

Guidelines on Use of Chlorine-containing Chemical for Disinfection of Swimming Pools

Incident of chlorine gas release

Recently, there was an incident involving chlorine gas release from the pump room at a local swimming pool. Staff and patrons within the vicinity had to be evacuated and some were sent to hospitals for treatment of nausea and irritation of the nose and throat. Investigations revealed that the release of chlorine gas was a result of a worker accidentally mixing two incompatible chemicals – sodium hypochlorite and hydrochloric acid in the dosing tanks. This circular is issued to you to take measures to ensure that a similar incident does not occur at your premises.

Storage and handling of chemicals

2. Chlorine-containing chemicals are commonly used in swimming pools as part of the routine water treatment. While such chemicals help to disinfect the water, care must be taken to ensure that they are used in a safe manner as improper storage and handling of these chemicals may result in spills and release of chlorine gas. (Chlorine gas can irritate our eyes and lungs. Inhalation of chlorine in higher concentrations may result in choking sensations, vomiting, chest pain and difficulty in breathing.)

Safety and security measures

3. The National Environment Agency (NEA), Ministry of Manpower (MOM), Singapore Civil Defence Force (SCDF) and Singapore Police Force (SPF) would like to advise swimming pool operators and owners, who use chlorine-containing chemicals (such as sodium hypochlorite) for disinfection, and acids (such as hydrochloric acid) for pH adjustment of the pool water, to take the following measures.

Safety measures

- a. Inlet couplers used for loading sodium hypochlorite and hydrochloric acid should be of different sizes or shapes and properly labeled.
- b. All pipings should be correctly labeled.
- c. Chlorine-containing chemicals (sodium/calcium hypochlorite, sodium di/trichloroisocyanurates, sodium chlorate, sodium chlorite or others) are incompatible with acids and shall be stored separately with adequate segregation and measures to prevent accidental mixing. Bund walls or kerbs should be erected for liquid chemicals to contain any spill or leak.
- d. The inventory of swimming pool water treatment chemicals should be kept to a minimum.

- e. All chemical containers should be labeled to indicate the identity of the chemicals, the hazards involved and the precautions to be taken.
- f. Only trained workers should be allowed to handle chemicals. They must be educated about the hazards involved and the precautions to be taken. Such instructions on safe handling of the chemicals can be found in the Material Safety Data Sheets (MSDS) of the respective chemical - provided by the manufacturer or the supplier of the chemical.
- g. Chemical storage / pump rooms should be well ventilated. Flooding and seepage of rainwater in these rooms should be prevented, since water may come in contact with the chemicals and trigger reactions among the chemicals.
- h. Loading of swimming pool water treatment chemicals and preparation of dosing chemicals should as far as possible be carried out during non-peak hours.

Security measures

- i. Blind flange or caps secured with a padlock or other secured devices should be installed at the inlet of the chemical loading lines. The keys should be kept by authorized persons.
 - j. Only authorized staff is allowed to access the chemical storage / pump room.
 - k. The doors to the chemical storage / pump room should have a double locking system. If the door has only one locking device, an additional latch-padlock device is to be fitted onto the door.
 - l. A proper key management system to the chemical storage / pump room should be established to ensure that the movements of keys are properly recorded and accounted for. E.g., procedures on key issuance, reporting loss of keys, keys register book etc.
 - m. Any chemical refilling activity must be supervised by the facility management staff.
 - n. Swimming pool owners / operators are advised to install a CCTV camera to monitor access into the chemical storage / pump room, for deterrence and detection of suspicious activities. The images captured by the CCTV camera should be recorded so that it can be used for investigations.
4. For more information on chemical safety, please refer to the following websites:

- a. <http://www.chlorineinstitute.org/files/FileDownloads/Warning-SodiumHypochloriteCanReleaseChlorineGas.pdf>
 - b. <http://www.chlorineinstitute.org/files/FileDownloads/SodiumHypoIncompatibility Chart-English.pdf>
 - c. [http://yosemite.epa.gov/oswer/ceppoweb.nsf/vwResourcesByFilename/spalert.pdf/\\$File/spalert.pdf](http://yosemite.epa.gov/oswer/ceppoweb.nsf/vwResourcesByFilename/spalert.pdf/$File/spalert.pdf)
5. Should you need further information, please contact:
- NEA at 1800-2255632 for disinfection levels of chlorine in the swimming pool water
 - MOM at 63171118 for safety and health of workers.
 - SCDF at 68483320 for emergency preparedness.
 - The nearest Neighbourhood Police Post for advice on security matters.

This circular is jointly issued by NEA, MOM, SCDF and SPF.

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