

Workplace Fatal Injuries due to Environmental Factors in 2H2023

The WSH Council reminds all companies to provide a safe work environment for employees and other persons at the workplace.

The following two incidents serve as a reminder that a safe working environment does not happen by chance but can be achieved through risk assessments and the implementation of risk controls.

Worker collapsed in a gas-filled confined space

On 19 July 2023, a worker climbed down a 3.8m deep chamber (confined space) previously filled with carbon dioxide gas to retrieve an item. However, he collapsed when trying to climb back up. The collapsed worker was rescued and sent to the hospital, where he passed away.

The chamber was neither ventilated nor gas-tested before entry. There was no permit issued for entry to the confined space.

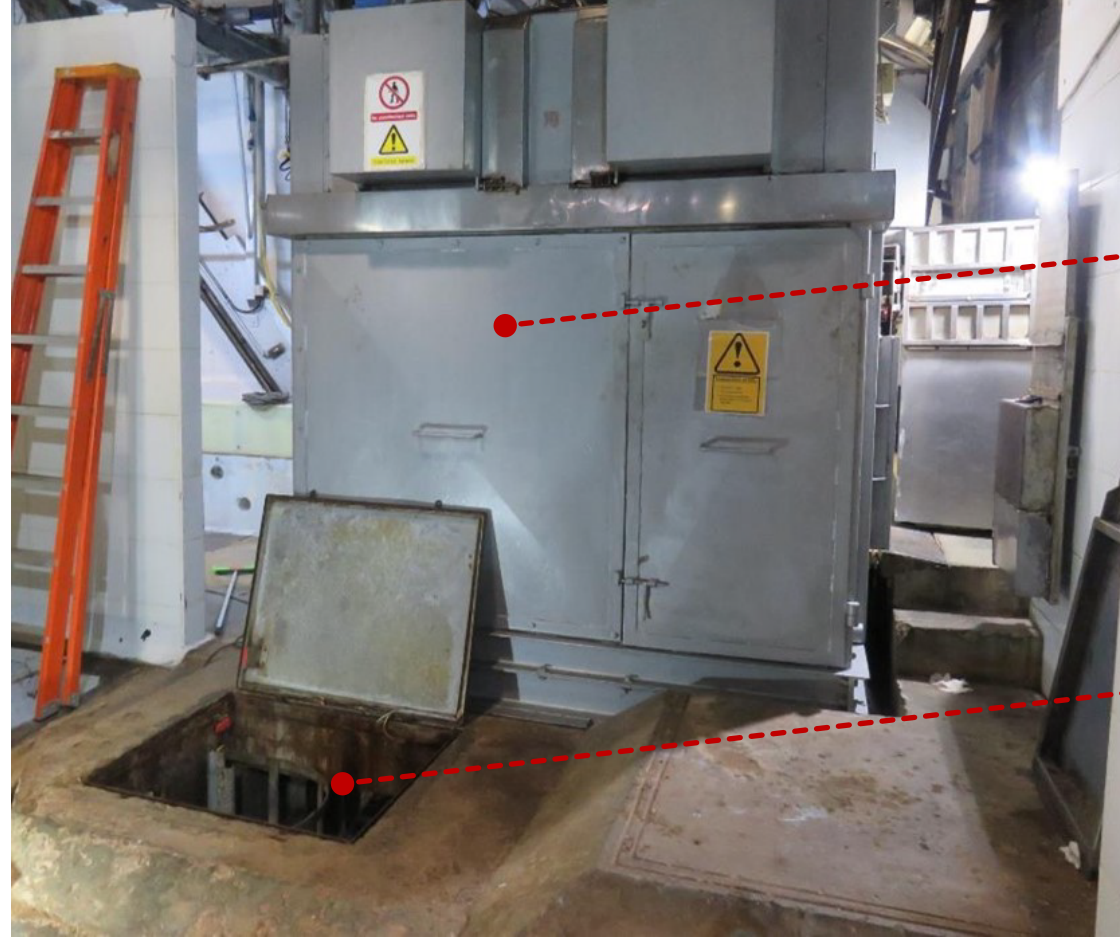


Figure 1: Scene of the accident.

Worker struck by lightning

On 29 July 2023, a worker was walking to his designated work area at an open site. After loud thunder was heard, the worker was struck by lightning and fell to the ground unconscious and not breathing. The worker was quickly moved to a lightning shelter where cardiopulmonary resuscitation was performed. The worker was later sent to the hospital where he passed away.



Figure 2: Scene of the accident.

What companies should do

Companies should consider the following risk control measures to prevent similar accidents:

Working in a confined space

Confined spaces can be hazardous work environments. Companies are advised to review their work processes to ensure the safety of every worker required to enter a confined space.

- **Confined space identification:** Conduct a site walkabout to identify the locations of all confined spaces at your workplace. Post a notice and/or warning sign at the entrance of each confined space to warn persons of the presence of a confined space, possible hazards, and that entry is not allowed unless an entry permit has been issued.
- **Confined space entry procedure:** Establish and implement safe work procedures for confined-space entry in compliance with the WSH (Confined Spaces) Regulations 2009. The procedure must cover risk controls to ensure safe entry and work inside a confined space as well as rescue operations. Access to confined spaces should be restricted (e.g. by locking all manhole entrances) until work needs to be done.
- **Confined space entry permit:** Implement a permit-to-work system for confined-space entry. Entry permits may be issued only when risk controls (e.g. lockout of material inflow and energy sources, purging and mechanical ventilation) are in place, checked to be effective and the atmosphere rigorously gas-tested by a confined space safety assessor to be safe for entry.
- **Competent workers:** For confined-space work, verify and deploy only workers who have completed the WSQ Perform Work in Confined Space Operation course.
- **Personal Protective Equipment (PPE):** Provide workers with PPE necessary for the task and specific confined-space work environment (e.g. safety helmet, ear plugs, safety goggles, respirator, safety gloves, flame retardant coveralls, safety boots).
- **Continued atmosphere monitoring:** Conduct periodic gas-test while the confined-space works are in progress. Provide at least one worker entering the confined space with a portable gas detector. Should a hazardous atmosphere be detected (e.g. lack of oxygen), immediately vacate all persons from the confined space and bar entry until a new entry permit has been issued.
- **Emergency Response Plan (ERP):** Proceed with entry to a confined space only if an ERP and rescue equipment (e.g. rescue tripod and winch) are in place. Onsite rescue personnel must be trained in rescue operations and first-aid, and provided with PPE for rescue (e.g. breathing apparatus, safety harness and ropes) and suitable reviving apparatus.

Working outdoors

Lightning can strike with little or no warning and severely injure or kill workers stationed outdoors especially in open spaces. Companies are advised to review their outdoor work protocols and put in place measures to protect workers from lightning risks.

- **Provide lightning-protected shelters (LPS):** Have onsite shelters equipped with lightning-protective fixtures. Instruct workers to move to the nearest building or LPS once they hear thunder or see lightning.
- **Monitor weather conditions:** Supervisors should check the daily weather reports before the start of each work shift and keep track of the weather condition regularly, e.g. before resuming work after a meal break, when working outdoors. Lightning activity can be tracked online via the [Meteorological Service Singapore's Lightning Information Service](#) or subscribing to the Heavy Rain and Lightning alerts via the National Environment Agency's myENV mobile app.
- **Use portable lightning detectors:** In addition to monitoring the weather conditions or lightning alerts, employers can consider equipping their supervisors with portable lightning detectors. These detectors provide early warning (through a warning light and/or audible alarm) of lightning activity in the vicinity.
- **Emergency action plan (EAP):** Establish an EAP for lightning safety at outdoor worksites. This should include the setup of sufficient LPS close to work areas, how workers will be informed of the lightning risk, action(s) to be taken upon hearing thunder or seeing lightning, and target response time to reach the nearest shelter. Ensure first-aiders are available during working hours and equip each worksite with sufficient first-aid boxes and at least one Automated External Defibrillator (AED). Companies are advised to clearly specify the criteria for suspending outdoor work activities and when work may resume.
- **Stop outdoor work during flash-bang weather condition:** Once lightning is seen ("flash") or thunder is heard ("bang"), follow the 30/30 lightning rule to consider stopping all outdoor work, even if it is not raining. Advise workers to stay away from tall objects such as isolated trees and lamp posts.

30/30 Lightning Rule

This flash-to-bang method can be used to estimate how far away the lightning is by counting the seconds between the lightning's flash and the thunder's bang. If the flash-to-bang is 30 seconds or less (i.e. the lightning is 9km or less away), it is recommended that persons located outdoors seek shelter inside an LPS. Activities should resume 30 minutes after the last thunder is heard.

The 30/30 lightning rule is dependent on flash-bang observations. Lightning risk may still be present even if there is no flash-bang pairing or when it is not raining.

- **Brief workers on lightning hazards:** Train workers on the risk of being struck by lightning when working outdoors and the risk controls/precautions in place. Encourage workers to report to their supervisors once they detect lightning activity or see signs of an approaching storm (e.g. dark clouds).
- **Hazard communication:** Set up a real-time communication system for supervisors to notify workers of possible lightning activity, the recommended action (e.g. stop work and move to a lightning shelter), and when outdoor work may resume.

For more information, refer to the WSH (Confined Spaces) Regulations 2009, WSH (First-Aid) Regulations, SS 568: 2011 Code of Practice for Confined Spaces, SS 555: 2018 Protection Against Lightning, the WSH Council's [Technical Advisory on Working Safely in Confined Spaces](#), [6 Basic WSH Rules for Confined Space Entry](#), and the US Occupational Safety and Health Administration's [Factsheet on Lightning Safety When Working Outdoors](#).

Under the WSH Act, first-time corporate offenders may be sentenced to the maximum fine of \$500,000 whilst individuals can either be sentenced to the maximum fine of \$200,000 and/or an imprisonment not exceeding 2 years. Read more on the [WSH Act penalties](#).

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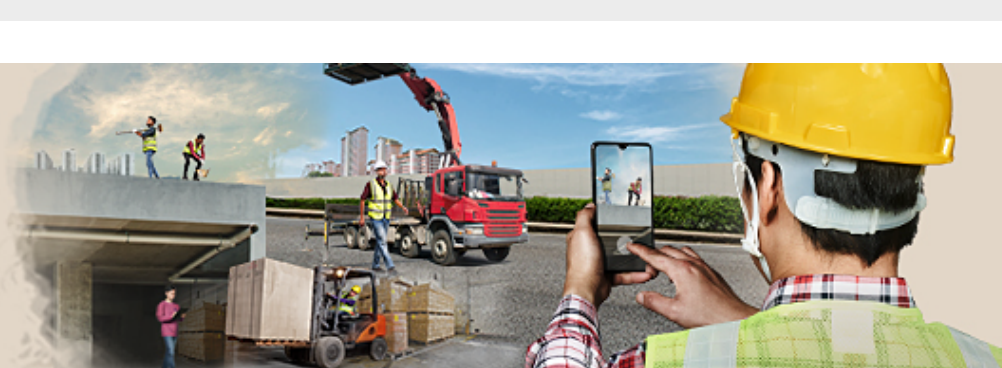


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