North American Float Tank Standard

Floatation Tank Association

Version 2
written February, 2017

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Introduction

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. 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. These Standards are supported by an appendix that explains the research and reasoning behind these recommendations, as well as some supporting documentation.

In jurisdictions that do not already have standards for float tanks, there is often an attempt to initially place them in the same category as pools or spas. Doing so ignores the unique nature of floating, leaving out inherent characteristics important to float tank safety and enforces others that make no sense for the small, saline environment. Equating pools and spas with floatation tanks may create unintended negative consequences to the health of the floater 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:

1) 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 operate with a single user at a time, with a filtration cycle between each user.
- 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.[1] 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 in a swimming pool.

- 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 clients.
- 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.

2) 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 ($MgSO_4$•$7H_20$).

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.[2]

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.

3) 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 (and each user). The minimum of three turnovers between each user set forth in this standard will allow 95% of the float tank solution to be filtered. Four turnovers will achieve about 98% filtration.

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 no reported cases of illness, infection, or outbreak. We estimate that in 2016 approximately 1,000,000 floats took place in commercial float centers across North America.

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.

The Standard

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 magnesium sulfate 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.

1. First time users will receive a clear and thorough orientation prior to floating, including health and safety instructions.

2. Users will take a cleansing shower before use to enter the float tank clean, and after use to remove the residual saline solution.

3. The inside of the float tank will be thoroughly evaluated for clarity and the presence of any impurities after each float session. The tank and solution will be cleaned as needed before each new float.

4. The room the float tank is in will be thoroughly evaluated and cleaned between uses.

5. Any items placed in the room intended for use must be made clean and sanitary for the next customer.

6. Single-use earplugs and a neck floatation device will be provided as an option for the user.

7. In float tanks with filtration systems that recirculate directly into the tank, the filtration process will complete, at minimum, three turnovers between each user. Four turnovers are encouraged. If no flow meter is present the operator must ensure they know the manufacturer's specified turnover rate.

8. Float tanks will utilize one of the following options as a sanitation and oxidation strategy:
    a. Ultraviolet light
    b. Ultraviolet light in conjunction with Hydrogen Peroxide
    c. Ultraviolet light in conjunction with Ozone
    d. Ozone

    [Note: The use of Chlorine or Bromine is not recommended for several reasons (see appendix)]

9. 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 at an appropriate water testing lab. The solution should be free of this organism. If present, measures should be taken to understand and mitigate the reasons for its presence. After corrective measures are taken, the solution should be

resampled. Two consecutive positive isolates for Pseudomonas should lead to closure of the tank until a satisfactory sample can be collected.

10. The float tank solution will be at all times maintained in accordance with ranges listed below. Each center is required to keep a daily log to record their measurements, and any chemicals added to adjust those measurements:
    a. Depth of solution should be within the parameters for proper surface level skimming.
    b. Specific Gravity: 1.23 - 1.3
    c. Temperature of Solution:
        i. 92-96°F / 33.3-35.6°C, or based on manufacturer's recommendation
    d. Hydrogen Peroxide (if used):
        i. Min-Max: 40 - 100 ppm
    e. Ozone (if used):
        i. Airborne ozone levels should be measured both inside and outside the tank and kept below 0.1 ppm (based on an 8 hour average), in accordance with OSHA standard 1910.1000.

11. Filter media will be cleaned / replaced based on manufacturer's recommendation.

12. If UV is used, UV bulbs will be cleaned / replaced based on manufacturer's recommendation.

13. For dealing with unexpected contaminations, the following protocol will be followed:
    a. In the case of a blood, formed (solid) fecal, or vomit incident within the basin, the operator is expected to undertake the following measures:
        i. Do not circulate the solution.
        ii. Remove all visible particles from the float solution and the basin walls.
        iii. Once thorough manual cleaning is complete, add a measured amount of sodium hypochlorite (household bleach) to the basin to achieve a 2.0ppm residual.
        iv. Maintain this 2ppm residual for a period of no less than 30 minutes.
        v. After a minimum of 30 minutes has gone by, the solution should be circulated according to the normal turnover rate.
        vi. At this point it should be safe for floating to resume.
    b. For any loose stool or suspected diarrheal contamination, it is not recommended that the float solution be chemically treated. Instead, the basin should be drained and cleaned in the following manner:
        i. Do not circulate the solution.
        ii. Remove all visible particles from the float solution and the basin walls.
        iii. Completely drain the float tank and filtration pack.
        iv. Thoroughly clean the empty basin and then sanitize with a 100ppm bleach solution.

v. Rinse and drain the basin to remove residual chemicals.
vi. Refill using fresh water and Epsom salt. A fresh filter should be placed into the system.

14. If the quality of the solution ever deteriorates, the entire solution should be drained and refilled.

Appendix

1. Some common items included in orientations and written waivers are:
    - Requiring a shower before and after the float.
    - 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.
    - Instructions on rinsing out the eyes if any float solution enters them.
    - Warning against entering with any large open wounds or rashes, and recommending applying a layer of petroleum jelly over any small wounds.
    - Screening for contagious skin diseases and respiratory diseases.
    - Screening for people with Epilepsy that is not under medical control.
    - Avoiding floating shortly after shaving or waxing.
    - Prohibiting entering the float tank under the influence of alcohol or drugs.
    - Informing people that they can use the float tank in whatever way is comfortable for them in terms of light, sound, door position, temperature, and time.

2. Those who float are significantly more likely to shower before and after a session than users of a pool or spa. This is because the shower is almost always in the room with the float tank, most often built to be directly in front of the entrance into the tank. 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. A *cleansing* shower is often emphasized, making sure to focus on the armpits and private parts.

3. *No comments.*

4. This typically involves wiping down all surfaces and handholds (including the shower area) with an appropriate cleaning agent.

5. Some examples of these items are towels, robes, sandals, individual packets of petroleum jelly, water bottles for rinsing the eyes, and toiletries such as q-tips and lotion.

6. User's typically float with their ears just barely submerged and the rest of their face above the solution.

7.
    - 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 that they empty their solution into between each float, accomplishing filtration of 100% of the solution in a single turnover.

- 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. Filter efficacy can have an impact on these numbers.

8.
    - Chlorine and Bromine are not recommended for use in floatation tanks for the following reasons:
        - Both through widespread industry experience and through this study done through NSF International, it has been found that most Chlorine and Bromine test kits are inaccurate in floatation tank solution, meaning that chemical levels cannot be effectively and responsibly monitored and managed.[3]
        - 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 floatation 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 long periods of time, 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 tank 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 peroxide acts synergistically with UV, creating hydroxyl radicals which further enhance the sanitation of the float solution.
    - While direct sanitation research into floatation 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 floatation clients is insignificant.[4] 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.[5] 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.

9. Common recreational water tests include those which look for heterotrophic (or standard) plate count and total coliform, however they are not ideal indicators of

floatation 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 saline water and because the fecal/oral route is not a reasonable pathway of exposure for a floatation client.

10.

- Actively balancing pH in a float tank is not necessary for the following reasons:
  - Unlike pools and spas that balance pH levels for the efficacy of the halogen disinfectant, the efficacy of UV, Ozone, or Hydrogen Peroxide is not affected by the fluctuations in pH a float tank will experience.
  - While pH levels outside of the 7.2 - 7.8 range 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 salt water is already a significant irritant.
  - Unlike pools and spas, which often have metallic equipment that is sensitive to corrosion, float tank equipment is mostly made of plastics and very corrosion resistant metals in order to handle the high salt content.
  - We are unaware of any testing device that will accurately measure pH in the float solution.
- Actively balancing the alkalinity in a float tank is not necessary for the following reasons:
  - Without the need to actively balance the pH, balancing 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.
- Actively balancing the calcium hardness in a float tank is not necessary for the following reasons:
  - As mentioned before, scaling is not an issue that is seen in the float tanks.
  - 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.

a. The depth is almost always between 10” - 12” / 25cm - 30cm.
b. There might not be a specific safety concern by going lower than this range, but it would be difficult to get proper floatation lower than 1.23. Above 1.29 you near the saturation point of the solution at the temperature most float tanks are held at, which could result in salt crystallizing in the equipment (around the impeller of the pump, for example) and the filtration system becoming inoperable.
c. While there is a point where too high of a temperature can become a safety concern, quantifying that point can be complicated. It relies on 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 we recommend following 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. From the perspective of user comfort, 96°F / 35.5°C is very often warmer than most float systems are normally operated.

   d. There should be no health concerns associated with hydrogen peroxide levels in reasonable excess of 100ppm. Common, off-the-shelf hydrogen peroxide (3%) is a 30,000ppm dilution and is used on open wounds and in people's mouths. The 100ppm maximum is written in because, above those levels, small oxygen bubbles will form in the float tank, which can be distracting to the float experience.
   e. We are unaware of any testing device that will accurately measure ORP in the float solution.

11. Most float tanks use either cartridge or bag filters.

12. In normal float tank operation, the UV light is turned on and off during the filtration phase between each user. This repetitive turning on and off of the system can lower the lamp life of the bulb in some UV units.

13. To determine how much chlorine is needed to achieve the residuals set forth in this protocol, you may wish to use an online chlorine dilution calculator such as the one offered by Public Health Ontario.[6]
    a. Similar protocol can be found in the CDC Fecal Incident Response Guideline.[7]
    b.
        - Chemical treatment is not recommended because of Cryptosporidium's resistance to chlorination.[8]
        - Fully draining the system could be an overly cautious approach. We have chosen to recommend this cautious protocol with an understanding that further research into contamination treatment of float solution could make this recommendation less stringent.

14. *No comments.*

Citations

1. Research Paper: Water Ingestion during swimming activities in a pool
    a. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.503.5685&rep=rep1&type=pdf
2. NSF International lab tests on Epsom salt solution
    a. https://s3-us-west-2.amazonaws.com/floattanksolutions/NSF-Salt-Only-Tests_2015.pdf
3. NSF International lab tests on chlorine test kits
    a. https://s3-us-west-2.amazonaws.com/floattanksolutions/Chlorine+Test+Kit+Accuracy+-+MgSO4+NSF+WQTD+Report.pdf
4. Research Paper: Effects of Floating in a Saturated Epsom Salt Solution on the Aerobic Microbial Flora of the Skin
    a. http://www.floattanksolutions.com/wp-content/uploads/2016/12/Effects-of-Floating-in-a-Saturated-Epsom-Salt-Solution-on-the-Aerobic-Microbial-Flora-of-the-Skin_Malowitz-Tortora-Lehmann_1988.pdf
5. Research Paper: Ultraviolet Light as a Sterilization Method in Floatation Tanks
    a. http://www.floattanksolutions.com/wp-content/uploads/2016/12/Ultraviolet-Light-as-a-Sterilization-Method-in-Floatation-Tanks_Wong-Suedfeld_1986.pdf
6. Public Health Ontario chlorine dilution calculator
    a. https://www.publichealthontario.ca/en/ServicesAndTools/Tools/Pages/Dilution-Calculator.aspx
7. CDC Fecal Incident Response Guideline
    a. http://www.cdc.gov/healthywater/swimming/pdf/fecal-incident-response-guidelines.pdf
8. Research Paper: Inactivation of Cryptosporidium parvum under chlorinated recreational water conditions
    a. https://iwaponline.com/jwh/article-pdf/6/4/513/397041/513.pdf

Other Resources

1. Review of floatation done by the National Collaborating Center for Environmental Health
    a. http://www.ncceh.ca/sites/default/files/Float_Tanks_Considerations_EPH_July_2016.pdf
2. Review of floatation done by Public Health Ontario
    a. http://www.publichealthontario.ca/en/eRepository/EB_Floatation_Tanks_Infection_Risk.pdf

Acknowledgements

Floatation Tank Association (aka FTA)

- Glenn Perry
- Lee Perry
- Shoshana Leibner
- Thomas Fine
- Richard Bonk

FTA Sanitation Committee

- Ashkahn Jahromi
- Shoshana Leibner
- Glenn Perry
- Graham Talley
- Kevin Johnson
- Carol Johnson
- Colin Stanwell-Smith

FTA wishes to acknowledge these members of the Float Collective

- Treeka Drake
- Matthew Smith
- Lance Foss

A special thank you to Jason MacDonald for reviewing this document.

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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