North American Float Tank Standard



Version 3

Updated May 2025

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Introduction

These recommendations are based on the current evidence that exists for float tanks, in addition to decades of operational experience, dating back to the invention of the commercial float tank in the 1970's. In jurisdictions that do not already have standards for float tanks, there is often an attempt to place them in the same category as pools or spas. Doing so ignores the unique nature of the float solution, leaving out inherent characteristics that are important to float tank safety and enforces other practices that do not apply to the small, saline environment. Equating pools and spas with floatation tanks may create unintended negative consequences to the health of the user and place unfair and unnecessary burden on the float tank operator.

With regard to health risks, float tanks differ from pools and spas in three major ways:

I. Reduced Contaminants & Protection of Typical Portals of Entry

Compared to a pool or spa, the way that users interact with the float tank results in significantly lower levels of contaminants being introduced into the solution, as well as much lower risks of those contaminants colonizing and potentially infecting the user:

- Standard float tanks typically operate with a single user at a time, with a filtration cycle between each session
- Users shower before entering the float tank, greatly reducing the contaminant load they bring into the solution. They also shower thoroughly afterwards to remove residual salt, reducing the chance that any pollutants from the solution would remain on their body.
- Swimmers have been shown to ingest about a mouthful of pool water each time they swim. (Dufour, et al. 2007) In a float tank, users float with their mouth, nose, and eyes above the solution. This, combined with the strong and unpleasant taste of the Epsom salt solution, essentially eliminates the possibility for ingestion and transmission of gastrointestinal pathogens via the fecal-oral route.
- The Epsom salt solution will immediately and noticeably sting any open wounds on a user's body, resulting in either covering their wounds with a protective layer of petroleum jelly, or deciding not to float until the wound is healed.
- It is very uncommon for children, especially young children, to float. Children are known contributors of fecal contamination in pools and spas and are also very likely to ingest recreational water.
- Floating requires no vigorous movement and the solution is kept at skin-temperature. This results in users producing much less sweat than active swimming or in hot tubs.
- Users do not wear bathing suits while floating, eliminating the detergents and other contaminants that bathing suits normally introduce into the float solution.
- Rather than relying on passive signage, float centers give each new client a thorough orientation, actively educating them on proper hygiene procedures to promote best sanitation and safety practices.
- Float tanks are relatively small devices, with small volumes of salt solution and short lengths of piping for their filtration system. This maximizes exposure to UV light and filtration between users.
- Room cleaning and a visual inspection of the tank occurs between each user. This, combined with the small volume of solution, makes it very unlikely that a fecal or vomit incident would go unnoticed before another user enters the float tank.

II. High Concentration of Epsom Salt

The most significant difference between a float tank and a pool or spa is the fact that float tanks are filled with a solution made of water and about 25%-30% Epsom salt ($MgSO_4 ext{-}7H_20$). This concentration of Epsom salt has a significant impact on the chemistry of the solution, making it very difficult for pathogens to grow or even survive.

A study done through NSF International shows that Pseudomonas aeruginosa placed in an Epsom salt solution (with no additional chemicals or sanitizers added) had a 5.54 \log_{10} reduction after 24 hours (down to undetectable levels), while the same dose of Pseudomonas aeruginosa in a control sample of distilled water showed a 0.96 \log_{10} growth. (NSF, Float On. 2015)

It is important to note that the same study also tested *Enterococcus faecium*. While this organism was shown not to grow in the Epsom salt solution, the salt solution did not show significant reduction in the contaminant population over 24 hours. Because of this, and because the length of time required for *Pseudomonas aeruginosa* reduction is longer than the typical time between float sessions, this standard still recommends the use of a suitable sanitation strategy beyond the use of Epsom salt and filtration alone.

III. Circulation & Filtration

The noise and movement of the solution generated by continuously running a pump during a user's float significantly disrupts the sensory reduction that is fundamental to the purpose of a float tank and conserving its specific environment. For this reason, the normal pool/spa requirement of continuous filtration is not suitable for float tanks.

Float tanks employ a filtration process that happens between each float session (each user). The minimum of three turnovers between each session set forth in this standard will allow 95% of the float tank solution to be filtered. Four turnovers will achieve about 98% filtration. (PHTA, 2024, Pool and Spa Operators Handbook, Chapter 10)

Conclusion

The minimal introduction of contaminants, the limited pathways for those contaminants to enter the user's body, the high salt content, and the operational practice of floating a single user at a time all contribute to an environment that is clearly distinguishable from many of the safety and sanitation concerns that pools and spas are faced with.

In the 40 years that float tanks have been commercially available, there have been three reported outbreaks of illnesses or infections. In all three outbreaks, the float solution was operated at sub-acceptable concentrations of Epsom salt, and in two of the cases the floatation tanks were not constructed or operated like a typical float tank or float tank facility (CBC News. October 20, 2022, Hyllestad, et al. 2019, Rehbeina, et al. 2019).

While there are operational and equipment standards that should be met to ensure safety, floatation is an inherently low risk activity. The differences between a float tank and a pool, spa, or other recreational water activity are distinct and fundamental, and it is important to keep this in consideration when assessing the health risks and the appropriate operational practices for commercial float centers.

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The Standard for Float Tanks

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1. Scope

These Float Tank Standards represent our recommendations for the baseline best practices to ensure quality, sanitation, and safety while operating float tanks in a commercial setting.

2. **Definitions**

- 2.1. <u>Balance</u>: A term used to refer to a condition of the float solution that is neither scaling nor corrosive. See Saturation Index.
- 2.2. <u>CFU (Colony Forming Units)</u>: Used to express the concentration of microorganisms per unit of volume, most often as CFU per mL of bacteria in float solution.
- 2.3. <u>Chemical Feeder</u>: A device (floating or mechanical) for adding a chemical to pool or spa water.
- 2.4. <u>Chemical Feeder Output Rate</u>: Amount of chemical or active ingredient delivered by a feeder per unit of time (for example, mL of hydrogen peroxide per hour). One pound per hour is equivalent to 0.45 kilograms per hour.
- 2.5. <u>Circulation System</u>: The mechanical components that are a part of a re-circulation system on a float tank. Circulation equipment may be, but is not limited to, categories of pumps, hair and lint strainers, filters, valves, gauges, meters, heaters, surface skimmers, inlet/outlet fittings, and chemical feeding devices. The components have separate functions, but when connected to each other by piping, perform as a coordinated system for purposes of maintaining float solution in a clear and sanitary condition.
- 2.6. <u>Clarity</u>: The degree to which the float solution remains free of visible particulates or discoloration.
- 2.7. <u>Coliform Bacteria</u>: Bacteria found in the intestines and fecal matter of warm-blooded animals. The detection of coliform bacteria is used to indicate the possibility of disease-causing bacteria.
- 2.8. <u>Filter</u>: A vessel that removes undissolved particles from float solution by flowing the solution through a porous substance (a filter medium or elements).
 - 2.8.1. Cartridge Filter: A filter that utilizes a porous element that acts as a filter medium.
 - 2.8.2. Permanent Medium Filter: A filter that utilizes a filter medium, such as sand.
- 2.9. <u>Filter Cycle</u>: A programmed filtration period. The operating time between cleaning or backwash cycles.
- 2.10. Float Room The room surrounding a float tank, usually containing a shower and an area for the user to undress, store their belongings, and dry/dress after the float. Also sometimes referred to as a 'float suite'.
- 2.11. Float Solution: A saturated aqueous solution of Epsom salt (magnesium sulfate, MgSO₄·7H₂O) and water, formulated to achieve a specific gravity between 1.23 and 1.30.

- 2.12. Float Tank (a.k.a. Floatation Tank, Float Room/Pod/Spa/Chamber, Isolation Tank, or Sensory Deprivation Tank): a tub that contains a saturated solution of Epsom salt (magnesium sulfate heptahydrate) having a specific gravity of 1.23 to 1.3, provides a light and sound reduced environment, and is maintained at a temperature of approximately 92-96°F / 33.3-35.6°C.
- 2.13. <u>Flow</u>: The rate of the movement of float solution, typically in gallons per minute. One U.S. gallon per minute is equivalent to 3.79 liters per minute.
- 2.14. <u>Fungi</u>: A diverse group of eukaryotic single-celled or multinucleated organisms that live by decomposing and absorbing the organic material in which they grow, comprising the mushrooms, molds, mildews, smuts, rusts, and yeasts.
- 2.15. <u>Hardness</u>: The amount of calcium and magnesium dissolved in float solution; expressed as parts per million (ppm) of equivalent calcium carbonate.
- 2.16. <u>Hydrogen Peroxide (H_2O_2) </u>: Compound consisting of hydrogen and oxygen supplied in an aqueous solution, used as an oxidizer. Will neutralize halogen sanitizer in float solution.
- 2.17. <u>Magnesium Hardness</u>: A measure of the amount of magnesium dissolved in float solution and expressed in parts per million (ppm) or milligrams per liter (mg/L) as calcium carbonate.
- 2.18. <u>Microorganism</u>: A microscopic plant or animal life, such as bacteria or fungi in the float solution.
- 2.19. <u>Organic Matter</u>: Carbon-based substances, generally originating from living organisms, often introduced to float tanks by users. For example, perspiration, urine, saliva, cosmetics, and dead skin.
- 2.20. Oxidizers: Products used to destroy organic contaminants in float solution.
- 2.21. Ozone (O_3) : A gaseous molecule composed of three (3) atoms of oxygen that may be generated on site and used for oxidation of float solution contaminants.
- 2.22. Ozone Contact Concentration: The amount of ozone that is dissolved in float solution.
- 2.23. Ozone Generator: A device that produces ozone, generally exposing oxygen or air to corona discharge or ultraviolet light.
- 2.24. Parts Per Million (ppm): The unit of measurement used in chemical testing that indicates the parts by weight in relation to one million parts by weight of float solution. It is essentially identical to the term 'milligrams per liter' (mg/L) in float solution.
- 2.25. Pathogens: Disease-causing microorganisms.
- 2.26. Pathological Agents: Toxins, microbes, etc. capable of causing diseases.
- 2.27. <u>pH</u>: a quantitative measure of the acidity of a liquid or aqueous solution, determined by the concentration of hydrogen ions in the solution. Expressed as a number on a scale of 0 to 14, with 7.0 being neutral; values less than 7.0 are acidic and values greater than 7.0 are basic.
- 2.28. Potable Water: Water that is safe and satisfactory for drinking.
- 2.29. <u>Pump</u>: A mechanical device, usually powered by an electric motor, that causes hydraulic flow and pressure for the purpose of filtration, heating, and circulation of the float solution.
- 2.30. Reagents: The chemical used to test various aspects of float solution quality.
- 2.31. <u>Recreational Water Illness (RWI)</u>: An infectious disease spread by swallowing, breathing, or having contact with contaminated water from swimming pools, spas, float tanks, cooling towers, lakes, rivers, or oceans.
- 2.32. Salinity: The salt content of float solution.
- 2.33. <u>Saturation Index</u>: A number expressing the degree of saturation of water as related to calcium carbonate solubility and used to predict whether or not water has a tendency to precipitate or dissolve calcium carbonate.
- 2.34. <u>Shock-oxidizer</u>: Product used to destroy non-living organic and inorganic contaminants in float solution. This product is neither a sanitizer nor algicide.

- 2.35. <u>Skimmer</u>: A device that can be installed in the float tank used to remove floating debris.
- 2.36. <u>Soft Water</u>: Water that has a low calcium and magnesium content.
- 2.37. Specific Gravity: The ratio of the density of a substance to the density of a standard, usually water for a liquid or solid, and air for a gas. In float tanks, it quantifies the relative density of the float solution compared to that of pure water.
- 2.38. <u>Supplemental Treatment Systems</u>: Systems or processes which are not required on an aquatic venue for health and safety reasons, but may be used to improve water quality and/or enhance overall system performance.
- 2.39. <u>Test Kit</u>: Equipment used to determine specific chemical residual and physical properties of float solution.
- 2.40. <u>Total Dissolved Solids (TDS)</u>: The measure of the total amount of dissolved matter in the float solution.
- 2.41. <u>Turnover Rate</u>: The period of time (usually in minutes) required to circulate a volume of float solution in the float tank.
- 2.42. <u>Ultraviolet Light</u>: UV light is often characterized as UV-A, UV-B, or UV-C, indicating wavelengths of 315 400 nanometers (nm), 290 315 nm, and 220 290 nm, respectively. UV-C is the germicidal region of the light spectrum that is used to deactivate micro-organisms, and can be generated artificially with gaseous lamps. UV light-generating devices may be used as a supplemental sanitizer to inactivate microorganisms.

3. Pre-Float Orientation

- 3.1. First time users shall receive a clear and thorough orientation prior to floating, including health and safety instructions. The orientation should include:
 - 3.1.1. Requiring a shower before and after the float.
 - 3.1.2. Screening for contagious skin diseases and respiratory diseases.
 - 3.1.3. Screening for people experiencing active diarrhea or who have experienced two or more episodes of diarrhea or loose stool within the previous fourteen calendar days.
 - 3.1.4. Screening for people with underlying health conditions, who should consult with their primary health care provider prior to floating.
 - 3.1.5. Screening to ensure users are not impaired by the use of any mind altering substances, such as alcohol or drugs.

4. Float Tank Operations and Room Management

- 4.1. Tank Maintenance
 - 4.1.1. <u>Sanitation</u>: Float tanks shall utilize Ultraviolet light, Ozone, or a combination of the two as a sanitation strategy.
 - 4.1.2. <u>Oxidation</u>: Hydrogen Peroxide may be used as an oxidizer in conjunction with the sanitizers listed above.

Note: If UV is used, UV bulbs shall be cleaned / replaced based on manufacturer's recommendation.

Note: The use of Chlorine or Bromine is not recommended for several reasons, which are listed in the appendix.

- 4.1.3. <u>Microbiological Testing:</u> To evaluate the effectiveness of the sanitation and oxidation strategy and tank system, it is recommended that the float solution be tested routinely for the presence of *Pseudomonas aeruginosa* and heterotrophic bacteria at a certified water testing lab.
- 4.1.4. <u>Float Solution Parameters:</u> The float solution shall be maintained in accordance with ranges listed below at all times. Each center shall keep a daily log to record their measurements and

any chemicals added to adjust those measurements:

- 4.1.4.1. *Depth of solution* should be within the parameters for proper surface level skimming.
- 4.1.4.2. Specific Gravity
 - 4.1.4.2.1. The source of salt used shall be United States Pharmacopeia (USP) Grade Epsom Salts.
 - 4.1.4.2.2. Specific gravity of the float solution shall be maintained between 1.23 and 1.30.
 - 4.1.4.2.3. At any time that the specific gravity is less than 1.23, the tank shall be removed from service. Corrective action shall be made and documented in the logbook before the tank is returned to service.
- 4.1.4.3. Temperature of Float Solution:
 - 4.1.4.3.1. The general use temperatures shall be 92-96°F / 33.3-35.6°C, or based on the tank manufacturer's recommendation.
- 4.1.4.4. *Hydrogen Peroxide* (if used):
 - 4.1.4.4.1. The maximum concentration of hydrogen peroxide shall be 100 ppm (mg/L).
- 4.1.4.5. *Ozone* (if used):
 - 4.1.4.5.1. Airborne ozone levels shall be measured inside and around the float tank and within proximity of the ozonator.
 - 4.1.4.5.2. The Permissible Exposure Limit (PEL) of airborne ozone levels shall not exceed 0.10 ppm (vol) in a time weighted average during an 8 hour period, in accordance with OSHA standard 1910.1000.
 - 4.1.4.5.3. The Short Term Exposure Limit (STEL) shall not exceed 0.30 ppm for 15 minutes. (OSHA Standard 1910.1000)
- 4.1.4.6. *Float solution balance:* Balancing the float solution using pool water parameters is not required.
- 4.1.5. <u>Visual Examination:</u> The inside of the float tank shall be thoroughly evaluated for clarity and the presence of any impurities after each float session and prior to the first float session of each day.
- 4.1.6. <u>Circulation and Filtration:</u> Float tanks shall be circulated to achieve a minimum of 95% turnover of the float solution between users.
 - 4.1.6.1. For Float tanks *without* external holding tanks, a minimum of three turnovers between each user shall be performed.

Note: Four turnovers are encouraged.

- 4.1.6.1.1. If no flow meter is present, the operator shall follow the manufacturer's specified turnover rate.
- 4.1.6.2. For Float tanks *with* external holding tanks, the float solution shall be filtered for one complete filter cycle.

Note: Float tanks of this design are not common in North America.

4.1.6.3. Filter media shall be cleaned / replaced based on manufacturer's recommendation.

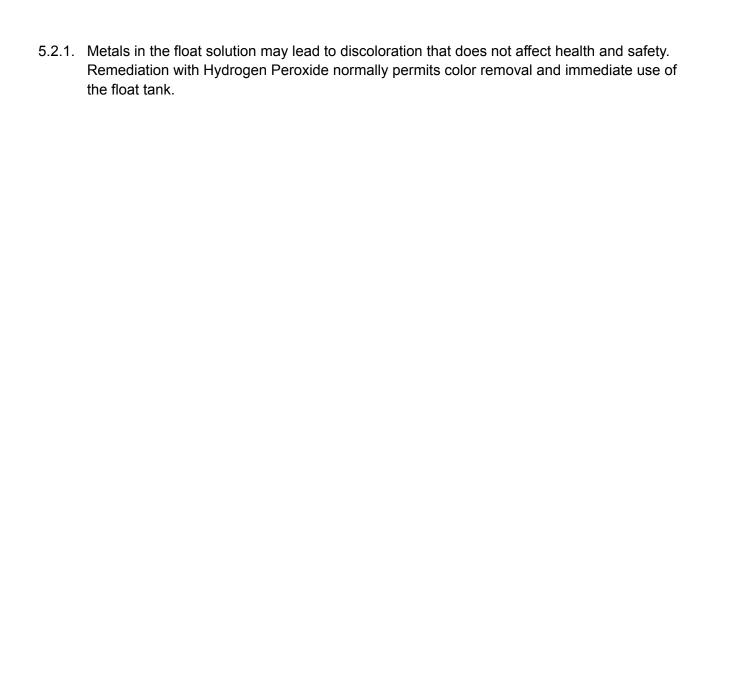
4.2. Room Maintenance

- 4.2.1. Room and float tank cleaning
 - 4.2.1.1. Surfaces that users interact with in and around the float tank (such as handles, seating, flooring, and the shower area) shall be thoroughly evaluated and cleaned between uses.
 - 4.2.1.2. The interior of the float tank above the solution line (including the ceiling) shall be thoroughly evaluated and cleaned on a weekly basis.

- 4.2.2. Any items placed in the room intended for use shall be made clean and sanitary for the next user.
- 4.2.3. Single-use earplugs and a neck floatation device should be provided as an option for the user.

5. Contamination and Emergency Management Procedures

- 5.1. <u>Unexpected Contamination:</u> For dealing with unexpected contaminations, the following protocol will be followed:
 - 5.1.1. In the case of a *blood* or *formed (solid) fecal* incident within the basin, the operator shall immediately close the float tank to users until the following measures are completed:
 - 5.1.1.1. Do not circulate the float solution.
 - 5.1.1.2. Remove all visible particles from the float solution and the basin walls and dispose of the contaminated material in a sanitary manner.
 - 5.1.1.3. Once thorough manual cleaning is complete, add a measured amount of sodium hypochlorite (household bleach) to the basin to achieve a 2.0 ppm residual of free chlorine.
 - 5.1.1.4. Maintain this 2 ppm residual for a period of no less than 30 minutes.
 - 5.1.1.5. After a minimum of 30 minutes has gone by, the solution should be circulated according to the normal turnover rate as specified in section 4.1.5.
 - 5.1.1.6. Add a start up dose of hydrogen peroxide to neutralize the sodium hypochlorite.
 - 5.1.1.7. After waiting 15 minutes, test the hydrogen peroxide concentration in the float solution. If the concentration is between 50 and 100 ppm in the float solution, return the tank to normal operating levels.
 - 5.1.2. For any *loose stool, suspected diarrheal contamination, or vomit incident,* the operator shall immediately close the float tank to users until the following measures are completed:
 - 5.1.2.1. Do not circulate the float solution.
 - 5.1.2.2. Remove all visible particles from the float solution and the basin walls and dispose of the contaminated material in a sanitary manner.
 - 5.1.2.3. Completely drain the float tank, including all applicable equipment (pump, filter housing, etc.) and dispose of the fouled float solution.
 - 5.1.2.4. Remove and dispose of the filter.
 - 5.1.2.5. Fill the float tank to standard height with water. Do not add Epsom salt. Add chlorine (bleach) to the float tank to provide 40 ppm of available free chlorine levels and ensure pH is 7.5 or lower; adjust if necessary. Verify and maintain water temperature at 77 °F (25 °C) or higher.
 - 5.1.2.6. Run the pump without a filter for at least 30 minutes.
 - 5.1.2.7. Empty the float tank of all bleach solution, including all applicable equipment connected to the float tank, (such as the filter housing, or UV light housing).
 - 5.1.2.8. Rinse and drain the basin to remove residual chemicals.
 - 5.1.2.9. Refill using fresh, potable water and Epsom salt. A fresh filter should be placed into the system.
 - 5.1.2.10. Ensure that all parameters of the float solution are within normal operating range before returning the tank to service.
- 5.2. <u>Visible Contaminants:</u> If the float tank solution contains visible contaminants or discoloration, or emits a musty odor, the tank shall be taken out of service, and appropriate remedial action must be taken before the tank is returned to service.



Appendix

1. Scope

Information in the Appendix is supplemental to the Standard to assist in implementing and enhancing user safety and comfort.

2. Definitions

See the body of the Standard

3. Pre-Float Orientation

- 3.1. Orientation should also include information such as:
 - 3.1.1. A *cleansing* shower reduces the carry in of cosmetics, body oils, and fecal matter. Emphasis should be placed on the hair, armpits, and groin. The design of a float room (or suite) typically includes a shower in the same room as the tank to ensure guest comfort and encourage showering.
 - 3.1.1.1. It is recommended that users do not use hair conditioner during the pre-float shower to avoid unnecessary contamination of the float solution.
 - 3.1.1.2. Not showering afterwards is almost inconceivable. If no shower were to be taken, the user would be entirely covered in crystallized salt within minutes of leaving the tank.
 - 3.1.2. Additional safety and comfort suggestions
 - 3.1.2.1. The most significant risk during a float session is a slip and fall. Appropriate floor treatments and hand-holds should be readily available.
 - 3.1.2.2. The use of mild-altering substances such as alcohol or drugs increases the risk of injury or death. For further information, see the FTA position paper: Use of Mind Altering Substances During A Float Session. (FTA Position Paper, 2024)
 - 3.1.2.3. Provide instructions on how to safely enter and exit the float tank, including how to operate tank and room lighting, how to operate the door to the float tank, and how to find the door to the float tank in the dark.
 - 3.1.2.4. Provide instructions on rinsing out the eyes if any float solution enters them.
 - 3.1.2.5. Warn users against entering with any large open wounds or rashes, and recommend the application of a layer of petroleum jelly over any small wounds; as well as warn users to avoid floating after shaving, waxing, or getting a tattoo.
 - 3.1.2.6. Inform guests that they can use the float tank in whatever way is comfortable for them in terms of light, sound, door position, temperature, and time.
 - 3.1.2.7. The safety of floating while pregnant or undergoing chemotherapy has not been reviewed by medical providers.
 - 3.1.2.8. While there is no physical risk of floating after a hair dye treatment, there is risk of float solution discoloration, as well as staining of the tank and any other materials in the room (towels). For more information, see the FTA Resource about the "White Towel Test". (FTA, White Towel Test. 2025)

4. Float Tank Operations and Room Management

4.1. Tank Maintenance

- 4.1.1. Sanitation strategies:
 - 4.1.1.1. UV and ozone systems are used to ensure that the concentrations of organic compounds in the float solution are minimized. Any combination of UV, ozone, and hydrogen peroxide will help ensure the clarity and general cleanliness of the float solution, provided that the units are properly sized and maintained according to the manufacturer's instructions.

In normal float tank operation, the UV light is only energized while the circulating pump is running. The multiple on-off cycles each day may reduce the useful life of the UV bulb. Discussing this pattern with the manufacturer is recommended. It is also recommended that float centers track the hours of operation of the bulb and the date of replacement in the operating records. One study has confirmed that the UV transmissivity of float solution averages 74-77% (NeoTech, 2018). Although this was a limited test, it does confirm the suitability of UV treatments in float tanks.

4.1.2. Oxidation Strategies:

- 4.1.2.1. Hydrogen peroxide alone is a weak oxidizer and is unlikely to provide the desired clarity and cleanliness of the float solution.
- 4.1.2.2. UV, in combination with hydrogen peroxide, may be useful in maintaining clarity of the float solution. Unless the system is a unique or custom design, this combination is unlikely to produce significant amounts of free radicals.
- 4.1.2.3. UV in combination with ozone results in greater oxidation potential than UV in combination with hydrogen peroxide.
- 4.1.2.4. Ozone provides significantly greater oxidation than hydrogen peroxide. The output of the generator must be sized appropriately to the float tank. Over-sized units may result in the release of excessive amounts of ozone into the air and a potential health hazard. Consult the manufacturer for proper sizing of the unit.

Neither Chlorine nor Bromine are registered by any national regulation authority for use in float solution and consequently do not have appropriate directions for use. Chlorine and Bromine are not recommended for use in float tanks for the following reasons:

- Based on widespread industry experience and an NSF International study, most Chlorine and Bromine test kits are inaccurate in float solution, meaning that chemical levels cannot be effectively and responsibly measured, monitored, or managed. (NSF, Recovery Analysis of... 2015.)
- Halogen effectiveness requires further chemical addition to balance pH and total alkalinity, both of which are also very difficult to accurately measure in the float solution.
- Disinfection byproducts created from halogen use have been shown to be linked to respiratory health concerns and mutagenicity. While no study on disinfection byproducts has been performed specifically on float tanks, the enclosed nature and passive air flow systems found on many float tanks raises a concern that this problem could be especially pronounced in this environment, both for the public who use the float tanks for an extended session or for repeated, frequent use, and for the staff in float centers who are continuously in that environment.
- Bromine use in pool and spa settings offers relatively poor control of *Pseudomonas aeruginosa*, and is more commonly associated with dermatoses.
- Hydrogen Peroxide is neither a sanitizer nor a disinfectant in the float solution, but it does play an
 important role in the overall sanitary condition of the system. Hydrogen peroxide acts as an oxidizer

- in the aquatic environment, burning off organic material and improving clarity. It is also suspected that hydrogen peroxide acts synergistically with UV, creating hydroxyl radicals which further enhance the sanitation of the float solution.
- While direct sanitation research into float tanks is limited at this time, there are a few studies that exist. A study conducted by Malowitz, Tortora, and Lehmann indicates that the chance of microbial transference between users is insignificant. (Malowitz, et al. 1998) With regard to UV, a study by Wong and Suedfeld found that UV exposure during the filtration process will significantly reduce microbial populations in float solution. (Wong. 1986) It should be noted that both of these studies are from the 1980's, and were therefore conducted and analyzed with the best understanding of the science that existed at the time.
 - 4.1.3. Common recreational water tests include those which look for heterotrophic (or standard) plate count and total coliform; however, they are not ideal indicators of float solutions sanitation. Health Canada cautions against relying on plate count and describes that it is not a good indicator of water safety. Total coliforms, including *E.coli*, also are not ideal indicators because they are difficult to isolate in the float solution and because the fecal-to-oral route is not a reasonable pathway of exposure for a float tank user. Previous editions of this standard specified monitoring using only *Pseudomonas aeruginosa*. This standard now includes monitoring *Pseudomonas aeruginosa* plus heterotrophic plate count. This change was made for two reasons:
 - 4.1.3.1. The FTA Microbiology Project has since found that heterotrophic plate count (HPC) method was more readily available at US testing laboratories. While none of the commonly utilized tests for swimming pool and hot tub water is optimized, the HPC method does provide a universally recognized indicator for assessing the hygiene of the float solution. The maximum concentration of 200 CFU/mL in swimming pools and hot tubs has been recognized in the US since 1964 by the APHA, as well as the US EPA.
 - 4.1.3.2. Pseudomonas aeruginosa is the most likely pathogen in float tanks, but the maximum permissible concentration has not been established. Few health departments have established limits, but those that have did so with the assumption that the infective dose of this bacterium is the same as that of gastrointestinal pathogens. That assumption is not in agreement with the pathogenesis of illness of these two distinctly different RWIs. Based on two separate risk assessments, it is likely that up to 1000 CFU/mL are tolerated in aqueous exposure venues including pools, hot tubs and float tanks (Price and Ahearn. 1988; Roser, et al, 2015). These two risk assessments are at least as well defined as any risk assessment for RWIs. But these risk assessments have not been widely discussed among public health code writing officials. Rather than proposing a new limit based on these risk assessments for P. aeruginosa, this edition of the Standard has switched monitoring to heterotrophs while acknowledging that monitoring *P. aeruginosa* is good practice but not an ideal indicator. The FTA Microbiology Project did find a few samples containing P. aeruginosa but those concentrations were 10,000 fold below the level of risk assessment concern. A suggested limit is <100 CFU/100mL. This provides a safety factor of 1,000 fold. Based on a study from NSF International, P. aeruginosa is not able to survive in properly maintained float solution. If counts are detected, it is more likely due to bacterium that is being introduced from the float room, potentially from the shower floor on the feet of the users, or that the specific gravity is <1.23. If so, discontinue

use of the float tank, verify the specific gravity of the float solution, and return to the recommended range. Secondly, disinfect the floor of the shower and surrounding room using an EPA registered product prior to resuming use.

- 4.1.4. Chemical operating parameters of the float solution:
 - 4.1.4.1. The nominal depth of the float solution is between 10" 12" / 25cm 30cm.
 - 4.1.4.2. The concentration of the Epsom salts is a critical factor in maintaining adequate control of bacteria in the float solution. All three of the documented outbreaks referenced in this document have evidence suggesting they were below a specific gravity of 1.23. Operating above a specific gravity of 1.30 is not advised due to the potential for salt crystallization in the equipment, particularly around the impeller of the pump for example, resulting in the filtration system becoming inoperable.
 - a. Experience has shown that even with heavy use, monitoring specific gravity once a week is adequate for most operations. During periods of especially heavy use or when float centers are first opening and establishing their patterns, more frequent testing of specific gravity is suggested. After any adjustments to the Epsom salt or water levels of the float solution are made, the tank should be circulated for three turnovers and the specific gravity should then be retested.
 - b. There are four available grades of magnesium sulfate: USP, ACS, Technical, and reagent. USP Grade is the only one specified for use in contact with the human body.
 - 4.1.4.3. A maximum temperature of 104°F is the well established upper limit used in hot tubs. Research to establish a maximum safety temperature in the float environment is currently lacking. Establishing a maximum temperature for the float solution involves multiple variables including the temperature of the air, the temperature of the float solution, and the humidity level. Different models of float tank can differ in their regulation of humidity and air temperature, which is why float centers should follow the manufacturer's recommendation. Since it is complicated, and there is the possibility of mistaking ideal temperatures in a float tank for those of a hot tub, this standard presents what in many models of float tank might be a conservative maximum temperature from a safety perspective. Because the purpose of a float tank is to minimize external sensations, the temperature of the float solution should be maintained for user comfort near average skin temperature. From the perspective of user comfort, 96°F / 35.5°C is very often warmer than most float tank systems are normally operated.
 - 4.1.4.4. The suggested concentration range of hydrogen peroxide is 40-100 ppm. The maximum concentration of 100 ppm hydrogen peroxide is based on skin feel from microbubble formation on the skin. Collective experience in the float community reports that some individuals experience skin tingling when the concentration is above 100 ppm. This tingling is likely the result of catalase in the skin inactivating the hydrogen peroxide forming bubbles of oxygen. This reaction is well understood and a normal cellular process. The skin tingling due to concentrations >100 ppm is a distraction to some users. This limit is set strictly to ensure an enjoyable float experience. There are no known health risks associated with this concentration of hydrogen peroxide. Common, off-the-shelf hydrogen peroxide (3%) is a 30,000ppm dilution and is used on open wounds and in people's mouths.

- 4.1.4.5. Ozone is a potent respiratory irritant. There are no documented studies on the concentration of ozone in the air inside a closed float tank or in the room air while the tank is being serviced between users. Float centers with concerns about respiratory exposure should obtain guidance from an industrial hygienist. The terms used in the standard have very specific meanings and were established by the U.S. Occupational Safety and Health Administration (OSHA). The Permissible Exposure Limit (PEL) is the maximum average concentration that an individual should not exceed exposure to over an 8-hour period. The Short Term Exposure Limit (STEL) is the maximum concentration an individual should be exposed to in any one 15-minute period. Typically, the highest risk will be for staff cleaning the room. In this case, the appropriate standard for risk management is the STEL.
- 4.1.4.6. Actively balancing the float solution as done in swimming pools and hot tubs is not possible.
 - a. The LSI calculation factors include pH, temperature, total alkalinity, calcium hardness, and total dissolved solids (TDS). Using the LENNTECH LSI calculator and ideal parameters of pH 7.5, 96°F, total alkalinity of 100 mg/L, calcium hardness of 200 mg/L and 300,000 mg/L of TDS the calculated LSI is -1.2. This is extremely corrosive to metals, cementitious surfaces and some plastics. With this LSI, attempts to achieve a near neutral water balance are not feasible nor reasonable. When selecting materials of construction for any component that continuously or intermittently contacts the float solution, it is imperative to consider corrosion resistance.
 - b. Actively maintaining the pH in a float tank is not necessary for the following reasons:
 - Unlike pools and spas that balance pH levels for disinfection efficacy, UV, Ozone, and Hydrogen Peroxide are not affected by the fluctuations in pH of float solution.
 - While pH levels below 6.8 and over 7.8 can be an irritant to the human eye, users in a float tank rarely get the solution in their eyes, and if they do, the saline content of the float solution is the significant irritant, not the pH.
 - There have been reports from a limited number of girls and women regarding vaginal irritation. It is unknown if this is related to pH or the salinity of the float solution.
 - Unlike pools and spas, which often have metallic equipment that is sensitive to corrosion, float tank equipment is mostly made of plastics and metals that are highly resistant to corrosion in order to handle the high salt content.
 - The FTA is unaware of any testing device that will accurately measure pH in the float solution.
 - The salinity of the float solution can cause inaccurate reading of pH. The titration tests and pH probes can provide the most accurate readings when instructions are followed closely.

EXCEPTION: If local code requires the use of chlorine, the pH should be maintained according to the local code.

- c. Balancing the alkalinity in a float tank is not necessary for the following reasons:
 - Without the need to actively balance the float solution, maintaining the appropriate alkalinity for pH stability becomes unnecessary.
 - Scaling is not an issue in a float tank. Magnesium has been shown to prevent calcium deposits.
 - We are unaware of any testing device that will accurately measure alkalinity in the float solution.
- d. Actively balancing the calcium hardness in a float tank is not necessary for the following reasons:
 - Calcium hardness is a critical parameter in maintaining the integrity of cementitious surfaces. Float tanks do not have any cementitious materials.
 - Most testing devices for calcium hardness measure for total hardness, which includes a measure of magnesium. The results are generally well beyond the scale of the testing device.
- e. ORP standards for float solutions have not been established. When hydrogen peroxide is the sole oxidant, the typical ORP should be approximately 300 mV at pH 7.0. If ozone or chlorine are used, the ORP value should be >650 mV at pH 7.0. ORP is subject to pH variations. The numbers listed here must be considered general guidelines and are not indications of float solution quality or sanitation.
- 4.1.5. Visual Examination includes checking for anything left behind in the solution such as debris, hair, oils, or soap; as well as checking for discoloration of the solutions.
- 4.1.6. Filtration notes:

Note: Detailed conversation on turnover can be found in the PHTA Pool & Spa Operator Handbook (PHTA, 2024).

- 4.1.6.1. For systems that recirculate, the figures of 95% and 98% filtration accomplished by 3 and 4 turnovers, respectively are based on the Gage and Bidwell Law of Dilution.
- 4.1.6.2. Although not commonly seen in North America, not all float tanks recirculate the solution directly into the float tank during filtration. Some float tanks have external vats into which they empty their solution between each float, accomplishing filtration of 100% of the solution in a single turnover.
- 4.1.6.3. Most float tanks use either cartridge or bag filters. Cartridges and bags have proven to provide reliable filter media. Additionally, they are disposable and permit quick turnarounds during service. The pore size of the filter cartridge or bag is an important factor in maintaining clarity of the float solution. Pore sizes can range from 1.0 to 20 uM. Generally the smaller the pore the better the clarity. But smaller pore sizes clog more frequently and will require more frequent replacement. Some jurisdictions may require NSF certification of the filter and/or media.

4.2. Room Maintenance

4.2.1. Cleaning in and around the tank should involve wiping down all surfaces and handholds with an appropriate cleaning agent. All sanitizing agents used shall be registered with the recognized national regulating authority.

- 4.2.1.1. For solid surfaces, kitchen, bathroom, and hospital disinfecting wipes are appropriate sanitizing treatments when used according to their label instructions.
- 4.2.1.2. Liquid sanitizing solutions shall be diluted appropriately and used according to their label instructions.
- 4.2.2. Some examples of these items in the room that should be cleaned are towels, robes, sandals, individual packets of petroleum jelly, water bottles for rinsing the eyes, and toiletries such as q-tips and lotion.
- 4.2.3. Users typically float with their ears just barely submerged and the rest of their face above the solution.

5. Contamination and Emergency Management Procedures

5.1. The Floatation Tank Association maintains an emergency procedures Fact Sheet in their resource documents. (FTA 2023)

Citations

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Other Resources

- 1. Review of floatation done by the National Collaborating Center for Environmental Health
- 2. Review of floatation done by Public Health Ontario
- 3. Public Health Ontario chlorine dilution calculator

Acknowledgements

This updated North American Float Tank Standard has been adjusted to match the language of relevant health departments and their codes, while keeping the steps clear to float tank operators. It is our goal to bridge the gap between those regulating and those maintaining float tanks, ultimately ensuring the safest and most enjoyable experience to guests of float centers.

Thank you to the 2024-2025 FTA Sanitations & Regulations committee for investing a significant amount of time and expertise in this newly updated document. We would like to extend a special thanks to Dr. Roy Vore and Jenn Huang for their time and expertise.

FTA wishes to acknowledge all the floaters who have participated in our grand experiment and given their feedback over the years to make floating a better experience for us all.

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