WSHAlert

22 February 2021, Ref: 2021092

Accident Advisory: Worker found with upper body in pipe

On 24 November 2020, a worker was tasked to carry out arc welding on a pipe. To facilitate welding works, an inert gas was earlier introduced into the pipe. The worker was subsequently found unconscious with his upper body inside the opening of an adjoining pipe. The worker was conveyed to the hospital where he was pronounced dead.

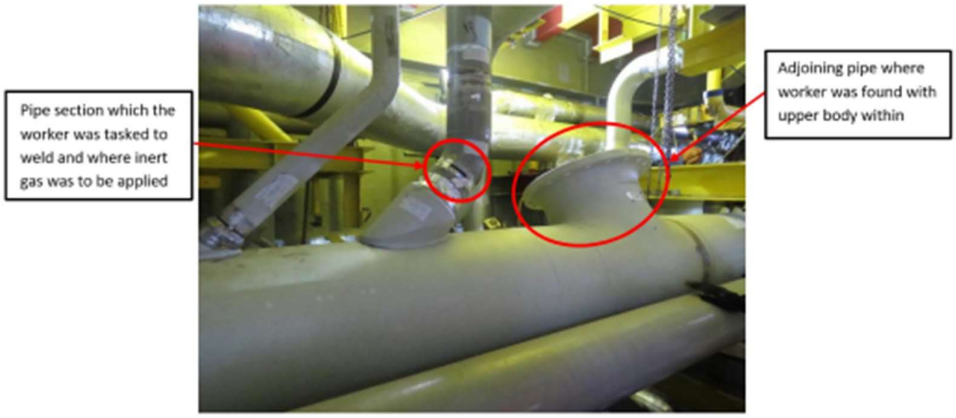

Figure 1: Overview of the accident scene.

Recommendations

Stakeholders such as occupiers, employers and principals in control of similar workplaces and work activities are advised to consider the following risk control measures to prevent similar accidents:

Safe use of inert gas for welding works

- The use of inert gases, particularly in confined spaces (likely the adjoining pipe in this case), presents an asphyxiation hazard as inert gases can dilute or displace oxygen from air. When carrying out work activities which require handling of inert gases, Risk Assessment (RA) must identify the risk of asphyxiation and the necessary controls that are to be in place prior to starting work;
- For gas-shielded welding work, the containment of inert gas (e.g. argon) to the weld area serves to enhance the weld quality. This technique of inert gas containment is commonly referred to as purge damming. One way for purge damming to be carried out safely is to make use of commercially available inflatable purge dams or bladders. These dams or bladders are designed with pull-cords that can help reduce or eliminate the need for workers to enter a pipe section;
- Establish and implement safe work procedures (SWPs) for the selected method of purge damming and ensure that the SWPs are communicated to and understood by all relevant workers; and
- When inert gases are used, equip workers with a portable gas detector to detect

the lack of oxygen and/or presence of toxics/flammables depending on the work environment.

Worker training and communication

- There are different types of welding (e.g. gas metal arc welding, gas tungsten arc welding) and each type may require a different work method. Workers must be trained for the specific type of welding they are tasked to perform;
- Deploy only properly trained and qualified welders to carry out specialised welding works requiring the application of inert gases. Such welders must be aware of the hazards associated with inert gas handling and the risk controls to be taken; and
- Instruct workers to never insert their head into a confined space so long as the atmosphere within is uncertain.

Safe entry into confined space

- All confined spaces in a workplace must be clearly identified and labelled on-site;
- According to the WSH (Confined Spaces) Regulations, a confined space can be any pipe in which the supply of air is inadequate, or is likely to be reduced to be inadequate, for sustaining life;
- The WSH (Confined Spaces) Regulations defines "entry" as ingress by a person into a confined space which occurs when the person's head passes through an opening into the confined space;
- Avoid entry into confined spaces and explore alternative safer methods for carrying out work wherever possible. Where entry into a confined space cannot be avoided, the requirements stated in the WSH (Confined Spaces) Regulations must be adhered to;
- Prior to confined space entry, carry out purging (to rid the atmosphere of hazardous contaminants) and ventilation (to render the environment safe for work). The atmosphere of the confined space must also be tested using suitable and calibrated instrument(s) for the level of oxygen content, level of flammable gas or vapour and concentration of toxic gas or vapour, where applicable; and
- Entry into or work in a confined space may be allowed only if the purpose of entry and the atmospheric test results have been evaluated, and a confined space entry permit issued by the occupier. Refer to the WSH (Confined Spaces) Regulations for the special conditions under which the confined space entry permit requirement does not apply.

Work supervision and monitoring

- Provide on-site supervision to ensure that all SWPs with regards to the use of inert gases are strictly adhered to; and
- The whereabouts of workers should be monitored, especially those who have to work alone. Tracking methods may include signing in at key work locations or checkpoints, regular check-in via radio communications, monitoring via Closed-Circuit Television, use of personal wearable devices and use of Global Positioning System (GPS) to indicate worker location. Monitoring will allow employers to respond quickly should an emergency arise.

Emergency response plan

- Establish an emergency response plan for rescuing persons from the work area/ confined space in the event of an emergency;
- Ensure an adequate supply of rescue equipment such as breathing apparatus, safety harness, ropes and reviving apparatus; and
- Ensure that appointed rescue personnel had received adequate training which can include first aid procedures and use of rescue equipment.

Risk Assessment

Conduct a thorough Risk Assessment (RA) for all work activities to manage any foreseeable risk that may arise when workers are required to work with inert gases. The RA should cover but not limited to the following areas:

- Presence of asphyxiation hazard;
- Identification of and control of entry into confined spaces;
- Adequacy of on-site supervision;
- Worker deployed to work alone (lone worker); and
- Emergency response/rescue plan.

Further Information

1. Workplace Safety and Health Act
2. Workplace Safety and Health (Risk Management) Regulations
3. Workplace Safety and Health (General Provisions) Regulations
4. Workplace Safety and Health (Shipbuilding and Ship-Repairing) Regulations 2008
5. Workplace Safety and Health (Confined Spaces) Regulations
6. Code of Practice on Workplace Safety and Health Risk Management
7. SS 510: 2017 Code of Practice for Safety in Welding, Cutting and Other Operations involving the Use of Heat
8. SS 568: 2011 Code of Practice for Confined Spaces
9. WSH Council's Technical Advisory on Working Safely in Confined Spaces
10. WSH Council's Workplace Safety and Health Manual for Marine Industries
11. UK HSE 's Information sheet: Asphyxiation Hazards in Welding and Allied Processes
12. UK HSE's Information sheet: The Risks posed by Exposure to Inerting Gases in the Open Air
13. OSHA's Factsheet on Controlling Hazardous Fume and Gases during Welding
14. International Maritime Organisation's (IMO's) Revised Recommendations for Entering Enclosed Spaces Aboard Ships

Information on the accident is based on preliminary investigations by the Ministry of Manpower as at 21 Dec 2020. This may be subject to change as investigations are still on-going. Please note that the recommendations provided here are not exhaustive and they are meant to enhance workplace safety and health so that a recurrence may be prevented. The information and recommendations provided are not to be construed as implying any liability on any party nor should it be taken to encapsulate all the responsibilities and obligations under the law.

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