

FLOODING GUIDANCE FOR COMMERCIAL AQUATIC VENUES

Introduction

Maintaining the safety of swimming pools and aquatic features is an incredible balance of chemistry and physics. Flooding can create unique challenges to keep a commercial aquatic venue up-and-running.

The following guidance is intended for commercial aquatic venues to help prepare for the impact caused by flooding events. Residential pool owners should consult with a pool professional on guidance specific to residential pools.

What is Flooding?

The [National Weather Service](#) defines a flood as “an overflow of water onto normally dry land. The flooding of a normally dry area is caused by rising water in an existing waterway, such as a river, stream, or drainage ditch. Ponding of water at or near the point where rain fell. Flooding is a longer-term event than flash flooding: it may last days or weeks.” The National Weather Service goes on to describe a flash flood as flooding caused by excessive rainfall over generally less than six hours.

Flooding is not limited to rainfall. Storm surge, a levee failure, or a dam break can all cause flooding in a localized area. Smaller scale flooding from broken sewer pipes, water pipes, and irrigation lines can also cause significant damage.

A challenge for weather forecasters is that the conditions right for flooding can be identified, but the timing of a flood event may be unpredictable.

To learn more about flooding, visit [NOAA National Severe Storms Laboratory](#). While flooding may carry some level of unpredictability, the Qualified Operator and owner should be aware of the flood risk for the aquatic venue. The first step in identifying the risk of flooding is to consult [FEMA Flood Maps](#).

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Prior to Anticipated Flooding Impacts

In some instances, weather forecasting allows for some warning prior to anticipated flooding. Where flooding is expected to occur, the following steps are helpful to lessen possible damage.

Secure all Documentation and Manuals

When closing an aquatics venue, documentation is often not the first thought. Flood waters can cause severe damage to paperwork. Any records, aquatic facility manuals, equipment, and/or instructional materials should be secured. Strategies such as having cloud-based digital copies, moving to a high floor in a watertight container, or moving off-site to a secured location should be considered.

Do Not Drain Pools or Spas

The weight of the water in a swimming pool is vital to resisting the hydrostatic pressure imparted on swimming pools from below and keeping the swimming pool in place. These hydrostatic forces increase during flooding due to the increased rain. The aquatics venue can handle any rainwater intrusion so there is no need to partially drain your pools and spas to accommodate rain or flood waters.

Store and Secure all Chemicals

If possible, all chemicals should be secured at a site not impacted by floodwaters. This will help prevent any accidental activation due to water intrusion, as well as reduce the environmental impact of spills and cross contamination.

Store and Secure all Unanchored Deck Furniture and Safety Equipment

All unanchored items on decks, walkways, or patios should be stored securely either inside a building or secured and anchored to prevent the items from becoming loose during flood forces. When loose during flooding, this equipment can cause potential harm to others or to structures, as well as increase local flooding severity by blocking pathways for the flood waters to drain.

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Turn off Power and Gas to all Aquatic Venue Equipment

It is likely your equipment is already equipped with Ground Fault Circuit Interrupter (GFCI) protection. However, manually shutting off the power supply to your facility's equipment will provide an extra level of safety. Similarly, turning off any natural gas or propane connections will prevent accidental fires or explosions and provide an added layer of safety during the recovery process.

Remove and Store Pumps and Equipment unable to be Protected in Place or are Below Grade

If the equipment room is below grade and correctly outfitted with properly functioning valves, it is advisable to remove and store any materials, chemicals, pumps, automated chemical controllers, and other equipment to prevent loss or damage. While the equipment used at an aquatic venue is very robust, it is not designed to be submerged. The Qualified Operator is advised not to rely on any existing sump pumps to remove excess water. These sump pumps will fail in the event of power loss from related storms, or in the event the flooding exceeds their capacity.

Remember to Store ORP & pH probes

Probes for automated controllers should be stored per manufacturer's instructions. ORP and pH probe tips are sensitive to drying out. During prolonged periods where the sensor tips may become dry, probe accuracy can be severely impacted.

Important Note:

Always remember, in all types of flooding events, the protection of human life is the overriding priority. Qualified Operators, owners, and aquatics venue staff should ensure personal safety first.

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What To Do After Flood Waters Recede

Inspect the Aquatic Venue for Safety

Depending on the strength and severity of the flooding, the impacted area may see significant damage. Remember: Human safety and public health are the first priorities. Please keep the following in mind:

- Do not attempt to assess any physical damage until the flooding has receded and local authorities deem that travel to the impacted area is safe.
- Debris is a major concern with flooding. Flood waters can carry various amounts of harmful debris such as chemicals, bacteria, damaged building materials, and potentially harmful displaced wildlife. Steps should be taken to ensure physical safety.
- If the aquatic venue has suffered structural damage, the venue should not be accessed until an inspection has been performed by the Authorized Health Jurisdiction or a licensed engineer.
- The aquatic venue should not be accessed if there are down power lines. The aquatic venue staff should wait until the power utility has ensured the area is safe to access.
- In addition to concerns about structural damage, the growth of harmful mold should be considered, especially in structures with poor ventilation. Qualified Operators and owners should take steps to ensure physical safety when entering flood damaged buildings. This may include the use of qualified professionals to address any concerns regarding mold growth.
- The Qualified Operator and/or owner should ensure personal safety by utilizing appropriate Personal Protective Equipment (PPE) which may include appropriate personal protective equipment (PPE) for displaced wildlife and mold.

Remove All Debris from the Aquatic Venue and Aquatic Features

All flood debris must be removed from your aquatic features and the aquatic venue must be thoroughly cleaned to ensure proper operation and water sanitization post event. Leaf nets and rakes should be used to remove all limbs, leaves, construction debris, or any storm debris that can cause staining, injury, or make the water toxic. Facility staff familiar with the cleaning and operation of the

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aquatic features should immediately consult the Qualified Operator of record to establish a timeline for post flood clean up. Together they will establish what work can be done by the facility staff, what work needs to be completed by the Qualified Operator of record, or what work should be subcontracted out to a commercial pool service company, building contractor, or mold remediation specialist.

Conduct a Post Flood Inspection

Once it is safe to access the aquatics venue, the Qualified Operator should conduct a thorough inspection to check for any damage to water features and attractions. The Qualified Operator should utilize available safety checklists provided by their insurance provider or equipment manufacturer. It is also advisable to have a licensed electrician inspect below ground or below grade equipment rooms for damage to the electrical connections.

Draining of the Venue

If the aquatics venue has experienced flooding, it should be assumed any flood waters are contaminated with sewage and hazardous chemicals. This means any impacted bodies of water should be drained, the surfaces cleaned of contaminants, and refilled, prior to restarting the filtration and disinfection systems. This includes performing an assessment of piping, any impacted pumps, and filters for impacted mud.

Due to potential larger scale impacts on human health and safety, the Qualified Operator should contact the Authority Having Jurisdiction and the local water provider prior to draining and filling to ensure the treatment plant is operational and to comply with any existing water restrictions.

If draining of the aquatic venue is not possible, Qualified Operators are recommended to work with the Authority Having Jurisdiction, a water analysis lab and, if applicable, their pool service provider to develop a plan of action which mitigates the harmful effects of oils, pesticides, phosphates, and other contaminants that may have been carried into the aquatic venue.

Long Term Closures

If the aquatic venue experiences a long-term closure due to the impact of a flood, the Qualified Operator and/or owner of the aquatic venue should contact their Authority Having Jurisdiction and,

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if a separate entity, the local Health Department. Standing water in pools may become breeding grounds for disease spreading mosquitoes, as well as inadvertent habitats for dangerous reptiles. The local Department of Health or Department of Environmental Health may have additional guidance to prevent vector borne diseases.

Opening Your Facility

The aquatic venue should remain closed until:

- Power is back on
- All necessary repairs have been completed
- Water is properly balanced using the Saturation Index
- Appropriate sanitizer levels have been achieved
- The aquatic venue has been thoroughly cleaned
- All other parameters are in normal operating ranges
- The Authority Having Jurisdiction has approved the aquatic venue for reopening

After the previous criteria has been met, it is recommended that the aquatic venue filtration and disinfection equipment runs for a minimum of 24 hours to ensure the system is working, and the aquatic venue is properly prepared for opening.

If you have any questions or for additional guidance, contact CMAHC's Technical Director Dewey Case at Dewey.Case@CMAHC.org or email CMAHC@CMAHC.org.

About CMAHC: [The Council for the Model Aquatic Health Code](#) (CMAHC) promotes health and safety for public swimming facilities in the United States. As a member-driven organization, CMAHC exists exclusively to advocate, evolve, innovate, promote implementation, organize research in support of, and advise [the Centers for Disease Control and Prevention](#) (CDC) on needed updates to [the Model Aquatic Health Code](#) (MAHC). Owned by the CDC, the MAHC is the only all-inclusive national pool code that addresses current aquatic issues.