of the disinfectant and pH tests. If the FAC and pH values are greater than the minimum values stated in appendix E, then the pool or spa water should be of acceptable bacterial quality. However, problems such as those with the distribution system may result in invalid tests.

2. Routine microbiological testing for pools, spas and other chlorinated aquatic venues is not required. Routine monitoring of chemical levels (e.g., pH, disinfectant concentration) and proper operation and maintenance of the aquatic venue have historically been considered to be sufficient to ensure that proper barriers are maintained to minimize potentially infectious disease risks from chlorine sensitive pathogens. However, while these tests provide an indication of disinfection potential, they may not provide complete assurance of the microbial quality of the aquatic venue water.

a. Although routine microbial testing is not required at this time, microbiological testing can be useful as supporting data for evaluating the need for (*or effectiveness of*) troubleshooting activities, remediation activities, and aquatic facility upgrades.

b. As indicated in *Guidelines for Safe Recreational Water Environments: Vol. 2-Swimming Pools and Similar Environments* (World Health Organization), microbiological testing of water samples from aquatic venues may be useful for the reasons stated:

(1) Before an aquatic venue is used for the first time,

(2) Before it is put back into use after it has been shut down for repairs or cleaning,

(3) If there are difficulties with the treatment system, or

(4) As part of any investigation into possible adverse effects on bather or patron health.

c. *Legionella pneumophila, Pseudomonas aeruginosa, Cryptosporidium parvum, Entamoeba histolytica* cysts, and *Mycobacterium avium* complex have been reported to show tolerance to chemical disinfectants (e.g., chlorine, bromine). These organisms may exist in planktonic form and in biofilms.

d. Microorganisms in biofilm receive additional protection from oxidizers (such as chlorine) when the exposure concentration of the oxidizers is reduced at the interface with the biofilm due to the reaction with biofilm material. Even at elevated concentrations, oxidizing and non-oxidizing chemicals have reduced effectiveness in controlling biofilm when their concentrations and contact times are not sufficient for penetrating the biofilm. Biofilm formation in aquatic venues is also a concern because microorganisms in the biofilm or the biofilm itself can detach and multiply.

3. If indicated, conduct all tests for bacteriological indicator organisms per the current edition of the American Public Health Association (APHA)/AWWA/Water Environment Federation (WEF) Standard Methods for the Examination of Water and Wastewater, using methods approved by the EPA for use in drinking water.

4-85. Bacteriological Laboratory Analysis

1. The preventive medicine authority should maintain the capability to perform total coliform analyses. More specific bacterial identification may require outside laboratory assistance.

2. If the water in a swimming pool or spa is suspected in the transmission of disease, tests may be warranted for other bacterial agents such as staphylococci and *Pseudomonas aeruginosa*. *P. aeruginosa* is commonly associated with spa waters. Methods for the enumeration of these species are in the current edition of the APHA/AWWA/WEF Standard Methods for the Examination of Water and Wastewater. The level of staphylococci should not exceed 50 CFU/100 mL of sample. No maximum acceptable value has been established for P. aeruginosa. Until a maximum value is established, use a guideline value of less than 1 CFU/100 mL of sample.

4-86. Bacteriological Sample Exceedance

1. Should bacteriological standards be exceeded, take the actions provided:

a. Collect repeat samples promptly at the points of the previous collection.

b. Expedite the shipment of samples so the laboratory report can be obtained promptly.

c. Working closely with the program manager and the PWO, investigate immediately to determine whether any unusual conditions such as repairs to facilities, storms (if an outdoor facility), military training at the facility, or other activities may have caused a problem. Also, determine if the filtration and disinfection systems have been operating properly.

d. Ensure that pH and chlorine residuals are within acceptable ranges (Appendix E).

e. Attempt to identify the specific organisms causing excessive bacterial counts. Seek the advice of the laboratory serving the installation for organism identification.

2. If the results of the resample again exceed standards, recommend that the installation CO close the facility until the cause of the problem is determined. Superchlorination of the pool may be required (paragraph 4-5-6.) to reduce the bacterial presence to acceptable levels.

4-87. Cleaning and Disinfection of Contaminated Surfaces

1. If feces, vomit, or blood has contaminated a surface in an aquatic facility, limit access to the area until remediation procedures are completed.

2. Before disinfection, clean and remove all visible contamination with disposable cleaning products effective with regard to the type of contaminant present, the type of surface to be cleaned, and the contaminant's location within the facility.

3. Disinfect the contaminated area using solution containing 500 ppm (mg/L) FAC for non-porous surfaces or 5,000 mg/L FAC for porous surfaces (one gallon of water mixed with ¼ cup of bleach = 500 ppm (mg/L) solution).

4-88. Measurement of Chemical Water Quality

1. Pool staff must evaluate and document the chemical water quality of training and recreational aquatic venues as per appendix E. Preventive medicine or public health personnel will review these records as part of their monthly inspections.

2. Determine chlorine residuals and pH using a test kit. Record chlorine residuals and pH determinations on the swimming pool operating log.

a. At swimming pools, the chlorine residual and pH are measured every 2 hours, at a minimum, during active pool operating hours.

b. At wading pools, aquatic play features, spray pools, and spas, greater usage may require testing the water more frequently.

c. Test the water 30 minutes before the facility opens.

d. If the tests reveal the water quality does not meet the minimum requirements, do not open the facility until the water quality is brought into compliance. Follow the reporting and response procedures in the facility's emergency action plan (section XIII of this chapter).

e. Measure the swimming pool water temperature at least twice each day and record the temperature on swimming pool operating log. Record the spa water temperature each time the residual chlorine and pH are measured. The temperature of spa water must not exceed 104 of and must be monitored every 2 hours and posted on the spa caution sign or monitored continuously by automated equipment that displays the temperature within sight of the spa.

3. As discussed in article 4-68 of this chapter, maintaining the proper pH level is critical to the effectiveness of the disinfectant.

4. PWO personnel perform and document a test for alkalinity at least once weekly.

5. Cyanuric acid levels should be measured at least monthly for pools adding cyanuric acid and biweekly for pools using stabilized chlorine as the primary disinfectant.

6. Each facility must have a test kit to measure pH, chlorine residual, calcium hardness, total alkalinity, cyanuric acid, and must have a device to measure total dissolved solids and temperature.

7. Retain all records for a minimum of two swimming seasons.

4-89. Physical Water Quality. Always maintain the water quality so that the bottom of the pool or spa is clearly visible when the water is undisturbed. If at any time the turbidity is such that the bottom of the pool or spa is not clearly visible, or when a Secchi disk (hockey puck) placed at the deepest point is not clearly visible to an adult standing on the deck, the facility should be closed until the water is clear enough for the bottom to be seen.

4-90. Hot-Water Diseases

1. Legionnaires' Disease

a. The risk of contracting Legionnaires' disease is much greater in and around a spa than a pool. Although these bacteria are quickly killed by chlorine or bromine, the risk is greater in spas because the spa environment is more favorable for bacteria growth.

b. The bacteria become aerosolized by the bubble action of the spa. The aerosol droplets are small enough that they float in the air and may be inhaled by people in or near the spa. Once in the lungs, the bacteria can begin to grow, reproduce and may cause pneumonia. Also see article 4-83 of this chapter.

2. Dermatitis. Associated with contact with water contaminated by *Pseudomonas aeruginosa* (see article 4-80 of this chapter).

4-91. Preopening Inspections

1. Approximately 30 days prior to opening, knowledgeable representatives of preventive medicine or public health, NAVFAC Public Works, the installation safety office, and MWR must perform a thorough annual inspection of all swimming facilities and spas to ensure safe and healthful swimming and aquatic activities.

2. At indoor facilities operated year-round, conduct the annual inspection at a specified time, preferably 30 days prior to the start of heavy seasonal use.

3. The training and recreational aquatic venues in subparagraphs 3a through 3c must undergo a preopening inspection:

a. facilities that have undergone renovations during which equipment has been changed or added;

b. those where a change in operations has taken place (water venue was modified, for example); or

c. any facility that has been closed longer than 30 days.

4. The inspected facility may not be opened until noted deficiencies have been corrected.

4-92. Routine Inspections

1. The preventive medicine authority conducts routine inspections of all training and recreational aquatic venues in active operation to determine whether a facility's sanitation and safety controls meet the minimum requirements of this chapter at least monthly. All recreational water inspections must be entered in the Environmental Health module of the Defense Occupational and Environmental Health Readiness System (DOEHRS), https://doehrs-ih.csd.disa.mil/. To facilitate data entry, utilize the DOEHRS Recreational Waters Survey form appropriate for the venue type (see Appendix F). The latest versions of the DOEHRS Recreational Water Survey forms are available at https://www.med.navy.mil/sites/nmcphc/program-and-policy-support/swimming-pools-and-bathing-places/Pages/default.aspx. Inspection records must be retained for at least 2 years.

2. More frequent inspections and concurrent bacteriological analysis must be conducted if local conditions so dictate. Frequent inspections of training and recreational aquatic venues ensure that proper sanitation and safety controls are implemented and followed.

3. Special attention will be given to these water quality parameters:

a. Disinfectant residual

b. Cyanuric acid (if used)

c. pH

d. ORP

e. Turbidity

f. Water temperature (especially hot water)

4. Any deficiencies identified during monthly inspections must be addressed with PWO in tandem with the program manager and corrected. The installation CO must be made aware of any recurring or major deficiencies that pose a direct threat to public health.

5. Appendix F provides additional information about inspections at training and recreational aquatic venues.

4-93. Closure of an Aquatic Facility

1. Aquatic facilities must be maintained in safe condition during planned or seasonal closures.

2. Closing a facility for 7 days or less is considered a temporary closure. Closing it for longer than 7 days is considered a long-term closure.

3. Facilities closed for more than 7 days must meet all criteria in this chapter before reopening.

4. When facilities are closed, even for short periods of time, their potable water sources will likely become stagnant. Ensure all potable water sources (including drinking fountains) are adequately flushed and disinfected prior to reopening the facility.

SECTION X. HEALTH CONSIDERATIONS IN NATURAL AQUATIC AREAS

4-94. Diseases

1. Natural aquatic areas are unique because water quality is influenced by many factors such as wild animals, plants, sewage outfalls, and storm runoff.

a. Early epidemiological studies have associated gastrointestinal illness with swimming in sewage-contaminated water. In some of these studies, typhoid fever and nonspecific enteritis were shown to be statistically related to swimming in water into which raw sewage had been discharged. In more recent epidemiological studies, swimming in natural bodies of water was found to be associated with outbreaks of shigellosis, salmonellosis, and viral infections caused by the Coxsackie A16 and B viruses, hepatitis A virus, and Norwalk agent virus.

b. From 1948 through 1950, epidemiological studies were conducted by the U.S. Public Health Service to determine specifically what, if any, relationship exists between the water quality of natural aquatic areas and the illnesses of patrons who come into contact with the water. These inconclusive studies tended to show that a higher incidence of disease (including gastroenteritis, respiratory disease, and infections of the eyes, ears, nose, and throat) was associated with swimming in water of poor bacterial quality.

c. In the 1970s and 1980s, EPA undertook several epidemiological studies to gain better insight into the public health problems associated with swimming in natural aquatic areas. These studies indicated that high gastrointestinal illness rates of swimmers were associated with high densities of fecal bacteria: *E. coli* and enterococci. Density values for total coliform bacteria showed little or no correlation with illness. These studies resulted in the proposal of new bacteriological standards for recreational waters.

d. More recently, EPA collaborated with CDC using rapid detection technology at fresh water and marine beaches in the United States and published updated water quality criteria in 2012 (see Appendix E).

4-95. Water Quality Standards

1. Swimming in natural waters (such as streams, rivers, lakes, and tidal or salt waters) presents special problems. The sanitary quality of these waters cannot be controlled nearly as easily as in well-designed swimming pools. Site selection for these facilities is the most critical factor in maintaining good sanitary quality.

2. Bacteriological examination, as part of a rigorous sanitary survey, is essential for all areas and tributary watersheds considered for use as natural aquatic areas. Use the water quality criteria discussed in articles 4-96 and 4-97 to determine the acceptability of the site. The use of all natural aquatic areas under installation control is subject to approval of the installation CO. Additional guidance for evaluating natural aquatic areas may be available in specific state regulations and policies applicable to natural recreational aquatic venues.

4-96. Bacteriological Indicators

1. *E. coli* and enterococci (a subgroup of fecal streptococci), are considered the best indicators for gastroenteritis risk to swimmers in fresh water. Enterococci are considered the best health risk indicators for marine waters.

2. Using these indicator organisms, the EPA created Beach Action Values (BAV) which function as conservative, precautionary tools for making water closure decisions. These values differentiate water quality criteria (discharge permit requirements, for example) from water health warnings. The BAVs are intended to be single sample guidance for issuing health warnings and are shown in table 4-96.1.

Indicator	BAV (Units per 100 mL)
Enterococci (fresh and marine)	70
E. coli (fresh)	235

Table 4-96.1. Beach Action Values

3. At a minimum, natural aquatic areas must be monitored monthly. Any single sample measuring above the BAV triggers a water closure that remains in effect until a repeat sample that measures below the BAV is collected. Repeat samples should be collected within 24 hours of the elevated sample.

4. Monitoring the natural aquatic area after rainfall can provide a baseline of data to:

a. Determine the extent to which runoff affects the quality of the aquatic area water.

b. Establish the period of time required for bacterial levels to return to normal. This information can support decisions to issue water health warnings or prohibit access to the water.

4-97. Physical Water Quality. Clarity and visibility in the waters of natural aquatic areas are very important, but not required. Water clarity will allow for:`

1. Clear observation of swimmers by the lifeguards.

2. Visibility of the bottom at wadeable depths.

4-98. Routine Inspection

1. The preventive medicine authority should conduct inspections at least monthly, to include bacteriological collection and analysis, of all-natural aquatic areas in use. Inspections determine if the sanitary control and safety of these facilities meet or exceed the minimum requirements of this chapter. More frequent inspections and concurrent bacteriological analyses must be conducted when local conditions warrant.

a. At some installations that feature natural aquatic areas, the local or state health department may conduct routine bacteriological analysis of waters they have access to. For example, a stretch of shoreline where the installation's beach is contiguous with a local public beach. In these cases, the installation preventive medicine authority may utilize the testing data from the health department to determine sanitary conditions at the natural aquatic area.

b. Even though the local or state health department may collect water samples and conduct bacteriological analysis for natural aquatic areas, the installation preventive medicine authority should continue to conduct monthly inspections of natural aquatic areas to ensure safe and sanitary conditions are maintained.

2. Water samples at natural aquatic areas are collected at least 25 feet from shore at a depth of 3 to 4 feet and in an area representative of the natural aquatic area water. If necessary, the preventive medicine authority may request assistance from lifeguard services to obtain a sample

3. Additional information is collected regarding factors that may impact the water quality of natural aquatic areas, to include the approximate amount of rainfall in the previous 24 hours, bather load at the time of sampling, presence of waterfowl, clarity of the water, and wind direction.

4. Appendix F provides additional information about inspections at natural aquatic areas.

4-99. Annual Inspection and Sanitary Survey

1. Along with representatives from the installation safety office, local environmental office, MWR program manager and others as appropriate, the preventive medicine authority will perform a sanitary survey at least yearly for all natural aquatic areas. See article 4-100 for more information about sanitary surveys. The survey:

a. Must be conducted approximately 30 days prior to the area's opening or prior to an annual increase in patron use.

b. Examines safety hazards and potential sources of pollution (such as wastewater discharge or agricultural drainage) that could impact the swimming area.

2. The factors provided, influence the suitability of a natural aquatic area:

a. Location and volume of point and non-point source discharges and their chemical, bacterial, and physical characteristics. For example, sewage treatment plant and pump station locations, industrial plant discharge points, agricultural drainage areas, and large populations of waterfowl can potentially impact natural aquatic areas.

(1) No specific distance from point and non-point surface discharges to a natural aquatic area will apply in all cases.

(2) An evaluation of the bacteriological and chemical effects of these discharges on the swimming area must be included as part of this survey. Interpretation of these results determines if the discharges are significant.

b. Volume and quality of the receiving water

c. Water depth and slope within the proposed swimming area

d. Water surface area

e. Tides (if applicable)

f. Time of day and year, and weather conditions at the time of the survey

g. Thermal and salinity stratification

h. Effects of tributaries on the area

i. Water current

j. Prevailing winds

k. Other site-specific criteria that may apply

l. Submerged objects, sharp drop-offs, the condition and stability of the beach bottom, and the water depth in the diving area. Some natural aquatic areas may be known to experience shifting sands after storm events. Evaluate such areas after storms to ensure patron safety.

3. The sanitary survey must also include inspection of grounds, bathhouses, toilets, drinking water supply, sewage disposal, safety equipment, and signage; as appropriate.

4-100. Causes for Closure

1. If a known waste contamination event (such as sewage bypass, ruptured sewer pipe, or other discharge) is expected to impact the swimming area's water quality, the preventive medicine authority in conjunction with the MWR program manager must recommend a beach or water closure. A beach or water closure may be decided upon without sample results confirming the pollution. However, factors such as currents, tides, and wind direction must be factored into the closure decision and will be discussed with the MWR program manager.

2. If a known or suspected contamination event prompts sampling of a natural aquatic area, the preventive medicine authority may recommend closure if the initial results exceed the standards (that is, prior to resample results).

3. Rainfall data may also be used to implement natural aquatic area closures. Establish a baseline by collecting samples within 24 hours of a measurable rainfall event for at least one season. If the data show that bacterial levels are above the BAV 24 hours after a measurable rain event, the preventive medicine authority should recommend that the affected natural aquatic area be closed following such rainfall events.

4. The natural aquatic area may be closed when requested by the preventive medicine authority preventive medicine authority or for the reasons provided:

a. Obvious contamination of the beach.

b. Swimming water quality does not meet bacteriological or physical standards.

c. Inadequate lifeguards or safety equipment, or other potentially hazardous conditions.

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SECTION XI. SAFETY CONSIDERATIONS FOR POOLS AND SPAS

4-101. Drowning and Injuries

1. All injuries sustained while using a recreational water facility and which require medical treatment must be reported to the safety office and preventive medicine or public health personnel. Medical treatment includes treatment administered by physicians, hospital staff, or emergency medical personnel. Notification must be made within 1 week of occurrence, including information on the victim, type of injury, treatment, outcome, and injury circumstances. Serious injuries such as drowning; any event requiring resuscitation; head or spinal injuries; or poisoning or asphyxiation from gaseous or solid disinfectants must be reported immediately up the established chain of command. This includes the installation commands, the Navy Safety Center, and the higher headquarters of the operating facility.

2. Common factors identified as leading to swimming pool injuries are:

a. No qualified person supervising the swimming pool area.

b. No signs posted to warn of potential dangers.

c. Absent, improperly marked, or improperly placed depth markers.

d. Occurrences of “shallow water blackout” the loss of consciousness under water are often caused by swimmers hyperventilating to increase the amount of time they can hold their breath under water. As noted in Appendix D of this chapter, **this practice is prohibited**.

3. Since it increases the risk of injury, alcohol is incompatible with safe swimming. Alcohol is not permitted at training and recreational aquatic venues.

4-102. Chemical Hazards

1. An emerging focus of concern at aquatic facilities is the risk of chemical injury from the improper handling of pool chemicals. Chemicals can become sources of illness and injury if they are not properly handled or if water quality and ventilation are poor. Recent cases have been linked to chemical overfeed, improper pool chemistry, and excessive chloramines.

2. There are three primary routes of chemical exposure from pools and spas:

a. Ingestion

b. Inhalation

c. Dermal contact and absorption

4-103. Spa Drowning and Injuries

1. In 2013, the CPSC reported an estimated 5,100 pool- or spa-related submersion injuries occurred each year between 2008 and 2012 with an estimated 3 percent of occurrences involving spas. The CPSC further reported 39 cases of circulation or suction entrapments during the same period with 33 percent of victims associated with a spa; the majority of victims were under the age of 15. In 2007, the VGB Act mandated that all new and existing swimming pool and spa drain covers comply with ANSI/APSP/ICC-7 and ANSI/APSP-16 standards.

2. Other reported injuries are related to slips and falls that occur while a patron is entering or exiting a spa. Installation of slip-resistant surfaces in and around the spa is recommended to reduce the hazard.

4-104. Water Temperature for Spas

1. The temperature of spa water can cause injury or even death. Maintain spas at or below 104°F, as there are no physiological benefits to operating at temperatures above this value.

2. When a person is submerged shoulder-deep in spa water, only the head, neck and upper portions of the shoulders are available to dissipate the heat generated by body metabolism. If the deep body temperature reaches or exceeds 104 °F, serious health consequences may result.

3. Evidence shows that exposure to the elevated temperatures of a spa can have a damaging effect to the developing fetus; therefore, pregnant women should not use spas. The following warning must be posted on all spa entrance signage: *"Potential risk of birth defects and miscarriages is associated with maternal hyperthermia, especially during the first 12 weeks of pregnancy. Heat exposure to the fetus later in pregnancy should be kept to a minimum to avoid maternal hyperthermia."* Additional information regarding the risks associated with high water temperature is provided in reference (f) Annex, section 5.7.4.7.2.

4. Persons using spas with high water temperatures may experience drowsiness followed by unconsciousness and possible drowning. Because alcohol also relaxes the user, consumption of alcoholic beverages during spa use is prohibited.

5. Young children are more susceptible to heat injury, such as overheating, when they are exposed to elevated spa water temperatures. As a result, the CDC recommends excluding children ages 5 years and younger from entering a spa, whether or not they are accompanied by an adult. Refer to http://www.cdc.gov/healthywater/swimming/resources/operating-public-hot-tubs-factsheet.html for additional information.

6. Guidance procedures for safe use must be posted at the entrance of every spa. Appendix D provides recommendations for safe use.

4-105. Supervision of Swimming

1. Lifeguards and aquatic staff must maintain certification and training requirements as specified in references (c) and (d), to include bloodborne pathogen training specified in 29 CFR 1910.1030.

2. At least one person responsible for maintaining pool balance and adjusting chemicals must hold a valid CPO or AFO certificate. Such persons do not have to be constantly available on the premises but must be available on-call.

3. Lifesaving measures and equipment must be per this chapter, or current nationally recognized standards, whichever is most stringent.

4. Surveillance duties (including shifts and breaks) must be implemented per references (c) and (d).

5. Locate lifeguards in positions from which they can observe their entire assigned swimming area.

6. Additional lifeguards may be needed during special events, instructional classes, or if play features, a zero-depth pool entry, or large aquatic areas are present. Site-specific conditions, to include bather occupancy loads, will determine the actual number of lifeguards required to adequately supervise a pool.

4-106. Lifesaving Equipment

1. Each pool must be furnished with the lifeguard and lifesaving equipment described in references (c) and (d).

2. In addition, a first-aid station must be equipped with the information provided:

a. A first-aid kit meeting the requirements of OSHA standard 29 CFR 1910.151, medical services and first aid, and service directives.

(1) The decision to stock aspirin in first aid kits to provide to patrons must be made locally among pool management, the safety officer, the staff judge advocate, and the preventive medicine or public health authority.

(2) Potential liability issues involved with dispensing aspirin to patrons should be weighed against the life-saving benefits of aspirin in cases of suspected heart attack. If aspirin is stocked in first aid kits, a minimal number of single use packages, rather than bottles, should be stocked.

a. A bloodborne pathogen personal protective equipment (PPE) kit meeting the requirements of OSHA standard 29 CFR 1910.1030 (d)(3)(i).

b. A blanket and stretcher.

c. An automated external defibrillator (AED) to include all required accessories and supplies.

3. Spas in a standalone location (not co-located with a pool) must be equipped with the lifesaving equipment provided:

a. An emergency shut-off button.

b. An automatic emergency phone or call button.

c. A first aid kit meeting the requirements of OSHA standard 29 CFR 1910.151.

d. A bloodborne pathogen PPE kit meeting the requirements of OSHA standard 29 CFR 1910.1030 (d)(3)(i).

e. A backboard with straps and a head immobilizer, X-ray and MRI and CT compatible.

f. A working clock clearly visible from the spa.

SECTION XII. SAFETY CONSIDERATIONS FOR NATURAL AQUATIC AREAS

4-107. Drowning and Injuries

1. Drowning is a significant safety issue at natural aquatic areas. The percentage of drownings in natural water settings increases with age; the majority of drowning victims are over 15 years of age.

2. Safety at natural aquatic venues depends upon the ability of swimmers to swim, to take care of themselves under ordinary conditions, and to recognize and avoid hazardous water conditions and practices.

4-108. Natural Aquatic Area Safety Guidelines

1. To provide a reasonably safe natural swimming area:

   a. Promote the prevention of accidents and injuries.

   b. Supervise the swimmers.

   c. Keep suitable rescue equipment readily available.

   d. Ensure nonhazardous levels of chemical and biological contaminants.

2. The bottom of the natural swimming area should:

   a. Slope gently and uniformly toward deep water.

   b. Have no holes or sudden step-offs.

   c. Be free of hidden or submerged obstructions such as rocks, stumps, snags, and sunken logs.

   d. Be composed of firm sand, small-sized gravel, or shale.

   e. Have no silt, quicksand, shell patches, sharp and broken rock, or debris in depths of 5 feet or less.

3. Clearly define and mark swimming areas for swimmers of varying levels of experience.

4. Permit no watercraft in the swimming areas other than those used for lifesaving.

5. If able, mark the outermost limits of swimming areas at regular intervals with buoys, or similar devices, bearing signs warning all watercraft to keep out.

6. If able, post signs on offshore floats or rafts indicating whether or not diving is permitted.

7. Post signs at unprotected ocean aquatic area beaches to warn swimmers and bathers of the possible presence of harmful aquatic life, such as jellyfish.

8. Keep beach areas clean at all times and well-raked when appropriate.

9. Designate smoking areas near the beach and provide proper waste receptacles.

10. Prohibit glass bottles and containers on the beach.

11. Prohibit alcohol on the beach.

12. MWR must post information at natural aquatic areas to advise the public about water conditions, hazards rip currents and weather. A flag or alert will be used to notify patrons of the water conditions of the day.

13. Recent research has shown Methicillin Resistant Staphylococcus Aureus (MRSA) may be present in the sand and water of natural aquatic areas. Post a sign where patrons will see it upon entry to the area. Wording should be similar to the following:

To Prevent the Risk of Illness—
1. Cover any open cuts or scrapes before playing in the sand, to reduce the risk of infection.
2. Shower after swimming and wash off all sand.

4-109. Over-the-Side Swimming Safety Guidelines

1. Swimming over-the-side (in the immediate area of the ship) is prohibited when the ship is in water that is suspected or known to be contaminated. Unless approved by the senior officer present, afloat, swimming over-the-side is prohibited in harbors or other fleet concentration areas.

2. All available medical intelligence regarding dangerous marine life, parasites, and waterborne diseases present in the ship's geographical area should be considered prior to authorizing swimming.

3. The water should be clear and free of floating or submerged debris, oil, algae, and dangerous marine life.

4. All suction and discharge outlets should be secured at least 30 minutes before swimming.

5. When the ship is anchored, a swimming area should be designated, preferably with anchored buoys on the leeward side of the ship.

6. Adequate resting devices (e.g., lowered accommodation ladder, rope ladder, "Jacob's ladder," secured inflatable rafts) must be provided to accommodate swimmers.

7. Two swimmers, qualified as lifeguards, must be posted for each group of less than 100 swimmers, with one additional lifeguard for each additional 50 swimmers, or fraction thereof.

8. One boat provided for "man overboard" must be in the water adjacent to the swimming area. An additional boat will be provided for parties larger than 100.

9. Two persons qualified in the use of firearms and provided with weapons and binoculars should be posted as shark guards in the ship's superstructure or other location with a clear view of the designated swimming area and adjacent waters.

10. A loudspeaker, megaphone, or the ship's 1MC system should be available to the officer in charge (OIC) of the swimming party to recall and direct swimmers. Additionally, the OIC should have communication with the small boats, shark guards, and the bridge.

11. For flooded well deck swimming:

a. Wash down the bulkheads and decks with water and scrub soiled and greasy areas.

b. Two swimmers qualified as lifeguards will be posted for each group of less than 100 swimmers, with one additional lifeguard for each additional 50 swimmers, or fraction thereof.

c. A complete exchange of water must be provided every 8 hours during periods of continuous use.

4-110. Supervision of Swimming

1. Whenever a natural aquatic area is open for use, at least two qualified lifeguards must be on duty within the area of responsibility. One of the lifeguards must be stationed in a lifeguard tower or elevated chair. Ensure elevated lifeguard towers and chairs are:

a. Provide one lifeguard tower or elevated chair every 200 yards of beach or fraction thereof for the entire area of responsibility.

b. Constructed and strategically located in such a manner to provide complete surveillance of all swimmers, bathers, and divers within assigned swimming areas.

c. High enough to give lifeguards a complete and unobstructed view of the swimming and beach area for which they are responsible.

2. Provide one lifeguard in a boat or rescue craft for every 1,000 feet of guarded water during increased patron use.

3. When on duty, lifeguards may not perform any duties other than patron surveillance, and they may not be in the water except in the line of duty.

4. Lifeguards must be certified per references (c) and (d).

5. Identify on-duty lifeguards by means of distinguishing apparel, emblems, or signs.

6. Equip each lifeguard with a whistle or megaphone, an umbrella, a hat that does not hinder peripheral vision, and sunscreen (sun protection factor (SPF) 15, at a minimum).

7. Surveillance duties (including shifts and breaks) must be implemented per references (c) and (d).

8. Natural aquatic areas not adequately staffed with lifeguards must have signage posted warning that no lifeguard is present.

4-111. Lifesaving Equipment

1. In natural aquatic areas, provide lifeguards with the lifesaving equipment provided:

a. A rescue board, kept in the immediate vicinity of each lifeguard tower or chair.

b. A swimming rescue can or tube available to each lifeguard. This device is used by a lifeguard to provide buoyancy for a victim and to assist the lifeguard in bringing the victim to safety.

2. In addition to the equipment previously listed, provide the additional equipment:

a. A properly equipped first-aid station and readily available telephone or communication device.

b. A backboard with straps and a head immobilizer, X-ray and MRI and CT compatible.

c. An AED equipped with all required accessories.

d. Mask(s) and snorkel(s) readily accessible for underwater search and rescue as appropriate.

e. Binoculars readily accessible in the lifeguard tower and emergency vehicle.

f. Marker buoy(s) readily accessible for submerged victim search and rescue.

g. Swim fins readily accessible to lifeguards for rescue purposes, as appropriate, per local conditions.

3. Position some of the lifesaving equipment at each lifeguard tower and elevated chair as appropriate. In addition, keep extra equipment at a central point where it is readily available.

SECTION XIII. EMERGENCY PLANNING

4-112. Emergency Response Plans

Managers of training and recreational aquatic venues must maintain an operating procedures manual onsite containing emergency response and communication information.

1. Develop an emergency response plan (ERP) similar to those outlined in reference (f), the American Red Cross, Young Men's Christian Association (YMCA®) or to comparable aquatic safety organization manuals. YMCA® is a registered trademark of National Council of Young Men's Christian Associations of the United States of America, Chicago, IL. At a minimum, the plan must include:

a. A diagram of the facility.

b. Names and telephone numbers of police, fire, ambulance, and other emergency service personnel.

c. Location of the first-aid kit and other rescue equipment.

d. Emergency response procedures for an accidental chemical release.

e. Anticipated emergency scenarios and response and communication procedures (including weather, evacuation, contamination, drowning, and medical and environmental emergencies).

f. Other topics included in specific service directives.

2. The ERP must be included in the orientation for newly-hired lifeguards and must be practiced at least once prior to their performing primary duties. It must also be practiced annually by current staff.

3. The ERP must be reviewed at least annually and updated as necessary.

4. A Communication Plan for natural swimming and aquatic areas must establish rules for using available or designated forms of communication. If radios or walkie-talkies are used for communication, ensure the codes and means of communication are documented and understood by all training and recreational water venue staff and lifeguards.

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CHAPTER 4
RECREATIONAL WATER FACILITIES

APPENDIX A
REFERENCES

References Cited in This Manual

(a) BUPERSINST 1710.11

(b) OPNAVINST 1710.11

(c) CNICINST 1710.3

(d) MCO 1700.39

(e) DoD UFC 4-750-07

(f) CDC Model Aquatic Health Code

(g) NAVMED P-5010 Chapter 1

(h) OPNAVINST 3120.32

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TB MED 575, *Recreational Water Facilities*

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EPA 820-B-13-001, *Marine Beach Sanitary Survey User Manual*

EPA 820-F-12-058, *Recreational Water Quality Criteria*

16 CFR 1207.5, *Safety Standards for Swimming Pool Slides*

28 CFR 35.151 and 28 CFR Part 36 Subpart D, *2010 ADA Standards for Accessible Design*

29 CFR 1910.134, *Respiratory Protection*

29 CFR 1910.151, *Medical Services and First Aid*

29 CFR 1910.1030, *Bloodborne Pathogens*

40 CFR 141 and 142, *National Primary Drinking Water Regulations*

69 FR 44084, *ADA Accessibility Guidelines for Buildings and Facilities*

15 USC 2051-2089, *Consumer Product Safety Act*

15 USC 8001, *Pool and Spa Safety* (Chapter 106)

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ANSI/APSP/ICC-1-2014, *Standard for Public Swimming Pools*

ANSI/APSP/ICC-7-2013, *Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins*

ANSI/APSP-11-2009, *Standard for Water Quality in Public Pools and Spas*

ANSI/APSP-16-2011, *Standard Suction Fittings for Use in Swimming Pools, Wading Pools, Spas and Hot Tubs*

ANSI/ASHRAE Standard 62.1-2010, *Ventilation for Acceptable Indoor Air Quality*

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ASTM F1346-91 (2010), *Standard Performance Specification for Safety Covers and Labeling Requirements for all Covers for Swimming Pools, Spas and Hot Tubs*

ASTM F2387-04 (2012), *Standard Specification for Manufactured Safety Vacuum Release Systems (SVRS) for Swimming Pools, Spas and Hot Tubs*

NRPA Aquatics Facility Operator Manual

NSF/ANSI Standard 50, *Equipment for Swimming Pools, Spas, Hot Tubs and Other Recreational Water Facilities*

NSF/ANSI Standard 60, *Drinking Water Treatment Chemicals – Health Effects*

NSF/ANSI Standard 61, *Drinking Water System Components – Health Effects*

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NSPF® Certified Pool-Spa Inspector™ Training Handbook

American Red Cross, *Swimming and Water Safety*

American Red Cross, *Lifeguarding*

CDC, *Unintentional Drowning: Get the Facts* (Fact Sheet)

CDC, *Fecal Incident Response Recommendations*

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EPA 550-F-01-003, *Safe Storage and Handling of Swimming Pool Chemicals*

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USCPSC, *2008-2012 Reported Circulation/Suction Entrapments Associated with Pools, Spas, and Whirlpool Bathtubs, 2013 Report*

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APPENDIX B
ACRONYMS AND ABBREVIATIONS

ABA	Architectural Barriers Act
ADA	Americans with Disabilities Act
AED	automated external defibrillator
AF	[total] alkalinity factor
AFO	aquatic facility operator
AFR	accidental fecal release
AGI	acute gastrointestinal illness
ANSI	American National Standards Institute
APHA	American Public Health Association
APSP	Association of Pool and Spa Professionals
ARI	acute respiratory illness
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BUMED	Bureau of Medicine and Surgery
°C	Degrees Celsius
CDC	Centers for Disease Control and Prevention
CF	calcium hardness factor
Cfm/sq ft	cubic feet per minute per square foot
CFR	Code of Federal Regulations
CFU	colony forming unit(s)
CNIC	Commander, Navy Installations Command
CNO	Chief of Naval Operations
CO	Commanding Officer
CO_2	carbon dioxide
CPO	Certified Pool Operator
CPR	cardiopulmonary resuscitation
CT	chlorine concentration
DBP	disinfection by-product
DHHS	Department of Health and Human Services
DOD	Department of Defense
DON	Department of the Navy
ERP	emergency response plan
°F	Degrees Fahrenheit
FAC	free available chlorine
FINA	Federation Internationale de Natation
GFCI	ground-fault circuit interrupter
HAA	haloacetic acid
HOCl	hypochlorous acid
HPC	heterotrophic plate count

ICC	International Code Council
MAHC	Model Aquatic Health Code
MCO	Marine Corps Order
mg/L	milligrams per liter
MTF	multiple tube fermentation
MWR	Morale, Welfare and Recreation
NAVMCPUBHLTHCEN	Navy and Marine Corps Public Health Center
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NSF	National Sanitation Foundation
NSPF	National Swimming Pool Foundation
NSPI	National Spa and Pool Institute
OPNAV	Office of the Chief of Naval Operations
ORP	oxidation reduction potential
OSHA	Occupational Safety and Health Administration
PFD	personal floatation device
pH	potential of hydrogen (positive hydrogen ion concentration)
PPM	parts per million
RWI	recreational water illness
SDS	Safety Data Sheet
SECNAV	Office of the Secretary of the Navy
SVRS	Safety Vacuum Release System
TAC	total available chlorine
TB MED	Technical Bulletin, Medical
TF	temperature factor
THM	trihalomethane
UFC	Unified Facilities Criteria
USC	United States Code
USCPSC	U.S. Consumer Product Safety Commission
USEPA	U.S. Environmental Protection Agency
UV	ultraviolet
VGB Act	Virginia Graeme Baker Pool and Spa Safety Act
WBDO	waterborne disease outbreak
WHO	World Health Organization
YMCA	Young Men’s Christian Association

APPENDIX C
TERMS AND DEFINITIONS

1. Agitated water. An aquatic venue with mechanical means (aquatic features) to discharge, spray, or move the water's surface above or below the static water line of the aquatic venue. Where there is no static water line, movement will be considered above the deck.

2. Algae. Primitive plants, single or multi-celled, usually aquatic and nonvascular, and capable of elaborating their foodstuffs by photosynthesis.

3. Alkalinity. A measure of the buffering capacity of a solution or its ability to resist a change in pH. Alkalinity represents the sum of the concentrations of bicarbonates, carbonates, and hydroxides expressed as calcium carbonate.

4. Aquatic facility. A physical place consisting of one or more aquatic venues and support infrastructure under a single management structure.

5. Aquatic feature. An individual component within an aquatic venue. Examples include mushrooms, slides, buckets, spray guns or nozzles, and other play features.

6. Aquatic play feature. Water-containing attractions at a recreational water facility that include, but are not limited to, wave pools, water slides, interactive play systems, Lazy Rivers, Action Rivers, and other special-use pools.

7. Aquatic venue. An artificially constructed or modified natural structure where the general public is exposed to water intended for recreational or therapeutic purposes. Such structures do not necessarily contain standing water, so water exposure may occur via contact, ingestion, or aerosolization. Examples include swimming pools, wave pool, rivers, spas (including spa pools and hot tubs), therapeutic pools, and spray pads or interactive water venues. Aquatic venues do not include natural swimming and recreational waters.

8. Automated controller. A system of at least one chemical probe, a controller, and an 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.

9. Backflow. A hydraulic condition caused by a change in water pressure that causes non-potable water or other liquid to enter the potable water system by either backpressure or back-siphonage.

10. Backwash. The process of reversing water flow through a filter in order to remove entrapped particles and thereby clean the media.

11. Bacteria. Single-celled microorganisms which have no chlorophyll and multiply by simple division; they do not contain a true cell nucleus.

12. Bather or Swimmer. 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.

13. Bather load. The maximum number of persons allowed in an aquatic venue's water. Bather load is used to determine the number of rinse and cleaning showers. Bather load is not the same as "occupant load," which refers to the maximum aquatic facility load.

14. Beach Action Value. Beach Action Values (BAV) are conservative, precautionary tools that can serve as the basis for issuing health advisories at beaches.

15. Breakpoint chlorination. The conversion of inorganic chloramine compounds to nitrogen gas. Chlorine added to water that contains ammonia (from urine, sweat, or the environment, for example) reacts with the ammonia to form chloramines. If more chlorine is added, the total residual chlorine continues to rise until the concentration reaches a point that forces the reaction with ammonia to go to rapid completion. In this reaction, the inorganic chloramines are converted to dichloramine, then to nitrogen trichloride, and then to nitrogen gas. Compounds of nitrogen and chlorine are released into the water, and the apparent residual chlorine decreases. 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 ten 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 "chlorine odors" and the potential for eye irritation.

16. Catch pool. (also called Landing Pool) A pool or designated section of a pool located at the exit of one or more water slide flumes. The body of water is provided for the purpose of terminating the slide action and providing a means of exit to a deck or walkway area.

17. Chloramine. Any of various compounds containing chlorine and nitrogen.

18. Chlorination. The application of chlorine to water, generally for the purpose of disinfection, but frequently for accomplishing other biological or chemical results.

19. Clarification. The process of removing suspended or colloidal matter from a turbid liquid.

20. Clarity. A term describing the clearness of water; the absence of suspended matter which affects transmission of light.

21. Coagulant. A material that, when added to water, will combine with certain substances ordinarily present and form precipitate comprising floc particles, more or less gelatinous in character, having the capacity to remove colloids from water.

22. Coagulation

a. The agglomeration of colloidal or finely divided suspended matter by the addition to the liquid of an appropriate chemical coagulant by biological processes or by other means.

b. The process of adding a coagulant and other necessary reactants.

23. Colloids. Very fine solid particles that will not settle out by their own action. Colloids may be removed by coagulation or by biochemical action.

24. Contamination. A general term signifying the introduction of microorganisms, chemicals, wastes, or sewage into water, thus rendering it unfit for its intended use.

25. Contamination Response Plan. A plan for handling contamination from formed stools, diarrheal stools, vomit, and contaminations involving blood.

26. Corrosion. The gradual deterioration or destruction of a substance or material by chemical action, frequently induced by electrochemical processes, the action proceeding inward from the surface.

27. CT 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.

28. Cyanuric acid. (also CYA) 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.

29. Deck. See "pool decks."

30. Diaper-aged children. Children younger than 5 years of age.

31. Diatomaceous earth. (diatomite) Minute, variously shaped, silica skeletons of diatoms that were small, single-cell marine plants that lived years ago. Diatomaceous earth is often used as a filter medium in swimming pool filters.

32. Disinfection. A treatment that kills microorganisms (bacteria, viruses, and parasites, for example). In water treatment, a chemical (commonly chlorine, chloramine, or ozone) or physical process (such as ultraviolet radiation) can be used.

33. Disinfection by-product. An undesirable chemical compound formed by the reaction of a disinfectant (such as chlorine) with a precursor (such as natural organic matter, nitrogenous waste from bathers) in a water system (pool, water supply).

34. Drop slides. Slides of various configurations in which riders are dropped into pool water from a height above the water rather than delivered to water level for entry.

35. Emergency Response Plan. A plan that details the levels of response to specific aquatic emergencies. It should also identify the responder (at each level), each responder's tasks, and the equipment that is necessary for completing the task/response.

36. EPA-registered. All pesticide products regulated and registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) by the U.S. Environmental Protection Agency (EPA; https://www.epa.gov/safepestcontrol/search-registered-pesticide-products). EPA-registered products will have a registration number on the label (usually stating "EPA Reg No." followed by a series of numbers). This registration number can be verified via the EPA National Pesticide Information Retrieval System (http://npirspublic.ceris.purdue.edu/ppis). EPA maintains a Selected EPA-registered Disinfectants List at https://www.epa.gov/pesticide-registration/selected-epa-registered-disinfectants

a. Products that do not bear an EPA or equivalent national standard marking recognized by the medical authority may not be used until reviewed and approved by the medical authority.

b. Foreign brands, such as brands that meet EU standards for disinfection, may be used overseas when approved by the medical authority or Command Surgeon. Disinfectants must contain bactericidal, fungicidal, and virucidal activity.

37. Epidemiology. The study of causes and control of illness or disease in a population.

38. Filter. A device or structure for removing solid or colloidal material, usually of a type that cannot be removed by sedimentation, from water or other liquid.

39. Flat water. An aquatic venue in which the water line is static except for movement made by users.

40. Flume. A high-water-flow water slide with deep riding channels and vertical and lateral curves that accommodate riders either using or not using mats, tubes, rafts, and other water transport vehicles.

41. Free Available Chlorine. The portion of total chlorine that is not combined chlorine and is available as disinfectant in the water. When chlorine is added to water, hypochlorous acid is produced in either the molecular state (HOCl) or the ionized state (hypochlorite ion (OCl-) plus hydrogen ion (H+)), and a by-product specific to the type of chlorine is produced. The pH of the water determines the amount of hypochlorous acid in each state. HOCl is a very effective bactericide and is the active available chlorine disinfectant in the water. OCl- is also a bactericide but acts more slowly than HOCl. Thus, chlorine is a much less effective bactericide at high pH. The sum of HOCl and OCl- is referred to as "free chlorine" in pool water. The hypochlorous acid that remains in pool water uncombined with ammonia is called "free chlorine residual." A free chlorine residual must be maintained for adequate disinfection.

42. Foot bath. Standing water in which patrons or aquatics staff rinse their feet.

43. Hard water. Water containing high concentrations of calcium and magnesium. It is difficult to obtain lather with soap in hard water. Hard water can result in scale in boilers and pipes.

44. Heterotrophic bacteria. Bacteria which require organic carbon as a source of energy for life processes.

45. Hypochlorite. Chemical compounds, including calcium hypochlorite (solid) and sodium hypochlorite (liquid), used as a chlorine carrier in pools and spas.

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

47. Isocyanurate. Compounds of stabilized chlorine containing a form of cyanuric acid.

48. Lazy River. A manufactured stream in which the water is moved by pumps or other means of propulsion to provide a river-like flow that transports bathers over a defined path that may include water aquatic features and play devices.

49. Monitoring. 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 and electronic means.

50. Movable floor. A pool floor whose depth varies through the use of controls.

51. Natatorium. A building which contains one or more aquatic venues.

52. Occupant load. The combined total of the bather load and the dry deck, pool deck, and perimeter deck surrounding an aquatic venue. A venue's occupant load is used to determine its required number of toilets, sinks, and diaper-changing stations.

53. Oocyst. The thick-walled, environmentally resistant structure released in the feces of infected animals. Oocysts transfer the infectious stages of sporozoan parasites (such as Cryptosporidium) to new hosts.

54. Oxidation. The process of changing the chemical structure of water contaminants by increasing the number of oxygen atoms or reducing the number of electrons of the contaminant. This process allows the contaminant to be more readily removed from the water or to become more soluble in the water. It is the "chemical cleaning" of pool water. Oxidation can be achieved by chlorine, bromine, ozone, and potassium monopersulfate.

55. Oxidation-reduction potential. A measure of a solution's tendency to either gain or lose electrons. A higher (more positive) reduction potential indicates a more oxidative solution.

56. Pathogenic. Disease-producing.

57. pH. A symbol that expresses the negative log of the concentration of hydrogen ions. When water ionizes, it produces hydrogen ions (H+) and hydroxide ions (OH-). If an excess of hydrogen ions is present, the water is acidic. If an excess of hydroxide ions is present, the water is basic. 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. As pH is raised, more ionization occurs, and the effectiveness of chlorine disinfectants decreases.

58. Pool. A subset of an aquatic venue. Pools are designed to hold impounded or standing water for total or partial bather immersion. Unless otherwise distinguished as a specific type of aquatic venue, the term *pool* as used in this document is intended to include all aquatic venues.

59. Pool decks. The hardscape surface areas beyond the perimeter deck within the aquatic facility enclosure. Pool decks are regularly trafficked and made wet by bathers. Landscape areas are not included in this definition. "Dry decks" are pedestrian surface areas that are not subject to frequent splashing or constant wet foot traffic.

60. Pool slide. An attraction that allows users to slide from an elevated height into a pool. Pool slides have a configuration as defined in The Code of Federal Regulations (CFR) Ch. II, Title 16 Part 1207, or are similar in construction to a playground slide. They must include children's (tot) slides, pool slides, and all other non-flume slides that are mounted on the pool deck or within the basin of a public swimming pool. Pool slides have a flow rate of less than 100 gpm and do not exceed 10 feet in height.

61. Portable vacuum system. A modular vacuum system normally consisting of a dolly-mounted pump, filter, and power cord.

62. Potable (water). Water that has been treated and confirmed via testing to meet established water quality standards and declared fit for human consumption (FFHC). FFHC is the term that is used by the U.S. Navy to indicate that the water is safe for drinking, cooking, bathing, showering, dishwashing and maintaining oral hygiene.

63. Preventive medicine. The term *preventive medicine* as referenced in this chapter refers to environmental health or public health personnel responsible for conducting recreational water facility surveillance on installations. The reference to preventive medicine also applies to military and civilian technicians and officers from other military branches with similar public health duties and responsibilities at joint bases.

64. Protozoa. One-celled microorganisms, including amoebae, ciliates, flagellates.

65. Recessed steps. A means of pool ingress/egress similar to a pool ladder but with individual treads recessed into the pool wall.

66. Recirculation system. A system that contains a pump, filtration system, and chemical treatment system for the purpose of disinfecting and filtering pool water.

67. Recreational water facility. A body of water which has been constructed, installed, modified, or improved for the purpose of public swimming or recreational activities. Under the control of a person, a recreational water facility includes, but is not limited to, swimming beaches; swimming, wading, and diving pools; aquatic play features; spas, hot tubs, therapeutic pools, hydrotherapy pools, and whirlpools.

68. Residual. (chlorine) The quantity of chlorine (expressed in mg/L or ppm), in excess of the chlorine demand, remaining in water, sewage, or effluents after a selected contact period of time; the difference between the chlorine dose and the chlorine demand.

69. Runout. That part of a water slide where riders are intended to decelerate and come to a stop. The runout is a continuation of the water slide's flume surface.

70. Safety Plan. A written document that states the procedures, requirements and standards for pre-service employees, communications, aquatic safety team members, in-service training, staffing, rescue skill competency, lifeguard rotation procedures, lifeguard management, emergency action plan, incident follow-up, bloodborne pathogen exposure control, emergency closure, and single lifeguard situations (if applicable).

71. Sanitary Survey. An inspection conducted to evaluate site-specific geographic and environmental conditions in a watershed. The sanitary survey report states the findings and recommendations concerning use of the watershed for a particular purpose (such as a natural aquatic facility).

72. Saturation Index. A mathematical representation or scale representing the ability of water to deposit calcium carbonate or to dissolve metal, concrete, or grout.

73. Secondary disinfection systems. Those disinfection processes (such as UV, ozone) which are required, in certain circumstances, to meet the minimum standards of this chapter and are in addition to the requirements of section IV of this chapter.

74. Skimmer. A device installed in the pool wall for the purpose of removing floating debris and surface water to the filter. Skimmers must include a weir to allow for the automatic adjustment to small changes in water level, maintaining skimming of the surface water.

75. Slurry. A watery mixture of an insoluble or partially soluble material (such as lime).

76. Spa. A permanent structure intended for use with either warm or cold water but not intended for prolonged exposure. Spa structures are intended for soaking or other recreational uses and are not usually drained and refilled after each use. A spa may include, but is not limited to, hydrotherapy, air induction bubbles, and recirculation. In this chapter, the term "spa" also refers to hot tubs and whirlpools.

77. Spray pad. *Synonyms: splash deck, wet deck.* The specific areas consisting of the play surface, features that spray bathers with recirculating water, and drains, upon which there is no standing water on the surface. For the purposes of this chapter, only those spray pads designed to recirculate water and intended for public use and recreation must be regulated.

78. Spray pad collection tank. The vessel used to collect the water that has been sprayed on the spray pad and returned through the spray pad drains.

79. Spray pad features. The devices and plumbing used to convey the treated water to the spray pad to spray the patrons.

80. Substantial renovation. The renovation of a major component or substantial structural part of an aquatic venue that either:

a. Materially increases the value of the property,

b. Substantially prolongs the useful life of the venue, or

c. Adapts the venue to a new or better use.

81. Supplemental disinfection systems. Those disinfection processes or systems which are optional and not required on an aquatic venue for health and safety reasons. They may be used to enhance overall system performance.

82. Trihalomethanes or THM. Chemical compounds in which three of the four hydrogen atoms of methane (CH4) are replaced by halogen atoms. Trihalomethanes are environmental pollutants, and many are considered carcinogenic.

83. Turbidity. The cloudy appearance of water due to the presence of fine suspended particles in it that interfere with the passage of light.

84. Turnover. The amount of time necessary for a pool's circulation system to handle as many gallons of water as the pool holds. The unit of measure for a "turnover" is depicted as hours.

85. Turnover rate. The number of times per day a complete turnover cycle occurs. For example, a 6-hour turnover is equivalent to a turnover rate of four [24 hours per day ÷ 6 hours per turnover = 4 turnovers per day]; a 2-hour turnover yields a turnover rate of 12. A short turnover time yields a high turnover rate, which results in more water being filtered each day.

86. Underwater ledge. A continuous step in the pool wall that allows swimmers to rest by standing without having to tread water; also known as a "toe ledge."

87. Wading pool. A special purpose pool intended for use by children. The depth of a wading pool does not exceed 2 feet (0.6 m).

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88. Water slide. An attraction having a configuration that enables users to slide into a pool from an elevated height. A water slide must consist of one or more **flumes**, landing areas, **catch pools**, or slide runouts, and must be equipped with facilities for the **disinfection** and chemical treatment of the water.

89. Waterborne disease. Disease that is spread by swallowing, breathing in mists or aerosols of, or having contact with contaminated water. Waterborne disease can include infectious or chemical causes of disease, including chemicals that evaporate from the water and cause health problems. Waterborne disease can also include a wide variety of infections, including gastrointestinal, skin, ear, respiratory, eye, neurologic, and wound.

90. Wave pool. Any pool designed to simulate breaking or cyclic waves for the purpose of general play or surfing.

CHAPTER 4
RECREATIONAL WATER FACILITIES

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APPENDIX D
SUGGESTED RULES FOR AQUATIC VENUES

D-1. Applicability. These rules should not necessarily be considered all-inclusive. Local conditions may dictate additional or fewer regulations. Management staff and lifeguards are authorized to correct unsafe or inappropriate behavior; compliance will be enforced. A placard listing pool rules and regulations will be posted in a prominent location.

D-2. Suggested Pool Rules

1. All patrons must comply with the directions and signals of lifeguards and the pool manager.

2. All pool patrons must take a cleansing shower prior to entering the pool.

3. Persons who have been ill with diarrhea or vomiting in the last 2 weeks are not permitted in the pool.

4. Persons with skin infections, open wounds, communicable diseases, and eye, nose, or throat infections or discharges are not permitted in the pool.

5. Never use the pool alone.

6. Persons under the influence of alcohol or drugs are prohibited from using the pool.

7. Hyperventilation and underwater breath-holding are not permitted.

8. Parents are responsible for their children, to include teaching them the pool rules and instructing them to obey the lifeguards.

9. Running, diving (other than in the prescribed diving area(s)), rough play, excessive noise, and profane language are not permitted.

10. While in the water, patrons are not permitted to consume food, drink, or chewing gum.

11. Spitting, spouting of water, and blowing one's nose is not permitted in the pool.

12. Dispose of trash properly.

13. Glass containers are NOT permitted.

14. Any injury that occurs on the premises must be reported to the pool manager or equivalent immediately.

15. No pets are allowed in the pool area. (A service animal escorting a disabled patron and working dogs accompanied by handlers will be permitted in swimming pool areas.)

16. Fraternizing with lifeguards is prohibited.

17. Diving is not allowed in less than 9 feet of water.

18. Swimmer load: _____persons.

19. Pool hours: ___ a.m. to __ p.m.

20. In case of emergency, call 911.

D-3. Suggested Rules for Spas

1. Do not use the spa alone.

2. Children under 5 years old are not permitted in the spa.

3. Children 5–12 years old must be accompanied by an adult.

4. No soap or bubble bath is allowed.

5. Do not use the spa at water temperatures above 104 °F.

6. Limit spa use to 15 minutes. Long exposure may result in nausea, dehydration, dizziness, fainting, or death.

7. The maximum number of people allowed in the spa is (*insert number*).

8. People with heart disease, diabetes, high blood pressure; and women who are or may be pregnant are advised to consult a physician before using the spa.

9. Do not use the spa pool while under the influence of alcohol, tranquilizers, or other drugs which may cause drowsiness, alter blood pressure, or put the patron at risk.

10. Anyone with symptoms of a disease or illness is prohibited from entering the spa.

11. Do not use the spa with any open wounds (to include vaccinations or bandaged wounds).

12. Failure to comply with these regulations constitutes grounds for management action or exclusion from the premises, as necessary.

D-4. Suggested Rules for Diving Boards and Platforms

1. Do hold your head and arms up, and steer up with your hands. Arms must stay extended above head during head-first entries.

2. Dive straight ahead from—not off the side of—the diving board.

3. Only one person is allowed on the diving board at one time.

4. Non-swimmers in life jackets are not allowed on the diving board or platform.

5. Running is not permitted on the board or platform. Don't run and dive.

6. Don't engage in horseplay on diving or sliding equipment.

7. Only one bounce is permitted on the diving board. Don't use diving equipment as a trampoline.

8. Back dive entries are not permitted.

9. Fancy dives are not permitted, forward dives only.

10. Headfirst diving at or through objects such as inner tubes is not permitted.

D-5. Suggested Rules for Swimming Pool Slides

1. Entering the pool headfirst from a slide is prohibited.

2. Horseplay is prohibited.

3. Non-swimmers are prohibited from entering deep water from a slide.

4. Patrons are not authorized in the catch pool or at the end of a slide.

5. Standing on the top of a slide or outside the guardrails is prohibited.

6. Jumping from a slide is prohibited.

7. Diving from a slide is prohibited.

8. Sliding into areas where submerged obstacles, surface objects, or other swimmers are located is prohibited.

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APPENDIX E
WATER QUALITY REQUIREMENTS
FOR AQUATIC VENUES

Parameter	**Minimum**	**Ideal**	**Maximum**	**Minimum Monitoring Frequency**
Free chlorine – pools, spray pads, aquatic play features (mg/L)	1.0 2.0[2]	2.0 – 4.0	10.0	Every 2 hours
Free chlorine – spas/therapy pools (mg-L)	3.0	3.0 - 5.0	10.0	Every 2 hours
Free chlorine – military training pools	2.0[2]	2.0 – 4.0	10.0	Every 2 hours
Combined chlorine (mg/L)	0.0	0.0	0.4	Weekly
Bromine (mg/L)	3.0 (pools) 6.0 (spas)	3.0 (pools) 6.0 (spas)	4.0 (pools) 6.0 (spas)	Every 2 hours
ORP (millivolts)	650	750-900	N/A	Every 2 hours
pH	7.2	7.4 - 7.6	7.8	Every 2 hours
Total Alkalinity (mg/L)	60	80 - 120	180	Weekly
Calcium Hardness (mg/L)	100	200 - 400	1000 pools 800 spas	Monthly
Total Dissolved Solids (mg/L)	0	N/A	1,500 above fill water TDS level	Quarterly
Cyanuric Acid (mg/L)	0	30 - 50	90	Monthly[2] Biweekly[3]
Temperature (°F) – pools	75	78 - 86	90	Twice a day
Temperature (°F) – spas	75	Personal preference	104	Every 2 hours

Table E-1. Water Chemistry Requirements for Aquatic Venues[1]

[1]Aquatic venues include pools, spas, aquatic play features, and military training pools
[2]Pools adding cyanuric acid
[3]Pools using stabilized chlorine as the primary disinfectant

Indicator Organism	Single Sample Limit (CFU/mL)	Monitoring Frequency
HPC	≤ 200	As necessary
Total Coliform (defined substrate[a])	0	As necessary
Total Coliform (membrane filtration)	< 2 CFU/100 mL	As necessary
Total Coliform (multiple tube fermentation)	0	As necessary
Staphylococci	≤ 50 CFU/100 mL	As necessary
P. aeruginosa	< 1 CFU/100 mL	As necessary

Table E-2. Bacteriological Requirements for Aquatic Venues

Notes:

Use of defined substrate without means to quantify

APPENDIX F
SANITATION INSPECTIONS BY PREVENTIVE MEDICINE PERSONNEL

F-1. Sanitation Inspections

1. Navy and Marine Corps aquatic venues (pools, spas, hot tubs, natural aquatic areas) will be inspected at least monthly by the cognizant preventive medicine authority, accompanied by the aquatic venue manager or designated representative. Special inspections should be performed prior to opening the facility for the season, or prior to opening a new facility, and prior to re-opening a pool after renovation. A sanitation inspection must be conducted whenever disease transmission is suspected, or upon request of the recreation or Semper Fit director or the public works officer.

2. The preventive medicine authority must be thoroughly familiar with this chapter, as well as all applicable local and State policies and procedures for pool and spa safety and sanitation. The preventive medicine authority should also become familiar with national and government standards and publications listed in Appendix A of this chapter.

F-2. Inspecting Swimming Pools and Spas

3. Sanitation inspections of aquatic venues should include all applicable factors listed on the DOEHRS Recreational Water Sanitation Report (contained in this appendix). The inspection will include the elements provided:

a. FAC testing of all pool and spa water.

(1) Use EPA approved chlorine residual method 4500-Cl G (DPD Colorimetric Method 8021, Low Range).

(2) The EPA recommends Hach® Pocket Colorimeter™ #5870000.

b. pH testing of all pool and spa water. Use a pH meter capable of measuring pH range from 0 to 14.00, with high resolution and accuracy of 0.01 pH, and temperature range from -5° to 90° C (23° to 193° F)

c. Bacteriological analysis of pool and spa water

(1) Not required for routine inspections. Conduct analysis if pool or spa water source is ground water.

(2) If contamination is suspected or RWI reported.

(3) Use EPA standard method 9223B (Enzyme Substrate Coliform Test [Presence/Absence]), such as Colilert® Total Coliform test for bacteriological analysis of fresh (chlorinated) water.

d. Calcium Hardness testing of pool and spa water.

e. Total Alkalinity testing of pool and spa water.

f. Cyanuric Acid testing of outdoor pools.

g. Inspect pool operation, safety, construction, restroom or bathhouse facilities, filter and pump operation per this chapter and the DOEHRS Recreational Water Sanitation Report.

h. Review facility records. (Are checks and tests done and recorded at required intervals?)

(1) Total number of swimmers each day and the peak number of swimmers using the pool each day.

(2) Number of hours the pumps and filters are in operation each day.

(3) Time and date each filter is backwashed and cleaned.

(4) Amount of chemicals added and time they were added.

(5) Hourly record of chlorinator and chemical solution feeder settings.

(6) Inventory of chemicals on hand.

(7) Results of pH testing, three times daily or as frequently as necessary to ensure the pool is within prescribed limits.

(8) The total alkalinity and calcium hardness levels.

(9) Residual chlorine readings (at least one test during each 2 hours of use at varying locations in the pool with one test conducted at the time of maximum bather load).

(10) Temperature readings for indoor venues as often as necessary to ensure proper temperature control and three times per day for outdoor venues, not including natural swimming and aquatic areas.

(11) Results of bacteriological laboratory analysis of swimming pool and spa water accomplished as required.

2. Inspection results may be transcribed from the DOEHRS Recreational Water Sanitation Report, into the DOEHRS IH-EH module. There is a separate DOEHRS Recreational Water Sanitation form for swimming pools, spas and hot tubs, natural aquatic areas, and recreational parks. The DOEHRS inspection forms are available to be downloaded from https://www.med.navy.mil/sites/nmcphc/program-and-policy-support/swimming-pools-and-bathing-places/Pages/default.aspx.

F-3. Inspecting Natural Aquatic and Swimming Areas

1. Sanitation inspections at natural aquatic places are to be conducted at least monthly. Local conditions may necessitate more frequent inspections. The inspection should cover all applicable areas outlined in sections X and XII of this chapter, including, but not limited to:

a. Bacteriological and physical water quality

(1) Utilize EPA approved method, such as Enterolert® Rapid Enterococci test for bacteriological analysis of salt water.

(2) Utilize EPA approved method, such as Enterolert® Rapid Enterococci test or Colilert® Total Coliform test for bacteriological analysis of fresh water.

b. Volume and quality of the receiving water

c. Water depth and slope within the swimming area

d. Water surface area

e. Tides (if applicable)

f. Time of day and year, and weather conditions at the time of the survey

g. Thermal and salinity stratification

h. Effects of tributaries on the area

i. Water current

j. Prevailing winds

k. Other site-specific criteria that may apply

(1) Submerged objects, sharp drop-offs, the condition and stability of the beach bottom, and the water depth in the diving area. Some natural aquatic areas may be known to experience shifting sands after storm events. Evaluate such areas after storms to ensure patron safety.

(2) The sanitary survey must also include inspection of grounds, bathhouses, toilets, drinking water supply, sewage disposal, safety equipment, and signage, as appropriate.

(3) The preventive medicine authority should utilize the DOEHRS Recreational Water Natural Bathing Areas Sanitation Report to document the inspection. Upon completion of the inspection, the preventive medicine authority will enter the results into the DOEHRS IH-EH module.

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SAMPLE

DOEHRS-IH EHM: RECREATIONAL WATER -- SWIMMING POOL SANITATION REPORT

Page 1 of 2

1. FACILITY NAME:	2. FACILITY ADDRESS:	3. INSTALLATION:	4. START DATE: (YYYYMMDD)	TIME: HH:MM
Navy Pool	1 Navy Blvd	Navy Base	20200225	14:00
			5. END DATE: (YYYYMMDD) 20200225	TIME: HH:MM 15:15

6. INSPECTOR (Surveyor)	a. *Name and Rank:*	b. *Phone:*	c. Email:	d. *Unit/Organization:*
	HM1 I.M. Halsey	444-444-4444	Ian.halsey.mil@mail.mil	Naval Hospital Sample

7. PERSON IN CHARGE (PIC)	a. *Full Name:*	b. *Phone:*	c. *Official Email:*
	Mr. R. U. Poole	555-555-5555	RON.U.POOLE@NAVFAC.MIL

8.CONTRACTOR OPERATED *(select one)*		Yes	✓	No	9. Pool Type *(select one)*	✓	Swimming		Plunge/Catch		Wave		Other *(specify):*

10. INSPECTION TYPE: *(select one)*	✓	Routine		Follow-Up		Complaint		Pre-Opening		Other *(specify):*

11. IS WATER HEATED?		Yes	✓	No	12. DISINFECTANT TYPE:	✓	Chlorine		Bromine		Other *(specify):*	13. Pool Volume :	100,000	gallons

Item	Water Feature Information: Swimming Pool Water Feature	Yes	No	N/A
1	Pool, deck, and surrounding areas maintained and in good repair?	✓		
2	Are spectators / tables / chairs - 10 feet from the edge of the pool?	✓		
3	Are there adequate covered trash receptacles?	✓		
4	Are there adequate number of water closets, lavatories, urinals, showers, and drinking fountains?	✓		
5	Is the filter / pump room clean and properly maintained?	✓		
Item	**Water Feature Information: Swimming Pool Water Quality**	**Yes**	**No**	**N/A**
6	Is a chemical test kit available?	✓		
7	Is the total ***Bromine*** disinfectant level satisfactory?			✓
	Total disinfectant level: **Shallow end:** ____ ppm **Deep end:** ____ ppm			
8	Is the free available ***Chlorine*** disinfectant level satisfactory?	✓		
	Free available chlorine level: **Shallow end:** 2.0 ppm **Deep end:** 1.5 ppm			
9	Is the pH satisfactory? pH: 7.6	✓		
10	Is the temperature satisfactory? Temperature: 80 °F	✓		
11	Is the visual clarity satisfactory?	✓		
12	Is the total alkalinity satisfactory? Total alkalinity: 100.0 ppm	✓		
13	Is the calcium hardness satisfactory? Calcium hardness: 350.0 ppm	✓		
14	If required by regulation, has a water sample been collected for bacteriological analysis (after analysis, attach copy of results)?			✓
15	Is the cyanuric acid satisfactory? Cyanuric acid: 30.0 ppm	✓		
16	Is the surface water free of scum/debris?	✓		
17	Are the bottom and sides clean; vacuumed and scrubbed daily and as needed?	✓		
Item	**Water Feature Information: Swimming Pool Operation**	**Yes**	**No**	**N/A**
18	Is a copy of the rules and warnings prominently displayed?	✓		
19	Is the maximum bather load posted?	✓		
20	Are an appropriate number of qualified lifeguards/employees with documented first-aid training and CPR certifications on duty?	✓		
21	Is an operational log properly completed?	✓		
22	Is a piping diagram of water and sewer lines posted near chemical equipment?	✓		
23	Is a pool specification sheet available?	✓		
24	Are chemical feeders operating properly?	✓		
25	Are hair/lint strainers operating properly?	✓		

Item	Water Feature Information: Swimming Pool Safety	Yes	No	N/A
26	Is there adequate number of lifeguards?	✓		
27	Is there lifesaving equipment (e.g. shepherd's hook, buoy ring (U.S. Coast Guard Approved and proper length), rescue tubes, back boards)?	✓		
28	Is there an OSHA approved first aid kit available?	✓		
29	Is an AED (Automated External Defibrillator) available and operable?	✓		
30	Is there a working telephone with emergency numbers?	✓		
31	Is there a safety line (line separating the shallow and deep ends)?	✓		
32	Is there adequate fencing?	✓		
33	Is (are) there self-closing gate(s) and are they operating correctly?	✓		
34	Is the facility free of other hazards?	✓		
35	Is it compliant with the Virginia Graeme Baker Pool and Safety Act (anti-entrapment system)?	✓		
36	Are chemicals properly stored?	✓		
37	Are required Material Safety Data Sheets (MSDS) available?	✓		
38	Are chemical warning signs properly displayed?	✓		
39	Is Personal Protective Equipment (PPE) available?	✓		
40	If diving is prohibited, are signs properly displayed?	✓		
Item	**Water Feature Information: Swimming Pool Construction**	**Yes**	**No**	**N/A**
41	Is the pool/spa/hot tub surface (walls and floors) easily cleaned and in good repair?	✓		
42	Is water on pool deck draining away from pool/spa/hot tub?		X	
43	Is the deck area constructed with a nonslip surface, and easy to maintain?	✓		
44	Is water removed for treatment and recirculation through overflow gutters or skimmers / water inlets and drains?	✓		
45	Is water distribution system protected against backflow?	✓		
46	Are ladders/steps with nonslip top surfaces provided at the shallow end and on each side of the deep end of the pool and in good repair?	✓		
47	Are diving boards, slides, and other pool recreation equipment constructed of approved materials and appropriately placed to avoid injury?	✓		
48	Are variations in pool depth marked on the pool deck or adjacent wall/fence in sufficient increments?	✓		
49	If a chlorine gas room is present, is it properly constructed and maintained?	✓		
50	Is the filter room properly secured, ventilated, lighted, and with proper drainage?	✓		

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SAMPLE

DOEHRS-IH: RECREATIONAL WATER -- SWIMMING POOL SANITATION REPORT | FACILITY: Navy Pool | START DATE: 20200225 | Page 2 of 2

Item	Restroom/Bath-House Facilities	Yes	No	N/A
51	Are the walls, ceilings and floors clean?	✓		
52	Are the toilets, urinals, showers and hand basins clean?	✓		
53	Is there adequate ventilation and lighting?	✓		
54	Are clothing, swimsuits and towels properly handled?	✓		
55	Is the baby changing station clean?	✓		
56	Are soap, toilet paper, paper towels, and trash receptacles available?	✓		

Filter Information

Filter Name (*Brand & model*):	CaroClean						
Filter Media Type:		Cartridge		Diatomaceous Earth	✓	Sand	
Influent pressure gauge	22 PSI	Effluent pressure gauge	12 PSI				
Filter operating properly?	✓	Yes		No			
Filter backwashed as need?		Yes	X	No			

Filter Comments:

Pump Information

Pump Name (*Brand & model*):	SuperPump			Rate of flow (*Comment required if value is zero*):	300 gal/min
Pump operating properly?	✓	Yes		No	Pump Comments:
Turnover Rate*:	6 Times/24-hours	This space left Blank			

Note: **Turnover Rate is the number of turnovers that occur in a 24-hour period. A **Turnover** is the length of time needed for the pool to circulate its entire volume one time. TB MED 575 specifies the maximum **Turnover Time** allowed for each aquatic venue.*

Turnover Time = 24 hours ÷ Turnover Rate

Turnover Rate = 24 hours ÷ Turnover Time

14. OVERALL REMARKS (describe individual Item deficiencies here)

**Water samples taken during this inspection:		Yes	Sample Type:		HPC	**Note: Attach a copy of the sample results to this inspection document and upload the results to the inspection report in DOEHRS.
	X	No			Coliform (Total or E.coli)	

ITEM:
#42: Water pooling on deck causing mold growth near pool edge. Clean and disinfect area. Resurface to allow water to properly drain away from pool.

15. INSPECTION RATING:					16. FOLLOW-UP REQUIRED:					17. FOLLOW UP DATE NLT: (YYYYMMDD)	
	✓	Satisfactory		Unsatisfactory			Yes		No		

18. SIGNATURE: *Signature on this form represents acknowledgment that the person in charge has been briefed on the deficiencies noted, corrective actions and timeframe to complete, the final inspection rating, and the date scheduled for follow-up inspection (unsatisfactory inspections only).*

a. Inspector Signature		b. DATE (YYYYMMDD): 2/25/20
c. Person in Charge Signature		d. DATE (YYYYMMDD): 20200225

SAMPLE

DOEHRS-IH EHM: RECREATIONAL WATER
NATURAL BATHING AREAS SANITATION REPORT

Page 1 of 1

1. FACILITY NAME (Bathing area name):	2. FACILITY ADDRESS:	3. INSTALLATION:	4. START DATE: (YYYYMMDD)	TIME: HH:MM
Submarine Beach	411 Nautilus Drive	Sub Base Somewhere	20200226	11:30
			5. END DATE: (YYYYMMDD) 20200226	TIME: HH:MM 12:30

6. INSPECTOR (Surveyor)	a. Name and Rank:	b. Phone:	c. Email:	d. Unit/Organization:
	HM3 U. Knowu	444-444-4444	Ulysses.Knowu@navy.mil	Naval Clinic Somewhere

7. PERSON IN CHARGE (PIC)	a. Full Name:	b. Phone:	c. Official Email:
	Mr. Rangkno	222-222-2222	Ian.Rangkno@mwr.mil

8.CONTRACTOR OPERATED:		Yes	✓	No	9. Water Type:		Fresh	✓	Marine	This space left Blank

10. INSPECTION TYPE: (select one)	✓	Routine		Follow-Up		Complaint		Pre-Opening		Other (specify):

Item	Water Feature Information: Natural Bathing Areas Water Feature	Yes	No	N/A
1	Are there adequate covered trash receptacles?		X	
2	Are there adequate number of water closets, lavatories, urinals, showers, and drinking fountains?	✓		
Item	**Water Feature Information: Natural Bathing Area Water Quality**	**Yes**	**No**	**N/A**
3	Is the temperature satisfactory? Temperature: 70 °F	✓		
4	If required by regulation, has a water sample been collected for bacteriological analysis (after analysis, attach copy of results)?	✓		
5	Is the surface water free of scum/debris?		X	
Item	**Water Feature Information: Natural Bathing Areas Operation**	**Yes**	**No**	**N/A**
6	Is a copy of the rules and warnings prominently displayed?	✓		
7	Are an appropriate number of qualified lifeguards/employees with documented first-aid training and CPR certifications on duty?	✓		
Item	**Water Feature Information: Natural Bathing Areas Safety**	**Yes**	**No**	**N/A**
8	Is there adequate number of lifeguards?	✓		
9	Are buoys or warning signs provided as necessary to designate the swimming perimeter?	✓		
10	Lifeguards have an unobstructed view of the entire designated swimming perimeter?	✓		
11	Are safety guidelines prominently displayed and being followed and enforced by lifeguards?	✓		
12	Are the lifeguards equipped appropriately?	✓		
13	Is there lifesaving equipment (e.g. shephard's hook, buoy ring (U.S. Coast Guard Approved and proper length), rescue tubes, back boards)?	✓		
14	Is there an OSHA approved first aid kit available?	✓		
15	Is an AED (Automated External Defibrillator) available and operable?	✓		
16	Is there a working telephone with emergency numbers?	✓		
17	Is there a safety line (line separating the shallow and deep ends)?	✓		
18	Is there adequate fencing?	✓		
19	Is the facility free of other hazards?	✓		
20	If diving is prohibited, are signs properly displayed?	✓		
Item	**Water Feature Information: Natural Bathing Areas Construction**	**Yes**	**No**	**N/A**
21	Are ladders/steps with nonslip top surfaces provided at the shallow end and on each side of the deep end of the pool and in good repair?	✓		
22	Are diving boards, slides, and other pool recreation equipment constructed of approved materials and appropriately placed to avoid injury?	✓		
23	Are variations in pool depth marked on the pool deck or adjacent wall/fence in sufficient increments?	✓		
Item	**Water Feature Information: Natural Bathing Areas**	**Yes**	**No**	**N/A**
24	No potential source of pollution such as agricultural drainage or waste water discharges?	✓		
25	No bacteriological and/or chemical contamination discharging into bathing areas?	✓		
26	The volume, quality, and temperature of the receiving water is suitable?	✓		
27	Is the water depth and bottom slope safe?	✓		
28	Is it free of safety hazards due to currents or tides?	✓		
29	Is it free of dangerous wildlife, submerged objects, drop-offs, or other physical endangerments?	✓		
30	Is the general cleanliness satisfactory?	✓		
31	Are sanitary facilities adequate based on bather load?	✓		
32	Has a water sample been collected for bacteriological analysis (after analysis, attach a copy of the results)?	✓		

SAMPLE

DOEHRS-IH EHM: NATURAL BATHING AREAS SANITATION REPORT	Facility: Submarine Beach	Date: 20200226	Page 2 of 2

11. OVERALL REMARKS (describe individual item deficiencies here)

**Water Sample Type:		Beach Action Values	Analysis Type:	✓	Enterococci		Other (specify):	**Note: Attach a copy of the sample results to this inspection document and upload the results to the inspection report in DOEHRS.
		Other (specify):			E.coli			

ITEM:
#1: Trashcans found overflowing. Trash cans not being emptied frequently. It appears that more trash receptacles are needed.

12. INSPECTION RATING:	✓	Satisfactory		Unsatisfactory	13. FOLLOW-UP REQUIRED:	Yes		No	14. FOLLOW UP DATE NLT: (YYYYMMDD)	

15. SIGNATURE: *Signature on this form represents acknowledgment that the person in charge has been briefed on the deficiencies noted, corrective actions and timeframe to complete, the final inspection rating, and the date scheduled for follow-up inspection (unsatisfactory inspections only).*

a. Inspector Signature			b. DATE: (YYYYMMDD): 2/26/20
c. Person in Charge Signature			d. DATE (YYYYMMDD): 20200226

SAMPLE

DOEHRS-IH EHM: RECREATIONAL WATER
SPA/HOT TUB/THERAPY POOL SANITATION REPORT

Page 1 of 2

1. FACILITY NAME:	2. FACILITY ADDRESS:	3. INSTALLATION:	4. START DATE: (YYYYMMDD)	TIME: HH:MM
MWR SPA	22 Carrier Place	Navy Base	20200211	13:00
			5. END DATE: (YYYYMMDD) 20200211	TIME: HH:MM 13:35

6. INSPECTOR (Surveyor)	a. Name (Last, First, M.) and Rank:	b. Phone:	c. Email:	d. Unit/Organization:
	HM1 Halsey	444-444-4444	tony.stark.mil@mail.mil	Navy Hospital Sample

7. PERSON IN CHARGE (PIC)	a. Name (Last, First, M.):	b. Phone:	c. Official Email:
	Mr. J. Smith	444-555-1234	Joseph.Smith.mil@mail.mil

8. CONTRACTOR OPERATED (select one)		Yes		No	9. Pool Type (select one)	✓	Spa/Hot Tub		Therapy Pool or Whirlpool	*NOTE: Input the spa/hot tub survey with the corresponding swimming pools survey report when entering data in the DOEHRS-EH Module.
	✓									

10. INSPECTION TYPE: (select one)	✓	Routine		Follow-Up		Complaint		Pre-Opening		Other (specify):

11. IS WATER HEATED?	✓	Yes	12. DISINFECTANT TYPE:		Chlorine	✓	Bromine	13. Pool Volume : 1000 gallons
		No			Other (specify):			

Item	Water Feature Information: Spa/Hot Tub/Therapy Pool Water Feature	Yes	No	N/A
1	Pool, deck, and surrounding areas maintained and in good repair?			✓
2	Are spectators / tables / chairs - 10 feet from the edge of the pool?			✓
3	Are there adequate covered trash receptacles?			✓
4	Are there adequate number of water closets, lavatories, urinals, showers, and drinking fountains?	✓		
5	Is the filter / pump room clean and properly maintained?	✓		
Item	**Water Feature Information: Spa/Hot Tub/Therapy Pool Water Quality**	**Yes**	**No**	**N/A**
6	Is a chemical test kit available?	✓		
7	Is the total *Bromine* disinfectant level satisfactory?	✓		
	Total disinfectant level: **Shallow end:** 6.0 ppm **Deep end:** 6.0 ppm			
8	Is the free available *Chlorine* disinfectant level satisfactory?			✓
	Free available chlorine level: **Shallow end:** ____ppm **Deep end:** ____ ppm			
9	Is the pH satisfactory? pH: 7.4	✓		
10	Is the temperature satisfactory? Temperature: 102 °F	✓		
11	Is the visual clarity satisfactory?	✓		
12	Is the total alkalinity satisfactory? Total alkalinity: 80.0 ppm	✓		
13	Is the calcium hardness satisfactory? Calcium hardness: 200.0 ppm	✓		
14	If required by regulation, has a water sample been collected for bacteriological analysis (after analysis, attach copy of results)?			✓
15	Is the cyanuric acid satisfactory? Cyanuric acid: ____ ppm			✓
16	Is the surface water free of scum/debris?	✓		
17	Are the bottom and sides clean; vacuumed and scrubbed daily and as needed?	✓		
Item	**Water Feature Information: Spa/Hot Tub/Therapy Pool Operation**	**Yes**	**No**	**N/A**
18	Is a copy of the rules and warnings prominently displayed?	✓		
19	Is the maximum bather load posted?	✓		
20	Are an appropriate number of qualified lifeguards/employees with documented first-aid training and CPR certifications on duty?	✓		
21	Is an operational log properly completed?	✓		
22	Is a piping diagram of water and sewer lines posted near chemical equipment?	✓		
23	Is a pool specification sheet available?	✓		
24	Are chemical feeders operating properly?	✓		

Item	Water Feature Information: Spa/Hot Tub/Therapy Pool Safety (continued)	Yes	No	N/A
25	Are hair/lint strainers operating properly?	✓		
26	Is there adequate number of lifeguards?	✓		
27	Is there lifesaving equipment (e.g. shepherd's hook, buoy ring (U.S. Coast Guard Approved and proper length), rescue tubes, back boards)?	✓		
28	Is there an OSHA approved first aid kit available?	✓		
29	Is an AED (Automated External Defibrillator) available and operable?	✓		
30	Is there a working telephone with emergency numbers?	✓		
31	Is there adequate fencing?	✓		
32	Is (are) there self-closing gate(s) and are they operating correctly?	✓		
33	Is the facility free of other hazards?	✓		
34	Is it compliant with the Virginia Graeme Baker Pool and Safety Act (anti-entrapment system)?	✓		
35	Are chemicals properly stored?	✓		
36	Are required Material Safety Data Sheets (MSDS) available?	✓		
37	Are chemical warning signs properly displayed?	✓		
38	Is Personal Protective Equipment (PPE) available?	✓		
39	If diving is prohibited, are signs properly displayed?	✓		
Item	**Water Feature Information: Spa/Hot Tub/Therapy Pool Construction**	**Yes**	**No**	**N/A**
40	Is the pool/spa/hot tub surface (walls and floors) easily cleaned and in good repair?	✓		
41	Is water on pool deck draining away from pool/spa/hot tub?	✓		
42	Is the deck area constructed with a nonslip surface, and easy to maintain?	✓		
43	Is water removed for treatment and recirculation through overflow gutters or skimmers / water inlets and drains?	✓		
44	Is water distribution system protected against backflow?	✓		
45	Are ladders/steps with nonslip top surfaces provided at the shallow end and on each side of the deep end of the pool and in good repair?	✓		
46	Are diving boards, slides, and other pool recreation equipment constructed of approved materials and appropriately placed to avoid injury?	✓		
47	Are variations in pool depth marked on the pool deck or adjacent wall/fence in sufficient increments?	✓		
48	If a chlorine gas room is present, is it properly constructed and maintained?	✓		
49	Is the filter room properly secured, ventilated, lighted, and with proper drainage?	✓		
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SAMPLE

DOEHRS-IH EFM: SPA/HOT TUB/THERAPY POOL SANITATION REPORT | FACILITY: MWR SPA | START DATE: 20200211 | Page 2 of 2

Item	Restroom/Bath-House Facilities	Yes	No	N/A
50	Are the walls, ceilings and floors clean?	✓		
51	Are the toilets, urinals, showers and hand basins clean?	✓		
52	Is there adequate ventilation and lighting?	✓		
53	Are clothing, swimsuits and towels properly handled?	✓		
54	Is the baby changing station clean?	✓		
55	Are soap, toilet paper, paper towels, and trash receptacles available?		X	

Filter Information

- **Filter Name** (Brand & model): CAROCLEAN
- **Filter Media Type:** ☐ Cartridge ☐ Diatomaceous Earth ✓ Sand
- **Influent Pressure Gauge:** 20 PSI — **Effluent Pressure Gauge:** 12 PSI
- **Filter operating properly?** ✓ Yes ☐ No
- **Filter backwashed as need?** ✓ Yes ☐ No
- **Filter Comments:**

Pump Information

- **Pump Name** (Brand & model): Haygood
- **Pump operating properly?** ✓ Yes ☐ No
- **Turnover Rate*:** 1 Times/24-hours — **This space left Blank**
- **Rate of flow** (Comment required if value is zero): 50 gal/min
- **Pump Comments:**

*Note: **Turnover Rate** is the number of turnovers that occur in a 24-hour period. A **Turnover** is the length of time needed for the pool to circulate its entire volume one time. TB MED 575 specifies the maximum **Turnover Time** allowed for each aquatic venue.

Turnover Time = 24 hours ÷ Turnover Rate

Turnover Rate = 24 hours ÷ Turnover Time

14. OVERALL REMARKS (describe individual item deficiencies here)

NOTE: If this facility operates more than one spa/hot tub or therapy pool, each "pool" must be assessed for compliance and may be documented on a single inspection report. Use the remarks section to document additional pump and filter data. When documenting deficiencies, provide a unique identifier to distinguish the non-compliant pool from the others.

Water samples taken during this inspection: ☐ Yes ☒ No — **Sample Type: ☐ HPC ☐ Coliform (Total or E.coli)

**Note: Attach a copy of the sample results to this inspection document and upload the results to the inspection report in DOEHRS.

ITEM:
#55: No paper towel found in restroom. Fill paper towel dispenser as soon as possible.

15. INSPECTION RATING: ✓ Satisfactory ☐ Unsatisfactory — **16. FOLLOW-UP REQUIRED:** ☐ Yes ☐ No — **17. FOLLOW UP DATE NLT:** (YYYYMMDD)

18. SIGNATURE: *Signature on this form represents acknowledgment that the person in charge has been briefed on the deficiencies noted, corrective actions and timeframe to complete, the final inspection rating, and the date scheduled for follow-up inspection (unsatisfactory inspections only).*

a. Inspector Signature		b. DATE (YYYYMMDD): 2/11/20
c. Person in Charge Signature		d. DATE (YYYYMMDD): 20200211

SAMPLE

DOEHRS-IH EHM: RECREATIONAL WATER
WADING POOL SANITATION REPORT

Page 1 of 2

1. FACILITY NAME:	2. FACILITY ADDRESS:	3. INSTALLATION:	4. START DATE: (YYYYMMDD) / TIME: HH:MM	5. END DATE: (YYYYMMDD) / TIME: HH:MM
Kiddie Time	1 Navy Blvd	Navy Base	20200203 / 11:00	20200203 / 12:00

6. INSPECTOR (Surveyor)	a. Name and Rank:	b. Phone:	c. Email:	d. Unit/Organization:
	HM1 I.M. Halsey	444-444-4444	Ian.halsey.mil@mail.mil	Naval Hospital Sample

7. PERSON IN CHARGE (PIC)	a. Full Name:	b. Phone:	c. Official Email:
	Mr.R. Poole	444-123-4567	robert.poole@mwr.navy

8. CONTRACTOR OPERATED (select one)	Yes	No	9. Pool Type (select one)	Wading pool	*NOTE: Input the wading pool survey with the corresponding swimming pools survey report when entering data in the DOEHRS-EH Module.
		✓	✓		

10. INSPECTION TYPE: (select one)	Routine	Follow-Up	Complaint	Pre-Opening	Other (specify):
	✓				

11. IS WATER HEATED?	Yes	No	12. DISINFECTANT TYPE:	Chlorine	Bromine	Other (specify):	13. Pool Volume :	3000 gallons
		✓	✓					

Item	Water Feature Information: Wading Pool Water Feature	Yes	No	N/A
1	Pool, deck, and surrounding areas maintained and in good repair?	✓		
2	Are spectators / tables / chairs - 10 feet from the edge of the pool?			✓
3	Are there adequate covered trash receptacles?	✓		
4	Are there adequate number of water closets, lavatories, urinals, showers, and drinking fountains?	✓		
5	Is the filter / pump room clean and properly maintained?	✓		
Item	**Water Feature Information: Wading Pool Water Quality**	**Yes**	**No**	**N/A**
6	Is a chemical test kit available?	✓		
7	Is the total ***Bromine*** disinfectant level satisfactory?			✓
	Total disinfectant level: **Shallow end:** _____ppm			
8	Is the free available ***Chlorine*** disinfectant level satisfactory?	✓		
	Free available chlorine level: **Shallow end:** 1.0 ppm			
9	Is the pH satisfactory? pH: 7.4	✓		
10	Is the temperature satisfactory? Temperature: 78 °F	✓		
11	Is the visual clarity satisfactory?	✓		
12	Is the total alkalinity satisfactory? Total alkalinity: 90 ppm	✓		
13	Is the calcium hardness satisfactory? Calcium hardness: 300 ppm	✓		
14	If required by regulation, has a water sample been collected for bacteriological analysis (after analysis, attach copy of results)?			✓
15	Is the cyanuric acid satisfactory? Cyanuric acid: _____ ppm			✓
16	Is the surface water free of scum/debris?	✓		
17	Are the bottom and sides clean; vacuumed and scrubbed daily and as needed?	✓		
Item	**Water Feature Information: Wading Pool Operation**	**Yes**	**No**	**N/A**
18	Is a copy of the rules and warnings prominently displayed?	✓		
19	Is the maximum bather load posted?	✓		
20	Are an appropriate number of qualified lifeguards/employees with documented first-aid training and CPR certifications on duty?	✓		
21	Is an operational log properly completed?	✓		
22	Is a piping diagram of water and sewer lines posted near chemical equipment?	✓		
23	Is a pool specification sheet available?	✓		
24	Are chemical feeders operating properly?	✓		

Item	Water Feature Information: Wading Pool Safety (continued)	Yes	No	N/A
25	Are hair/lint strainers operating properly?	✓		
26	Is there adequate number of lifeguards?	✓		
27	Is there lifesaving equipment (e.g. shepherd's hook, buoy ring (U.S. Coast Guard Approved and proper length), rescue tubes, back boards)?	✓		
28	Is there an OSHA approved first aid kit available?		X	
29	Is an AED (Automated External Defibrillator) available and operable?	✓		
30	Is there a working telephone with emergency numbers?	✓		
31	Is there adequate fencing?	✓		
32	Is (are) there self-closing gate(s) and are they operating correctly?		X	
33	Is the facility free of other hazards?	✓		
34	Is it compliant with the Virginia Graeme Baker Pool and Safety Act (anti-entrapment system)?	✓		
35	Are chemicals properly stored?	✓		
36	Are required Material Safety Data Sheets (MSDS) available?	✓		
37	Are chemical warning signs properly displayed?	✓		
38	Is Personal Protective Equipment (PPE) available?	✓		
39	If diving is prohibited, are signs properly displayed?	✓		
Item	**Water Feature Information: Wading Pool Construction**	**Yes**	**No**	**N/A**
40	Is the pool/spa/hot tub surface (walls and floors) easily cleaned and in good repair?	✓		
41	Is water on pool deck draining away from pool/spa/hot tub?	✓		
42	Is the deck area constructed with a nonslip surface, and easy to maintain?	✓		
43	Is water removed for treatment and recirculation through overflow gutters or skimmers / water inlets and drains?	✓		
44	Is water distribution system protected against backflow?	✓		
45	Are ladders/steps with nonslip top surfaces provided at the shallow end and on each side of the deep end of the pool and in good repair?	✓		
46	Are diving boards, slides, and other pool recreation equipment constructed of approved materials and appropriately placed to avoid injury?	✓		✓
47	Are variations in pool depth marked on the pool deck or adjacent wall/fence in sufficient increments?	✓		
48	If a chlorine gas room is present, is it properly constructed and maintained?	✓		
49	Is the filter room properly secured, ventilated, lighted, and with proper drainage?	✓		
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SAMPLE

DOEHRS-IH EHM: WADING POOL SANITATION REPORT | FACILITY: Kiddie Time | START DATE: 20200203 | Page 2 of 2

Item	Restroom/Bath-House Facilities	Yes	No	N/A
50	Are the walls, ceilings and floors clean?	✓		
51	Are the toilets, urinals, showers and hand basins clean?	✓		
52	Is there adequate ventilation and lighting?	✓		
53	Are clothing, swimsuits and towels properly handled?	✓		
54	Is the baby changing station clean?	✓		
55	Are soap, toilet paper, paper towels, and trash receptacles available?	✓		

Filter Information

Filter Name (Brand & model):	HAYGOOD				
Filter Media Type:		Cartridge		Diatomaceous Earth	✓ Sand
Influent Pressure Gauge:	25 PSI	Effluent Pressure Gauge:	20 PSI		
Filter operating properly?	✓ Yes	No			
Filter backwashed as need?	Yes	X No			
Filter Comments:					

Pump Information

Pump Name (Brand & model):	HAYGOOD	Rate of flow (Comment required if value is zero):	50 gal/min
Pump operating properly?	Yes X No	Pump Comments:	
Turnover Rate*:	1 Times/24-hours	This space left Blank	

*Note: **Turnover Rate** is the number of turnovers that occur in a 24-hour period. A **Turnover** is the length of time needed for the pool to circulate its entire volume one time. TB MED 575 specifies the maximum **Turnover Time** allowed for each aquatic venue.

Turnover Time = 24 hours ÷ Turnover Rate

Turnover Rate = 24 hours ÷ Turnover Time

14. OVERALL REMARKS (describe individual item deficiencies here)

**Water samples taken during this inspection:	Yes / X No	Sample Type:	HPC / Coliform (Total or E.coli)	**Note: Attach a copy of the sample results to this inspection document and upload the results to the inspection report in DOEHRS.	

ITEM:
#28: No OSHA first aid kit available. Obtain an approved OHSA first aid kit immediately.
#32: Gates to wading pool area is not closing appropriately. Immediately fix closure to secure gates to prevent unauthorized entry.

15. INSPECTION RATING:	✓ Satisfactory		Unsatisfactory	**16. FOLLOW-UP REQUIRED:**		Yes	✓ No	**17. FOLLOW UP DATE NLT:** (YYYYMMDD)

18. SIGNATURE: *Signature on this form represents acknowledgment that the person in charge has been briefed on the deficiencies noted, corrective actions and timeframe to complete, the final inspection rating, and the date scheduled for follow-up inspection (unsatisfactory inspections only).*

a. Inspector Signature		b. DATE (YYYYMMDD): 2/3/20
c. Person in Charge Signature		d. DATE (YYYYMMDD): 20200203

APPENDIX G
ADDITIONAL ROLES AND FUNCTIONS FOR INSTALLATION PERSONNEL

G-1. Roles and Functions. The roles and responsibilities listed apply to various installation staff for the safe operation and maintenance of training and recreational aquatic venues:

1. The installation CO and the program manager are responsible for ensuring that training and recreational aquatic venues are maintained in sanitary condition. The installation CO and facility program manager will:

a. Provide overall supervision of training and recreational aquatic venues.

b. Enforce safety, health and sanitation regulations.

c. Forward requests for exception from any of the provisions contained in this chapter via the installation chain-of-command through the applicable Chief, Navy Installations Command (CNIC) regional office or Headquarters Marine Corps to the Navy and Marine Corps Public Health Center, Portsmouth, Virginia.

d. Ensure that deficiencies found during pre-season or pre-opening inspections are corrected before the facility is opened to the public.

e. Ensure that risk management, as specified in OPNAVINST 3500.39 series, is applied during the planning, construction, operation and maintenance of training and recreational aquatic venues.

2. The senior medical officer or public health officer or designated representative for the installation or at the cognizant military treatment facility (MTF) will:

a. Review all concept designs and final plans for the construction of training and recreational aquatic venues with regard to sanitary control and safety prior to final acceptance of the plans.

b. Investigate suspected illness or injury due to training and recreational aquatic venues, and implement remedial measures as appropriate.

c. Approve the use of all natural aquatic areas under installation control.

3. The preventive medicine authority or designated preventive medicine personnel will:

a. Provide medical oversight of the operation and use of training and recreational aquatic venues within its area of responsibility.

b. Provide inspections and sanitary surveys as required.

c. Maintain basic laboratory capability to provide routine chemical monitoring, and bacteriological monitoring as necessary (see Appendix F).

d. Provide guidance to pool operators and management as necessary.

e. Ensure safe and healthful training and recreational aquatic venues by:

(1) Maintaining information regarding engineering and operational features.

(2) Determining that operators and lifeguards are properly trained in the sanitary operation of the facility.

(3) Performing pre-opening inspections.

(4) Providing technical reviews regarding sanitation prior to renovations or new construction.

f. Ensure that water facility oversight activities are conducted only by personnel who have been trained or certified as pool operators or inspectors.

4. The NAVFAC Public Works Office is responsible for the maintenance, repair and alterations of installed swimming pools and natural aquatic area equipment under the control of the installation CO. The Public Works Officer will:

a. Maintain swimming pools and spas per this chapter and DOD UFC 4-750-07, *Aquatic Facilities*.

b. Ensure that at least one pool operator maintains a valid certification, other than the aquatics staff.

c. Ensure proper operation of the recirculation system and adjustment of chemical feed rates (such as pH adjustment and chlorine addition).

d. Provide emergency engineering assistance to correct health-related deficiencies as they develop.

e. Maintain appropriate water test kits for each recreational water facility.

f. Ensure the availability of safety data sheets (SDS) for all hazardous materials used in the pool.

g. Participate in pre-opening and annual inspections of pools and spas.

h. Maintain facility equipment.

i. Perform breakpoint chlorination as necessary.

j. Notify the appropriate wastewater treatment plant before draining a facility.

k. Monitor and maintain proper flow rates.

l. Ensure all facilities are designed per military and local regulations and that construction documents are approved by a local, or higher jurisdictional health agency.

m. Apply the risk management process, as specified in OPNAVINST 3500.39 series during the prioritization and execution of maintenance and repair tasks associated with training and recreational aquatic venues.

n. Ensure proper monitoring is occurring and facility monitoring records are maintained for at least 2 years following the end of the current season.

o. Ensure the required chemical and physical water quality measurements are recorded as specified.

5. Installation Safety Office personnel will:

a. Conduct a yearly Standard Safety and Occupational Health Inspection, to include evaluations of the chlorine equipment and attachments, personal protective equipment, respiratory protection program, and electrical and grounding hookups.

b. Ensure the proper maintenance and placement of personal protective equipment.

c. Investigate any reported injuries.

d. Provide oversight and input for training and recreational aquatic venues as requested or deemed necessary.

6. MWR recreational water facility staff is responsible for swimmers and oversight of all pool operations. MWR staff will:

a. Ensure that at least one person within the pool management staff maintains a valid pool operator’s certificate from a nationally recognized program.

b. Ensure the lifeguard staff is adequately trained.

c. Provide proper lifesaving equipment for all facilities.

d. Maintain the appropriate test kit onsite for each recreational water facility.

e. Ensure lifeguards are trained in the use of chemical water quality test kits.

f. Maintain the facilities, as required, and keep the facilities clean.

g. Ensure a safe recreational water facility.

h. Initiate maintenance of the facility when necessary.

i. Apply the risk management process, as specified in OPNAVINST 3500.39 series during the operation and maintenance of training and recreational aquatic venues.

7. Lifeguards will

a. Maintain the safety of patrons in and around the pool. Communicate and enforce pool regulations and rules in a personable and professional manner.

b. Check rescue equipment daily to ensure the equipment's availability and serviceability.

c. Record daily maintenance activity.

d. Ensure drain covers are in place and unbroken.

e. Alert the pool supervisor when water quality requires adjustment or hazards are present.

8. Information Management Control. The surveys required in chapter 4 section 74 subparagraphs 3a through 3c, chapter 4 section 92 paragraph 1, chapter 4 section 95 paragraph 2, chapter 4 section 99 paragraphs 1, 2a(2) and 2(a)3 and chapter 4 Appendix F are exempt from reports control per Secretary of the Navy Manual 5214.1 of December 2005, part IV, paragraph 7j.