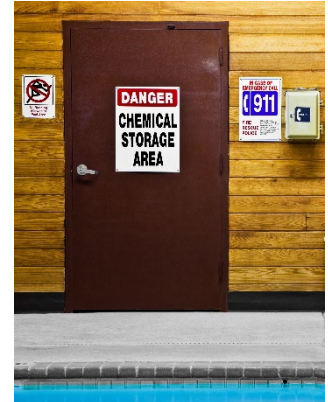


Preventing Toxic Chlorine Gas Exposures at Aquatic Venues

In June 2015, first responders and hazmat services were called to a municipal water park in Contra Costa County, CA, where 50 bathers in a swimming pool were exposed to chlorine gas. Two-thirds of the impacted bathers required medical care for respiratory, gastrointestinal, and eye irritation.

The Challenge

The correct mixture of sodium hypochlorite and muriatic acid keeps the water in swimming pools safe for bathers, but these chemicals are hazardous if improperly stored or released and can generate toxic chlorine gas when mixed at high concentrations. An electronic chemical controller combines and dispenses the chemicals into the pool with oversight from a human operator. Bathes and pool employees can be exposed to chlorine gas if there is an error by the operator, equipment, or both. In 2014, after a seven-year effort by public health officials, aquatics sector experts, and researchers, the CDC published the first edition of the Model Aquatic Health Code (MAHC), a consensus document of best practices and regulatory language for recreational swimming pool safety. Of note, swimming pool regulation is managed at the state and local level, and officials are not required to adopt the MAHC guidelines.



The Response

The incident in Contra Costa County prompted a response at the local and state levels. Local officials found that a malfunction in the chemical controller allowed sodium hypochlorite and muriatic acid to be dispensed and build up in the pool's recirculation system while the main pump was off, generating a chlorine gas bubble. A human operator incorrectly performed a manual override of the chemical controller's alarm and turned on the main pump, which caused the chlorine gas to be released onto the bathers in the pool. State investigators reviewed records from 2008 through 2015 and found eight similar incidents caused by equipment failure, human error, or both that resulted in exposures to bathers and swimming pool employees.

The Impact

The investigational team in CA submitted change requests to the Council for the MAHC (CMAHC) to update best practices on the regular testing of chemical controllers, installation of a mechanism to lock chemical release if a malfunction is detected, and evacuation of bathers during inquiry into equipment failure. The CMAHC adopted these changes into the third edition of the MAHC, released in 2018. The CA team has disseminated the findings of the investigation and best practices through a Morbidity and Mortality Weekly Report (MMWR) publication, numerous presentations to environmental and public health stakeholders at national and state venues, and a mass mailing of a [factsheet](#) and [booklet](#) to recreational pool operators on the new MAHC guidelines for preventing hazardous chemical releases, which will improve employee and bather safety.

For more information, visit:

[CDPH Occupational Health Branch Pool Safety](#), [MMWR article](#), [Model Aquatic Health Code](#)