



TECHNICAL NOTE

71 – ICE BATHS

8 August 2024

Cold water immersion is popular for the rehabilitation of muscles and other soft tissue after exercise, with evidence cited for reducing inflammation and helping with mood and sleep. This can be achieved in open water, but increasingly there are lots of baths and other vessels being used to achieve the same result.

This technical note reviews the health aspects as well as water quality considerations. The emphasis here is on commercial operations; domestic users should follow these guidelines as closely as they can.

The health risks

There are multiple risks for those whose thermoregulatory systems operate sub-optimally, such as the elderly or immunosuppressed. The risks are related to sudden increased heart rate caused by changes to blood pressure. This can cause cardiac and respiratory stress and reduced neural conductivity; and in turn cardiac failure and respiratory shock.

So paralysis and drowning is a potential risk, but it may be less of an issue, depending on the volume of water in the vessel relative to the height of the bather when sitting down.

Construction and installation

There are two types of ice bath, with different target temperatures:

- chill tub 3 - 8°C
- cold tub less than 2°C

This note refers to both as ice baths, Both require proper design and electrical supply.

Design Commercial ice baths with multiple users must be designed to deal with the number of bathers and the potential contaminants. This should include:

- water removal from both the surface and the base
- a filtration system
- a primary disinfection system and ideally secondary disinfection (UV or ozone).

Commercial ice baths with no circulation, filtration and disinfectant must be emptied, disinfected and cleaned after every user.



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Bathing load The operational daily and hourly bathing load in filtered ice baths will be determined by the manufacturer. Heavy bathing can cause the temperature in the system to increase where the chiller/refrigeration unit is not able to maintain a lower temperature.

Inlets and outlets Pollution is introduced to the water from the users – tissues such as skin, excretions and dirt (including cosmetics and from the bath's surroundings). So there must be at least two points of water collection: surface and base outlets. Surface collection can be a skimmer or deck-level system.

The base outlet must not be flat or in line with the base of the bath, to avoid the potential for suction entrapment of users. The base outlet cover must be of anti-vortex design and protrude upward from the base of the system.

Electrical supply Consideration should be given to the position of ice baths in relation to their electrical supply, in line with the IET Wiring Regulations.

Zone 0 is the inside of the pool including flumes.

Zone 1 is the volume above the pool to 2.5m and to either side by 2.0m.

Zone 2 is the area extending 1.5m beyond the edge of zone 1.

There must be no socket outlets within zones 0 and 1. These should be industrial three round pin type to BS EN 60309, positioned at least 2.0m from the edge of zone 0, at least 0.3m above poolside, and protected by an RCD. In the current edition of the IET Wiring Regulations (BS 7671) sockets do not have to be to industrial standard (BS EN 60309) as long as they have non-conducted covers and meet the guidance as above. An example sometimes seen is the moisture-resistant IP56 type socket. However, just because these sockets are present doesn't mean that it is acceptable to use 240v equipment on poolside while the pool is in use.

Floor loading This is an additional consideration when siting the ice bath due to the weight when filled with water. The base will have to be firm, slip-resistant and level for equal water loading.

Hygiene

To avoid unnecessary hygiene issues, a pre-immersion routine is paramount. Users should first go to the toilet, wash their hands and then shower with soap. They should be told not to get their head in the water or ingest any of the water in the ice bath.

Before immersion, users should be well hydrated, not under the influence of drugs or alcohol and refrain from eating for an hour or so [*still to be verified*]. Bathers with open wounds should not use an ice bath.



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The low temperature will reduce the risk of colonisation of the pool by many microorganisms such as *Legionella pneumophila* and *Pseudomonas aeruginosa*. But in the absence of effective disinfection, they will probably survive quite well. And microorganisms such as *Staphylococcus aureus* that are relatively resistant to chlorine disinfection will survive better and become a greater risk, particularly of causing wound infections.

Bathers who have suffered from sickness and diarrhoea should not use ice baths until 48 hours after symptoms have ceased. If they have been diagnosed with cryptosporidiosis the exclusion period is 14 days.

Water testing

The water should be tested regularly, based on a risk assessment and taking account of the number of users, volume of water and the results from routine monitoring, just as with a hot tub. There will be differences in the frequency of testing, depending on whether the setting is domestic, or business/commercial.

All results of monitoring and testing should be maintained and recorded for at least five years.

Chemistry Testing should be done with a photometer or comparator that is checked and calibrated in line with the manufacturer's guidance. The water should be tested (disinfectant levels and pH values) before users get in, then every two hours. For a chlorine-based disinfectant the levels should be:

- free chlorine, 1.0mg-5.0mg/l
- pH value 7.0 - 7.6.

For a bromine-based disinfectant the levels should be:

- free bromine 4.0 - 6.0mg/l
- pH value 7.2 - 7.6.

It is not necessary to check water balance as the water is completely changed regularly.

Microbiology Commercial ice baths should be microbiologically tested monthly by a ISO 17025 UKAS-accredited laboratory. Testing should include:

- aerobic colony count (37°C)
- coliforms
- *E coli*
- *Pseudomonas aeruginosa*

Studies show that *E coli*, coliforms and other bacteria can be found in ice and if the ice is produced from contaminated water, or becomes contaminated, there may be a chance of infection.



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Ice baths that introduce air should also be tested quarterly for *Legionella*. This must be included in the *Legionella* risk assessment of the premises. Aerosol sampling does not remove the risk but fitting of an inline 0.2µm filter can.

Filtration

Filtration in commercial ice baths is essential: media (silica sand 16/30 or glass) and cartridge are common. The baths should be filtered continuously as overnight stagnation, requiring a high dosage of disinfectant when the circulation is restarted, is not advised.

Continuous filtration of the water ensures the turnover needed to maintain water quality and must be maintained over a 24-hour period. A turnover time of up to 30 minutes should be maintained.

Media filters should be backwashed daily, as per the pressure differential in line with the manufacturer's guidance, until the sight glass runs clear. A period of about an hour [still to be verified] with no bathing after backwashing is advised to ensure that the filter media ripens before use. Filter media will have to be changed in line with the manufacturer's guidance to ensure water quality. This can be accomplished by backwashing after bather entry has stopped for the day.

Filter cartridges should be changed daily. Used cartridges should be cleaned and disinfected prior to being reused or disposed of – all in line with the manufacturer's guidance.

Any secondary disinfectant systems, (UV or ozone) should be checked daily before bathing starts, to ensure that they are operational.

Faeces, vomit and blood release How such accidents are dealt with will depend on the rate of filtration. Medium-rate filtration is 10 - 25m/h, high-rate 25 - 50m/h. Operational details are in PWTAG Technical Note 2 *Faecal contamination* (<https://www.pwtag.org/faecal-contamination-february-2014/>).

Cleaning

Ice baths should be cleaned daily, certainly in commercial settings. Recommended is 100mg/l chlorinated water to disinfect and a product that removes body fat, such as sodium bicarbonate, to clean the scum line. Operators should check the manufacturer's guidance for suitable materials to clean the surface of the ice bath. This will vary depending on the material – wood, stainless steel etc.



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Subject to the risk assessment, changes of water in business settings should be done in accordance with the manufacturer's guidance, the plant and disinfection. It might be and weekly or after every change of guests, depending on the type of system. A more frequent change is required when the bath has no disinfection or plant.

Pool surrounds should be made of material that can be kept clean and free of debris.

Useful advice

Where these ice baths are to be used in business or commercial settings, then HSG 282 has useful advice originally directed to for warm water immersion in hot tubs. PWTAG's *Hot Tubs for Business* is also a very useful guide for looking after spa pool systems.