Maritime and Coastguard Agency

MARINE GUIDANCE NOTE

MGN 354 (M+F)

Fishing and Small Vessels - Safe Operation of Fixed CO2 Gas Fire Extinguishing Systems

Notice to all Owners, Companies, Masters, Skippers and Crew of Fishing and Small Vessels

PLEASE NOTE:-
Where this document provides guidance on the law it should not be regarded as definitive. The way the law applies to any particular case can vary according to circumstances - for example, from vessel to vessel and you should consider seeking independent legal advice if you are unsure of your own legal position.

Summary

This note is to provide guidance to the crew for the safe use of fixed CO_2 gas fire extinguishing systems, and the safety precautions to be taken before entering the space after release of the CO_2 gas.

Key Points

- Be fully competent with the operation and maintenance of fixed CO_2 fire extinguishing systems
- Be fully competent with the operation of the remote controls for the isolation of fuel oil and hydraulic oil from the space
- Be fully competent with the operation of the remote controls for the isolation of ventilation systems from the space
- Be aware of the preparations required before entering the space after CO_2 release

1. INTRODUCTION

1.1 Whilst fishing off the Shetland Islands a United Kingdom fishing vessel suffered engine room fires on two separate occasions, the second of which resulted in the sinking of the vessel.

1.2 The Marine Accident Investigation Branch (MAIB) report identified that the fixed CO_2 system had been badly maintained, and the crew's knowledge of the operating procedures was inadequate.

2. SAFE USE OF CO_2 FIRE EXTINGUISHING SYSTEMS

2.1 It is recommended that in the event of **any** fire breaking out onboard, including one that requires the fixed CO_2 system to be activated, the nearest Coastguard to your position is

informed as soon as practicable.

2.2 Carbon dioxide (CO_2), a compound of carbon and oxygen, is a colourless gas with a slightly astringent smell causing coughing to occur when inhaled; at high concentrations it is acutely toxic. As it is about 50% heavier than air, it will form a blanket over a fire and smother it.

2.3 To obtain "total flooding" of an engine room, a CO_2 concentration of about 35% by volume or more is required to be obtained within 2 minutes. This will reduce the oxygen content of the air in the space to less than 15% to extinguish the fire. **At this CO_2 concentration human life cannot be supported**.

2.4 It is therefore **essential** that personnel leave the space as soon as the CO_2 warning alarm sounds. CO_2 **should not** be discharged into a space until all those within have left and a full head count has been taken.

2.5 Before a space is filled with CO_2 it is **essential** that the compartment ventilation flaps are properly closed and sealed, ventilation fan emergency stops and all fuel and hydraulic oil remote quick closing valves are operated.

2.6 Whilst safe navigation is always a priority, in the event of a serious machinery space fire it is imperative that all machinery within the affected space, e.g. main engine(s) and generator(s), are shut down to prevent fuel and/or oil feeding the fire.

2.7 Masters, skippers and crew should be fully competent with the remote and local operation of the fixed CO_2 fire extinguishing system.

2.8 Masters, skippers and crew should be fully competent with the operation of the remote controls for the isolation of fuel oil, hydraulic oil and ventilation systems from the space.

2.9 Masters, skippers and crew should be fully competent with the maintenance of the fixed CO_2 fire extinguishing system.

2.10 Typically, it takes about 15–20 seconds after release of CO_2 before the concentration within the space reaches a **dangerous** level.

2.11 Personnel inadvertently caught in the space when the CO_2 is released are recommended to hold their breath and **leave the space immediately**.

3. SAFETY PRECAUTIONS AFTER CO_2 RELEASE

3.1 **It is strongly recommended that expert advice should be obtained from ashore before ventilation of the space or any attempt at re-entry is made. The nearest Coastguard to your position may be contacted who will assist in trying to obtain this advice. Unless specifically requested, this will not be interpreted by the Coastguard as a request for on-scene fire-fighting assistance.**

3.2 Immediately after activation of the CO_2 system checks should be carried out to ensure that the gas has been correctly released from the cylinders. This can be achieved by feeling the CO_2 cylinders which should be cold to the touch and visually checking the individual cylinder release valves to ensure they are in the open position.

3.3 Crew should keep well clear of the ventilation flaps to prevent the inhalation of noxious gases.

3.4 Ventilation of the space should not be resumed until it has been **definitely established** that the fire has been extinguished. **This is likely to take several hours.** Monitoring

the fire boundary to confirm that temperatures are falling, especially in way of the seat of the fire if this is known, may be useful in this regard. Applying controlled amounts of water to the boundaries, by whatever means, to see if any steam is given off can also be good indicator of the temperature inside the space.

3.5 Entry into a space that has contained CO_2 should only be attempted by trained personnel wearing breathing apparatus with safety lines attached and sufficient back-up immediately available should difficulties arise.

3.6 In the event that breathing apparatus is not carried onboard and it is really impossible to wait for assistance from ashore, **to avoid asphyxiation to personnel**, **entry should only be attempted when the space has been thoroughly ventilated with clean air**. This can be achieved by using mechanical or natural means, with more time given for natural ventilation, to remove all residues of CO_2 and toxic gases from the fire.

3.7 The number of persons entering the space should be limited to those who actually need to be there. An attendant should be detailed to remain at the entrance to the space whilst it is occupied.

3.8 An agreed and tested system of communication should be established between any person entering the space and the attendant at the entrance.

3.9 Should an emergency occur to the personnel within the space, under no circumstances should the attendant enter the space before help has arrived and the situation has been evaluated to ensure the safety of those entering the space to undertake the rescue.

3.10 Ventilation should continue throughout the period that the space is occupied and during temporary breaks.

3.11 In the event that the ventilation system fails any personnel in the space should leave immediately.

3.12 Protection methods, other than a clean source of air, such as smoke filters on an ordinary gas mask, should not be used as these will not protect the user against the effects of CO_2.

3.13 If a space is suspected to be deficient in oxygen a smoke hood will offer no respiratory protection and must not be used for entry.

4. ADDITIONAL RECOMMENDATIONS

4.1 Ensure clear instructions for operating CO_2 fixed fire extinguishing systems are displayed near the remote operating controls, distribution control valves and the gas cylinders.

4.2 Ensure remote controls for fuel oil and hydraulic pumps, quick closing fuel oil valves and closing devices for ventilators, emergency stops for ventilation fans and CO_2 fixed fire fighting systems are clearly marked, regularly tested and maintained in good working order.

4.3 Audible and visual CO_2 alarms within the machinery spaces, for warning personnel within the spaces that the CO_2 fire extinguishing system is about to be operated, should be automatically activated when opening the door of the CO_2 release valves control cabinet(s). These alarms should be regularly tested, maintained in good working order and the crew familiar with them.

More Information

Shipping Safety Branch
Maritime and Coastguard Agency
Bay 2/11
Spring Place
105 Commercial Road
Southampton
SO15 1EG

Tel : +44 (0) 23 8032 9100
Fax : +44 (0) 23 8032 9251
e-mail: ShippingSafety@mcga.gov.uk

General Inquiries: 24 Hour Infoline
infoline@mcga.gov.uk
0870 600 6505

MCA Website Address: www.mcga.gov.uk

File Ref: MS 022/009/0330

Published: November 2007

Safer Lives, Safer Ships, Cleaner Seas

An executive agency of the Department for Transport

Printed on material containing minimum 75% post-consumer waste paper