

Preventing Chlorine & Acid Mixing at the Pool: Unintended Releases of Chlorine Gas at Aquatic Facilities



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International Pool and Spa Expo Conference

Las Vegas, NV

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Douglas Sackett, Executive Director, CMAHC

OUTLINE

- Problem-what happens?
- How does it happen?
- How to prevent

Unintended Releases of Chlorine Gas

- **WHAT HAPPENS?**
 - Chlorine gas released when chlorine and acid are mixed
- **HOW DOES IT HAPPEN?**
 - Mechanical Failure
 - Human Factors

Unintended Releases of Chlorine Gas

- Impact

- Approximately 5,000 pool-chemical related injuries treated in emergency rooms each year



Unintended Releases of Chlorine Gas

- **Mechanical Failure**
 - Chlorine and acid pumps continue to feed when no flow in recirculation system
 - No effective electrical interlock
 - Show video
 - » American Chemistry Council-“Preventing Unintended Chemical Injection”
(<https://www.youtube.com/watch?v=4TjgvL8Ln18&t=1s>)

Unintended Releases of Chlorine Gas

- **PREVENTION**

- How does the Model Aquatic Health Code (MAHC) help?

- **Mechanical (Design criteria)**

- Interlock controls and no or low flow deactivation (MAHC Section 4.7.3.2.1.3)

- Electrical interlock with at least 2 of the following:

- Recirc. pump power monitor

- Flow meter/flow switch in return line

- Flow meter/flow switch at chemical controller

Unintended Releases of Chlorine Gas

- Mechanical (design criteria) continued
 - Electrical interlock system installed per manufacturer's instructions with no subsequent alterations allowed
 - Visual Alarm (or other indication)
 - Initiated to alert staff If chemical feeder is disabled through electrical interlock
 - » Bathers to be evacuated from pool

Unintended Releases of Chlorine Gas

- Mechanical (operational criteria)
 - Chemical feed system components to be interlocked
 - Chemical feeders cannot operate when recirc. system has no or low flow (MAHC Section 5.7.3.5.1.2)

 - Bathers to be evacuated from aquatic venue when:
 - Interlock is activated, or
 - Recirculation pump stops

Unintended Releases of Chlorine Gas

- **Mechanical (operational criteria)**
 - **Bather Re-entry not permitted until:**
 - **Cause of interlock activation and/or recirc. pump interruption determined and the recirc. pump and chemical feeders run a minimum of 5 minutes (MAHC Section 5.7.3.5.1.2.2)**
 - **Upon backwashing, the recirc. pump and chemical feeders must run a minimum of 5 minutes before allowing bathers to reenter pool (MAHC Section 5.7.2.2.4.1.1)**

Unintended Releases of Chlorine Gas

- Mechanical (operational criteria)
 - Challenge Testing
 - Monthly challenge testing of chemical feeder interlock system

Unintended Releases of Chlorine Gas

- **Human Factors**
 - **Erroneous mixing of chlorine and acid**
 - **Contributing factors**
 - **Lack/or inadequate training of staff**
 - **Lack/improper labeling of chemical containers/crocks**
 - **Improper storage/handling**

Unintended Releases of Chlorine Gas

- **PREVENTION**
 - How does the Model Aquatic Health Code (MAHC) help?
- **Training**
 - Qualified Operators required (MAHC Section 6.3.1)
 - Qualified operator qualifications, training and certification requirements in MAHC Section 6.1.1

Unintended Releases of Chlorine Gas

■ Training

- Staff training required prior to access of chemicals and annual review of procedures thereafter
 - Qualified operators
 - Responsible supervisors
 - Maintenance staff
 - Others involved in storage, use, or handling of chemicals

Unintended Releases of Chlorine Gas

- **Labeling**
 - All chemical feed system components to be dedicated to a single chemical and clearly labeled.
 - All chemical containers to be labeled per OSHA and/or EPA requirements
- **Handling**
 - Measuring devices
 - Dedicated and compatible with chemical
 - kept clean and dry
 - Never mix 2 or more chemicals together

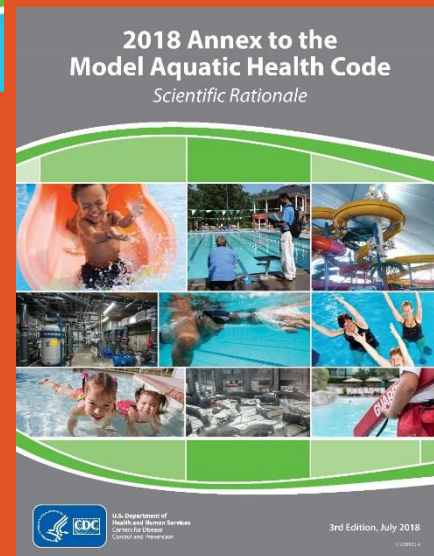
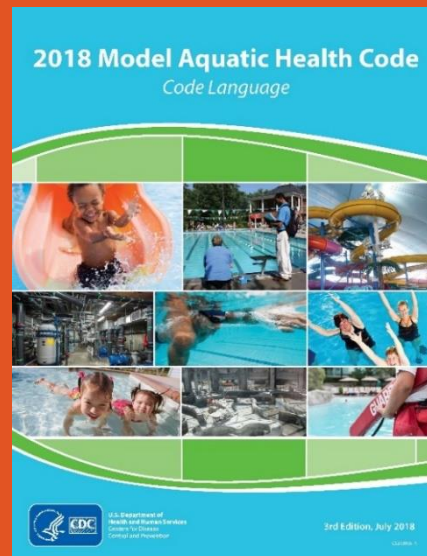
Unintended Releases of Chlorine Gas

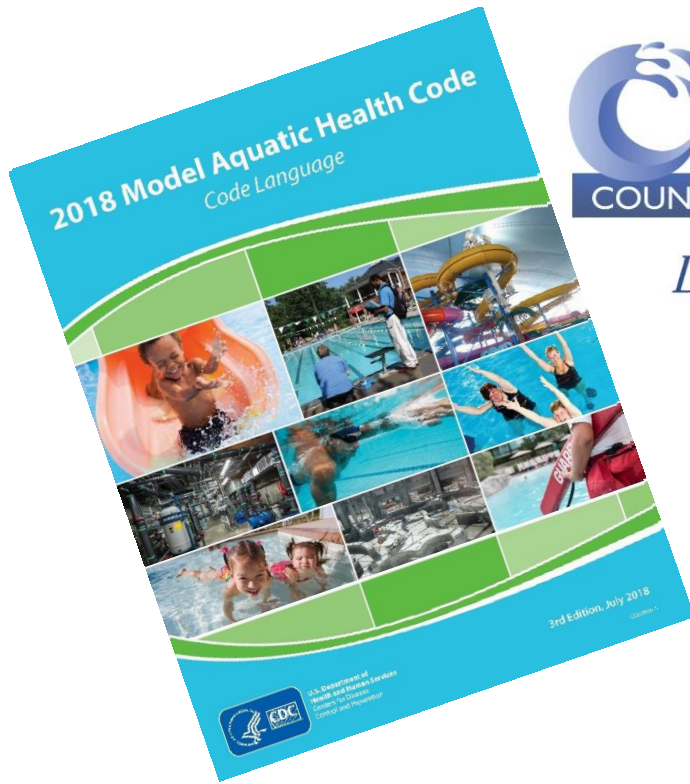
- **Storage**
 - Protection from getting wet
 - Stored so if packages leak, no mixing of incompatible materials



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2018 MAHC 3rd Edition Released

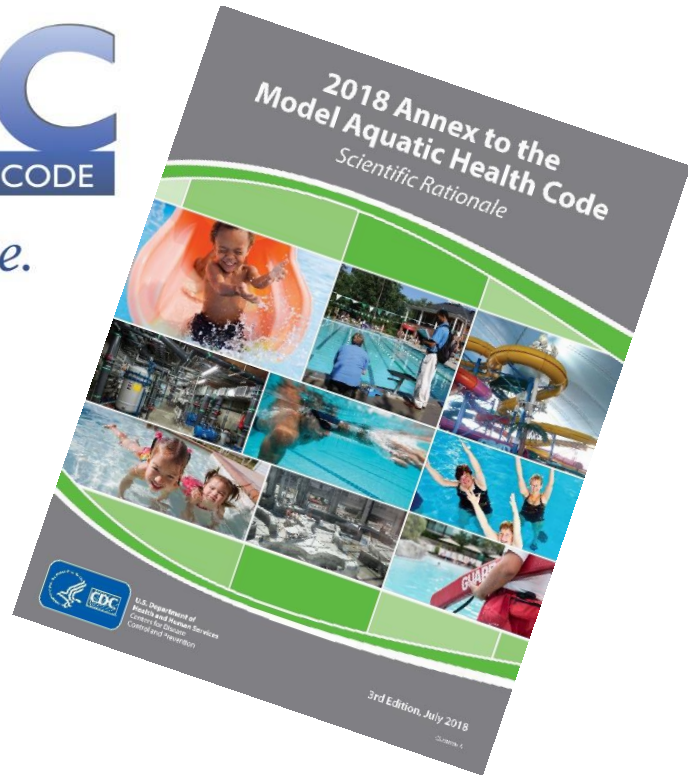




CMAHC

COUNCIL for the MODEL AQUATIC HEALTH CODE

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Driven by your expertise. The Council for the Model Aquatic Health Code (CMAHC)

VOTE ON THE CODE
BRING YOUR VOICE TO UPDATE THE MAHC
October, 2020

The 2018 MAHC is OUT!

NOTE: With the release of the 2018 MAHC, the CMAHC website has switched all 2017 Conference information.

Just about everyone or their family uses public swimming facilities. The Council for the Model Aquatic Health Code (CMAHC) promotes health and safety at the nation's public swimming pools and hot tubs through use of the science-based guidance found in the Centers for Disease Control and Prevention's (CDC's) Model Aquatic Health Code (MAHC), the only distribution model pool code. The CMAHC, a non-profit, non-partisan organization, is active in that no other organization could be formed by a publicly owned, privately governed representative approach to support or lead state or local CDC or model pool code to the MAHC. Join or support the CMAHC now and add your voice to the national aquatic health and safety discussion. If you are a returning member, get ready to renew your membership. Click here.

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Overview, vision, mission

Adoption and Support Status

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MAHC Update Process
How the CDC and MAHC update the MAHC

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Find 2020 Info On

Registration and Key Dates

- Announcement (08-01-2018): New MAHC Endorsements
- Announcement (07-18-2018): 2018 MAHC Released
- Announcement (08-15-2018): New CMAHC Board member announced
- Presentation (08-01-2018): 2017 Member Program Report
- Presentation (04-18-2018): CH Environmental Health
- Announcement (04-18-2018): CMAHC receives the WHO Safety Code Safety Award

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