

## Chapter 9

# MANAGEMENT OF SAFETY AND EMERGENCIES

The participants in the carriage of dangerous goods shall take appropriate measures according to the nature and the extent of foreseeable dangers, so as to avoid damage or injury and, if necessary, to minimise their effects. To control health and safety aspects associated with the handling of dangerous goods, it is recommended that a safety management system is in place aimed at minimising related risks. For the transport of dangerous goods by inland waterways, the ISM Code for seagoing vessels may be used as an example should there be no equivalent Code addressing inland waterway transportation. This Chapter provides guidance on safety management systems and introduces a risk based approach to the planning and execution of hazardous work

Guidance is given on risk assessment and risk management processes and information is provided on the practical application of these processes with regard to the management of Hot Work and other hazardous tasks on board.

Safety on board tankers also extends to the activities of contractors and repair teams working on board. Issues relating to the safe management of contractors and repair work outside a shipyard are addressed.

Finally, advice is provided on the emergency management structure and organisation to facilitate effective responses to shipboard emergencies.

### 9.1 The International Safety Management (ISM) Code

All tankers, as defined in the SOLAS and MARPOL Conventions, of 500 gross tonnage and over, are required to comply with the International Safety Management (ISM) Code. Tankers to which the Code does not apply are encouraged to develop a management system that provides an equivalent standard of safe operations.

Under the ISM Code, safety management processes are based on risk assessments and risk management techniques. This is a significantly different approach from the strictly compliance based requirements previously observed.

The purpose of the ISM Code is to provide an international standard for the safe management and operation of tankers and for pollution prevention.

The Code requires that tanker operators should:

- Provide for safe practices in tanker operation and a safe working environment.
- Establish safeguards against all identified risks.
- Continuously improve the safety management skills of personnel ashore and aboard tankers, including preparing for emergencies related to safety and environmental protection.

The Code defines a tanker operating company, and requires the Company to develop a Safety Management System (SMS), which should include certain functional requirements - particularly "instructions and procedures to ensure safe operation of tankers and protection of the environment".

The ISM Code is not prescriptive with regard to how a tanker is managed. It is left to the Company to develop the SMS elements suitable to the operation of a specific tanker.

In developing their SMS, Companies are encouraged to take into account applicable industry publications and guidelines.

The SMS should identify that cargo loading and discharge operations, including those related to dangerous goods, should be included within the scope of the Company's documentation.

## 9.2 Safety Management Systems

The Safety Management System (SMS) enables effective implementation of the Company's health, safety and environmental protection policy. The SMS is subjected to regular audit to verify its suitability, to confirm that it is effective and that stated procedures are being followed.

Although a range of safety management topics is specified in the Code, the Company should develop the content and form of its SMS. The SMS must demonstrate that acceptable levels of safety management are in place to protect the tanker, personnel and the marine environment.

To deliver the required levels of safety, the SMS will need to address all activities undertaken in the operation of the tanker together with possible situations that may arise which would affect the safety of the tanker or its operation.

These activities and situations will involve varying degrees of hazard to the tanker, its personnel and the environment. Careful assessment of these hazards, and the probability of their occurrence, will determine the severity of the risks involved. Risk management tools are then applied to accomplish safe completion of the work, to ensure compliance with the SMS and to provide the objective evidence needed for verification, such as:

- Documented policies, procedures and instructions.
- Documentation of the verification carried out by the Responsible Person of day to day operation, when relevant to ensure compliance.

The end result of an effective Safety Management System is a safe system of work.

## 9.2.1 Risk Assessment

A risk assessment should entail a careful examination of what, in the range of operations, could cause harm, with a view to deciding whether the precautions are adequate, or whether more should be done to minimise accidents and ill health on board a tanker.

The risk assessment should first establish the hazards that are present at the place of work and then identify the significant risks arising out of the work activity. The assessment should take into account any existing precautions to control the risk, such as permits to work, restricted access, use of warning signs, agreed procedures and personal protective equipment. The type of questions that should be answered when carrying out a risk assessment are as follows:

### **What can go wrong?**

An identification of the hazards and accident scenarios, together with potential causes and outcomes.

### **How bad and how likely?**

An evaluation of the risk factors.

### **Can matters be improved?**

An identification of risk control options to reduce the identified risks.

### **What is the effort involved and how much better would the result be?**

A determination of the benefit and effectiveness of each risk control option.

### **What action should be taken?**

An identification of the appropriate course of action to deliver a safe activity based on the hazards, their associated risks and the effectiveness of alternative risk control options.

In summary, the risk assessment should ensure that protective and precautionary measures are taken which will reduce the risks associated with a task to a level that is considered to be as low as reasonably practicable (ALARP).

## 9.3 Permit to Work Systems

### 9.3.1 General

While companies will develop their own procedures for managing all aspects of operations and tasks undertaken, many operators choose to incorporate a Permit to Work system into their SMS in order to manage hazardous tasks.

A Permit to Work system is a formal written system that is used to control certain types of work. It delivers a risk based approach to safety management and requires personnel to undertake and record risk assessments in the development of a safe system of work.

Guidance for establishing a Permit to Work system is contained in a number of publications issued by industry organisations and national safety bodies.

The Permit to Work system may include one or more of the following documents to control hazardous activities:

- A work instruction.
- A maintenance procedure.
- A local procedure.
- An operational procedure.
- A check-list.
- A permit.

The measures to be employed when carrying out a particular task are determined by a risk assessment and recorded in the Permit to Work.

### 9.3.2 Permit to Work Systems - Structure

The structure of the system and the processes employed are very important in ensuring that the system delivers the necessary level of safety and operational integrity.

The Permit to Work system should define:

- Company responsibility.
- Responsibilities for all personnel operating the system.
- Training in the use of the system.
- A measure of the competency of personnel.
- Types of permit and their application.
- Levels of authority.
- Isolation processes.
- Permit issuing procedures.
- Permit cancelling procedures.
- Emergency actions.
- Record keeping.
- Auditing.
- System updating.

The system will determine the appropriate controls needed to manage the risk associated with each task and determine the appropriate management tool needed to manage the task, as listed in Section 9.3.1 above.

The system need not require that all tasks be undertaken under the control of a formal permit. However, it is important that the work instruction, procedure or permit used for managing a task is appropriate to the work being carried out and that the process is effective in identifying and managing the risks.

### 9.3.3 Permit to Work Systems - Principles of Operation

A Permit to Work system should comprise the following steps:

- Identify the task and location.
- Identify the hazards and assess the risks.
- Ensure appropriate competency of personnel who will carry out the work.
- Define the risk control measures - state the precautions and personal protective equipment needed.
- Determine communication procedures.
- Identify a procedure and initiate a Permit to Work.
- Obtain formal approval to perform the work.
- Carry out a pre-work briefing.
- Prepare the work.
- Carry out the work to completion.
- Return work site to a safe condition.
- Complete the process, keeping records for audit purposes.

### 9.3.4 Permit to Work Forms

The Permit to Work form is designed to lead the operator through an appropriate process in a logical, detailed and responsible manner. The permit is produced as a joint effort between those authorising the work and those performing the work. The permit should ensure that all safety concerns are fully addressed.

The structure and content of Permit to Work forms will be determined by the specific individual requirement of a tanker's SMS, but are typically as follows:

- Type of permit.
- Number of permit.
- Supporting documents - e.g. details of isolations, gas test results.
- Location of work.
- Description of work.
- Hazard identification.
- Precautions necessary.
- Protective equipment to be used.
- Period of validity.
- Authorisation for the work including duration, endorsement by the Master or department head.
- Acceptance by those performing the work.
- Management of changes to workforce or conditions.
- Declaration of completion.
- Cancellation.

The issue of a permit does not, by itself, make a job safe.

Adherence to the requirements of the permit, and the identification of any deviations from the specified controls or expected conditions, are essential in completing the task safely. The system should also identify any conflicts between tasks being carried out simultaneously on board.

### 9.3.5 Work Planning Meetings

Work planning meetings should be held to ensure that operations and maintenance tasks are correctly planned and managed with the aim of completing all tasks safely and efficiently. These meetings may include discussion of:

- Risk assessments.
- Work permits.
- Isolation and tagging requirements.
- The need for safety briefings, tool box talks and correct procedures.

The format and frequency of work planning meetings should be in accordance with the requirements of the company's SMS, and will be determined by the tanker's activities.

It may be appropriate to have two levels of meetings - one on a management level and one that addresses the practical issues associated with carrying out specific tasks.

## 9.4 Hot Work

**Warning!** The following sections regarding Hot Work do not replace any legal obligations to perform Hot Work under the supervision and/or official approval of a competent authority. Authorities may mandate on-site gas-free inspections before any Hot Work is undertaken by an Authority Accredited Surveyor. It is best practise to use an Authority Accredited Surveyor for on-site gas-free inspections before any Hot Work is performed.

There have been a number of fires and explosions due to Hot Work in, on, or near cargo tanks or other spaces that contain, or that have previously contained, flammable substances or substances that emit flammable vapours.

### 9.4.1 Control of Hot Work

The SMS should include adequate guidance on the control of Hot Work and should be robust enough to ensure compliance (see Figure 9.2). Absence of guidance should be regarded as prohibition rather than approval.

### 9.4.2 Hot Work Inside a Designated Space

Whenever possible, a space such as the engine room workshop, where conditions are deemed safe, should be designated for Hot Work and first consideration should be given to performing any Hot Work in that space.

If the company designates such a place, it should be assessed for possible risks, and the conditions under which Hot Work can be undertaken in that place defined.

These conditions should include the need for additional controls, including consideration of the conditions under which Hot Work may be carried out in the designated space, when taking bunkers alongside or at anchor.

### 9.4.3 Hot Work Outside a Designated Space

#### 9.4.3.1 General

Hot Work undertaken outside the designated space should be controlled under the SMS by means of a permit to work system.

The Master should decide whether the use of Hot Work is justified and whether it can be safely undertaken. The Master or Responsible Officer must approve the completed permit before any Hot Work can begin.

Consideration should be given to performing only one Hot Work operation at a time, due to the resource limitations usually present on board a tanker. A separate permit should be approved for each intended task and location.

A risk assessment should be carried out to identify the hazards and assess the risks involved. This will result in a number of risk reduction measures that will need to be taken to allow the task to be carried out safely.

The risk assessment should identify hazards associated with the risks to fire watch personnel and their means of evacuation in an emergency. The risk assessment should also include additional personal protective equipment required to ensure risk levels are acceptable.

A written plan for undertaking the work should be completed, discussed and agreed by all who have responsibilities in connection with the work.

This plan should define the preparations needed before work commences, the procedures for actually carrying out the work and the related safety precautions. The plan should also indicate the person authorising the work and the people responsible for carrying out the specified work, including contractors if appropriate. (See also Section 9.7.)

A Responsible Officer, who is not directly involved in the Hot Work, should be designated to ensure that the plan is followed.

The Hot Work permit should be issued immediately before the work is to be performed. In the event of a delay to the start of the work, all safety measures should be re-checked and recorded before work actually commences.

If the conditions under which the permit has been issued should change, Hot Work must stop immediately. The permit should be withdrawn or cancelled until all conditions and safety precautions have been checked and reinstated to allow the permit to be reissued or re-approved.

The work area should be carefully prepared and isolated before Hot Work commences.

Fire safety precautions and fire extinguishing measures should be reviewed. Adequate fire-fighting equipment must be prepared, laid out and be ready for immediate use.

Fire watch procedures must be established for the area of Hot Work and for adjacent spaces where the transfer of heat or accidental damage might create a hazard, e.g. damage to hydraulic lines, electrical cables, thermal oil lines etc. The fire watch should monitor the work and take action in case of ignition of residues or paint coatings. Effective means of containing and extinguishing welding sparks and molten slag must be established.

The atmosphere of the area should be tested and found to be less than 1% LEL.

The work area must be adequately and continuously ventilated and the frequency of atmosphere monitoring must be established. Times of atmosphere monitoring and results should be recorded on the Hot Work permit.

If it is necessary to carry out Hot Work in a dangerous or hazardous area the guidance given in Section 9.4.4 should also be followed.

When alongside a terminal, Hot Work should only be permitted in accordance with prevailing national or international regulations, port and terminal requirements and after all necessary approvals have been obtained.

Isolation of the work area and fire safety precautions should be continued until the risk of fire no longer exists.

Personnel carrying out the work should be adequately trained and have the competency required to carry it out safely and effectively.

A flow chart for guidance is shown in Figure 9.1. The flow chart assumes the work is considered essential for safety or the immediate operational capability of the tanker, and that it cannot be deferred until the next planned visit to a repair yard.

Figure 9.2 depicts how guidance for Hot Work on an inerted tanker may be presented within the SMS. This is provided as an example for operators to tailor to their own requirement.

#### 9.4.3.2 Hot Work in a Gas Safe Area

A dedicated area outside the engine room, for example on the poop behind the accommodation and well clear of any oil tank vents, may be considered for Hot Work. Such an area should be marked accordingly. Any work intended at this location should be subject to a full risk assessment and the precautions set out in Section 9.4.3.1 should be taken.

#### 9.4.3.3 Hot Work Inside the Machinery Space

Hot Work inside the main machinery space, when associated with fuel tanks and fuel pipelines, must take into account the possible presence of hydrocarbon vapours in the atmosphere and the existence of potential ignition sources.

No Hot Work should be carried out on bulkheads of bunker tanks, or within 500 mm of such bulkheads, unless that tank is cleaned to Hot Work standard.

## 9.4.4 Hot Work in Dangerous or Hazardous Areas

### 9.4.4.1 General

Dangerous or hazardous areas are locations on board or within the terminal where an explosive atmosphere could be present, as defined in Section 4.4.2. For tankers, this effectively means an area slightly larger than the cargo tank deck, which includes cargo tanks and pumprooms, and the atmospheric space around and above them. No Hot Work should be undertaken in a dangerous or hazardous area until it has been made safe, and has been proved to be safe, and all appropriate approvals have been obtained.

Any Hot Work in a dangerous or hazardous area should be subject to a full risk assessment, and the guidance in Section 9.4.3 should also be followed. Account must be taken of the possible presence of hydrocarbon vapours in the atmosphere and the existence of potential ignition sources.

Hot Work in dangerous or hazardous areas should only be carried out when the tanker is in ballast. Hot Work should be prohibited during cargo or ballast operations, and when tank cleaning, gas freeing, purging or inerting. If Hot Work needs to be interrupted to carry out any of these operations, the permit should be withdrawn or cancelled. On completion of the operation, all safety checks should be carried out once more and the permit re-approved or a new procedure developed.

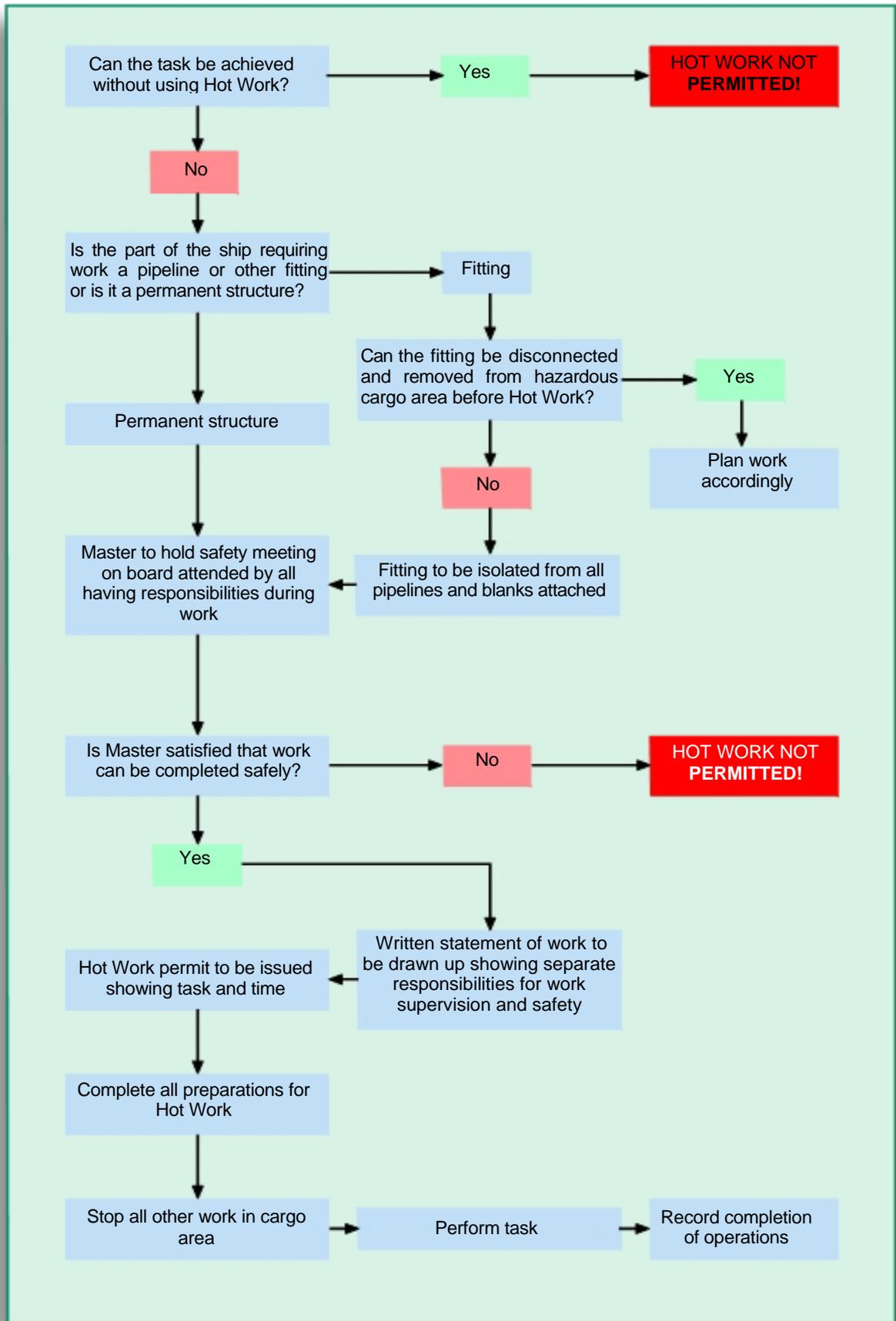


Figure 9.1 - Hot work flow chart

Work Location Minimum Requirements	Engine room workshop	Other parts of non-hazardous area	Open deck aft of accommodation	Enclosed spaces (other than pumprooms)	Main deck (deck plating)	Work on fixtures/fittings in the main deck area	Work on any cargo-related pipelines incl. heating coils in a cargo tank	Cargo pumprooms	Cargo or ballast tanks
Work planning meeting to be held and risk assessment completed	✓	✓	✓	✓	✓	✓	✓	✓	✓
Work in designated space with shield or curtain erected	✓								
Adequate ventilation	✓	✓		✓			✓	✓	✓
Confirmation from Master or designate that work is OK to proceed	✓								
Tank atmosphere checks carried out and entry permit issued				✓			✓		✓
Tank to be washed and gas freed					✓		✓		✓
Cargo tanks to be purged and inerted to not more than 8% O <sub>2</sub> and not more than 2% HC					✓		✓	✓	✓
Work to be carried out further than 500 mm from the tank deck or bulkheads				✓		✓		✓	
Work to be carried out more than 500 mm from a fuel oil tank deck or bulkheads			✓	✓		✓		✓	
Local cleaning to be carried out as per requirements				✓			✓	✓	✓
All interconnecting pipelines flushed and drained							✓	✓	✓
Tank valves isolated							✓	✓	✓
Hot Work permit to be issued on board		✓							
Hot Work permit issued in agreement with Company			✓	✓	✓	✓	✓	✓	✓
Hot Work permit approved by Master or Responsible Officer		✓	✓	✓	✓	✓	✓	✓	✓

Figure 9.2 - Example of SMS guidance for Hot Work on an inerted tanker

Where Hot Work involves entry into an enclosed space, the procedures outlined in Chapter 10 for enclosed space entry should be followed. A compartment in which Hot Work is to be undertaken should be cleaned and ventilated. Particular attention should also be given to the condition of any adjacent spaces.

Adjacent fuel oil bunker tanks may be considered safe if tests give readings of less than 1% LEL in the vapour space of the bunker tank. No Hot Work should be carried out on bulkheads of bunker tanks, or within 500 mm from such bulkheads, unless that tank has been cleaned for Hot Work.

Adjacent ballast tanks and compartments, other than cargo tanks, should be checked to ensure they are gas free and safe for Hot Work. If adjacent ballast tanks and compartments are found to contain hydrocarbon liquid or vapours, they should be cleaned and gas freed or inerted.

#### 9.4.4.2 Hot Work in Cargo Tanks

To clean the work area, all sludge, cargo-impregnated scale, sediment or other material likely to give off flammable vapour should be removed. The extent of the cleaned area should be established following a risk assessment of the particular work to be carried out. Special attention must be given to the reverse side of frames and bulkheads. Other areas that may be affected by the Hot Work, such as the area immediately below the work location, should also be cleaned.

Table 9.1 provides guidance on the safe distance for areas to be cleaned and represents minimum requirements that may need to be extended, based on the output of the risk assessment. Cleaning distances are based on the type of work being carried out and the height above the tank bottom.

Consideration should be given to using fire resistant blankets or putting a water bottom in the tank to prevent falling sparks coming into contact with paint coatings.

All interconnecting pipelines to other compartments should be flushed through with water, drained, vented and isolated from the compartment where Hot Work will take place. Cargo lines may be subsequently inerted or completely filled with water, if considered necessary.

Height of Work Area	Operator's Side			Opposite Side		
	Gas Cut	Welding	Gouging	Gas Cut	Welding	Gouging
0-5 metres	1.5 m	5.0 m	4.0 m	7.5 m	2.0 m	2.0 m
5-10 metres	1.5 m	5.0 m	5.0 m	10.0 m	2.0 m	2.0 m
10-15 metres	1.5 m	5.0 m	7.5 m	15.0 m	2.0 m	2.0 m
>15 metres	1.5 m	5.0 m	10.0 m	20.0 m	2.0 m	2.0 m

Table 9.1 - Radius of areas to be cleaned in preparation for Hot Work in tanks

Heating coils should be flushed or blown through with steam and proved clear of hydrocarbons.

An adjacent fuel oil bunker tank may be considered safe if tests give a reading of less than 1% LEL in the vapour space of the bunker tank, and no heat transfer through the bulkhead of the bunker tank will be caused by the Hot Work.

### **Non-inerted Tankers**

The compartment in which the Hot Work is to be carried out should be cleaned, gas freed to Hot Work standard and be continuously ventilated.

Adjacent cargo tanks, including diagonally positioned cargo tanks, should either have been cleaned and gas freed to Hot Work standard or completely filled with water.

All slops should be either removed from the tanker or securely isolated in a closed and non-adjacent tank at least 30 metres from the Hot Work location. For this purpose, tanks located diagonally should be regarded as adjacent tanks. A non-adjacent slop tank should be kept closed, securely isolated from the IG main and isolated from the piping system for the duration of the Hot Work.

Vapour or vent lines to the compartment should also be ventilated to not more than 1% LEL and isolated.

The possibility of using an external source of inert gas should be considered.

### **Inerted Tankers**

The compartment in which the Hot Work is to be carried out should be cleaned, gas freed to Hot Work standard and be continuously ventilated.

Adjacent cargo tanks, including diagonally positioned cargo tanks, should either be:

- Cleaned and gas freed, with hydrocarbon vapour content reduced to not more than 1% LEL and maintained at that level; or
- Emptied, purged and the hydrocarbon vapour content reduced to less than 2% by volume and inerted; or
- Completely filled with water.

All other cargo tanks should be inerted and their deck openings closed.

When Hot Work is to be carried out on a cargo tank bulkhead, or within 500 mm of such a bulkhead, then the space on the other side should also be cleaned to Hot Work standard.

Consideration should be given to reducing the inert gas pressure for the duration of the Hot Work to prevent uncontrolled venting.

Inert gas lines to the compartment should be purged with inert gas to not more than 2% hydrocarbon by volume and isolated.

All slops should be either removed from the tanker or securely isolated in a non-adjacent tank at least 30 metres from the Hot Work location. For this purpose, tanks located diagonally should be regarded as adjacent tanks. A non-adjacent slop tank should be kept closed, securely isolated from the IG main and isolated from the piping system for the duration of the Hot Work.

#### 9.4.4.3 Hot Work Within the Cargo Tank Deck Area

##### **On the Tank Deck**

If Hot Work is to be undertaken on the tank deck or at a height of less than 500 mm above the tank deck, it should be classed as Hot Work within that tank and the appropriate measures complied with (see 9.4.4.2).

##### **Above the Tank Deck**

If Hot Work is to be undertaken above the tank deck (higher than 500 mm), cargo and slop tanks within a radius of at least 30 metres around the working area should either be:

- Cleaned and gas freed, with hydrocarbon vapour content reduced to not more than 1% LEL and maintained at that level; or
- Emptied, purged and the hydrocarbon vapour content reduced to less than 2% by volume and inerted; or
- Completely filled with water.

All other cargo tanks must be inerted with openings closed.

All slops should be either removed from the tanker or isolated in a tank as far as practicable from the Hot Work location.

##### **Additionally, on Non-Inerted Tankers**

All cargo tanks within 30 metres of the work location, including diagonally positioned cargo tanks, should either have been cleaned and gas freed to Hot Work standard, or completely filled with water.

All slops should be either removed from the tanker or securely isolated in the tank furthest (and at least 30 metres) from the Hot Work location. Vapour or vent lines to the compartment should also be ventilated to not more than 1% LEL and isolated.

The possibility of using an external source of inert gas should be considered.

#### 9.4.4.4 Hot Work in the Vicinity of Bunker Tanks

Hot Work in the vicinity of bunker fuel tanks should, in general, be treated in the same manner as Hot Work over the tank deck. No Hot Work should be carried out on the deck, or within 500 mm from such a deck, unless the tank has been cleaned to Hot Work standard.

Bunker fuel tanks should be clearly identified to avoid any misunderstanding as to their location and extent.

#### 9.4.4.5 Hot Work on Pipelines

Wherever possible, sections of pipelines and related items, such as strainers and valves, should be removed from the system and repaired in the designated space. (See Section 9.4.2.)

Where Hot Work on pipelines and valves needs to be carried out with the equipment in place, the item requiring Hot Work must be disconnected by Cold Work, and the remaining pipework blanked off. The item to be worked on should be cleaned and gas freed to a 'safe Hot Work' standard, regardless of whether or not it is removed from the hazardous cargo area.

If the location where the Hot Work is to be carried out is not in the immediate vicinity of the disconnected pipeline, consideration should be given to continuous through ventilation of the pipeline with fresh air and monitoring the exhaust air for hydrocarbon vapour.

Heating coils should be flushed or blown through with steam and proved clear of hydrocarbons.

## 9.5 Welding and Burning Equipment

Welding and other equipment used for Hot Work should be carefully inspected before each occasion of use to ensure that it is in good condition. Where required, it must be correctly earthed. When using electric arc equipment, special attention must be paid to ensure that:

- Electrical supply connections are made in a gas free space.
- Existing supply wiring is adequate to carry the electrical current demand without overloading, causing heating.
- Insulation of flexible electric cables is in good condition.
- The cable route to the work site is the safest possible, only passing over gas free or inerted spaces.
- The earthing connection is adjacent to the work site and the earth return cable leads directly back to the welding machine. The tanker's structure should not be used as an earth return.

## 9.6 Other Hazardous Tasks

A hazardous task is defined as a task, other than Hot Work, which presents a hazard to the tanker, terminal or personnel, the performance of which needs to be controlled by a risk assessment process, such as a Permit to Work system.

It follows that, for each hazardous task, a work permit or controlled procedure should be developed and approved. The permit or controlled procedure should follow the process outlined in Section 9.3 and should be discussed with the personnel who are performing the task.

The procedure, approval and record of compliance should be retained within the SMS records.

Hazardous tasks should only be carried out alongside a terminal with prior agreement of the Terminal Representative.

Examples of such tasks are:

- Enclosed space entry.
- Tank inspections.
- Diving operations.

- Blanking sea chests.
- Extended work aloft or over the side.
- Heavy or unusual lifting operations.
- Work on or adjacent to a pressurised system.
- Testing and launching of lifeboats.

## 9.7 Management of Contractors

The Master should satisfy himself that, whenever contractors or work gangs are employed, arrangements are made to ensure their understanding of, and compliance with, all relevant safe working practices. This is particularly important when they are to be involved in Hot Work or hazardous tasks. Contractors should be effectively supervised and controlled by a designated Responsible Person.

The contractor should take part in relevant safety meetings to discuss the arrangements for work. Where applicable, the contractor should sign the formal approval relevant to work being undertaken, thereby verifying awareness of the hazards and safety precautions required to reduce the risks to an acceptable level.

## 9.8 Repairs at a Facility Other Than a Shipyard

### 9.8.1 Introduction

This Section deals with repairs that are to be carried out on board a tanker that is at a facility other than a shipyard. The guidance given in this Section is intended to supplement, not replace, the guidance given elsewhere in this publication.

### 9.8.2 General

When a tanker is operational, under way or in port, the tanker's personnel carry out their duties in accordance with the tanker's Safety Management System (SMS). When a tanker is at a shipyard, the tanker is not operational and the work is primarily carried out and managed by the shipyard. While it may be monitored and checked by the tanker's personnel, the safety of the tanker and anyone on board is generally dependent on the shipyard's safety management system. There will be occasions when a tanker that is operational is required to carry out repairs using shore labour outside a shipyard or dry dock facility. In these cases, the safety of all on board will be dependent on the tanker's SMS and all activities should therefore be carried out in accordance with the SMS.

Repairs may be undertaken while the tanker is:

- At anchor.
- Alongside at a lay-by berth, not normally used for cargo operations.
- Alongside a commercial jetty.
- Under way.

Such repair work is only carried out on an exceptional basis and attention will need to be paid to ensuring that the scope of the tanker's SMS fully embraces the planned activities and the exposures to the shore labour employed.

### 9.8.3 Supervision and Control

The Master, Company Superintendent or other specifically appointed person should maintain full control of the repair work, ensuring that the tanker is maintained in a safe condition at all times and that all work is carried out in a safe and proper manner.

Specific procedures will be required when the tanker is to be repaired in a 'dead tanker' condition or when there are limitations on the electrical power available.

### 9.8.4 Pre-Arrival Planning

Prior to arrival at the repair berth, anchorage or other facility, the following should be taken into consideration in the initial planning:

- Type and location of the berth or anchorage.
- Moorings - numbers, type.
- Condition of the tanker - gas free or inert.
- Safe access - by launch, gangway or other means.
- Number of persons involved, including contractors.
- Location of work to be undertaken - engine room, cargo spaces, above deck, accommodation, etc.
- Facilities for disposal of slops or sludge.
- Arrangements for permits and certification.
- Understanding of port or terminal requirements.
- Availability of main power or main engine(s).
- Emergency procedures, on board and ashore.
- Availability of assistance - fire-fighting, medical facilities, etc.
- Connection to shore side services - water, power, etc.
- Weather conditions.
- Draught and trim limitations (to avoid unnecessary ballast handling).
- Restrictions on smoking and other naked lights.

### 9.8.5 Mooring Arrangements

When moored to a repair berth, the number and size of mooring lines used should be adequate for all likely weather and tidal conditions.

Whenever practicable, an alternative power source should be provided for the deck machinery, in order that moorings can be adjusted if main power is not available.

On repair berths, the mooring pattern may be restricted due to crane movements or other activity on the dock side. Such restrictions should be taken into account when planning the berthing of the tanker.

Moorings should be clear of Hot Work areas or other locations where the lines may be damaged by the repair work in progress.

When at anchor, it may be necessary to use additional cable, particularly if the main engine(s) will not be available at any time.

### 9.8.6 Shore Facilities

Whenever practicable, the tanker should be physically isolated from regular terminal facilities or berths where other tankers are being worked.

If any repairs are to be carried out concurrent with cargo handling operations, specific permission should be granted by the terminal operators.

The Master should establish whether any significant operations are to take place involving other vessels in the vicinity of the berth at which repairs are being undertaken, i.e. departure/arrival of other vessels, bunkering, fuel oil transfer, etc.

The Master should be familiar with any specific safety requirements of the facility and/or harbour authorities.

There should be safe means of access at all times with guard rails and safety nets as appropriate. The number of access points should be sufficient to allow timely evacuation of all personnel on board. The gangway should be monitored at all times and a gangway watch should be posted to control access to the vessel (see also Chapter 6 - Security).

On a lay-by berth where the tanker is not gas free, a sign should be placed at the foot of the gangway worded "No Unauthorised Access. This Tanker Is Not Gas Free."

Port security plans should be implemented and followed as may be appropriate.

Contractors should advise the Master of the number and movement of workers on board each day during the repair period.

Procedures for the use of cranes or other lifting equipment should be determined upon arrival.

Garbage disposal procedures should be agreed between the tanker and the facility, with regular disposal of accumulated garbage being arranged.

Emergency alarm signals should be agreed and, whenever practicable, a drill held prior to commencing repair work. Subsequent drills should be arranged when the repairs are to be carried out over an extended period.

Any restrictions on activities such as bunkering, storing or taking luboils are to be agreed.

### 9.8.7 Pre-Work Safety Meeting

Work planning meetings should be held prior to the commencement of any work, and on each subsequent work day.

Work planning meetings will normally include representatives from the tanker and all the contractors involved.

The prime function of these meetings is to ensure that all personnel involved are aware of the daily schedule, the interrelation between contractors, particular areas of concern and special precautions to be taken etc.

### 9.8.8 Work Permits

Permits should be issued for the relevant repair work jobs, including any repairs being carried out by tanker's staff. In particular, permits should be issued for:

- Enclosed space entry.
- Hot Work.
- Electrical isolation.
- Other hazardous tasks.

Copies of all permits should be posted as may be necessary. Copies should also be retained by the person in charge of the operation.

All personnel involved should be made fully aware of the requirements for, and benefits of, the work permit system, and should be advised of restrictions on commencing any work until the appropriate permit has been issued.

### 9.8.9 Tank Condition

Whether the tanker is gas free or not will depend on the work being undertaken and the specific port or facility regulations.

A certified chemist should test all cargo/ballast spaces for oxygen content and hydrocarbon content. The conditions of all tanks and void spaces should be included on the chemist's certificate.

As a minimum, gas free certificates should be issued on a daily basis.

If cargo tanks are not required to be gas free and the tanker is inert, positive inert gas pressure should be maintained within the tanks at all times.

### 9.8.10 Cargo Lines

All cargo lines on deck, in the tanks and in the pumproom, including those lines and pumps which may not have been used for recent cargo or tank cleaning operations, should be thoroughly washed and drained. This includes any dead ends in the system.

The hydraulic valve system should be isolated in such a way as to prevent unintentional operation of cargo valves during the work process. Appropriate notices should be posted and the persons in charge of the relevant repair team(s) should be advised.

### 9.8.11 Fire-Fighting Precautions

#### 9.8.11.1 Fire Water

Fire-mains should be continuously pressurised, either by the tanker's pumps or from a shore supply.

There should be an agreed pressure for the fire-main, which should be maintained at all times.

#### 9.8.11.2 Fire patrols

There should be an agreed procedure for fire patrols on board.

Fire patrols can be provided either by the tanker's crew or by shore contractors.

Each member of the fire patrol should be fully aware of the procedure for raising the alarm and the action to be taken in the event of an emergency situation arising.

All areas where Hot Work is being carried out should be monitored by fire patrols at all times.

### 9.8.12 Dedicated Safety Responsible Person

A dedicated Safety Responsible Person should be appointed to co-ordinate the permit and certification processes associated with the repair period.

The dedicated Safety Responsible Person should be fully aware of all his duties and responsibilities.

### 9.8.13 Hot Work

The following supplements and does not replace the guidance given in Section 9.4, which should also be followed for any repair activities involving Hot Work.

Hot Work should be prohibited within or on the boundaries of cargo tanks, ballast tanks, slop tanks, bunker tanks, pumprooms and forward cofferdams, including the deck and tanker's shell plating, except when special preparations have been made prior to entering the berth or facility and the necessary special conditions have been met.

Use of electrical welding equipment should be controlled and correct grounding cables should be used. Welding current should not be returned to the transformer via the tanker's hull.

Hot Work should not be carried out within 30 metres of any non-gas free spaces unless specific permission has been received from the controlling authority.

Notices should be posted to indicate the current state of any tank or void space, e.g. stating whether it is either gas free and suitable for Hot Work, or only safe for entry.

Hot Work should be suspended immediately if any of the specific safety requirements cannot be complied with.

Any Hot Work on or above the weather decks should be stopped if the inert gas pressure reaches the relieving pressure of the pressure/vacuum valves. If it is found necessary to release tank pressure to atmosphere, all work should be suspended until the operation has been completed. Consideration may need to be given to clearing the deck area of personnel during venting, especially when there is the possibility of toxic gas (e.g. H<sub>2</sub>S) being present. A new permit should be issued prior to resuming work.

## 9.9 Shipboard Emergency Management

### 9.9.1 General

The SMS should require that the Company establishes procedures to identify, describe and respond to potential emergency shipboard situations. This Section provides guidance on meeting this responsibility by addressing those aspects covered by the scope of this Guide.

### 9.9.2 Tanker Emergency Plan

#### 9.9.2.1 Preparation

Planning and preparation are essential if personnel are to deal successfully with emergencies on board tankers. The Master and other officers should consider what they would do in the event of various types of emergency, such as fire in cargo tanks, fire in the engine room, fire in the accommodation, the collapse of a person in a tank, the tanker breaking adrift from her berth and the emergency release of a tanker from her berth.

They will not be able to foresee in detail what might occur in all such emergencies, but good advance planning will result in quicker and better decisions and a well organised reaction to the situation.

The following information should be readily available:

- Type of cargo, amount and disposition.
- Location of other hazardous substances.
- General arrangement plan.
- Stability information.
- Fire-fighting equipment plans.

#### 9.9.2.2 Emergency Organisation

An emergency organisation should be set up for mobilisation in the event of an emergency. The purpose of this organisation will be to raise the alarm, locate and assess the incident and possible dangers, and organise manpower and equipment.

The following provides guidance for use in planning an emergency organisation, which should cover four elements:

### **Command Centre**

There should be one group in control of the response to the emergency, with the Master or the Senior Officer on board in charge. The command centre should have means of internal and external communication.

### **Emergency Party**

This group should be under the command of a senior officer and should assess the emergency and report to the command centre on the situation, advising what action should be taken and what assistance should be provided, either from on board or, if the tanker is in port, from ashore.

### **Backup Emergency Party**

The backup emergency party, under the command of an officer, should stand by to assist the emergency party as instructed by the command centre and should provide backup services, e.g. equipment, stores, medical services, including cardio-pulmonary resuscitation, etc.

### **Engineering Group**

This group should be under the command of the Chief Engineer or the Senior Engineering Officer on board, and should provide emergency assistance as instructed by the command centre. The prime responsibility for dealing with any emergency in the main machinery spaces will probably rest with this group. It may be called on to provide additional manpower elsewhere.

The plan should ensure that all arrangements apply equally well, whether the tanker is in port or at sea.

#### **9.9.2.3 Preliminary Action**

The person who discovers the emergency must raise the alarm and pass on information about the situation to the officer on duty who, in turn, must alert the emergency organisation. While this is being done, those on the scene should attempt immediate measures to control the emergency until the emergency organisation takes effect. Each group in the emergency organisation should have a designated assembly point, as should those persons not directly involved as members of any group. Personnel not directly involved should stand by to act as required.

#### **9.9.2.4 Tanker's Fire Alarm Signal**

When a tanker is in port, the sounding of the tanker's fire alarm system should be supplemented by a series of long blasts on the tanker's whistle, each blast being not less than 10 seconds in duration, or by some other locally required signal.

#### 9.9.2.5 Fire Control Plans

Fire control plans must be permanently displayed in prominent positions showing clearly, for each deck, the location and particulars of all fire-fighting equipment, dampers, controls etc. When the tanker is in port, these plans could also be displayed, or be readily available, outside the accommodation block for the assistance of shore based fire-fighting personnel.

#### 9.9.2.6 Inspection and Maintenance

Fire-fighting equipment should always be ready for immediate use and should be checked frequently. The dates and details of such checks should be recorded and indicated on the appliance, as appropriate. The inspection of all fire-fighting and other emergency equipment should be carried out by a Responsible Person, and any necessary maintenance work completed without delay.

#### 9.9.2.7 Training and Drills

Tanker personnel should be familiar with the theory of fire-fighting outlined in Chapter 5 and should receive instruction in the use of fire-fighting and emergency equipment. Practices and drills should be arranged at intervals to ensure that personnel retain their familiarity with the equipment.

If an opportunity arises for a combined fire practice or 'table-top' drill with shore personnel at a terminal (see Section 20.2.8), the Master should make an officer available to show the shore personnel the location of portable and fixed fire-fighting equipment on board and also to instruct them on any design features of the tanker which may require special attention in case of fire.

### 9.9.3 Actions in the Event of an Emergency

#### 9.9.3.1 Fire on a Tanker at Anchor or Under Way

Tanker personnel who discover an outbreak of fire must immediately raise the alarm, indicating the location of the fire. The tanker's fire or general alarm must be operated as soon as possible.

Personnel in the vicinity of the fire should apply the nearest suitable extinguishing agent to attempt to limit the spread of the fire, to extinguish it, and thereafter to prevent re-ignition (see Section 5.3). If they are unsuccessful, their actions should very quickly be superseded by the activation of the tanker's emergency plan.

Any cargo, ballast, tank cleaning or bunkering operations should be stopped immediately and all valves closed. Any craft alongside should be removed.

Once all personnel have been evacuated from the vicinity, all doors, openings and tank apertures should be closed as quickly as possible and mechanical ventilation should be stopped. Decks, bulkheads and other structures in the vicinity of the fire, and adjacent tanks that contain products or are not gas free, should be cooled with water.

If circumstances permit, the tanker should be manoeuvred so as to resist the spread of the fire and to allow the fire to be attacked from windward.

### 9.9.3.2 Emergencies in Port

Emergencies occurring either on board or adjacent to the tanker when it is in a port are addressed in Section 26.5, as action taken will be the joint responsibility of the Master and the port or terminal authority.

### 9.9.3.3 N/A

### 9.9.3.4 Follow-up

As soon as possible after an incident, there should be a thorough check of all the equipment used. Portable extinguishers should be re-filled, or replaced with spares from stock, and breathing apparatus bottles should be recharged. Foam systems should be flushed through with water.

Post-incident discussion should address how and which lessons can be learned and how contingency plans can be further developed.