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

Incidents of chlorine gas release

We have investigated a number of incidents involving release of chlorine gas from swimming pool facilities due to accidental mixing of incompatible chemicals such as sodium hypochlorite and hydrochloric acid. During these incidents, persons at work and patrons within the vicinity had to be evacuated whilst those who were exposed to chlorine, were sent to hospital for treatment. This circular serves to provide advice and guidance to swimming pool operators and owners on measures to prevent a similar incident on their 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 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 pool water, to take the following measures where relevant.

Safety measures

(1) Inlet couplers used for loading sodium hypochlorite and hydrochloric acid should be of different sizes or shapes and properly labelled.

(2) All piping should be correctly labelled.

(3) Chlorine-containing chemicals (sodium/calcium hypochlorite, sodium dichloroisocyanurates, sodium trichloroisocyanurates, sodium chlorate, sodium chlorite or others) are incompatible with acids and should 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.

(4) The inventory of swimming pool water treatment chemicals should be kept to a minimum.

(5) All chemical containers should be properly labelled to indicate the identity of the chemicals, the hazards involved and the precautions to be taken.

(6) Only trained workers should be allowed to handle chemicals\textsuperscript{1}. They must be educated on the hazards involved and the precautions to be taken. Such instructions on safe handling of the chemicals can be found in the Safety Data Sheets (SDS) of the respective chemicals – provided by the manufacturers or the suppliers of the chemicals. Copies of the SDS must be provided and made readily accessible to persons at work areas where the chemicals are used or handled.

(7) 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. Hazard information on the chemicals used and the emergency contact numbers should be duly posted at a conspicuous area outside the chemical storage / pump room. An example of the information to be displayed is shown below:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Hazards</th>
<th>Emergency Contact Numbers</th>
</tr>
</thead>
</table>
| Sodium Hypochlorite/ Calcium Hypochlorite | • Contact with acids liberates toxic gas - DO NOT MIX WITH ACIDS  
• May be corrosive to metal  
• Causes severe skin burns and eye damage | In times of emergency, please contact XXX at Tel: XXXXXXXX |
| Hydrochloric Acid                     | • Fatal if inhaled  
• Toxic if swallowed  
• Toxic in contact with skin  
• Causes severe skin burns and eye damage |                                                 |
(8) Loading of swimming pool water treatment chemicals and preparation of dosing chemicals should as far as possible be carried out during non-peak hours.

(9) Safe work procedures should be established and documented to facilitate swimming pool operations in a safe manner. The procedures must include the measures to be taken to safeguard persons in the event of an emergency as well as information on the contact numbers of the relevant persons in charge and the responding authorities.

**Security measures**

(10) 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 authorised persons.

(11) Only authorised persons have access to the chemical storage / pump room.

(12) 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.

(13) A proper key management system to the chemical storage / pump room should be established to ensure that the movements of the keys are properly recorded and accounted for, such as procedures on key issuance, reporting loss of keys, keys register book etc.

(14) Any chemical refilling activity must be supervised by the facility management staff.

(15) 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 this website:

http://www.chlorineinstitute.org/files/FileDownloads/SodiumHypoIncompatibilityChart-English%20202090324%20CSIT%20FINAL.pdf
Duties and responsibilities of swimming pool operators and employers

5. Swimming pool operators (workplace occupier) must take measures to ensure that the workplace, machinery, equipment, plant, article or substance kept on the workplace are safe and without risks to health to every person within the premises. Employers must take measures to ensure the safety and health of his employees at work as well as the safety and health of persons who may be affected by any work carried on by him in the workplace. These are mandatory under the Workplace Safety and Health (WSH) Act which will cover all workplaces from September 2011.

6. Employers must conduct a risk assessment in relation to the safety and health hazards associated with any routine and non-routine work carried on at the workplace, identify the hazards, determine the risk involved and take measures to eliminate or minimise the risk. This is required under the WSH (Risk Management) Regulations.

7. Workplace occupiers and employers are required to report accidents, dangerous occurrences and occupational diseases that occur in the workplace. This is mandatory under the WSH (Incident Reporting) Regulations. For all cases, notify the Commissioner for WSH via iReport at:


8. Should you need further information, please contact:

- NEA at **1800 CALL NEA (1800 2255 632)** for disinfection levels of chlorine in the swimming pool water and for notification of incidents involving the release of chlorine gas.
- MOM at **6317 1118** for safety and health of workers.
- SCDF at **6848 3321** for assistance on emergency response plan.
- 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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