Annex A

MGN 309 (F) Fishing Vessels - The Dangers of Enclosed Spaces

MARINE GUIDANCE NOTE

MGN 309 (F)

Fishing Vessels – The Dangers of Enclosed Spaces

Notice to all Owners, Builders, Employers, Skippers and Crews of Fishing Vessels.

Summary

This note warns of the unseen risks from the build-up of gases in "enclosed" spaces including refrigerated Salt Water (RSW) tanks and provides guidance on the avoidance of such risks and of the safe entry into enclosed spaces.

Key Points

- Be aware that unless absolutely necessary, avoid enclosed spaces whilst at sea
- Be aware of what constitutes a dangerous enclosed space
- Be aware of the procedures for preventing toxic gases in RSW tanks

If entry to enclosed space is necessary

- Be aware of the procedures for prevention of risk
- Be aware of how to test the atmosphere
- Be aware of the preparations required before entering
- Be aware of how to work while in an enclosed space
- Be aware how to leave

1. Introduction

1.1 Whilst on board a United Kingdom fishing vessel operating off the west coast of Africa three crew members tragically lost their lives.

1.2 The Marine Accident Investigation Branch (MAIB) report identified the release of dangerous gases from decaying fish, fish waste or offal as the cause of the accident. The source of the gases was a Refrigerated Salt Water (RSW) tank.

1.3 The tank had not been cleaned or chilled after use and a residue of fish and sea water remained. Hydrogen, cyanide, hydrogen sulphide and carbon dioxide gas accumulated over a period of several days; the effect being accelerated in tropical temperatures.

1.4 Gases were released into an occupied working space and inhaled when a side door to the RSW tank was opened, with fatal consequences to three of the crew and injuries to others.

1.5 In another case a vessel's engineer lost his life as a result of high carbon monoxide (CO) poisoning. A portable, petrol-engined pump was being used with the pump exhausting directly into the engine room.

1.6 These incidents further highlight:

.1 that all spaces receiving little or no ventilation, including RSW tanks, should be treated as potentially dangerous;

.2 the need for proper training in the use of plant and equipment; and

.3 the importance of completing a thorough safety risk assessment and of informing the crew of the measures taken for their safety and health (see MGN20).

2. WHAT IS MEANT BY A DANGEROUS "ENCLOSED SPACE"?

2.1 A dangerous enclosed space:

.1 One that is poorly ventilated or sealed with the oxygen reduced to low levels; or

.2 where toxic and/or flammable gases have built up to dangerous levels.

2.2 Many forms of chemical reaction can cause low oxygen levels or dangerous gases to build up, for example the decay of waste material or the exhaust from machinery, one common source is corrosion or rusting, which can significantly reduce the oxygen content in a space. All enclosed spaces therefore need to be treated with caution before opening or entering.

2.3 Examples of such spaces on fishing vessels are:

.1 RSW tanks;
.2 Fuel tanks;
.3 Fish holds containing decaying fish, fish waste or offal;
.4 Fresh water tanks;
.5 Sea or fresh water ballast tanks;
.6 Void spaces; and
.7 Stores containing chemicals.

3. OPENING OR ENTERING AN ENCLOSED SPACE

3.1 Unless it is absolutely necessary, **DO NOT** open or enter enclosed spaces whilst at sea. It is better to wait until the vessel is in port. Then "Call in the specialists" to certify that the air in the space is safe.

3.2 If entry is necessary, the following procedures are recommended prior to opening or entering, together with others that may be identified as a result of risk assessment:-

4. PREVENTION OF RISK

4.1 **Ensure** tanks are empty and not under pressure. **Be patient** and make sure that tanks are **completely empty**.

4.2 **Ensure** filling pipes to tanks are isolated, that all valves are shut and notices are put up to prevent tanks from being filled by someone else.

4.3 **Ventilate spaces THOROUGHLY.** Mechanical or natural means of ventilation may be used, with more time given for natural ventilation.

5. TESTING THE ATMOSPHERE

5.1 A **person competent** in the use of the equipment should test the atmosphere (air) inside a space.

5.2 When testing the air for the first time, **breathing apparatus should be worn**.

5.3 An **oxygen meter should be used**, with a steady reading of 20% before entry is considered.

5.4 A **combustible gas indicator** (“explosimeter”) **should be used** to test for combustible gases where these are suspected, especially where this may be a build up of hydrogen (e.g. in fuel tanks).

5.5 **Toxic gases should also be tested for where any risk is suspected**, the test equipment being specific to the gas (e.g. for unclean RSW tanks, test for hydrogen sulphide and hydrogen cyanide).

REMEMBER

IF TESTING APPARATUS IS NOT ON BOARD AND DOUBT EXISTS ABOUT THE SAFETY OF THE SPACE, DO NOT ENTER!

6. PREPARING TO ENTER

6.1 The following should be carried out before entry.

6.2 **Ensure the space is well lit**, including the entrance.

6.3 **Remove sources of ignition** from clothing, such as matches or lighters.

6.4 **Position appropriate rescue equipment at the entrance**, such as breathing apparatus, (intrinsically safe) torches, life lines and hoists.

6.5 **Limit** the number of persons entering the space.

6.6 **Place an attendant at the entrance**, who should remain there until everyone has left the space.

6.7 **Agree and test** a suitable means of communication.

7. DURING ENTRY TO A SPACE

7.1 Whilst inside the enclosed space, the following procedures should be observed.

7.2 **Regular communication** should be maintained.

7.3 **Continue ventilating** the space.

7.4 Every so often, **re-test the atmosphere** in the tank and **if any doubt exists, stop the operation.**

7.5 **Should an emergency occur**, the attendant at the entrance should raise the alarm and should **NOT ENTER** the space himself until help has arrived.

7.6 **Breathing apparatus MUST be worn during any rescue** from a space. Once making contact with a casualty, he must be removed to safety and given first aid as necessary.

8. LEAVING A SPACE

8.1 After completion of the operation, everyone should leave the space and the entrance should be resealed (unless further entry is required).

9. RSW TANKS

9.1 MAIB commissioned research into the toxic gases produced by fish as they decay. The study revealed that:-

.1 **Temperature influences the level of toxic gases** produced by decaying fish in sea water;

.2 **At 45°C**, a “half and half” mix of rotting fish and sea water produced dangerous levels of hydrogen cyanide, hydrogen sulphide and carbon dioxide after only 24 hours;

.3 **At 35°C,** similar results to 45°C were obtained;

.4 **At 20°C,** a “half and half mix” of rotting fish and sea water produced dangerous levels of hydrogen cyanide, hydrogen sulphide and carbon dioxide after just 64 hours;

.5 **At 5°C, only** traces of the three gases were measured after 10 days.

9.2 The research identifies the importance of the following procedure for the RSW tanks, particularly when operating in warmer waters:-

.1 **Immediately clean all un-chilled RSW tanks after use, removing all residues.**

.2 **If cleaning has not occurred immediately and a mixture of fish and sea water has been left for more than a few hours, flush the tank through (using the appropriate sea water pump) and fully ventilate the tank.**

.3 **Ensure adequate ventilation exists in spaces adjacent to RSW tanks.**

.4 **On no account open or enter RSW tanks known to contain sea water/decaying fish unless the full procedures for entry into an enclosed space have been carried out (see paragraphs 4-8 above).**

10. FURTHER ADVICE

10.1 Crew of vessels that operate at sea for longer periods, particularly on those of 24 metres and over in registered length may have need to enter enclosed spaces whilst at sea. Further guidance on enclosed spaces may be found elsewhere, such as the Code of Safe Working Practices for Merchant Seamen.

Further Information

Further information on the contents of this Notice can be obtained from:

Fishing Vessel Safety Branch
Bay 2/05
Maritime and Coastguard Agency
Spring Place
105 Commercial Road
Southampton
SO15 1EG

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MCA Website Address:	www.mcga.gov.uk

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Annex B

MGN 165 (F) Fishing Vessels: The Risk of Flooding

MARINE GUIDANCE NOTE

Maritime and Coastguard Agency

MGN 165 (F)

Fishing Vessels: The Risk of Flooding

Notice to Owners, Builders, Employers, Skippers and Crews of Fishing Vessels.

This Notice replaces Marine Guidance Note No. MGN 49 (F).

Summary

This notice:

1. provides guidance on bilge systems, during construction and operation, to help reduce the number of vessels and lives lost as a result of flooding; and

2. recommends owners and skippers to consider using additional or alternative equipment, such as salvage pumps, propeller shaft-mounted pumps and secondary bilge alarms, to reduce the risk of catastrophic flooding.

1. INTRODUCTION

MAIB investigations into fishing vessel losses continue to show flooding as the primary cause. In 1999, 18 (out of a total of 33) vessels were lost for this reason.

Flooding is preventable, but if not prevented, in most cases can be controlled. If discovered early, leaking pipes can be isolated and the flooding controlled by pumping out the affected space. Flooding can be rapid and late discovery leaves no time to treat the cause. An efficient bilge alarm can be critical in providing early warning of flooding.

No alarm or pumping system, however efficient, is fully reliable on its own. Good practice requires regular checks and function tests of bilge alarms and pumps, together with regular checks of hull and pipework to prevent potential leaks or failures developing.

2. ARE THE PUMPS ON YOUR VESSEL ADEQUATE?

Statutory requirements provide for a minimum capacity for pumping bilges. There is no guarantee that the statutory minimum is adequate for dealing with serious hull or pipework failure. Alternative supplementary means of pumping bilges are available, such as salvage pumps and propeller-shaft mounted pumps. Use of such equipment is highly recommended.

3. CONSIDER CARRYING MORE EQUIPMENT THAN THE REGULATIONS REQUIRE

A range of bilge pumps and alarms are available. To help reduce the consequences of flooding, in addition to statutory requirements, consider one or more of the following options:-

- Install an efficient bilge alarm in the fish hold and any other compartment below the waterline.

- Fit secondary bilge alarms, positioned at a higher level to the main bilge alarm. This will reinforce the main alarm.

- Fit secondary bilge alarms, fed from a separate supply, that incorporate an alarm visible from outside the vessel (e.g. an orange "strobe" light).

- When available, fit electronic bilge level monitoring systems in addition to conventional "float switch" alarms.

- Fit "circuit healthy" indicators on bilge alarm circuits to ensure that the alarm system is working correctly (similar idea to navigation light failure alarms).

- Fit a propeller-shaft mounted pump; this type of pump runs continuously on the main propeller shaft and automatically attempts to pump out the engine room space in the event of flooding.

- Install "submersible" pumps, which continue to operate whilst submerged in water.

- Where practical, fit remotely operated clutches to engage engine driven bilge pumps.

- Carry a portable salvage pump. Extremely positive feedback has been received from Skippers who have sailed with this type of pump, which may "double-up" as a fire-fighting pump in a "dead ship" situation. However, a recent investigation attributed the death of one crew member to such a salvage pump. Unfortunately, he received fatal carbon monoxide poisoning whilst operating the pump inside the engine room.

Such pumps should be:-

i) Used in a well-ventilated space, preferably on deck, where the exhaust fumes will be released to outside the vessel.

ii) Permanently rigged, or readily available, with direct attachment to permanent suction lines (to prevent the need for hoses to be fed through open hatches/doors).

iii) Given due consideration concerning the storage of fuel, particularly petrol driven versions (i.e. adequate ventilation provided, fit for purpose storage canisters and away from sources of ignition).

4. PREVENTATIVE MEASURES - DURING CONSTRUCTION AND REFITS

Bulkheads/Openings

- Ensure that the main bulkheads are as watertight as practicable, to prevent (or at least delay) a flood from spreading to other compartments.

- DO NOT make additional penetrations through main bulkheads unless absolutely necessary.

- Clearly label ("TO BE KEPT CLOSED AT SEA") all doors which contribute to the watertight integrity of the vessel.

Sea Valves/Pipework

- Try to keep the number of sea inlet valves to a minimum.

- Valves and fittings should be manufactured from a suitable* material.

- Avoid unnecessary bends in sea water pipework.

- Position sea valves where they can be easily and quickly closed. Fit extended spindles if necessary, to ensure that sea intake valves can be closed without having to remove floor plates.

- Fit clear labels to identify sea valves.

- DO NOT fit flexible sections of piping in seawater lines unless designed and fitted to withstand vibration. Such sections should be made from reinforced neoprene rubber and secured with stainless steel clips (at least two at each end). The date of manufacture should be clearly marked to identify renewal dates in accordance with the manufacturers' instructions (typically every 5 years).

* "Suitable" means a ductile and corrosion resistant material e.g. bronze, gunmetal, stainless steel, alpha-brasses (containing 70% copper or more and effectively inhibited from de-zincification).

Bilge Alarms

- Position floats or level sensors to bilge alarm systems in accessible positions but where they cannot be damaged and low enough to provide early warning of flooding.

Bilge Valves/Strainers

- Fit bilge valves so they can easily be reached in an emergency.
- Fit clear labels to identify bilge valves.
- Fit and position all bilge strainers (mud boxes) in the engine room, so they can be cleaned easily.
- Fit grids over the fish hold slush well or some other form of coarse strainer.
- Fit a bilge isolating valve in the engine room for the fish hold, to allow cleaning of the strainer even if the hold is flooded.

Bilge Lines

- Avoid unnecessary bends in bilge lines, keeping them straight and direct.

Refits

- Inspect the outer hull closely each time the vessel is slipped, paying close attention to any signs of wastage, damage, caulking and fastenings.
- Inspect sea water pipework closely each time vessel is slipped, paying close attention to bends, "sumps" (e.g. the bottom of sea strainer boxes) and those pipes which are not easily accessible.
- If in doubt about the condition of the sea water pipework, have an ultrasonic inspection carried out and renew those pipes found to be wasted by more than 25-30% of the original wall thickness.

5. REDUCING THE RISK – DURING OPERATION

- Always investigate <u>immediately</u> the cause of high bilge alarms.
- Ensure all watertight and weathertight doors are closed when not in use.
- Regularly (at least weekly) test the bilge pumps and bilge system.
- Test bilge alarms daily.
- Regularly (at least monthly) open and close all bilge and sea water valves, to ensure they don't "seize".
- Keep sea water valves closed when not in use.
- Permanently repair any leaking sea water pipe as soon as possible. Do not rely on temporary repairs and find out if the other sea water pipes are in a similar condition and require renewal.
- Ensure crew members are familiar with sea water side valves and bilge systems. As a reminder, keep a plan at the engine room entrance, identifying the position of sea inlet valves.
- Regularly (several times a day) check compartments not fitted with bilge alarms.
- Regularly (at least weekly) clean bilge. strainers
- Keep the engine room and fish hold free of rubbish, which could choke the bilge system.
- Check sea valves (including overboard non-return valves) whenever the vessel is slipped.

6. EFFECTIVE USE OF THE BILGE PUMPING SYSTEM

- Close the sea suction after any priming of bilge pumps.
- Stop the bilge pump when pumping bilges is finished.
- Close all bilge valves when not in use.

7. WHAT TO DO IN AN EMERGENCY

- Immediately try to find the cause of the flooding and shut the right sea valve. <u>If in doubt, close all sea valves until the flooding stops.</u>
- Start pumping the bilge as soon as possible.
- Do not concentrate on other matters, such as recovering the fishing gear. <u>Deal with the flooding first.</u>

8. PREVENTION AT ANCHOR OR IN HARBOUR

- Close all sea suction valves.
- Avoid "squeezing" wooden vessels in harbour, whenever practicable. This can damage the caulking and lead to a sprung plank.

9. FURTHER NOTES

1. Statutory requirements for fishing vessels of 12 metres in length and over are detailed in the Fishing Vessels (Safety Provisions) Rules 1975 as amended [currently under review]. New vessels 24 metres in length and over now need to comply with EC Directive 97/70/EC, in accordance with the Torremolinos Protocol.
2. This notice is considered relevant to all types of fishing vessels, regardless of size.

Enquiries relating to the content of this MGN should be addressed to:-

Fishing Vessel Safety Branch
The Maritime and Coastguard Agency
Spring Place
105 Commercial Road
SOUTHAMPTON SO15 1EG

Tel: 023 8032 9478
Fax: 023 8032 9173

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Tel: 023 8032 9297
Fax: 023 8032 9298

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MS 088_001_0456

July 2001

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Annex C

Technical report on refrigeration equipment post-accident

Please find the following report on findings on board MFV Starlight Rays as requested.

26.8.11
To attending the vessel at the request of MAIB at 1530hrs and making contact with [redacted] and his colleague. Arranging to go on board the vessel tomorrow, as the Police investigations which were being carried out, took priority over our presence. Inspection of the equipment including a thorough leak test is to be continued on Saturday 27.8.11.

27.8.11
Travelled to Peterhead and boarded the vessel. Checked over all three refrigeration plants and individually leak tested each system for refrigerant gas leaks. The tests were carried out on the Fish Hold Cooling plant, the Buus Ice Plant and the Slurry Ice Plant, and all system pressures were found to be intact with no traces of leaks from either system. The Fish Hold Cooling plant was put on run test but was tripping out on the safety HP (High Pressure) cut out switch which was due to the condenser cooling water pump sea suction valve had been shut off after the vessel returned to Peterhead.
In my personal opinion, as a qualified refrigeration engineer with over 40 years experience in the Industry, I am completely satisfied that the refrigeration equipment on board this vessel was totally gas tight and fully operational in all respects.

[redacted] (Managing Director) Forbes Refrigeration Ltd.

Annex D

Technical analysis of the pump’s exhaust on the fish hold

Investigation of incident on motor fishing vessel 'Starlight Rays PD230' on 23 August 2011.

Author and investigator:

[redacted]
School of Engineering
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Fraser Noble Building
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This document reports the investigation of the generator used on the motor fishing vessel (MFV) named Starlight Rays PD230. The investigation includes the following:

- Experimental analysis of the Emergency Fire Pump including measurements of CO and CO2 concentration.
- Calculations of CO build up in the Fish Hold of the motor vessel The Starlight Rays (dimensions of room provided) assuming different conditions (fastest and slowest possible mixing) in order to get a realistic estimate.
- Opinion on any potential dangers of operating the Emergency Fire Pump within the Fish Hold of the MV Starlight Rays.

1. Emergency Fire Pump

The Emergency Fire Pump is a Pramac model MP 36-2 with a Honda engine model GX120 (gasoline, 2.6kW net power). It was attempted to run the pump under realistic conditions, i.e. operation with a certain load when pumping water. However, although the generator was running the pump did not pump any water.

When the engine was running, the exhaust gas was collected in a bag and the time was taken in order to obtain an estimate of the flow rate. Under the set conditions, i.e. idle running, the engine produced about 0.75 litres off-gas per second. With increasing speed, the amount of exhaust gas was multiplied. At a speed that would be realistic when pumping water about 3 litres off-gas were emitted per second.

The off-gas collected was then analysed using CO_2 and CO sensors to measure the concentrations of the two gases. The exhaust contained ~10% CO_2 and ~2.2% CO.

2. Carbon Monoxide Build Up

In order to obtain a realistic estimate of the CO build up in the fish hold of the motor vessel two different cases/conditions must be considered concerning the fundamental mixing phenomena: (a) diffusion only and (b) turbulent mixing.

(a) Diffusion Driven Mixing

In the first case, it is assumed that the mixing of CO from the engine with the air in the fish hold is driven by diffusion only. This means that the air in the fish hold and the exhaust are not actively mixed by any kind of flow introduced. For this case, the generator is considered as a local source with constant CO concentration.

In order to calculate the CO build up in the fish hold, Fick's second law of diffusion is used:

$$\frac{\partial c}{\partial t} = D\frac{\partial^2 c}{\partial x^2} \tag{1}$$

where *c* is the concentration, *t* is the time, *D* is the diffusion coefficient and *x* is the space coordinate. As the density of CO and air are almost identical, effects of an accumulation conditioned by gravity are negligible. (Note that this is different for CO_2 which has higher density than air, hence it would accumulate at the bottom of the room.)

The diffusion case calculation suggests that at a distance of 1m from the generator the CO concentration reaches a level of 30 ppm (this is the typical long term exposure limit, LTEL) after about 45 min.

Note: *The diffusion case is unrealistic as it assumes no macroscopic motion of the air and fumes. According to the report on the circumstances of the incident, one person was working in the fish hold all the time, and a second person entering and leaving the room several times. Moreover, the exhaust from the generator enters the surrounding air with a certain flow velocity. All these facts contribute to the active mixing of the fumes and the air in the fish hold.*

(b) Turbulent Mixing

The second case assumes that the engine exhaust is instantaneously mixed with the entire air in the fish hold. In this scenario, running the engine idle the 30 ppm LTEL is reached after about 5 minutes. After 30 minutes some 180 ppm CO, and after 60 minutes about 360 ppm CO are reached. At a higher speed (as it would be used to pump water), the engine produced about the 4-fold amount of exhaust. Consequently, after 30 minutes 720 ppm CO, and after 60 minutes about 1440 ppm CO were reached.

Note: *The perfect mixing case is more realistic than the diffusion case. However, it assumes that the entire gas volume inside the fish hold is permanently circulated which is hardly possible taking into consideration the shape of the fish hold and the presence of any shelves or other installations.*

(c) Turbulent Mixing in Vicinity of Generator

A better (and the most realistic) estimate of the CO build-up time can be obtained under the assumption that the fumes are well mixed with air in the close vicinity of the generator. This can be considered assuming that the exhaust is mixed with about half of the total gas volume in the fish hold.

In this scenario, around the generator the 30 ppm LTEL is reached after 2.5 min when idle running or within less than a minute under load. After 30 minutes, a CO concentration of 350 ppm (idle) or 2800 ppm (load) is reached. According to the "Circumstances of Incident" report, after 30 minutes the generator was hoisted to the main deck and then taken back to fish hold. In the mean time the CO had sufficient time to distribute in the entire fish hold and part of it was likely to have escaped through the hatch, so when the generator was re-started a CO concentration of 100 ppm (idle) or 600 ppm (load) was present. After another 30 minutes operation a CO level of 450 ppm (idle) or 3400 ppm (load) is reached in the vicinity of the pump. The latter is the most realistic estimate.

3. Opinion on Potential Dangers

This section draws conclusions from the above results and gives some comments. The CO levels are put in context with information about CO intoxication available from the medical literature (e.g. see L.D. Prockop and R.I. Chichkova "Carbon monoxide intoxication: An updated review" Journal of the Neurological Sciences 262, 122-130, 2007 and the references therein). However, it must be noted that the author of this report is not a medical expert and therefore these details would require confirmation should they be considered for the line of evidence.

- It must be noted that a warning sign on the pump (see figure 1) clearly indicates that the engine produces CO and must not be operated in a closed room.
- The calculations reveal that within half an hour a CO level between 350 and 2800 ppm was reached in the vicinity of the pump where deceased was working. These levels are sufficient to cause symptoms including headache, dizziness and nausea.
- When the pump was restarted in the fish hold a CO level between 450 and 3400 ppm was reached after 30 minutes of operation. The latter level is sufficient to cause convulsions, respiratory insufficiency and death within a short period of time.
- It must also be kept in mind that parallel to the CO level rising, the oxygen level was decreasing as oxygen was consumed by the engine. Moreover, the CO_2 concentration was build up rapidly (the engine exhaust contains 10% CO_2). As CO_2 is a main driver for the human respiratory system, the increasing CO_2 level must have resulted in a higher breathing rate and hence a faster intake of toxic CO by deceased.
- The exhaust of the generator contains 22,000 ppm CO. This concentration is sufficiently high to be lethal when a few breaths are directly inhaled.

In conclusion, operating the pump in the fish hold without an appropriate exhaust duct lead to a rapid CO and CO_2 build up. The CO level after 30 minutes can be considered as harmful to health, the level after 60 minutes can be considered lethal when exposure lasts several minutes.

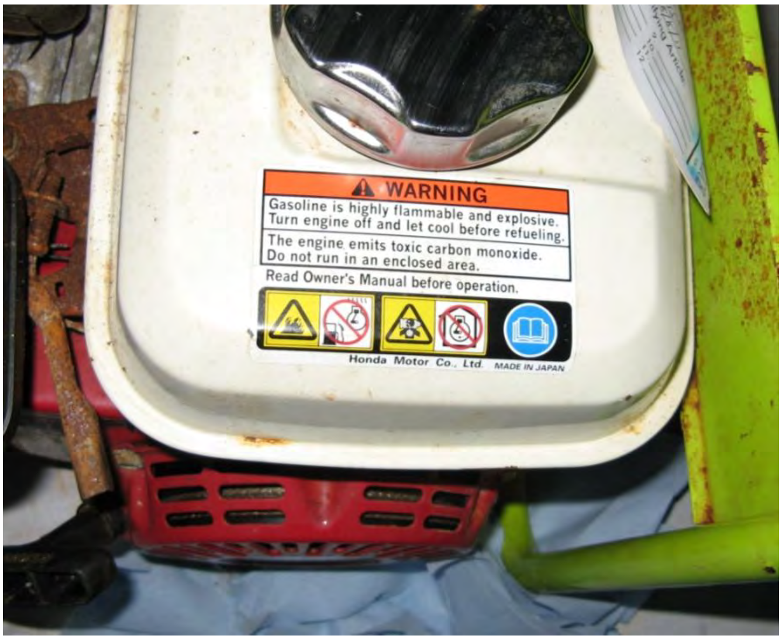


Figure 1: Warning sign on pump

MSN 1770 (F) extract

CHAPTER 4 (MECHANICAL & ELECTRICAL INSTALLATIONS)
back to Chapter 3

4.1 MACHINERY

4.1.1 General Requirements

4.1.1.1 Machinery installations should comply with the general requirements given below and to the requirements of the Certifying Authority. Other installations proposed may be specially considered, provided that full information is presented to and approved by the Certifying Authority. Attention is drawn to Chapter 11, Clean Seas, regarding prevention of pollution.

4.1.2 Machinery Installations

4.1.2.1 Machinery and pressure vessels should be of a design and construction adequate for the service for which they are intended (fit for purpose) and be efficiently installed (taking into account the manufacturer's guidance) and protected so as to minimise any danger to persons on board. Due regard should be given to moving parts, hot surfaces and other hazards.

4.1.2.2 Machinery spaces should be designed to provide safe and free access to all parts of the machinery that may require servicing at sea.

4.1.2.3 Main and auxiliary machinery essential for the propulsion and safety of the vessel should be provided with effective means of control. The machinery should be capable of being brought into operation from the "deadship" condition.

4.1.2.4 Where risk from over-speeding of machinery exists, provisions should be made to ensure that the safe speed is not exceeded.

4.1.2.5 Machinery spaces that will be periodically unattended at sea should be provided with proper alarm, detection and machinery control systems.

4.1.2.6 Means should be provided to prevent overpressure in any part of the machinery and pressure vessels (refer to section 4.1.5).

4.1.2.7 Main engines controlled from the engine room, should also be controlled from a separate area, soundproofed and insulated from the engine room and accessible without entering the engine room.

4.1.2.8 The wheelhouse is considered to be an area that meets the requirements of section 4.1.2.7.

4.1.2.9 To ensure safety of personnel, it should be possible to start and stop the main engine(s) from the engine room, in addition to any wheelhouse control.

4.1.3 Means for Going Ahead and Astern

4.1.3.1	Every vessel should have adequate power for going ahead and astern to maintain proper control of the vessel in all foreseeable service conditions.	
4.1.3.2	*The main propulsion machinery and all auxiliary machinery essential to the propulsion and the safety of the vessel should be designed to operate when the vessel is upright and when inclined at any angle of heel and trim up to and including 22.5 degrees and 7.5 degrees respectively, either way under dynamic conditions.*	*N*

4.1.4 Engine Starting

4.1.4.1 Main or auxiliary engines should be capable of being started from the dead-ship condition without external aid. Such means should be either hydraulic, air, hand or electric starting or other means acceptable to the Certifying Authority.

4.1.4.2 Main engine starting arrangements should be adequate to start the main engine or engines not less than six times successively.

4.1.4.3 When the sole means of starting is by battery, provision should be made, via a change over switch, to make available an alternative battery as a safeguard for starting. Charging facilities should be available for the batteries in accordance with the requirements of section 4.2.9.

4.1.4.4 Every vessel in which machinery essential for the propulsion and safety of the vessel is required to be started, operated or controlled solely by compressed air, should be provided with an efficient air system, including an adequate number of air compressors and air storage receivers and should be so arranged as to ensure that an adequate supply of compressed air is available under all foreseeable service conditions.

4.1.5 Air Pressure Systems

4.1.5.1 Air pressure systems should be designed, constructed and pressure tested to the satisfaction of the Certifying Authority.

4.1.5.2 Means should be provided to prevent excess pressure in any part of compressed air systems and wherever water-jackets or casings of air compressors and coolers might be subjected to dangerous excess pressure due to leakage into them from air pressure parts. Suitable pressure-relief arrangements should be provided.

4.1.5.3 The main starting air arrangements for main propulsion internal combustion engines should be adequately protected against the effects of backfiring and internal explosion in the starting air pipes.

4.1.5.4 All discharge pipes from starting air compressors should lead directly to the starting air receivers and all starting pipes from the air receivers to main or auxiliary engines should be entirely separate from the compressor discharge pipe system.

4.1.5.5 Provision should be made to reduce to a minimum the entry of oil into the air pressure systems and to drain these systems.

4.1.5.6 Compressed air systems should be well maintained, examined at regular intervals and appropriately certified.

4.1.6 Propeller Shafts

4.1.6.1 Every propeller shaft should be designed and constructed to the satisfaction of the Certifying Authority, to withstand the maximum working stresses to which it may be subjected, with a factor of safety that is adequate having regard to:

i)the material of which it is constructed;

ii)the service for which it is intended;

iii)the type and size of prime mover or motor by which it is driven or of which it forms a part.

4.1.7 Gearboxes

4.1.7.1 Where fitted, gearboxes should be suitable for the intended purpose and installed and maintained in an efficient manner, to the satisfaction of the Certifying Authority.

4.1.8 Propeller and Stern Gear

4.1.8.1 As appropriate to the vessel, the propeller materials and design in total (including shaft brackets, propeller securing, bearings, stern-tube and thrust block) and supporting structures should correspond to the operating conditions for the vessel. Design, construction and fitting standards should be to the satisfaction of the Certifying Authority.

4.1.9 Controllable Pitch Propellers

4.1.9.1 Where any vessel is equipped with a controllable pitch propeller, the propeller and its control gear should be adequate having regard to the intended service of the vessel and be to the satisfaction of the Certifying Authority.

4.1.10 Exhaust Systems

4.1.10.1 Exhaust pipes and silencers of every internal combustion engine should be adequately cooled or lagged to protect persons on board the vessel. Oil and fuel pipes should be kept as clear as practicable from exhaust pipes and turbochargers.

4.1.11 Cooling Water and Other Seawater Systems

4.1.11.1	All new or replacement installations of sea water piping and fittings for cooling water systems should be of aluminium bronze, cupro-nickel or similar corrosion resistant material.	
4.1.11.2	Heavy wall’ mild steel pipe for ‘cross vessel’ inlet mains may be used, provided that the internal diameter is 100 millimetres or greater and the pipe is galvanised internally after all fabrication work is complete.	
4.1.11.3	Care should be taken to ensure that galvanic corrosion effects from dissimilar metals are prevented, by such means as isolation packing, washers and sleeves between the flanges and fasteners joining pipes.	
4.1.11.4	Recommendations may also be found in MGN 190 (F): Fishing Vessels – The Premature Failure of Copper Pipes in Engine Cooling Water Systems.	
4.1.11.5	Sea water pipes, wherever practicable, should be connected by means of bolted flanges, visible and readily accessible for maintenance and inspection purposes as done in section 4.1.12.4.	

	Existing vessels should be fitted with such arrangements whenever seawater pipework is renewed.	**E**
4.1.11.6	Where cooling water services are essential for the cooling of the propelling machinery, alternative means of circulating water should be provided in the event of failure of the primary source. Such alternative means should be demonstrated to the satisfaction of the Certifying Authority.	
4.1.11.7	Sea water suctions of cooling systems essential for internal combustion machinery should be provided with strainers suitably arranged so that they may be cleaned without interrupting the supply.	
4.1.11.8	*New vessels should be fitted with at least two main seawater cooling inlets, with one inlet fitted on each side of the vessel (except when fitted with 'keel cooling' arrangements).*	*N*
4.1.11.9	Refer also to section 2.2.6 (Scuppers, Inlets and Discharges)	

4.1.12 Fuel, Lubricating and Hydraulic Systems (fire hazards)

4.1.12.1	Pipes used to convey lubricating oil, cooling oil or hydraulic oil should be made of seamless steel or other suitable material and should be properly installed. Pipes, joints and fittings, other than those fitted in hydraulic control systems, should, before being put into service for the first time, be subjected to a test by hydraulic pressure to twice their maximum working pressure and at any time thereafter should be capable of withstanding such a test.	
4.1.12.2	Main engine lubricating oil filters, capable of being readily dismantled for cleaning or replacement, should be provided. Sufficient spare filter elements should be carried on board.	
4.1.12.3	Adequate means should be provided for indicating failure of the main engine lubricating oil system.	
4.1.12.4	The length of any flexible pipework in the engine room should be as short as possible according to the service conditions. *In new vessels it is recommended that such lengths should not exceed 1500 millimetres.*	*N*
4.1.12.5	*Where flexible hydraulic pipes are fitted to new vessels within a high fire risk area, such pipes should be fire proof and capable of withstanding a fire test*	*N*

	to 800^o centigrade for 30 minutes. One of the following standards may be used to verify such a test: *BS ISO 15540:1999 – Fire resistance of hose assemblies – Test methods; and* *BS ISO 15541:1999 – Fire resistance of hose assemblies – Requirements for the test bench.*	
4.1.12.6	*The construction requirements of flexible hoses fitted within high fire risk area should comply with one of the following British Standards (BS):* *BS EN 853;1997 Rubber covered wire braided reinforced hydraulic type.* *BS EN 856; 1997. Rubber covered spiral wire reinforced hydraulic type*	*N*
4.1.12.7	Equivalent or higher standards may be accepted by the Certifying Authority.	
4.1.12.8	Where the failure of a flexible pipe or connection could result in oil being sprayed onto a source of ignition, then spray/splash guards should be fitted.	
4.1.12.9	**Existing vessels should comply with sections 4.1.12.5, 4.1.12.6 and 4.1.12.7 whenever systems are renewed or fitted.**	**E**
4.1.12.10	All hydraulic pumps should be fitted with a remote stop facility.	
4.1.12.11	Where tubular gauge glasses are fitted to lubricating oil or hydraulic oil tanks they should be of substantial construction, adequately protected and, where the capacity of the tank exceeds 40 litres, they should be fitted with self-closing arrangements on the tank.	
4.1.12.12	Hydraulic oil tanks with a capacity greater than 65 litres should comply with section 4.1.13.11	
4.1.12.13	Hydraulic oil storage tanks directly supplying pumps may, in place of section 4.1.13.11, be accepted with automatic non-return valves (which may be integral with the pump), provided that the pumps can be stopped remotely. Any flexible pipes/hoses fitted should comply with sections 4.1.12.5 and 4.1.12.6 (above) and if fitted between the pump and the storage tank, they should be located and protected such that in the event of hose failure, hydraulic oil will not come into contact with an ignition source.	
4.1.12.14	*Hydraulic oil storage tanks, with a capacity greater than 65 litres, should be fitted with an alarm to detect leakage from the system.*	*N*

4.1.13 Oil Fuel Installations

4.1.13.1	Oil fuel used in machinery should have a flash point of not less than 60^{o} centigrade (Closed Cup Test).	
4.1.13.2	Oil fuel tanks should be properly constructed and provided with save-alls or gutters in way of valves and fittings. Such tanks should not be situated directly above engines, heated surfaces, stairways, ladders or electrical equipment other than unbroken runs of cable. Prior to installation, tanks should be subjected to a suitable pressure test to the satisfaction of the Certifying Authority.	
4.1.13.3	Means should be provided for measuring the contents of oil fuel tanks and means provided to prevent overpressure in such tanks. The sounding arrangements or oil level indicating gear fitted to settling tanks or daily service tanks should not permit the escape of oil if these tanks are overfilled. Oil level indicators should not allow oil to escape in the event of their being damaged.	
4.1.13.4	Oil fuel, lubricating oil and other flammable oils should not be carried in fore peak shell tanks.	
4.1.13.5	Fuel filling and venting pipes should be constructed of steel, adequately supported and of sufficient dimensions to prevent spillage during filling. A venting pipe should be led to the open atmosphere terminating in a position level with or higher than the fuel filling mouth and where there is no danger of fire or explosion resulting from the emergence of oil vapour from the pipe (refer also to section 2.2.6). The open end of the pipe should be protected against: i)water ingress - by ball float or equivalent means; ii)flame ingress - by a corrosion resistant gauze mesh (that can be detached for cleaning).	
4.1.13.6	**Existing vessels may be accepted with other suitable means of protection, if arranged to the satisfaction of the Certifying Authority.**	**E**
4.1.13.7	Where pipes also serve as overflow pipes, provision should be made to prevent pollution of the sea.	
4.1.13.8	The overflow should not run into or near a machinery space, galley or other space where ignition may occur.	

4.1.13.9	Air pipes from oil fuel tanks and levelling pipes attached to tanks should have a net cross-sectional area not less than 1.25 times that of the filling pipes.	
4.1.13.10	Self-closing type drains should be provided for the removal of water from oil fuel in storage tanks or settling tanks or in oily water separators.	
4.1.13.11	Means should be provided to isolate a source of fuel (either fuel or oil, capacity greater than 65 litres) that may feed a fire in an engine space. A valve or cock, capable of being closed from a position outside the engine space, should be fitted in the fuel feed pipe as close as possible to the tank and in an accessible position. Tanks to be considered for such an arrangement are those fitted with an outlet valve which may be left open during normal operation of the vessel. Inlet and re-circulation valves should be of the non return type.	
4.1.13.12	*Electric driven fuel and oil pumps should be fitted with a remote stop at a suitable position outside the machinery space* **It is recommended that existing vessels are fitted with such an arrangement.**	*N* **E**
4.1.13.13	*Save-all(s) or equivalent means of containment of spillage should be provided below fuel pump(s), auxiliary engines, oil pumps and filter(s).* **Existing vessels should be fitted with such arrangements, as far as practicable.**	*N* **E**
4.1.13.14	Fuel supply lines to main propulsion and essential auxiliary machinery should be provided with duplicate filters, so constructed that either filter may be dismantled for cleaning without disrupting the fuel supply through the filter in use.	
4.1.13.15	Oil fuel filling points should be so arranged that oil fuel will not readily be spilled, overflow, drain or lodge in any space.	
4.1.13.16	Pipes used to convey fuel oil should, wherever possible, be made of seamless steel or other suitable material and should be properly installed, taking into consideration vibration and chafing. Pipes, joints and fittings should, before being put into service for the first time, be subjected to a test by hydraulic pressure to twice their maximum working pressure, and at any time thereafter should be capable of withstanding such a test. Where fitted, flexible pipes should comply with section 4.1.12.5, to the satisfaction of the Certifying Authority.	

4.1.13.17	Where tubular gauge glasses are fitted to oil fuel tanks they should be of substantial construction, adequately protected and fitted with self-closing arrangements on the tank.	

4.1.14 Ventilation

4.1.14.1 Adequate means of efficiently ventilating the engine room under all operating conditions, with doors and hatches closed, should be provided.

4.1.15 Refrigerating Plant

4.1.15.1 Refrigerating plants should be of a design and construction adequate for the service for which they are intended and should be so installed and protected as to reduce to a minimum any danger to persons on board. Refrigerant detection sensors, compatible with the refrigerant being used, are recommended to be fitted (where practicable).

4.1.15.2 Ammonia, methylchloride or chlorofluorocarbons (CFCs, with ozone depleting potential higher than 5% of CFC-11) should not be used as refrigerants.

4.1.15.3 Where refrigerating plants are installed they should be maintained in an efficient working condition and examined at regular intervals.

4.1.16 Spare Gear

4.1.16.1 Adequate spares should be provided for normal operation of the main machinery, auxiliary machinery and electrical equipment, having regard to the intended service of the vessel. Such spares should include fuel filters, oil filters, temporary means of repairing pipework, seawater pump spares, bilge pump spares, tool-kit, fuses and light bulbs.

4.2 ELECTRICAL ARRANGEMENTS

4.2.1 General

4.2.1.1	The electrical arrangements should be such as to minimise the risk of fire and electric shock and satisfy the requirements of the Certifying Authority. The installation should also be designed and constructed so as to ensure the proper functioning of all equipment necessary to maintain the vessel in normal operational and living conditions without recourse to an emergency power	

	supply.	
4.2.1.2	Tanks, machinery or other metallic objects that do not have good electrical continuity with the water surrounding the vessel should have special earthing arrangements to reduce potential risk.	
4.2.1.3	*For general guidance, a number of the most common standards that are appropriate to a small vessel are listed in section 4.2.6. Other standards that are considered more appropriate and safe for a particular application may also be used for guidance*	*N*

4.2.2 Systems

4.2.2.1	*DC Systems should be of the two wire insulated type, with double pole switches used* **Other DC systems on existing vessels are acceptable.**	*N* **E**
4.2.2.2	*It is recommended that AC systems are of the insulated neutral type.*	*N*
4.2.2.3	Hull return systems for earth monitoring and impressed current systems are acceptable.	
4.2.2.4	For vessels with systems of 50 volts or less, the insulation resistance should be at least 0.3 megohm. For vessels with systems greater than 50 volts, the insulation resistance should be at least 1.0 megohm. A low voltage instrument should be used for testing to avoid the possibility of damage.	
4.2.2.5	*Insulated neutral distribution systems should be continuously monitored by suitable means.*	*N*
4.2.2.6	All circuits except the main supply from the battery to the starter motor and electrically driven steering motors, should be provided with electrical protection against overload and short circuit, (i.e. circuit breakers should be installed). Short circuit protection should be for not less than twice the total rated current load in the circuit protected.	

4.2.3 Distribution Systems

4.2.3.1 Main and emergency switchboards should be suitably guarded and arranged to provide easy access without danger to any person. Adequate non-conducting mats or gratings should be provided. Exposed parts that may have a voltage between conductors or to earth exceeding 55 volts should not be installed on the face of any switchboard or control panel.

4.2.3.2 Where two or more generating sets may be in operation at the same time for providing the auxiliary services essential for the propulsion and safety of the vessel each generator should be arranged to supply such essential services and means should be provided to trip automatically sufficient non-essential load when the total current exceeds the connected generator capacity. It should be possible to connect such generators in parallel whilst maintaining continuity of electrical supply.

4.2.3.3 Cable systems and electrical equipment should be so installed as to reduce interference with radio reception to a minimum.

4.2.4 Lighting

4.2.4.1 Lighting circuits should be distributed through the spaces so that a total blackout cannot occur due to the failure of a single protective device.

4.2.4.2 Where general lighting is provided by a single centralised source, an alternative source of lighting should also be provided sufficient to enable persons to make their way to the open deck or to permit work on essential machinery.

4.2.4.3 Emergency lighting should be provided to illuminate the wheelhouse, the machinery space, all means of escape, the survival craft launching and embarkation areas and man-overboard rescue equipment and rescue areas.

4.2.4.4 The stroboscopic effect of fluorescent lighting should be avoided.
N

4.2.5 Hazardous Spaces

4.2.5.1 Electrical equipment, other than lighting, should not normally be installed in a space where petroleum vapour or other hydrocarbon gas may accumulate. When electrical equipment is unavoidably installed in such a space, it must comply with a recognised standard for prevention of ignition of the flammable atmosphere and wherever possible, switches should fitted outside that space.

4.2.6 Reference Standards

4.2.6.1	*The Institution of Electrical Engineers Regulations for the Electrical and Electronic Equipment of Ships with Recommended Practice for their Implementation, 6th Edition 1990 and subsequent supplements.*	*N*
4.2.6.2	*BS 6883(1999), Specification for elastomer insulated cables for fixed wiring in vessels. (Suitable for lighting, power, control, instrumentation and propulsion circuits)*	*N*
4.2.6.3	*IEC 600 92-350, Low-voltage shipboard power cables. (General construction and test requirements for shipboard cables with copper conductors intended for low-voltage power systems at voltages up to and including 0.6/1kV.)*	*N*
4.2.6.4	*ISO 10133, Small Craft - Electrical systems - Extra-low voltage D.C. installations.*	*N*
4.2.6.5	*ISO 13297, Small Craft - Electrical systems - Alternating current installations.*	*N*
4.2.6.6	*BS EN 28846, Small Craft - Electrical devices - Protection against ignition of surrounding flammable gases.*	*N*

4.2.7 Electrical Precautions

4.2.7.1 Electrical equipment should be so constructed and installed that there will be no danger to any person handling it in a proper manner.

i)Subject to section ii), where electrical equipment is to be operated at a voltage in excess of 55 volts the exposed metal parts of such equipment that are not intended to have a voltage above that of earth, but which may have such a voltage under fault conditions, should be earthed;

ii)Exposed metal parts of portable electrical lamps, tools and similar apparatus, to be operated at a voltage in excess of 55 volts should be earthed through a conductor in the supply cable unless, by the use of double insulation or a suitable isolating transformer, protection at least as effective as earthing through a conductor is provided.

4.2.7.2 Fixed electrical cable should be of a flame retarding type. All metal sheaths and armour of any electric cable should be electrically continuous and should be earthed. Electric cable that is neither metal sheathed nor armoured should, if installed where its failure might cause a fire or explosion, be effectively protected.

4.2.7.3 Wiring should be supported in such a manner as to avoid chafing or other damage (refer to section 4.2.6 above).

4.2.7.4 Joints in all electrical conductors except those in low voltage communications circuits should be made only in junction or outlet boxes or by a suitable method such that it retains the original mechanical, flame retarding and electrical properties of the cable. Junction or outlet boxes should be so constructed as to confine the spread of fire.

4.2.7.5 Lighting fittings should be so arranged that the rise in temperature will not damage the associated wiring or cause a fire risk in the surrounding materials, especially where fitted at the head of bunk beds.

4.2.7.6 Every lighting circuit terminating in a fish hold or similar space should be provided with an isolating switch positioned outside that space.

4.2.8 Equipment and Installation Requirements

4.2.8.1	*Where electrical power is the only means for maintaining auxiliary services essential for propulsion or safety of the vessel, a main source of electrical power should be provided comprising of at least two independent generators, one of which may be driven by the main engine. Such services should be capable of being provided when any one of the sources of electrical power is out of operation.* **Existing arrangements for existing vessels will continue to be accepted.**	*N* **E**
4.2.8.2	The power rating of each of the generators required in section 4.2.8.1 should be sufficient to simultaneously supply the essential services required for propulsion, navigation and safety of the vessel. Such services include lighting, communications, bilge pumps, steering gear, fire pumps and navigation lights.	
4.2.8.3	The output of any generator or alternator driven by a variable speed engine should be based on the lowest operational speed of the engine. Throughout the entire operating engine speed range, the generator or alternator should operate within its safe speed range.	
4.2.8.4	*Sources of electrical power should be so arranged to operate efficiently in the conditions detailed in section 4.1.3.2.* **Existing arrangements for existing vessels will continue to be accepted.**	*N* **E**
4.2.8.5	Where transformers form an essential part of the supply system, they should be arranged to ensure continuity of supply.	
4.2.8.6	*Main and emergency lighting systems should be such that a fire or other*	*N*

	incident in the spaces containing either source of supply will not render the other system inoperable.	

4.2.9 Accumulator (Storage) Batteries

4.2.9.1Accumulator (storage) batteries should be housed in boxes, trays or compartments that are constructed to provide protection of the batteries from damage and ventilated to outside atmosphere to reduce the accumulation of explosive gas to a minimum. Where fans are fitted in exhaust ducts from compartments assigned principally to the storage of batteries they should be of a flameproof type. Electrical arrangements liable to arc should not be installed in any compartment used principally for the storage of accumulator batteries. Lead acid and nickel alkaline batteries should not be housed in the same space.

4.2.10 Emergency Power Source

4.2.10.1 An emergency electrical power source should be located outside the engine room and should, in all cases, be so arranged as to ensure that in the event of fire or other failure of the auxiliary installation, the emergency electrical power source will provide the simultaneous functioning for at least three hours of the following services:

i)the internal communication system, fire detectors and emergency signals;

ii)the navigation lights;

iii)the emergency lights (in stairways, exits, machinery spaces, wheelhouse and liferaft launching stations);

iv)the radio installation (reference should be made to The Merchant Shipping (Radio)(Fishing Vessels) Regulations, SI 1999, No. 3210).

Vessels 18 metres in length LBP and over, constructed before 23 November 1995, may continue to locate the emergency electrical power source inside the engine room, where structural characteristics do not permit relocation.	**E**

4.2.10.2 The emergency source of electrical power may be an independently driven generator, provided with an independent fuel supply and means of starting, or accumulator batteries.

4.2.10.3 If the emergency electrical power source is an accumulator battery and the main electrical power source fails, the accumulator battery should be automatically connected to the emergency electrical switchboard and supply power for an uninterrupted period of three hours to the systems referred to in section 4.2.10.1, above.

4.2.10.4 The generating sets (required in section 4.2.8.1) should each be capable of charging such accumulator batteries.

4.2.10.5 Adequate means should be provided to enable regular testing of the emergency source of electrical power. *N*

4.3 BILGE PUMPING

4.3.1 General

4.3.1.1 A vessel should be provided with efficient means for removal of water entering any compartment below the weather deck (other than a tank permanently used for carriage of liquids that is provided with efficient means of pumping or drainage).

4.3.1.2 Section 11.1 contains requirements for prevention of pollution of the sea.

4.3.2 Bilge and Fish Processing Space Pumping Arrangements

4.3.2.1	Every vessel should be provided with: i)Efficient means of draining any compartment, other than a compartment appropriated for the storage of oil or fresh water, when the vessel is upright or is listed not more than five degrees either way. Suction(s) should be provided in the engine room and in the fish hold to the lowest drainage level of the compartment. *ii)The bilge suctions and means of drainage should be so arranged that water entering any main watertight compartment can be pumped out through at least two independent bilge systems and suctions.* **Existing arrangements for existing vessels will continue to be accepted.** iii)Where wet fish processing takes place within a weathertight compartment that does not have sufficient freeboard to permit direct overboard discharge via scuppers or other arrangements (see paragraph 2.2.6.2), that space should be provided with independent pumping arrangements having a capacity of at least 1.5 times the wash water supply. Where pumping arrangements are intended to cater for solid waste, discharge should be arranged via local	*N* **E**

	sumps with pumps suitable for pumping fish waste products.	
4.3.2.2	All vessels should have: i)Not less than two separate bilge pumps, <u>each</u> having a minimum capacity (Q) calculated as follows: $Q = (0.00575)\ D_m^2$ (metres^3 per hour) where D_m= bilge main diameter (millimetres) and L= length of vessel (metres) B= breadth of vessel (metres) D= depth of vessel (metres) *ii)On new vessels, both pumps should be power driven, with at least one pump driven by independent means.* **iii)On existing vessels, at least one pump should be power driven and the second may take the form of either:** **a)a power driven pump, powered by separate means to the first pump); or** **b)a portable salvage pump; or** **c)a submersible pump, powered by separate means to the first pump; or** **d)a hand operated bilge pumping system.** Note:The capacity of systems (a) to (d) above should satisfy the minimum capacity (Q). If not, a portable salvage pump, satisfying the minimum capacity (Q) should be provided. A portable salvage pump may also be used as an emergency fire pump and it is recommended that existing vessels (particularly those vessels fitted with non- watertight bulkheads or singular bilge systems) carry such a pump in addition to the minimum requirements.	*N* **E**
4.3.2.3	A general service pump, of minimum capacity (Q), may be used as a power driven bilge pump.	
4.3.2.4	Bilge ejectors do not meet the requirements of a power driven bilge pump.	

4.3.2.5	Bilge pumps should be self-priming. Pumps, whether operated by hand or power, should be capable of drawing water from any space as required by section 4.3.1.1.	
4.3.2.6	Distribution boxes, valves and cocks fitted in bilge pumping systems should be in accessible positions.	
4.3.2.7	In every vessel- i)pipes from the pumps for draining hold spaces or any part of the machinery space should be independent of pipes that may be used for filling or emptying spaces in which water or oil is carried; ii)bilge pipes should be of steel or other suitable material having flanged joints wherever practicable. Flexible piping, if accessible for inspection and jointed with suitable clamps, may be installed where necessary.	
4.3.2.8	Bilge main pipe diameters should be in accordance with section 4.3.2.2. **Existing vessels may continue to comply with the requirements of The Fishing Vessels (Safety Provisions) Rules 1975.**	**E**
4.3.2.9	Bilge branch suction pipes diameters should be not less than: Where D_b = internal bilge branch line diameter or 40 millimetres, whichever the greater C = length of compartment (metres) B = breadth of vessel (metres) D= depth of vessel (metres) **Existing vessels may continue to comply with the requirements of The Fishing Vessels (Safety Provisions) Rules 1975.**	**E**
4.3.2.10	Bilge pumping systems should be so arranged as to prevent water passing from the sea or from water ballast spaces into holds or into machinery spaces or from one watertight compartment to another. The bilge connection to any pump that draws from the sea or from water ballast spaces should be fitted with either a non-return valve or a cock which cannot be opened simultaneously either to the bilges and to the sea or to the bilges and water ballast spaces.	
4.3.2.11	Valves in bilge distribution boxes should be of a screw down non-return type.	

	Non-return valves should be fitted in the discharge lines of hand operated bilge pumps unless the pumps are of suitable design and discharge directly onto the deck.	
4.3.2.12	All bilge suctions should be fitted with readily accessible strainers. The total area of the perforation in the strainer should be not less than twice the cross sectional area of the bilge pipe.	

4.3.3 Bilge Alarms

4.3.3.1	A bilge alarm sensor should be fitted in the propulsion machinery space and fish hold(s) of the vessel. These alarms should be accessible for regular testing. **Existing vessels should be fitted with a fish hold sensor by the first periodical survey under this Code.**	**E**
4.3.3.2	To prevent pollution, bilge sensors in compartments containing pollutants should not automatically start bilge pumps.	
4.3.3.3	Any auto-start bilge pump serving a clean compartment should be fitted with an audible and visual alarm at the control position(s) so that the reason for pumping may be investigated. Such pumps should also be fitted with a "manual override" to start the pump.	
4.3.3.4	Each dry compartment provided with a bilge suction capability (built-in or portable) should be fitted with a bilge level alarm if the level of bilge water can not be readily checked visually without entering the compartment. Alternatively, spring loaded drain valves may be fitted outside the compartment as a means of checking the bilge level.	
4.3.3.5	A bilge alarm should provide an audible and visual warning at the control position(s).	
4.3.3.6	Each engine room bilge alarm system should be provided with: i) a secondary, independent bilge alarm system; or ii) a "fail safe " warning should the bilge alarm circuit become faulty. **Existing vessels should be fitted with (i) or (ii) above, by the first periodical survey under this Code.**	**E**
4.3.3.7	Further guidance for bilge alarms and bilge pumps is provided in MGN 165(F).	

4.4 STEERING GEAR, RUDDERS, ANCHORS AND CHAIN CABLES

4.4.1 Steering Gear

4.4.1.1	Every vessel should be provided with a main steering gear and an auxiliary means of actuating the rudder to the satisfaction of the Certifying Authority.	
4.4.1.2	The main steering gear and the auxiliary means of actuating the rudder should be arranged so that as far as is reasonable and practicable a single failure in one of them will not render the other one inoperative. If electrical power is lost in the wheelhouse, the auxiliary steering should remain operable.	
4.4.1.3	In every vessel: i)the main steering gear including any rudder, stock, tiller and associated fitting should be of adequate strength and capable of steering the vessel at the maximum ahead service speed and should be so designed that they are not damaged at maximum astern speed or in any other operating condition; ii)the auxiliary means of steering should be capable of being brought rapidly into action and should enable the vessel to be steered at a navigable speed.	
4.4.1.4	*The main steering gear should be capable of turning the rudder from 35 degrees on one side to 35 degrees on the other in 30 seconds when the vessel is at navigable speed and from 20 degrees on one side to 20 degrees on the other in 30 seconds when the vessel is at maximum ahead service speed, with the rudder totally submerged.*	*N*
4.4.1.5	Every vessel should have a rudder position indicator in the wheelhouse.	

4.4.2 Vessels Fitted with Steering Devices other than Rudders

4.4.2.1 If a vessel is fitted with a steering device other than a rudder, the construction and operation of such a device should be adequate and suitable for its intended purpose.

4.4.3 Electrical and Electro-hydraulic Steering Gear

4.4.3.1 Where electrical or electro-hydraulic steering gear is fitted, indicators should be provided which will show when the power units of such steering gear are in operation. These indicators should be situated in the machinery control room or other suitable position and in the wheelhouse.

4.4.3.2 Where electrical power is the only source of power for steering, in the event of electrical systems failure, either of the following provisions should be available for emergency steering:

i) a portable tiller arm that can mount on the top of the rudder stock and be operated by a block and tackle system; or

ii) a hand pump powered by a hydraulic system with direct connection via a hydraulic ram to the tiller arm (this may be a helm-mounted pump within the steering system).

4.4.3.3 An efficient form of communication between the main control position and the emergency steering position should be provided.

4.4.3.4 Each circuit should be adequate for the most severe load condition; short circuit protection only should be provided.

4.4.4 Anchors and Cables

4.4.4.1	Every vessel should be equipped with anchors and chain cables sufficient in weight and strength, having regard to the vessel's size and intended service. Wire rope of suitable strength (e.g. trawl warps) may be substituted for chain cable provided that a length of chain cable is attached between the wire rope and the anchor. The size of this chain should be appropriate to the anchor weight and length of the chain cable should not be less than the LOA of the vessel.	
4.4.4.2	The anchor(s) with the associated cable should be stowed to enable rapid deployment and be provided with means of retrieval.	
4.4.4.3	*Anchor weights and lengths of cables should comply with the table 1 on the following page (subject to 4.4.4.4, 4.4.4.5 and 4.4.4.6 below) where:* *Equipment numeral =* $D^{2/3} + 1.6BH + A/10$ *Where:* *A= area (in metres*^{2}*) in profile view of the hull, superstructures and houses above the deepest operating waterline, having a breadth greater than B/4* *B = breadth of vessel (in metres)* *H = freeboard midships (in metres) from the deepest operating waterline to the freeboard deck, plus the sum of the heights, in metres, of each tier of superstructures and houses at the centreline, each tier having a breadth greater than B/4* *D= displacement, in tonnes, to the deepest operating waterline.*	*N*
4.4.4.4	*Where stud link cable is used, the diameter may be 1.5 millimetres less than the tabular diameter.*	*N*

4.4.4.5	** Where it is proposed to use high holding power anchors, a reduction in anchor weight of up to 20% will be considered.*	*N*
4.4.4.6	*** U2 Grade refers to special quality steel (wrought/cast with a tensile strength in the range 490 - 690 N/millimetres^2).* *Chain cables constructed of mild steel (U1) (tensile strength in the range 300 - 490 N/millimetres^2) should be increased by 14% in diameter.*	*N*
4.4.4.7	**The anchor and cable arrangements on existing vessels will be accepted provided those arrangements continue to remain efficient in service.**	**E**

TABLE 1

EQUIPMENT NUMERAL	*TOTAL ANCHOR WEIGHT IN KGs (MINIMUM)**	*MIN NO OF ANCHORS*	*MINIMUM LENGTH OF CABLE IN METRES*	*SIZE OF CHAIN CABLE IN MM; U2***
UP TO 60	*95*	*1*	*82.5*	*12.0*
61-80	*130*	*1*	*82.5*	*12.0*
81-90	*165*	*1*	*82.5*	*12.0*
91 -100	*190*	*1*	*110*	*14.0*
101-110	*210*	*1*	*110*	*14.0*
111-120	*245*	*1*	*110*	*15.0*
121 - 130	*270*	*1*	*110*	*15.0*
131 - 140	*305*	*1*	*137.5*	*16.0*
141 - 150	*350*	*1*	*137.5*	*16.0*
151 - 175	*435*	*1*	*137.5*	*19.0*
176-205	*520*	*1*	*137.5*	*20.5*
206-240	*590*	*1*	*137.5*	*22.0*
241-280	*660*	*1*	*165*	*24.0*

For intermediate values of equipment numeral, linear interpolation may be carried out for anchor weights, cable lengths and sizes. ***N***

Continue Previous Contents

Annex F

MCA survey dated 24 June 2011

REPORT OF INSPECTION* AND/OR SURVEY*
Of *United Kingdom / *Dependent Territory or *Foreign Vessel
(*delete as appropriate)

mca
Maritime and Coastguard Agency

1. Maritime and Coastguard Agency HQ, Inspection Branch - 105 Commercial Road, Southampton, SO15 1EG - United Kingdom
Tel: +44 (0)2380 329100 Fax: +44 (0)2380 329104

MCA Copy

2. Name of Ship: STARLIGHTS RAYS		3. Flag of Ship: UK	
3a. Classification Society:	4. Type of Vessel:	4a. UK Class: X	
5. Call Sign: ZQDW3	6. IMO: —	6a. UK Official No: C17103	6b. FV No: PD230
6c. Length (m): 23.65	7. GT: 320.00	7a. DWT: (tankers)	7b. KW: 739.00
8. Year of Build: 1999	9. Date of Report: 24-06-11	10. Place of Inspection: PETERHEAD	
		Inspection At Sea/Anchor/Passage?	YES ☐ NO ☑

3b. & c. Company Details (Name, Address, Unique (Company DOC No), Tel/Fax (to be taken from ISM certificates, where applicable)

[redacted]
51 SCOTSTOWN RD. PETERHEAD AB42 1LW

11. Relevant Certificate(s)

	a Title	b Issuing authority	c Dates Issue	Expiry	d Last Intermediate / Annual Survey Authority	Date	Place	Country
1.	Cert. of Class							
2.	Saf Con							
3.	SEC							
4.	Radio							
5.	Load Line							
6.	I.O.P.P							
7.	Safe Manning							
8.	Passenger Cert							
9.	ISM SMC							
10.	DOC							
11.	ISSC							
12.	DG DOC							
13.	I.A.P.P							
14.	I.A.F.S							
15.	UKFVC	MCA	11-05-10	23-10-14				
16.								
17.								
18.								
19.								
20.								

12. Deficiencies NO ☐ YES ☑ If yes see attached FORM B
13. Ship Detained NO ☑ YES ☐ If yes Date of Release:

Type of Inspection: ICWS
Type of Survey(s): LLEx(A)

This report must be retained on board for a period of two years and must be available for consultation by MCA Officers at all times.

MCA Office Address	MCA Office Stamp	
Maritime & Coastguard Agency Aberdeen Regional Office Marine House Blaikies Quay Aberdeen AB11 5EZ Tel: +44(0)1224 597900 Fax: +44(0)1224 573725		Name [redacted] (duly auth[redacted] of issuing author[redacted]
		Signature [redacted]
		Telephone +[redacted]
		Fax +44 (0)
		email mcga.gov.uk

* This Inspection Report has been issued for the purpose of informing the Master/Skipper that an inspection has taken place. This report cannot be construed as a seaworthiness certificate in excess of the certificates the ship is required to carry.

mca
Maritime and Coastguard Agency

REPORT OF INSPECTION* AND/OR SURVEY*
Of *United Kingdom /
*Dependent Territory / *Foreign Vessel
(*delete as appropriate)

MCA Copy

2. Name of Ship: STARLIGHT RAYS	6. IMO No: or Call Sign or Official no: ZQUW3
9. Date of Inspection/Survey: 24-06-11	10. Place of Inspection/Survey: PETERHEAD

15. Nature of Deficiency

No:	15. (a) Code	I/S[1]	(b) Description of Deficiency	(c) Regulation references	16. Action Code[2]	Notification of Rectification of Deficiency (✓)	Date of Rectfication
1	1570	S	ALMANAC TO UPDATE.		17		
2	1570	S	CHARTS TO RENEW AS REQ'D		17		
3	0199	S	RISK ASSESSMENT TO COMPLETE		17		
4	0739	S	EMERGENCY FIRE PUMP TO		16		
			RUN WITH WHOLE CREW WITHIN 2 WEEKS				
5	0739	S	MOVE SUCTION HOSE TO NEARER POSITION		17		
6	1270	S	GUT SHUTE TO PROVE (PORT SIDE)		17		
7	1270	S	TONNAGE VALVE (STBD) TO FREE (SPINDLE)		17		
8	1270	S	~~DOORS~~ TO WINCH ROOM TO MAKE GOOD.		17		
9	1460	S	GUARD FOR COMPRESSOR (REFRIG) TO MAKE GOOD		17		
			OR REINSTATE.				
10	0741	S	ALL FUEL SHUT OFFS TO PROVE.		17		
11	0960	S	FIRE EXIT IN ENGINE ROOM TO CLEAR.		17		
12	0945	S	ALL EMERGENCY LIGHTS TO RECHECK		17		
			- MANY NOT WORKING.				
13	1099	S	ENGINE ROOM BILGE ALARM		17		
			(LOWER) TO RECTIFY				
14	0650	S	~~[illegible]~~ LIFEBUOYS TO RENEW		17		
			RETRO REFLECTIVE TAPE				
15	B1270	S	DOORS THROUGHOUT TO RE-SLACKEN		17		

Remarks
~~FAX~~/EMAIL OFFICE PRIOR TO LLEx CERT. ISSUE.

MCA Office Address	MCA Office Stamp	
		Name [redacted] (duly [redacted] of issuing [redacted]
		Signature [redacted]
		Telephone [redacted]
		Fax +44 (0)
		email mcga.gov.uk

REPORT TO SURVEYOR - The Master, Skipper or Owner is requested to confirm in writing to the MCA Office as above by / / (date) that all / item Nos .... of the outstanding requirements listed above have been met and to indicate where and when the vessel will be available for re-inspection/survey (to be deleted by surveyor if not required).

Office use only: Confirmation received on / / (date) Signature ....

1 Please prefix inspection deficiencies with 'I' and survey deficiencies with 'S'
2 For codes see reverse of copy

Annex G

Facsimile sent by Caley Fisheries Limited to the MCA dated 27 June 2011

Mca. [redacted]

O

CALEY FISHERIES LIMITED

11 HARBOUR STREET
PETERHEAD AB42 1DL

Telephone [redacted]

Fax No. [redacted]

E-mail: sales@caley-fisheries.co.uk

[redacted] 27/06/11

YOUR REF. [redacted]

OUR REF. LOADLINE SURVEY
MFV STARLIGHT Rays BD230

[redacted]

PLEASE ACCEPT CONFIRMATION THAT
ALL ITEMS LISTED @ ABOVE SURVEY
HAVE BEEN ATTENDED TO

Best Regards

[redacted]

Annex H

MCA survey dated 30 August 2011

mca
Maritime and Coastguard Agency

REPORT OF INSPECTION* ~~AND/OR SURVEY*~~
Of *United Kingdom /
*~~Dependent Territory / *Foreign Vessel~~
(*delete as appropriate)

Master's Copy

2. Name of Ship: STARLIGHT RAY	6. ~~IMO No. or Call Sign or~~ Official no: C17103
9. Date of Inspection/~~Survey~~: 30/8/2011	10. Place of Inspection/~~Survey~~: PETERHEAD

15. Nature of Deficiency

No:	15. (a) Code	I/S[1]	(b) Description of Deficiency	(c) Regulation references	16. Action Code[2]	Notification of Rectification of Deficiency (✓)	Date of Rectfication
1		I	No Annual Self Certification of UKFVC.				
2		I	Risk Assessment not signed by all crew no entry for work being carried out on thruster compartment in Fish Hold.				
3		I	Official log book Not filled in as appropriate				
4		I	No Crew Agreement onboard.				
5		I	GMDSS Log book not filled in				
6		I	No LOLER & PUWER RECORDS.				
7		I	No MUSTER LIST (Normal crew 6 persons)				
8		I	Net Drum has been removed from after upper deck and MCA not informed or any stability check made confirming that vessel remains within criteria.				
9		I	Several watertight door dogs very tight or frozen				
10		I	Emergency Escapes not mark appropriately.				
11		I	Exit path from Engine Room not clear				
12		I	Quick closing valve on daily service tank could not work due to accumulated debris in area holding valve open.				
13		I	Main Engine room Ventilation Inlet grill has a deflector plate installed to keep water from Nets out this could not be easily removed.				
14		I	Engine room main door not self closing.				
15		I	No Almanac could be found.				
16		I	Fire flaps around accommodation very tight or frozen				

Remarks

MCA Office Address	MCA Office Stamp	
	ABERDEEN MARINE OFFICE mca Maritime and Coastguard Agency	Name (duly aut[redacted]
		Signature [redacted]
		Telephone [redacted]
		Fax +44 (0)
		email mcga.gov.uk

REPORT TO SURVEYOR - The Master, Skipper or Owner is requested to confirm in writing to the MCA Office as above by / / (date) that all / item Nos .... of the outstanding requirements listed above have been met and to indicate where and when the vessel will be available for re-inspection/survey (to be deleted by surveyor if not required).
Office use only: Confirmation received on / / (date) Signature ....

1 Please prefix inspection deficiencies with 'I' and survey deficiencies with 'S'
2 For codes see reverse of copy

mca
Maritime and Coastguard Agency

REPORT OF INSPECTION* AND/OR SURVEY*
Of *United Kingdom / *Dependent Territory / *Foreign Vessel

(*delete as appropriate)

Master's Copy

2. Name of Ship: STARLIGHT RAY	6. ~~IMO No. or Call Sign or~~ Official no: C17103
9. Date of Inspection/~~Survey~~: 30/8/11	10. Place of Inspection/~~Survey~~: PETERHEAD

15. Nature of Deficiency

No:	15. (a) Code	I/S[1]	(b) Description of Deficiency	(c) Regulation references	16. Action Code[2]	Notification of Rectification of Deficiency (✓)	Date of Rectfication
17		I	Paper charts onboard dont cover area where working during guard duties				
18		I	Some Emergency lights not working (eg skippers berth, No lamp and no cover)				
19		I	Tonnage valve tight to operate (freed up Port side) S Hold side				
~~20~~ 19		I	clamping screw missing				
20		I	Chemicals stowed in ford hold not securely held in place				
21		I	Flourescent lamp fitting in winch compartment hanging by electrical cables unsecured				
22		I	Fuel for Emergency fire pump not in correct type of container (Plastic 1gallon) Also stowed in alley way between watertight doors.				
23		I	No designated storage place for emergency fire pump.				
24		I	No Guard on Refridgeration plant Drive Belts				
25		I	One section lagging missing from Main Engine Exhausts at the Turbo chargers.				

Remarks

MCA Office Address	MCA Office Stamp	
	ABERDEEN MARINE OFFICE mca Maritime and Coastguard Agency	Name [redacted] (duly au[redacted]hority)
		Signature [redacted]
		Telephone [redacted]
		Fax +44 (0)
		email mcga.gov.uk

REPORT TO SURVEYOR - The Master, Skipper or Owner is requested to confirm in writing to the MCA Office as above by / / (date) that all / item Nos .... of the outstanding requirements listed above have been met and to indicate where and when the vessel will be available for re-inspection/survey (to be deleted by surveyor if not required).

Office use only: Confirmation received on (date) Signature ....

1 Please prefix inspection deficiencies with 'I' and survey deficiencies with 'S'
2 For codes see reverse of copy

Annex I

BP’s golden rules of safety

bp's golden rules of safety

bp

BP's safety policy states no harm to people and no accidents. Everyone who works for or on behalf of BP is responsible for their safety and the safety of those around them.

The following safety rules will be strictly enforced to ensure the safety of our people and our communities.

BP's senior leadership are accountable for communicating, training, implementing, and auditing these rules to assure compliance and performance.

"These simple golden rules provide basic guidance. I ask every individual to read them and to act upon them. The safety of everyone depends on our common commitment to the highest standards of care at all times and in all circumstances."

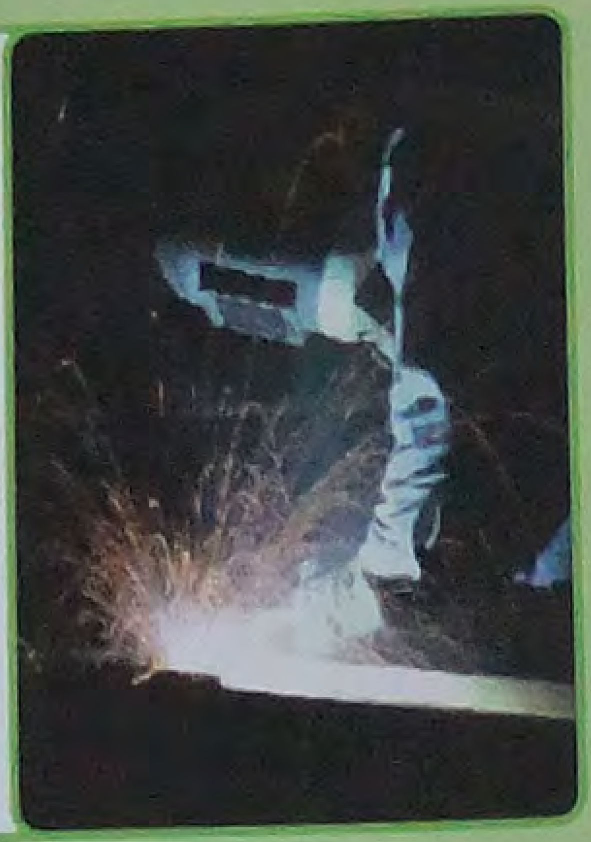
LORD JOHN BROWNE December 2001

EVERYONE has an obligation to stop work that is unsafe!

PERMIT TO WORK

Before conducting work that involves confined space entry, work on energy systems, ground disturbance in locations where buried hazards may exist, or hot work in potentially explosive environments, a permit must be obtained that:

- ✓ defines scope of work
- ✓ identifies hazards and assesses risk
- ✓ establishes control measures to eliminate or mitigate hazards
- ✓ links the work to other associated work permits or simultaneous operations
- ✓ is authorised by the responsible person(s)
- ✓ communicates above information to all involved in the work
- ✓ ensures adequate control over the return to normal operations



ENERGY ISOLATION

Any isolation of energy systems; mechanical, electrical, process, hydraulic and others, cannot proceed unless:

- ✓ the method of isolation and discharge of stored energy are agreed and executed by a competent person(s)
- ✓ any stored energy is discharged
- ✓ a system of locks and tags is utilised at isolation points
- ✓ a test is conducted to ensure the isolation is effective
- ✓ isolation effectiveness is periodically monitored

LIFTING OPERATIONS

Lifts utilizing cranes, hoists, or other mechanical lifting devices will not commence unless:

- ✓ an assessment of the lift has been completed and the lift method and equipment has been determined by a competent person(s)
- ✓ operators of powered lifting devices are trained and certified for that equipment
- ✓ rigging of the load is carried out by a competent person(s)
- ✓ lifting devices and equipment have been certified for use within the last 12 months (at a minimum)
- ✓ load does not exceed dynamic and/or static capacities of the lifting equipment
- ✓ any safety devices installed on lifting equipment are operational
- ✓ all lifting devices and equipment have been visually examined before each lift by a competent person(s)

CONFINED SPACE ENTRY

Entry into any confined space cannot proceed unless:

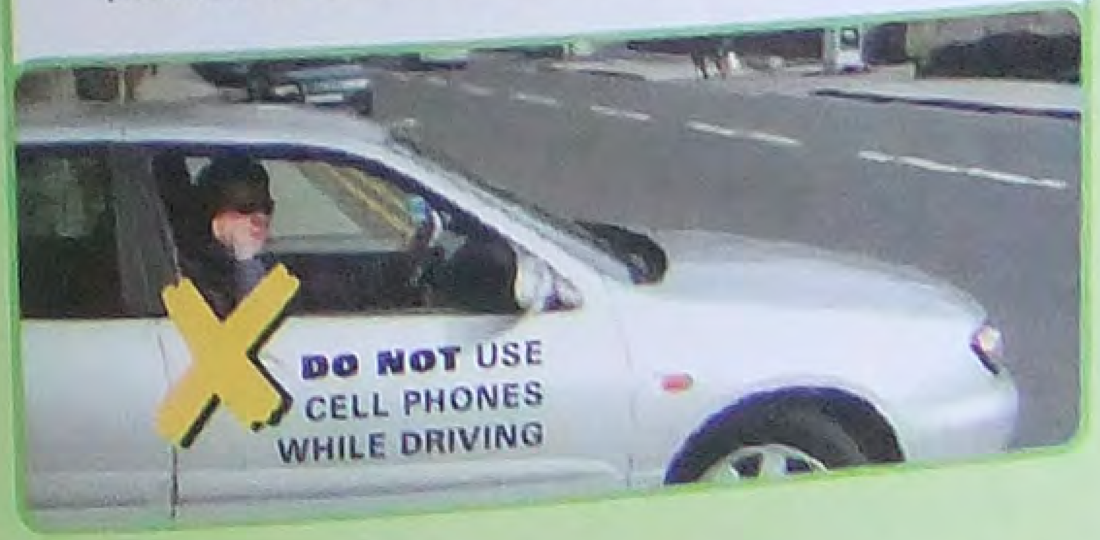
- ✓ all other options have been ruled out
- ✓ permit is issued with authorisation by a responsible person(s)
- ✓ permit is communicated to all affected personnel and posted, as required
- ✓ all persons involved are competent to do the work
- ✓ all sources of energy affecting the space have been isolated
- ✓ testing of atmospheres is conducted, verified and repeated as often as defined by the risk assessment
- ✓ stand-by person is stationed
- ✓ unauthorised entry is prevented

PHOTO COURTESY OF NL ROPE

DRIVING SAFETY

All categories of vehicle, including self-propelled mobile plant, must not be operated unless:

- ✓ vehicle is fit for purpose, inspected and confirmed to be in safe working order
- ✓ passenger number does not exceed manufacturer's design specification for the vehicle
- ✓ loads are secure and do not exceed manufacturer's design specifications or legal limits for the vehicle
- ✓ seat belts are installed and worn by all occupants
- ✓ safety helmets are worn by riders and passengers of motorcycles, bicycles, quads, snow-mobiles and similar types of vehicle
- ✓ Drivers must not be authorised to operate the vehicle unless:
  - they are trained, certified and medically fit to operate the class of vehicle
  - they are not under the influence of alcohol or drugs, and are not suffering from fatigue
  - they do not use hand-held cell phones and radios while driving (best practice is to switch off all phones and two-way radios when driving)



MANAGEMENT OF CHANGE

Work arising from temporary and permanent changes to organisation, personnel, systems, process, procedures, equipment, products, materials or substances, and laws and regulations cannot proceed unless a Management of Change process is completed, where applicable, to include:

- ✓ a risk assessment conducted by all impacted by the change
- ✓ development of a work plan that clearly specifies the timescale for the change and any control measures to be implemented regarding:
  - equipment, facilities and process
  - operations, maintenance, inspection procedures
  - training, personnel and communication
  - documentation
- ✓ authorisation of the work plan by the responsible person(s) through completion

GROUND DISTURBANCE

Work that involves a man-made cut, cavity, trench or depression in the earth's surface formed by earth removal cannot proceed unless:

- ✓ a hazard assessment of the work site is completed by the competent person(s)
- ✓ all underground hazards, ie pipelines, electric cables etc, have been identified, located and if necessary, isolated
- ✓ Where persons are to enter an excavation:
  - a confined space entry permit must be issued if the entry meets the confined space definition
  - ground movement must be controlled and collapse is prevented by systematically shoring, sloping, benching etc, as appropriate
  - ground and environmental conditions must be continuously monitored for change

WORKING AT HEIGHTS

Working at heights of 2 metres (6 ft) or higher above the ground cannot proceed unless:

- ✓ a fixed platform is used with guard or hand rails, verified by a competent person(s) or...
- ✓ fall arrest equipment is used that has:
  - a proper anchor mounted, preferably overhead
  - full body harness using double latch self locking snap hooks at each connection
  - synthetic fibre lanyards
  - shock absorber
- ✓ fall arrest equipment will limit free fall to 2 metres (6 ft) or less
- ✓ a visual inspection of the fall arrest equipment and system is completed and any equipment that is damaged or has been activated is taken out of service
- ✓ person(s) are competent to perform the work

PHOTO COURTESY OF NL ROPE

getting **HSE** right

The HSE expectations of gHSEr require regular assessment of hazards and risks and the right processes and procedures in place. The Golden Rules of Safety provide the interpretation for some of the most common risks, learning from lessons learned and providing useful guidance on some of the key expectations.

no accidents **no** harm to people **no** damage to the environment

Technip/BP Devenick QHSE Charter

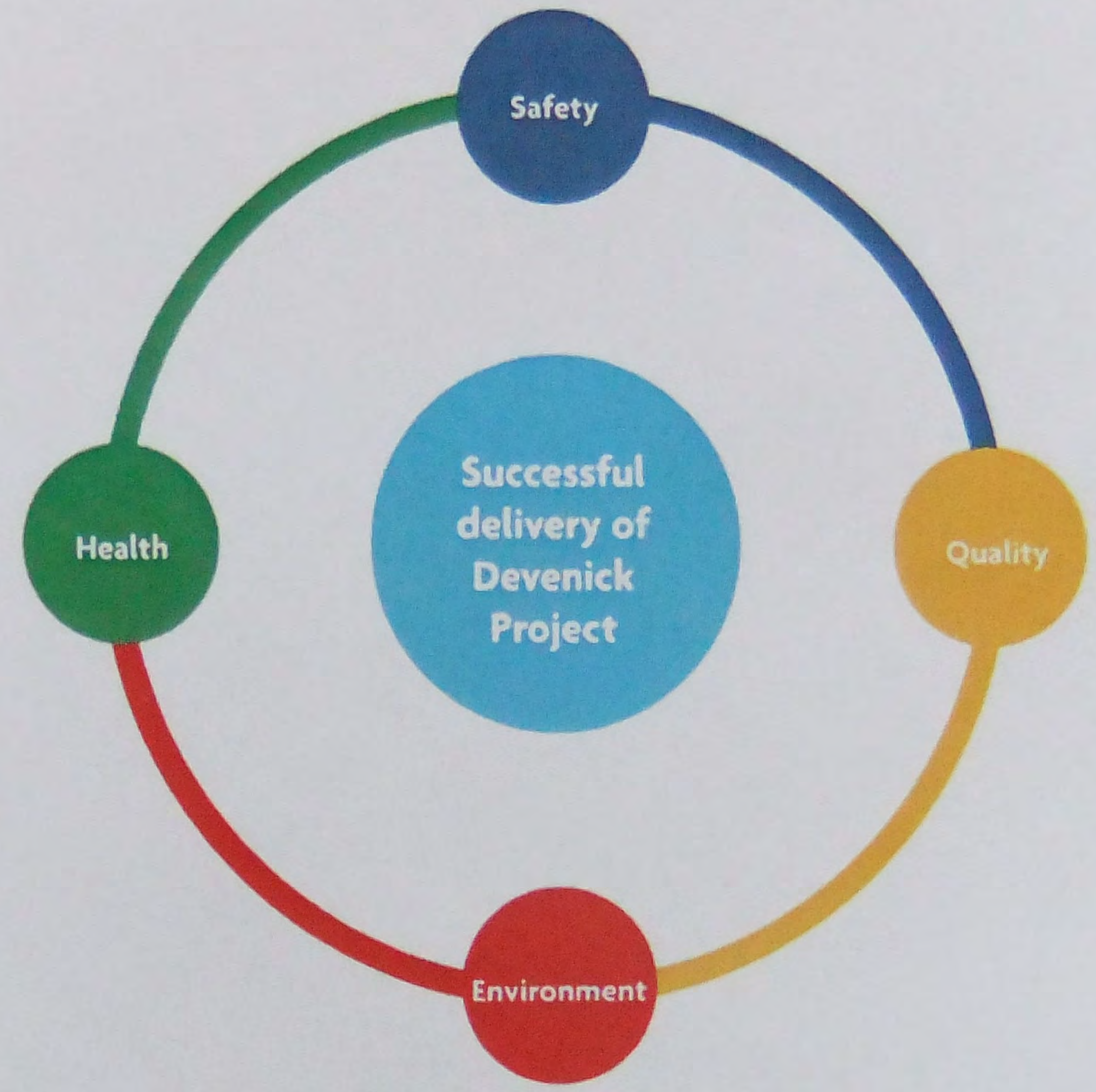
Technip

Devenick QHSE Charter

bp

TECHNIP AND BP ARE JOINTLY COMMITTED TO OPERATIONS WHERE QHSE IS A CORE VALUE:

The Health & Safety of our people is a core value and an absolute commitment



No Accidents

No Harm to People

No Damage to the Environment

MAKE IT SAFE

- Know and Follow Procedures
- Keep Worksite Tidy
- Make Safety Observations
- Share Your Knowledge

MAKE IT SAFE

- Assess & Communicate Risk
- Manage Change Effectively
- Engage with Sub-Contractors
- Follow BP Golden Rules

SUCCESS IS WHEN EVERY MEMBER OF STAFF IS ABLE TO GO HOME AT THE END OF THE WORKING DAY WITHOUT HAVING SUFFERED OR CAUSED HARM IN ANY WAY

Signed for Technip ....[redacted]........................

Signed for BP ....[redacted]........

Annex K

SFF Services Limited Guard Vessel Services terms and conditions

SFF
SERVICES
LIMITED

SFF Services Limited
24 Rubislaw Terrace
Aberdeen, AB10 1XE
Scotland UK

T: +44 (0) 1224 646966
F: +44 (0) 1224 647078
E: sff.services@sff.co.uk

www.services.sff.co.uk

Our Ref: Devenick GV 3 11/01

19/08/11

[redacted]
MV "Starlight Rays" PD230
c/o Caley Fisheries (Peterhead) Limited
11 Harbour Street
Peterhead
AB42 1DL

Dear [redacted]

PROVISION OF GUARD VESSEL SERVICES RELATIVE TO TECHNIP/BP: DEVENICK FIELD DEVELOPMENT – GUARD VESSEL 2

SFF Services Limited, whose Registered Office is at 24 Rubislaw Terrace, Aberdeen (the Company), hereby offers to take on hire from (the Owners), being the Owners or acting on behalf of the Owners of the MV "Starlight Rays" PD230, c/o Caley Fisheries (Peterhead) Limited, 11 Harbour Street, Peterhead, AB42 1DL, and that on the following Terms and Conditions:

1. The Owner shall hire the Vessel to the Company for the period from approximately **2400 hours on Tuesday 23rd August 2011** to approximately **2400 hours on Saturday 10th September 2011** (the initial hire period) or such other dates as the Company in its sole discretion may determine.

2. The Company will have the option to extend the initial hire period by a further mutually agreed period from the termination of the initial hire period on giving one day's notice of extension before the end of the initial hire period.

3. (a) The vessel shall only be used as a Guard Vessel in connection with the Subsea Operations associated with the Devenick Field Development and shall be stationed at the following location. The Hire Contract should be read in conjunction with the Project Documents and with SFF Services' Guard Vessel Operational Procedures Manual:

Protection Location(s): To provide protection for the Devenick Crossings and a section of the 34 km of vulnerable pipeline being laid between the East Brae Platform and the Devenick Manifold and Wells:

58 deg 59.90 min N, 001 deg 32.70 min E - Crossing Point 3
59 deg 02.00 min N, 001 deg 33.00 min E - Crossing Point 2
59 deg 04.60 min N, 001 deg 33.50 min E - Crossing Point 1

59 deg 10.119 min N, 001 deg 35.918 min E – Devenick Manifold

58 deg 52.534 min N, 001 deg 31.526 min E - East Brae Platform

58 deg 58.10 min N, 001 deg 32.40 min E - Temporary Pipeline Lay Down Head (as at 27.07.11)

59 deg 09.725 min N, 001 deg 36.987 min E – Well S2 (Drilling Rig "PBLJ" currently on site)
59 deg 10.577 min N, 001 deg 37.067 min E – Well S1 & Wellhead protection structure

(b) For the avoidance of doubt during the initial hire period or any extension thereof the initial hire period of any extension thereof the vessel shall not be used for fishing operations.

4. The Master of the Vessel will have the following duties:

(a) To contact all shipping approaching the location to ensure that vessels do so in a safe manner.
(b) To monitor vessels' approach to that location both visually and by radar.
(c) To liaise with vessels carrying out pipelay and installation activity.
(d) To take all reasonable steps to protect the equipment at the location, most particularly from Fishing Activity

Annex L

MAIB Safety Flyer to the fishing industry

MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

FLYER TO THE FISHING INDUSTRY

Fatal accident to a crewman while operating a petrol engine-driven pump in a fishing vessel's fish hold

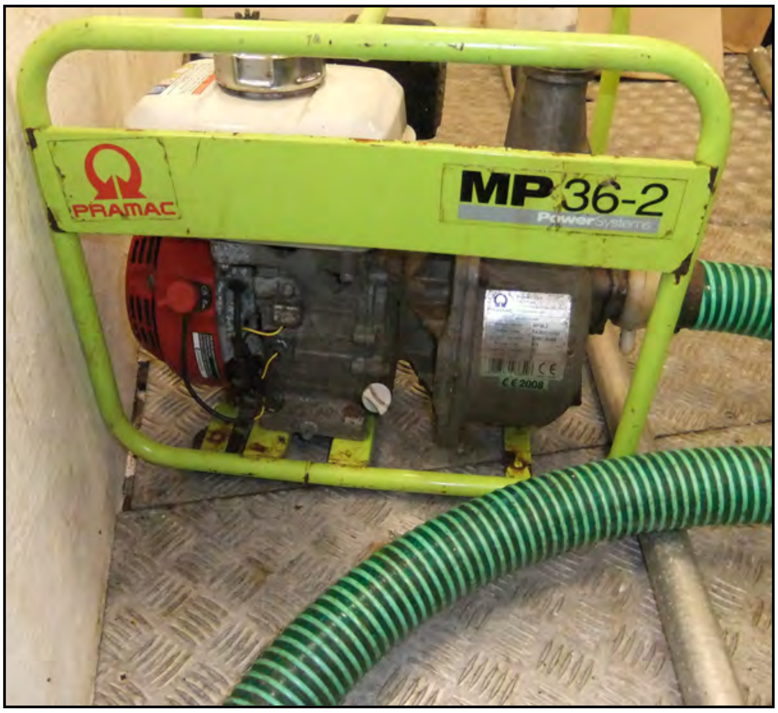


Figure 1: The petrol engine-driven salvage pump

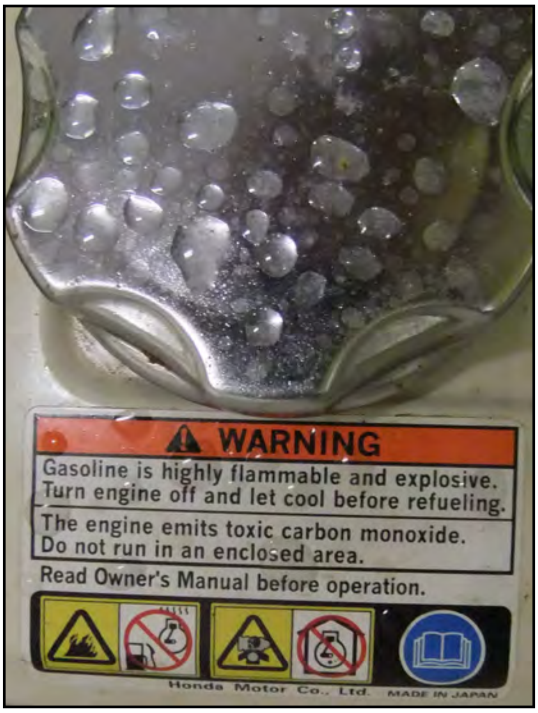


Figure 2: Warning notice on pump

Background

One crewman died and two more crewmen required evacuation to hospital by helicopter for medical treatment when they were poisoned by carbon monoxide on board a 23m fishing vessel, which was acting as a guard vessel, more than 100 nautical miles from land.

Two crewmen took a petrol engine-driven salvage pump **(Figure 1)** into the fish hold to pump oily water from the bow thruster space overboard. One of the crewmen started the engine, but the pump would not prime; he persevered for over an hour to get the pump to work, and the engine was running for most of this time.

The fish hold had no forced ventilation system and the hatches, except for a small access hatch, were closed. The pump was labelled *'The engine emits toxic carbon monoxide. Do not use in an enclosed space'* **(Figure 2)**.

Analysis

The petrol engine produced poisonous carbon monoxide that built up to fatal levels in the unventilated fish hold. The first crewman continued to work in the fish hold space, close to the engine for enough time for him to be overcome by the poisonous gas.

As the fishing vessel did not have a gas monitor on board, the crew were not able to check whether the fish hold was safe to enter, and they had no breathing apparatus to allow them to enter the toxic atmosphere safely. Consequently, the three remaining crewmen risked their lives in their attempt to rescue the collapsed crewman.

Safety lessons

Before using petrol or diesel-driven portable pumps, owners, skippers and crewmen working on fishing vessels should ensure that:

- The pumps are not used in enclosed spaces, such as fish holds, unless the engine exhaust is vented to fresh air outside the space.
- They fully understand the risks of carbon monoxide poisoning.
- They think about the risks involved and ensure that the potential hazards are removed or any adverse effects are reduced.
- They consider how to rescue safely a crewman who has collapsed in the toxic atmosphere of an enclosed space.

This flyer and the MAIB's investigation report are posted on our website:

www.maib.gov.uk

For all other enquiries:

Marine Accident Investigation Branch
Mountbatten House
Grosvenor Square
Southampton
SO15 2JU

Tel: 023 8039 5500
Fax: 023 8023 2459
Email: maib@dft.gsi.gov.uk

Marine Accident Investigation Branch
June 2012