British Marine Federation

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Health and Safety Specialised Topic Guide S6

Working in Confined Spaces

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Preface

The purpose of this guide is to provide a brief introduction, overview and summary of one of the principal health and safety topics which has implications for many of the operations carried out by BMF members. It identifies some particular aspects which need to be taken into account and provides references and links for further information you may require. However a brief guide cannot be definitive or comprehensive, or include the detailed information you might need. Members need to ensure that their own safety management systems adequately address the risks in their own business and are consistent with legal requirements.

These Specialised Topic Guides assume that the reader is familiar with the general principles of managing health and safety as discussed in BMF's 'Guide to Members' and with the associated sector guidance.

Contents

1 Introduction

A ‘confined space’ is any space where there is a risk of death or serious injury from hazardous substances or by inhalation of an oxygen depleted atmosphere. This can include:

- boat hulls
- dry docks
- storage tanks
- silos
- drains
- ductwork
- poorly ventilated rooms

Residues left in tanks or other vessels can give off gas, fumes or vapours. Exhaust fumes given off by portable generators or other fossil-fuelled tools or appliances can accumulate in enclosed areas which must then be treated as ‘confined spaces’. Further examples of confined spaces issues in the marine industry are discussed in the appendix.

The history of tragic accidents involving confined spaces has led to the introduction of specific health and safety legislation[1].

2 Nature of the Hazards

Over the years there have been a number of tragic accidents involving confined spaces. Often these involve a lack of appreciation of the circumstances which lead to the creation of a confined space and the dangers that might be present:

- throughout their manufacture and operational life, boat hulls make excellent vessels for retaining heavier-than-air gases, vapours or fumes.
- hazardous atmospheres can occur in enclosed spaces open to the atmosphere such as dry docks or pits
- ignition of gas or vapour accumulations
- generation of fumes, heat and ignition sources within the confined space through welding, cutting and grinding processes
- dust in high concentrations
- residues in tanks or bilges can give off gas, fumes or vapours
- liquids or free-flowing solids suddenly filling spaces
- petrol, LPG and other hydrocarbon based fuels and chemicals produce heavier than air vapours which will collect in enclosed spaces.
- atmospheres in enclosed spaces often become oxygen-depleted if they are subject to fume or vapour accumulations, are poorly ventilated, or whose contents react with oxygen (e.g. corrosion processes or stowed goods)

Lack of appreciation of what constitutes a confined space has led on many occasions to potential rescuers also becoming victims.

[1] Confined Spaces Regulations 1997. Approved Code of Practice L101

3 Duties and Responsibilities

If when carrying out their risk assessments[2], employers identify risks of serious injury from work in confined spaces the confined spaces regulations come into effect. They have the following key duties:

- avoiding entry to confined spaces by using alternative work methods
- following safe systems of work where entry is unavoidable
- putting adequate emergency arrangements in place before work commences (section 6)

4 Risk Assessment

Use the risk assessment process to identify the hazards which may arise from confined space working and the precautions necessary to control risks to an acceptable level. These precautions need to be taken forward to the safe system of work, section 5.

5 Risk Control – Safe Systems of Work

The following are some of the aspects which should typically be taken into account when preparing safe systems of work:

5.1 Supervision

Supervisors need to ensure that the control measures indicated by the risk assessment and included within the safe system of work are being adhered to. Depending on the level of risk, they may need to be present while work is in progress.

5.2 Suitability of Staff

Staff need to be competent (including physical abilities) to carry out the work. This may require training. They will need to be able to competently use the equipment provided for the carrying out of the safe system of work (which could include gas detecting equipment and breathing apparatus).

5.3 Isolation of Equipment

It may be necessary to isolate pipework or other routes by which gases, fumes or vapours could enter the confined space. It will also be necessary to isolate electrical equipment which could create an ignition source, and mechanical equipment whose operation could endanger persons working in the confined space.

Measures should also be taken to prevent inadvertent operation of any of this isolated equipment by persons not involved or aware of the confined space entry. This could be achieved by physical locking-off of controls, removal of fuses, etc. See section 7, permits to work.

[2] BMF Guide to Members, Appendix 3

5.4 Access and Egress

The route into and out of the confined space needs to provide ready access taking account of the equipment which the operator may need to carry with him, and the need for a rapid exit in the event of an emergency. Ease of access will also have a bearing on the equipment which could be used by rescuers.

5.5 Ventilation

Mechanical ventilation may be necessary where there is a possibility of danger from gas, vapour or fume accumulations, or where necessary to regulate working temperatures. Mechanical ventilation should be considered essential where portable gas cylinders or diesel fuelled equipment are being used inside a space. The risks from carbon monoxide emissions from petrol fuelled generators and plant means they should ***never*** be used in confined spaces, or where their exhaust fumes could enter a confined space (as with a boat hull).

5.6 Testing of Air

This may be necessary where the atmosphere in a confined space may contain toxic or flammable substances, or where its breathability needs to be confirmed. The testing equipment must be suitable for the conditions being tested for, calibrated in accordance with manufacturer's instructions and operated by a competent person. Often the equipment can be lowered into the confined space, as with a boat's bilges, and alarms set at predetermined levels.

Where it is possible that conditions may change whilst work is going on within the confined space, continuous monitoring may be necessary.

5.7 Special Tools and Lighting

Where flammable or potentially explosive atmospheres may be present in the confined space, tools should be non-sparking and installed electrical equipment 'intrinsically safe'. Special measures to prevent electric shock may be needed when working inside metal tanks.

5.8 Breathing apparatus

This will be necessary where the air within the confined space is unfit to breathe and there is no alternative to working within the space. Under no circumstances must oxygen be realised into the space since this will greatly increase the risk of fire or explosion.

6 Emergency Preparedness

In the event of unexpected conditions or faults arising, it will be necessary to have in place arrangements for raising the alert and recovering the person(s) who may be exposed to serious danger. There are many instances recorded where poor or non-existent contingency planning has led to the deaths of the rescuers as well as the casualty.

6.1 Communications

A means must be provided for anyone inside the confined space to communicate with people outside so that if necessary, rescue plans can be put into effect. This communications route is an essential part of the safety system of work (section 8) at all times confined space working is in progress.

6.2 Rescue Equipment

The equipment provided will depend on the emergencies being planned for:

- where **rescue harnesses** are part of the plan, the lifelines should always be led back to outside of the confined space.
- **breathing apparatus** may be required for the rescuers.
- **rescuers must be trained** in the use of all the equipment required and be on hand should the need arise.
- trained and equipped **first-aiders** should be available.

6.3 Emergency Services.

Emergency plans should address how the emergency services can be summoned. Beware having emergency plans which are too dependent on the attendance of the emergency services.

7 Permits to Work

Permits to Work are an administrative measure designed to improve assurance that all the measures included within the safe system of work are implemented and that lines of communication are maintained. They should be considered where the dangers from not adhering to the safe system of work are severe, and where the control measures are relatively complex or involve several people.

The following are typical elements of a permit-to-work system:

- identification of required authorisation
- competence level of the person carrying out the work
- isolations of equipment and energy sources required to ensure safety
- conditions to be proven before entry to the confined space, e.g. temperature, oxygen levels
- communications
- provisions required for dealing with emergencies

Sources of further information are listed in section 8 below. The HSE website also has information on permit to work systems especially those used in the petro-chemical industries. These may be of relevance to applications in the marine industry.

8 Information Sources

The principal information sources referred to in this guide are listed below together with other reference material which members may find useful:

Safe Work in Confined Spaces: Confined Spaces Regulations 1997, Approved Code of Practice.L101. HSE

Safe Work in Confined Spaces. HSE. Guidance leaflet INDG 258. Free from HSE website.

Guidance on permit to work systems: A guide for the petroleum, chemical and allied industries. HSE. HSG250

Appendix. Examples of Confined Spaces Issues in the Marine Industry

The BMF Technical Department is committed to sharing experience amongst members in the interests of encouraging adoption across the industry of good standards of safety management and business-efficient solutions to safety issues. We intend to keep these documents up-to-date in the light of members' experiences and developments in 'best practice' and legislation.

The following are examples of some instances where confined space working can occur and some of the issues affecting the design of a safe system of work:

Boat repairs, modification or maintenance

- Possible accumulations of gases and vapours in bilges
- Need to check atmospheres without putting staff at risk
- Avoidance of ignition sources
- Hot work
- Investigation of 'dangerous boats' which may have failed examinations due to leaking fuels or inadequate ventilation
- Access and recovery in the event of an emergency

Commissioning

- Need for access to spaces not required in normal operation
- Control of temporary working arrangements

Hull moulding

- Styrene accumulations within moulds and mouldings

Accumulations of exhaust gases

These are particularly dangerous with petrol engines and can occur in:-

- Dry docks
- Lock chambers
- Boats

Workshop facilities

- Cleaning and degreasing fluids and storage arrangements

Members with specific queries or suggestions for sharing best practices should contact the Technical Department on 01784 473377 , or email www.britishmarine.co.uk