Chapter 8

SHIP'S EQUIPMENT

This Chapter describes equipment that is provided on board tanker for fire-fighting purposes, for gas measurement and for lifting operations. Reference is also made to the need for testing and maintenance procedures for this equipment.

8.1 Shipboard Fire-Fighting Equipment

8.1.1 General

The requirements for tankers' fire-fighting equipment are laid down by the regulations of the particular country in which the tanker is registered.

The theory of fire-fighting and the types of fire that may be encountered are discussed in Chapter 5.

8.1.2 Tanker Fixed Fire-Fighting Installations - Cooling

All tankers are provided with a water fire-fighting system consisting of pumps with a permanent underwater connection, a fire-main with hydrant points, fire hoses complete with couplings, and jet nozzles or, preferably, jet/spray nozzles. A sufficient number of hydrants are provided and located so as to ensure that two jets of water can reach any part of the tanker.

In cold weather, the freezing of fire-mains and hydrants should be prevented by continuously bleeding water overboard from hydrants at the extreme end of each fire-main. Alternatively, all low points of the fire-main may be kept drained.

8.1.3 Tanker Fixed Fire-Fighting Installations - Smothering

One or more of the different smothering systems listed below may be installed on board tankers. (See also Section 5.3.)

8.1.3.1 Carbon Dioxide Flooding System

This system is designed to fight fires in the engine room, boiler room and pumproom. The system normally consists of a battery of large carbon dioxide cylinders. The carbon dioxide is piped from the cylinder manifold to suitable points having diffusing nozzles. An alarm should be activated in the compartment before the carbon dioxide is released to give personnel time to evacuate the compartment.

8.1.3.2 Foam Systems

Foam systems are used for fighting fire in the cargo spaces, on the cargo deck, in the pumproom or in the engine spaces. A foam system has storage tanks containing foam concentrate. Water from the fire pumps picks up the correct proportion of foam concentrate from the tank through a proportioner and the foam solution is then conveyed through permanent supply lines to offtake points, fixed foam monitors or, in the case of engine room installations, to fixed dispersal nozzles.

8.1.3.3 Water Fog

A water fog system consists of high pressure water lines and special fog nozzles. A ring of nozzles around the inside of the tank opening effectively blankets a cargo tank hatch fire. Some tankers are also fitted with fixed pressurised water fog systems for protecting specific parts of the engine room, such as oil fuel treatment spaces, boiler firing platforms, small machinery spaces and pumprooms.

8.1.3.4 Water Curtain

Some tankers have a fixed system to give a protective water curtain between the cargo deck and the superstructure.

8.1.3.5 Inert Gas System

The purpose of an inert gas system is to prevent cargo tank fires or explosions. It is not a fixed fire-fighting installation but, in the event of a fire, the system may be of assistance in controlling the fire and preventing explosions.

8.1.4 Portable Fire Extinguishers

All tankers are provided with a range of portable fire extinguishers to meet the requirements of the respective legislation.

All fire extinguishers should at all times be in good order and available for immediate use.. As a minimum, all fire extinguishers should be formally checked for proper location, charging pressure and condition annually.

Consideration should be given to providing portable extinguishers, suitable for use on Class A fires (see Section 5.2.1), and dedicated to deployment at the tanker’s manifold when in port.

8.1.4.1 Types of Portable Fire Extinguisher

In addition to fire hose reels for water extinguishing of Class A type fires involving combustible materials, such as wood, paper and fabrics, all tankers are provided with a range of portable fire extinguishers. Table 8.1 provides an overview of the types of extinguisher likely to be found on board a tanker and their uses. Class D type fires are included mainly for completeness. (See Section 5.2 for information on the Classification of Fires.)

Type of Fire	Class A	Class B	Class C	Class D	Class F	
Fire Extinguishing Medium	Fires Involving Solid Materials (e.g. wood, paper, fabrics)	Fires Involving Liquids or Liquefiable Solids	Fires Involving Gases	Fires Involving Metals (e.g. magne-sium, titanium, potassium and sodium)	Fires Involving Cooking Media in Cooking Ap-pliances	Electrical Equipment Fires
Water/Hose Reels	✓					
Water with Additive	✓					
Spray Foam	✓	✓				
Dry Chemical	✓	✓	✓			✓
CO_2 Gas		✓				✓
Wet Chemical	✓				✓	
Fire Blanket					✓	
Designed to match a particular type of fire				✓		

Table 8.1 - Portable fire extinguishing media and their uses

8.2 Gas Testing Equipment

8.2.1 Introduction

This Section provides operational guidance on the use of the gas measuring instruments described in Section 2.4.

The safe management of operations on board tankers is often dependent upon the crew's ability to determine the composition of the ambient atmosphere or the atmosphere in an enclosed space.

Tanker crews need to measure the oxygen, flammable and toxic gas concentrations in an atmosphere. This will enable them to detect the presence of any explosive mixtures, toxic vapours or oxygen deficiency that may present a risk of explosion or hazard to personnel.

On tankers fitted with an inert gas system, there is the additional need to measure the oxygen content of inert gas as part of the safe management of cargo tank atmospheres.

8.2.2 Summary of Gas Testing Tasks

8.2.2.1 Atmosphere Monitoring

The external atmosphere should be monitored for:

- Flammable vapour when undertaking Hot Work. (See part 9.4 for important restrictions on performing Hot Work.) This is achieved by using a flammable gas indicator, capable of measuring gas to the Lower Explosive Limit (LEL) and with the scale graduated as a percentage of this limit.
- Toxic vapours when loading cargoes containing toxic components and when undertaking gas freeing operations following the carriage of such cargoes. This is achieved by using an instrument capable of measuring concentrations of toxic gases in the human toxicity range, usually calibrated in parts per million.

8.2.2.2 Enclosed Space Monitoring

Prior to permitting entry into an enclosed space, measurements must be taken to detect the presence of hydrocarbon gas, to confirm normal oxygen levels and, if applicable, to detect the presence of any toxic vapours. (For a full description of the tests required prior to entering an enclosed space, reference should be made to Section 10.3.)

Measurement to ensure that the atmosphere is free of harmful hydrocarbon vapour is undertaken using a flammable gas indicator capable of measuring gas to the Lower Explosive Limit (LEL) and with the scale graduated as a percentage of this limit (% LEL).

An oxygen analyser is used to determine that the normal level of oxygen in air of 20.9% by volume is present.

Where toxic vapour may be present in the space to be entered, the atmosphere should also be tested with an instrument capable of measuring concentrations of toxic gases in the human toxicity range, usually calibrated in parts per million.

8.2.2.3 Inert Gas Atmosphere Management

Tankers fitted with an inert gas system should be equipped with an oxygen analyser for determining the quality of the inert gas and for measuring the levels of oxygen in the cargo tanks.

A gas indicator capable of measuring the percentage of flammable gas by volume (% Vol) in an inerted atmosphere is also required for safe management of operations that include the purging and gas freeing of cargo tanks.

8.2.3 The Provision of Gas Measuring Instruments

It is recommended that a tanker carrying cargoes that are likely to emit a toxic or flammable gas, or to cause oxygen depletion in a cargo space, be provided with an appropriate instrument for measuring the concentration of gas or oxygen in the air, together with detailed instructions for its use.

Implicit in the above recommendation is the requirement that the tanker operator provides the correct instrument for each gas test required. It should be noted that the different gas testing functions can be incorporated into a multi-function gas measuring instrument.

The gas measurement instrumentation on board a tanker should form a comprehensive and integrated system that addresses all the necessary applications identified by the operator. The instruments should be fit for the task to which they are applied and users should be made aware of the particular applications and limitations of each instrument.

Users of gas measuring instruments should be trained in the proper use of the equipment, to a level suited to their work duties.

8.2.4 Alarm Functions on Gas Measuring Instruments

Alarms should only be fitted to instruments that are to be used where an audible warning is necessary, such as a personal gas alarm monitor. Analytical instruments that are used to provide numerical values for gases and vapours for dangerous space entry certification do not need to have an alarm function.

Instruments with an alarm capability should be designed so that the alarm inhibit and activate function cannot be changed by the instrument operator. This is to avoid the possibility of inappropriate or accidental inhibition of the alarm function.

The use of different instruments for testing atmospheres for entry certification, and for monitoring atmospheres with a personal monitor during the entry operation, reduces the probability of an accident due to an instrument malfunction. It is therefore recommended that the testing instrument is not also used as the personal alarm instrument during the entry operation.

8.2.5 Sampling Lines

If fitted, sampling lines should be suitable for the intended service and be impervious to the gases present in the atmospheres being monitored. They should also be resistant to the effects of hot wash water.

8.2.6 Calibration

Calibration should not be confused with operational testing (see Section 8.2.7 below).

The accuracy of measurement equipment should be in accordance with the manufacturer's stated standards. Equipment should, on initial supply, have a calibration certificate, traceable where possible to internationally recognised standards. Thereafter, procedures for management of the calibration certification process should form part of the on board Safety Management System. These procedures may include on board calibration in line with the manufacturer's guidelines and/or equipment being periodically landed to a recognised testing facility for calibration, either on a timed basis, or during the tanker's refit, or when the accuracy of the equipment is considered to be outside the manufacturer's stated accuracy.

Calibration certificates, showing the instrument's serial number, the calibration date and the calibration gas or the method of calibration used, together with reference to applicable standards, should be provided for retention on board.

Instruments are typically calibrated using a calibration gas consistent with the use of the instrument, such as propane or butane. The calibration gas used should be marked on the instrument

The use of an inappropriate gas for calibration could result in erroneous readings during operation, even though the instrument appears to be operating correctly.

Instruments should only be dismantled by persons who are qualified and certified to carry out such work.

8.2.7 Operational Testing and Inspection

Gas measuring instruments should be tested in accordance with the manufacturer's instructions before the commencement of operations requiring their use. Such tests are designed only to ensure that the instrument is working properly. They should not be confused with calibration (see Section 8.2.6 above).

Instruments should only be used if the tests indicate that the instrument is giving accurate readings and that alarms, if fitted, are operating at the pre-determined set points.

Physical checks should include (if applicable):

- Hand pump.
- Extension tubes.
- Tightness of connections.
- Batteries.
- Housing and case.

Instruments not passing these operational tests should be re-calibrated before they are returned to operational use. If this is not possible, they should be removed from service and clearly labelled to denote that they are not to be used.

During operations, it is important to check the instrument and sample lines for leakage occasionally, since the ingress of air will dilute the sample and give false readings. Leak testing may be carried out by pinching the end of the sample line and squeezing the aspirator bulb. The bulb should not expand as long as the sample line is pinched.

During extended operations, the tanker operator should determine the frequency at which operational checks should be made. The results of the tests and inspections should be recorded.

These procedures should be documented in the Safety Management System (see Section 9.2).

8.2.8 Disposable Personal Gas Monitors

Disposable personal gas monitors should be periodically tested in accordance with the manufacturer's recommendations to confirm that they are operating correctly.

Disposable gas detection monitors, which cannot be re-calibrated, should be safely disposed of when the calibration expiry date is reached. For this reason, it is important to record the date when disposable instruments are first commissioned in order to establish their expiry date.

8.3 Lifting Equipment

8.3.1 Inspection and Maintenance

All shipboard lifting equipment, such as is used for the handling of cargo transfer equipment and/or gangways, should be examined at intervals not exceeding one year and load tested at least every 5 years unless local, national or company regulations require more frequent examinations.

Lifting equipment includes:

- Cargo hose handling cranes, derricks, davits and gantries.
- Gangways and associated cranes and davits.
- Store cranes and davits.
- Chain blocks, hand winches and similar mechanical devices.
- Personnel lifts and hoists.
- Strops, slings, chains and other ancillary equipment.

All equipment should be tested by suitably qualified individuals or authorities and be clearly marked with its Safe Working Load (SWL), serial number and test date.

The tanker should ensure that all maintenance of lifting equipment is carried out in accordance with manufacturer's guidelines. Routine checks should be included within the tanker's planned maintenance system.

All records of tests and inspections should be recorded in the ship's Lifting Equipment Register. These records should be available for inspection by Terminal Representatives when their personnel are involved in lifting operations using tanker's equipment.

8.3.2 Training

Lifting equipment should only be operated by personnel who are trained and proven to be competent in its operation.