

ACCORD MARINE MANAGEMENT PVT. LTD.	Issue No : 2	Date : 25 AUG 2010
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FLEET OPERATION MANUAL CARGO AND BALLAST OPERATIONS	Chapter : FOM-12.1 Page : 1 of 63	
	Prepared By : DPA	Approved By : CEO

1.1. CARGO AND BALLAST OPERATIONS

It is the Masters responsibility to ensure that the instructions contained in this manual and in any specialised manual applicable to a particular ship, are closely followed. In following these instructions due attention shall be paid to the safety regulations and recommendations, the statutory requirements, and by-laws National and Harbour Authorities. The following publications are therefore provided to each vessel for reference:-

- Code of Safe Work Practices for Merchant Seamen
- Bridge Procedures Guide
- Peril at Sea and Salvage
- Effective Mooring
- Guide to Helicopter/Ship Operations
- Masters Role in Collecting Evidence
- Ship to Ship Transfer Guide

For tankers, it is Accord Marine Management's policy to use the guidelines contained in the International Safety Guide for Oil Tankers and Terminals - (ISGOTT). The instructions contained in this manual are therefore, not intended to replace these guidelines but to act as a supplement to these and any other specialised operating instructions, codes of practice and instructions that may be issued by individual principals. The following list of Publications should be referred to:-

IMO Publications:

- International Convention for the safety of life at sea 1974.
- MARPOL 73/78.
- Crude oil washing systems.
- Inert gas systems.

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OCIMF/ICS/SIGTTO Publications:

- International safety guide for oil tankers and terminals.
- Clean Seas Guide for oil tankers
- Prevention of oil spillage through cargo pump room sea valves
- Recommendations for equipment employed in the mooring of ships at single point moorings
- Inspection guidelines for bulk oil carriers

1.1.1. TANKER OPERATIONS

1.1.1.1. Industry Standards

All personnel directly involved in cargo operations are to be familiar with the contents of the International Safety Guide for Oil Tankers and Terminals (ISGOTT), a copy of which is on board each tanker in the charge of Accord Marine Management.

All operations are to be undertaken with due regard for the recommendations contained with ISGOTT.

1.1.1.2. Leakage from Manifolds Not In Use

During all cargo handling operations and during the discharge of dirty ballast, all manifolds not actually in use, including stern discharge line if fitted, must be shut hard down and blanked off.

Immediately after the disconnection of shore loading/unloading lines manifolds are to be blanked.

The Removal and Replacement of manifold blanks are to be recorded in the Cargo Log Book.

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1.1.1.3. Leakage from Segregated Ballast System (Permanent Ballast)

Escape of oil into the segregated ballast system is always a possibility when the ballast lines pass through cargo spaces. Contamination may also occur from structural failure between cargo and ballast tanks. This type of leakage does not happen frequently, but it is more likely to occur as vessels grow older. As required by MARPOL, segregated ballast may be discharged below the waterline in port, offshore terminals and at sea provided that the surface of the ballast water has been examined immediately before discharge, to ensure that no contamination with oil has taken place. The surface of the waters around the ship must be watched when during the ballast discharge.

The following company requirements, in accordance with the requirements of OCIMF and ISGOTT, apply to all tankers under full management of Accord Marine Management Pvt Ltd.

- Hydrocarbon Gas readings shall be taken of all ballast tanks once per week during loaded passages
- Ballast and cargo space soundings/ullages are to be monitored during loaded passages
- There shall be a visual inspection of each ballast tank water surface on completion of ballasting
- There shall be a visual inspection of each ballast water surface during ballast passages
- There shall be a visual inspection of each ballast water surface prior to commencement of ballast discharge

Records of the above checks shall be kept in the ballast water log book and cargo operations log book.

Extracts of relevant ISGOTT sections.

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1.1.1.4. ISGOTT 7.8 Monitoring of Void and Ballast Spaces

Void and ballast spaces located within the cargo tank block should be routinely monitored to check that no leakage has occurred from adjacent cargo tanks. Monitoring should include regular atmosphere checks for hydrocarbon content and regular sounding/ullaging of the empty spaces.

The guidance given in Chapter 8 'Double Hull Operations' should be followed to the extent that it may apply to single hull tankers, particularly with regard to routine monitoring procedures (Section 8.2); actions to be taken in the event of cargo leakage being detected (Section 8.5) and the handling of ballast after a leak (Section 8.9)

1.1.1.5. ISGOTT 8.2 Routine Monitoring of Double Hull Spaces

Double hull spaces should be regularly monitored in order to check the integrity of the inner shell plating. This can be accomplished by monitoring the ballast tank atmosphere for hydrocarbon gas, and by regular sounding/ullaging of ballast tanks. The sampling referred to in this section is for leak detection purposes only, and should not be used as criteria for tank entry. Section 8.3 refers to the procedures relating to tank entry for double hull spaces.

The atmosphere in each double hull tank and double bottom tank should be monitored for hydrocarbon content:

- Regularly during loaded passage
- Prior to ballasting the tank following a period of heavy weather
- After any unusual event or occurrence e.g. Unexpected list, unforeseen operational problems.

The atmosphere monitoring programme should ensure that each tank is monitored at least once per week during loaded passage. However, where ships are engaged on short haul voyages that make this impractical, visual inspection of the tanks or the ballast water is considered to be a suitable alternative measure.

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The hydrocarbon measurements should be taken with a portable gas detector at designated sampling points using fixed lines or a portable sampling hose or with a fixed gas detection system where one is installed.

Where fixed gas detection systems are installed, operators should develop procedures to ensure that tank atmospheres are monitored on a regular basis. They should ensure that the full operating, maintenance and fault detection instructions are readily available to ship's personnel and that they are familiar with the use of the equipment.

Information as to the point of origin of each fixed sampling line should be readily available to ship's personnel.

Procedures should be developed for the regular clearing of all fixed sampling lines.

The ship should be provided with information relating to any restrictions on lowering a sampling hose into the tank that might be imposed as a result of normal operating trim or list.

During loaded passage, ballast tanks should be sounded on a frequent and regular basis as a back up method of detecting any oils leakage into them.

After ballasting, tanks should be checked visually to ascertain if any oils is present. A similar procedure should be carried out prior to discharge of ballast.

During the ballast voyage, the ullage of each ballast tank should be checked at frequent and regular intervals. Consideration should also be given to the feasibility of routine monitoring to detect water ingress to the cargo tanks.

1.1.1.6. Tank Venting

During the loading of volatile petroleum the installed tank venting system shall be used. Tank hatches and tank washing openings shall always be kept closed. Other tank openings, such as ullage and sighting ports, shall be kept closed except when actually in use for ullaging or sighting.

At such times access to the main deck must be both limited and strictly observed.

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In using a common venting line system, the rate of loading and the volatility of the cargo shall be considered in relation to the flow capacity of the venting system, and with multi-grade cargoes, the consequences of flammable gas being carried to tanks containing non-volatile petroleum is to be recognised.

1.1.1.7. Loading Overall

Class 'A' and Class 'B' petroleum shall not be loaded or transferred overall.

Class 'C' petroleum shall not be loaded overall without Accord Ship Management agreement.

Ballast or slops shall not be loaded or transferred overall into a tank which contains a flammable gas mixture.

1.1.1.8. Transferring Cargo

No transfer of cargo is permitted without approval from the oil principal, Charterer or Accord Marine Management.

1.1.1.9. Transfers Ship-to-ship

For details of transfers see ICS publication "Ship to Ship Transfer Guide (Petroleum)" second edition.

1.1.1.10. Segregation of Grades and Cargo Care

Queries relating to cargo matters are to be discussed directly with the ship owner while keeping Accord Marine Management advised of any operational impediments to the safe and efficient working of the ship.

Masters are to note protest when in dispute with cargo receivers or when called upon to deviate from the owners standard instructions.

1.1.1.11. Cargo Information

Cargo instruction will, in all cases, be provided by the Ship owners or Charterer.

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Emphasis is placed on the fact that the completion of a safe and successful cargo handling operation is dependent upon effective co-operation and co-ordination between all the parties involved. Certain additional information relating to cargo, ballast and bunker handling shall be exchanged before these operations begin.

A ship/shore safety check list shall be completed prior to commencement of cargo working. If no check list is provided by the terminal operator, then the First Mate shall use the check list provided in Appendix A of the ISGOTT Manual.

The safety check list shall be completed in duplicate in full and signed by both the First Mate and the terminal representative, each retaining a copy.

Violation of any safety rule or precaution which occurs during any operation shall be immediately reported to the Officer on duty who will take immediate steps to correct the violation or cease operations until it can be corrected. The First Mate and/or the Master and the terminal representative shall be informed as soon as possible.

Permanent notices shall be displayed in conspicuous places on board, stating:-

1. SMOKING AND THE USE OF NAKED LIGHTS ARE STRICTLY PROHIBITED EXCEPT AT TIMES AND IN PLACES AUTHORISED BY THE MASTER.
2. Which doors are required to be closed during hazardous operations?
3. The precautions to be taken before entering compartments, such as cofferdams, which are infrequently opened.
4. At Pump Room entrances: - NO ONE IS ALLOWED TO DESCEND INTO THIS PUMP ROOM WITHOUT THE PERMISSION OF THE RESPONSIBLE OFFICER.
5. Notices stating "EMERGENCY EXIT" shall also be displayed permanently on escape trunkways.

Temporary notices shall be displayed:

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- Giving clear instructions as to when and where smoking may be allowed, According to the condition of the ship and the operations being carried out.
- On arrival in port, near the access to the ship stating:
 - NO ADMITTANCE EXCEPT ON BUSINESS.
 - SMOKING AND NAKED LIGHTS STRICTLY FORBIDDEN.
- Any other notices required by local authorities.

5.1.1.12. Persons Smoking or Intoxicated

Personnel on duty on a jetty or on watch on a tanker must ensure that no one who is smoking approaches the jetty or boards a tanker. Persons apparently intoxicated should not be allowed to board a tanker unless they can be properly supervised.

5.1.1.13. Cargo Tank Lids

During the handling of volatile petroleum and loading of non-volatile petroleum into non-gas free tanks and while ballasting after the discharge of volatile cargo, all cargo tank lids shall be closed and secured.

Cargo tank lids or coamings shall be clearly marked with the number and location (port, centre or starboard) of the tank they serve.

5.1.1.14. Sighting and Ullage Ports

During any cargo and ballast handling operations, sighting and ullage ports should be kept closed unless required to be open for operational purposes. If for design reasons they are required to be open for venting purposes, the openings shall be protected by a flame screen which may be removed for a short period during ullaging, sighting, sounding and sampling. These screens shall be a good fit and be kept clean and in good condition. For details concerning inert gas systems see the ship's Operations and Equipment Manual.

5.1.1.15. Cargo Tank Vent Outlets

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The cargo tank venting system shall be set for the operation concerned and, if required, the outlets shall be protected by a device to prevent the passage of flame. High velocity vents shall be set in the operational position to ensure the high exit velocity of vented gas.

Pressure/vacuum relief valves (P/V valves) shall be either opened or bypassed during loading or ballasting.

Hi Jets shall be tested for correct operation before cargo work commences.

When volatile cargo is being loaded into tanks connected to a venting system which also serves tanks into which non-volatile cargo is to be loaded, particular attention shall be paid to the setting of P/V valves and the associated venting system, including any inert gas system, in order to prevent flammable gas entering the tanks to be loaded with non-volatile cargo.

5.1.1.16. Tank Washing Openings

When using portable tank washing equipment during tank cleaning or gas freeing operations, tank washing covers shall only be removed from the tanks in which these operations are taking place and shall be replaced as soon as these operations are completed. Other tank washing covers may be loosened in preparation but they should be left in their fully closed position.

5.1.1.17. Segregated Ballast Tank Lids

Segregated ballast tank lids shall be kept closed when cargo or ballast is being handled as petroleum gas could be drawn into these tanks. Segregated ballast tank lids must be clearly marked as such.

5.1.1.18. Cargo Tank Lids and Ullage Openings

These shall be maintained in good order and checked prior to loading any cargo. The method of securing is to be in good workable condition. The tank lid and ullage ports are to be checked for alignment and ensure that they are in no way

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distorted. Ensure that tank lid and ullage port packing is in good condition. All dogs and clips must be fully operational.

5.1.1.19. Electrical Equipment

The use of portable electrical equipment, self-contained or on wandering leads shall be prohibited over the tank deck and within the cargo tanks and adjacent spaces unless:-

- The compartment over which or within which the equipment and/or lead is to be used is gas free throughout the period during which the equipment is in use.
- Compartments adjacent are also gas free.
- All tank openings to other compartments if not gas free are closed and remain so.
- The equipment and circuit of any wandering lead is intrinsically safe.
- The electrical equipment is wholly within an approved explosion proof container, an approved air pressurised container or is an approved safety torch.

When in port, reference shall be made to local regulations that may totally prohibit the use of any electrical equipment, self-contained or on wandering leads, unless the equipment and any external leads are intrinsically safe.

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Minimum required insulation resistance is 1 MEGA OHMS.

5.1.1.20. Responsibility

The chief officer is responsible for the conduct of all ballast operations. Although he may delegate much of the routine monitoring to the deck OOW, the chief officer must have personal charge of the operation during the following activities:

- start of operations
- topping off tanks

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- completion of transfer
- at any critical part of the operation.

Ballast operations must always be carried out in Accordance with a pre-planned written program prepared by the chief officer and approved by the master. This plan must be discussed with and be clearly understood by all the officers dealing with the operation.

5.1.1.21. Cargo Loading

The greatest potential for a major spill during loading operations is from a tank overflow. In order to minimize this hazard attention must be paid to the following factors:

- Always start loading at a low rate until it has been positively confirmed that product is coming only into the designated tanks, and is not entering non designated tanks.
- Never load any tank or group of tanks at a rate higher than the officers are comfortable with.
- During bulk loading operations monitor and record the tank ullage at regular intervals. This should include any tanks not being loaded in order to ensure against inadvertent and unexpected oil flow due to leaking valves etc, and void spaces/ballast tanks etc.
- Always try to leave one tank, normally the final one to be topped off, with a significantly greater ullage than the other tanks being loaded. In the event of an unexpected situation this can then be used as a "crash tank" whilst cargo is being stopped.
- Never try to top off tanks at the full loading rate. Always reduce the rate of flow into the tank either by diverting some of the cargo into tanks with a greater ullage or by reducing the overall-loading rate.
- Top off tanks in accordance with a pre-arranged sequence which should be part of the overall plan.

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- Never rely solely on remote reading gauges for topping off. Always top off from a local gauging position.
- Never try to "squeeze" an extra few barrels into a tank. Always stop at the agreed ullage.
- As tanks are topped off and shut down the loading rate should be progressively reduced.
- After a tank has been topped off, it must not be forgotten. Continue to monitor the ullage to ensure that the valve is fully closed.
- Always ensure that there is adequate communication between people on deck and those in the cargo control room. This is particularly important during the topping off stage.
- Always ensure that the terminal staff are advised when topping off is taking place and are prepared for an emergency cargo stop.
- As completion of a grade or cargo is approached, always ensure that the terminal staff is given notice as to completion time and standby for stopping. Ensure that there is reliable communications with them during this period.
- Always leave sufficient ullage to accept any line draining.

So far as possible keep the ship upright as a list might lead to unexpected decreases in ullage. When topping off this should be done with the ship close to even keel. If this is not possible, such as when handling multi-grade cargoes, always ensure that the finishing ullage takes into account all likely changes of trim as the loading operation continues.

When loading a cargo where for any reason the temperature is likely to increase (e.g. heated cargoes, loading cold cargo for discharge in warmer areas), always ensure that the finishing ullage leaves enough space for cargo expansion.

Prior to the start of loading, always ensure that unused manifolds on both sides of the ship have the valve closed and that the blanks are secured with all bolts.

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When loading starts a crewmember with direct communication to the cargo control room must be monitoring the loading arms or hoses to ensure that the connections are tight. He should also monitor the opposite side of the manifold to ensure that there is no leakage.

Once loading has started the water around the ship must be visually checked to ensure that there is no leakage of oil and must be monitored at regular intervals thereafter.

After loading has started the pump room must be checked to ensure that there are no leaks. The sea valve leak check system must be monitored to ensure that there are no leaking valves on the lines.

When changing over tanks always ensure that the next tanks are open to the flow before shutting down the working tanks. This will avoid any risk of damaging deck lines or loading arms/hoses.

When draining hoses particular care must be taken to ensure that this is only done into the tank designated for this purpose and the ullage in this tank must be closely monitored during this period.

Prior to disconnecting hoses or loading arms the manifold valve must be fully closed. The drip tray must be empty prior to arrival at the loading terminal. Always try to ensure that terminal staff crack open the connection to drain any excess product into the drip tray before disconnecting completely.

During the loading operation all deck personnel must be instructed to regularly monitor the cargo lines, hydraulic lines, manifold connections, jumper hoses etc. for any signs of leakage.

Gauging and sampling must always be done as carefully as possible to minimize oil dripping on to the deck. Such drips must be cleaned up immediately.

The loading facility should be advised of any significant changes/reduction in the number of cargo tanks or loading lines to prevent over pressurization of the piping, hose or loading arm system.

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5.1.1.22. Cargo Discharge

Prior to starting discharge the pipeline and valve settings must be separately checked by the chief officer and the OOW. This must be recorded in the cargo/ballast records.

Although the risk of tank overflows during cargo discharge operations is far less than that during loading, there are still certain precautions that must be taken:

- Start at a slow rate and ensure that oil is only being drawn from the designated tanks.
- Monitor all the remaining tanks to ensure that oil is not being inadvertently discharged into them.
- Never allow a major trim to develop whilst there are full tanks on the ship. If this is not possible, closely monitor the effect of the developing trim on full tanks.
- So far as possible keep the ship upright.
- At regular and frequent intervals throughout the discharge monitor the ullage of all tanks to ensure that oil is not inadvertently leaking into other tanks.

Prior to commencing discharge, ensure that all sea valves and other overboard valves are closed and lashed or the controls disabled.

At regular and frequent intervals during the discharge operation, monitor the sea valve leak check system to ensure that there is no leakage of oil through the inboard sea valve.

Prior to the start of discharge, unused manifolds on both sides of the ship must have the valve closed and blanks secured with all bolts.

When discharging starts, a crewmember with direct communication to the cargo control room must be monitoring the loading arms or hoses to ensure that the

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connections are tight. He should also monitor the opposite side of the manifold to ensure that there is no leakage.

When discharging has started the pump room must be checked to ensure that there are no leaks from pipelines, pumps or valves etc. Such checks should be carried out at regular intervals during the discharge.

The pump room high-level bilge alarm must be tested prior to commencing operations.

Once discharging has started the water around the ship must be visually checked to ensure that there is no leakage of oil and must be monitored at regular intervals thereafter.

Prior to disconnecting hoses or loading arms the manifold valve must be fully closed. The drip tray must be empty prior to arrival at the discharge terminal. Always try to ensure that terminal staff crack open the connection to drain any excess product into the drip tray before disconnecting completely.

During the discharge operation all deck personnel must be instructed to regularly monitor the cargo lines, hydraulic lines, manifold connections, jumper hoses, etc. for any signs of leakage.

Because of the hazards associated with any leakage of crude oil under high pressure, crude oil wash lines must be pressure tested prior to arrival at the discharge port. Whilst COW operations are being carried out the lines should be carefully monitored for any signs of leakage.

On completion of discharge all pumps and lines must be drained as thoroughly as possible.

Gauging and sampling must always be done as carefully as possible to minimize oil dripping on to the deck. Such drips must be cleaned up immediately.

5.1.1.23. Communication Equipment, use in port

A transmitter operating on a frequency between 300 Khz and 32 Mhz (e.g. DSC & Radio Telex) must never be used within 200 metres of the shore, a jetty or another

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ship. VHF transmissions above 40 Mhz do not present a risk of ignition from transmitted power received by structures acting as aerials and can be used within this 200 metre zone.

Peak power of transmissions in port beyond the 200 metre zone should not exceed:

1.5 KW between 4 mhz and 32 mhz.

0.4 KW between 1.5 mhz and 4 mhz

KW below 1.5 mhz.

Testing of transmitters within these limited zones is only permitted if the aerial is disconnected and earthed and a dummy load is used.

5.1.2. ENGINE AND BOILER ROOM PRECAUTIONS

5.1.2.1. Combustion Equipment

As a precaution against funnel fires and sparks, the burners, tubes, uptakes, exhaust manifolds and spark arresters shall be maintained in good working condition.

If, for any reason sparks are emitted from the funnel, the ship shall, as soon as possible, alter course to prevent such from falling on the tank deck.

5.1.2.2. Pump Room Precautions

If CO₂ or Halon smothering systems are fitted in Pump Rooms, the alarm shall be tested at intervals not exceeding 7 days to ensure that it is functioning efficiently, and an entry made in the Deck and Engine Room Log Books. Personnel should be familiar with its operation.

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5.1.2.3. Pumproom Entry

Personnel shall not enter a cargo Pump Room without first obtaining the permission of the proper Officer. For the purpose of this section only, the proper Officer will be either the Deck Officer of the watch or the First Mate. A permanently rigged rescue line and harness must be established at the top of all cargo and transfer Pump Rooms. This is part of the life-saving equipment and ***IS NOT TO BE USED FOR ANY OTHER PURPOSE.***

Entry procedures to Pump Rooms as per International Safety Guide for Oil Tankers and Terminals (ISGOTT).

5.1.2.4. Fixed Gas Monitoring

Some Cargo Pump Rooms are fitted with a gas monitoring system which shall be maintained in good working order at all times. It shall be calibrated against a standard instrument at monthly intervals and shall be tested at weekly intervals, both of which events shall be recorded in the Deck Log Book. In the event that the system comes into alarm in normal service, the cause shall be immediately investigated and rectified.

5.1.2.5. Bilge Alarm

Cargo Pump Rooms are fitted with a bilge alarm which shall be tested at weekly intervals and recorded in the Deck Log Book. In the event that the system comes into alarm in normal service, the cause shall be immediately investigated and rectified.

5.1.2.6. Inert Gas

Where inert gas systems are installed, the equipment and the system shall be operated in Accordance with the approved Operations and Equipment Manual, as well as the SOLAS regulations relating to the use of inert gas systems.

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5.1.3. BALLASTING

Sequence of Valve Operations

The following procedures shall be adopted when loading ballast or cargo.

- The tank valves must be the first valves opened.
- The initial flow of ballast must be restricted so that the entrance velocity is less than one (1) metre/second until the longitudinal are covered or, if there are no longitudinal, until the depth of the ballast in the tank is at least 1.5 metres.

These precautions are required to avoid a geyser effect which may lead to the build up of an electrostatic charge in a mist or spray cloud near the point where the ballast enters the tank. When a sufficient charge exist the possibility of a discharge and ignition cannot be excluded.

5.1.3.1. Supervision

A responsible Officer who is familiar with the arrangement of lines, valves and venting system of the tanker shall supervise and control all ballasting operations.

5.1.3.2. Ullaging Ballasted Tanks

Manual ullaging must be carried out only through the ports provided, which shall be opened only long enough to carry out the operation.

5.1.3.3. Ballasting Overall

Ballast shall not be loaded overall into a tank which has contained volatile clean oil.

5.1.3.4. Gas Freeing

It is generally recognised that tank cleaning and gas freeing is the most hazardous period of tanker operations. This is true whether washing for clean ballast, gas

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freeing for entry, or gas freeing for hot work. The additional risk from the toxic effect of petroleum gas during this period cannot be overemphasised and must be impressed on all concerned. It is therefore essential that the greatest possible care is exercised in all operations connected with tank cleaning and gas freeing.

5.1.3.5. Supervision

A responsible Officer shall supervise all gas freeing and tank cleaning operations. This will normally be the First Mate.

5.1.3.6. Crude Oil Washing

Accord Marine Management must be advised immediately of any problems with equipment or machinery which could affect the ships ability to comply with MARPOL or SOLAS standards. Oil record books and Inert Gas Log Books are to be kept up to date with dates and times of checks and operations as they occur.

5.1.3.7. Tank Washing Atmospheres

It is Accord Marine Management policy to tank clean in an inerted condition or in an undefined atmosphere. Other methods may be used, only if agreed by the ship owner.

5.1.3.8. Instruments

Explosimeters of the type used on tankers are generally designed to show the concentration of hydrocarbon vapour as a percentage of the lower flammable limit. Since gases from petroleum can be toxic at concentrations well below the flammable limit, no readings above zero, taken at the bottom of a tank, shall be accepted when deciding whether a compartment is gas free and safe for entry.

Although the explosimeter is not designed to detect hydrogen sulphide (H₂S) and similar gases which are toxic in small concentration, these gases occur in

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petroleum only in association with the hydrocarbon gases and if the explosimeter gives a zero reading, it may be taken that the tank is free of such gases.

The equipment shall be checked regularly in Accordance with the maker's instructions. All checks made shall be recorded.

An explosimeter does not indicate oxygen deficiency or reliably indicate the presence of hydrogen.

In order to be able to check the effectiveness of gas freeing for tank entry the following instruments shall be provided:-

- A flammable gas indicator capable of measuring gas to the lower flammable limit (LFL) and with the scale graduated as a percentage of this limit.
- An oxygen analyses.
- An instrument capable of measuring concentrations in the human toxicity range of toxic gases and calibrated in parts per million.

The instruments to be used for gas measurements shall be calibrated and tested in Accordance with the manufacturer's instructions before starting to tank clean or gas free. All tests made shall be recorded.

Tank atmosphere sampling lines shall be of an approved type and kept clean.

5.1.3.9. Gas Free Certificates

A gas free certificate is usually necessary before carrying out repairs or maintenance work in port. Certificates shall indicate the condition of each individual tank or compartment and the type of work that may be carried out in it with safety. The following are examples of such certificates:-

- a) Safe for entry.
- b) Safe for hot work.

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A certificate states the condition of the tank only at the time it was tested and gives no assurance that the tank will remain in that condition.

5.b)3.10. Disposal of Sludge, Scale and Sediment

Sludge may give off flammable gas and may contain rags or waste liable to spontaneous combustion. If kept in drums before being disposed of, it must be stowed on deck and kept wetted down.

Sludge and scale in a tank which has been declared gas free may give off further gas if disturbed or subjected to a rise in temperature. Hence the atmosphere in the vicinity must be constantly checked for flammable and toxic vapours when sludge and scale is being removed.

For information on the following points, the latest version ISGOTT is to be consulted.

5.b)3.11. Cargo and Ballast Handling Plan

Prior to commencing any cargo or ballast operation the chief officer must develop a written operational plan covering the critical aspects of the operation. This plan should include as a minimum the following information:

(a) Loading, for each grade of cargo or ballast:

- tanks to be loaded
- sequence of loading
- position of loading arms/hoses, including any jumper hoses
- manifold/drop/bottom lines to be used
- required status of all manifold, crossover, drop, block and bulkhead valves
- maximum loading rates at different stages of the operation

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- maximum tank pressure
- required status of all vent and IG valves
- topping off sequence, including identification of "crash" tanks
- finishing ullages
- maximum trim/list/stress
- ship/shore communication procedures
- emergency shut down procedures
- any other relevant details of operation
- details of deck watch procedures (e.g. tending moorings/gangways, etc.).

(b) Discharging, for each grade of cargo or ballast

- tanks to be discharged
- sequence of discharge
- position of cargo arms/hoses, including jumper hoses
- bottom/riser/deck/manifold lines to be used
- cargo pumps to be used
- required status of cargo pump suction and discharge valves
- required status of all manifold, crossover, drop, block and bulkhead valves
- required status of all vent and inert gas valves
- identify when crude oil washing to be carried out

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- identify any rpm/pressure restrictions
- draining sequence
- maximum and minimum pressure
- maximum trim/list/stress
- ship/shore communication procedures
- emergency shutdown procedures
- any other relevant details of operation
- details of deck watch procedures (e.g. tending moorings/gangways, etc.).

The cargo plan must be signed by each officer coming on watch to acknowledge that he has read and understood it.

Any changes to the plan must be authorised by the chief officer. This requirement does not preclude the OOW taking whatever action he considers necessary in the event of an emergency.

On completion of a cargo or ballast operation the written cargo plans must be filed with the other voyage papers.

5.b)3.12. Stress and Stability

Hull stress must be kept to a minimum and the builder's recommended limits must not be exceeded at any stage of the voyage or during any cargo or ballast operation.

Stress calculations must be made prior to the handling of any cargo or ballast. These calculations must cover the various stages of the operation and must take account of the changing situation as the on board disposition of cargo and ballast changes. A record of all stress calculations must be retained on board for one year.

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The chief officer must check stress calculators for accuracy at least once every three months. The date of this test must be recorded in the MPS. The test must be undertaken by using the machines test programmes and the stress calculation tables provided by the shipbuilder. The Company must be informed immediately of any inaccuracies discovered.

It is recommended that the stresses do not exceed 80% of the allowable maximum in port or at sea. Stresses must never exceed 90% of the allowable maximum in port or at sea without prior approval from the Ship Manager

5.b)3.13. Cargo/Ballast Records

Ship-specific cargo/ballast records must be maintained throughout each cargo or ballast operation. This system must be used to record:

- times of starting and stopping all cargo pumps, together with significant speed changes
- times of starting and stopping discharge of cargo, with grade, tanks discharged and reasons for stoppages
- times of starting and stopping inert gas operation and changes in status of inert gas plant and/or lines, individual tanks and vents
- times of crude oil washing operations, together with tank oxygen level at start
- tank pressure at two hourly intervals
- inert gas pressure and line oxygen content at two hourly intervals (discharging only)
- load/discharge rate at hourly intervals
- pump suction/discharge pressures at hourly intervals
- pump bearing temperatures at two hourly intervals

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- manifold pressure at hourly intervals
- pump room leak check monitored and recorded regularly.

Each ship is required to maintain an accurate, neat and legible record of cargo/ballast operations. These records are to be compiled on a per voyage basis and filed with cargo and voyage documentation. All cargo/ballast records are to be maintained on board for a period of three (3) years.

5.b)3.14. Cargo/Ballast Rate Monitoring

Tank ullages must be monitored every hour and a loading/discharge rate calculated for each grade being handled and this is to be recorded in the cargo/ballast records.

5.b)3.15. Material Safety Data Sheet (MSDS)

A Material Safety Data Sheet (MSDS) relating to the products being handled, or which were previously contained in cargo tanks being ballasted, must be posted in the cargo control room.

5.b)3.16. Checklists Prior to Commencing Operations

Before commencing cargo transfer or ballast operations all the items listed in the ISGOTT Ship/Shore Safety. Checklist must be positively checked.

Any national, local or terminal checklist, which complies with the ISGOTT requirements, can be used in lieu of the ship's checklist. If not in compliance, such a checklist must be completed in addition to the ship's ISGOTT checklist.

In addition the following company checklists are to be used are to be completed;

- T 25 – DISCHARGE OPERATION CHECKLIST
- T 26 – LOADING OPERATION CHECKLIST

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- T 27 - PRE ARRIVAL AND COMMENCEMENT OF CARGO OPERATIONS CHECKLIST
- T 28 - COMPLETION OF CARGO AND PRE DEPARTURE CHECKLIST

5.b)3.17. Depth of Water at Berth

Before commencing cargo or ballast operations the depth of water at the berth must be checked. Cargo operations must be conducted so that the ship remains safely afloat at all times and pumping over the tide is prohibited.

5.b)3.18. Safety Violations

Violation of any safety rule or precaution, which occurs during cargo or ballast transfer operations, must be reported immediately to the OOW. He must take immediate steps to correct the violation or stop cargo operations until it can be corrected.

5.b)3.19. Closed Operations

When loading/discharging cargo or ballasting/deballasting to or from tanks which are not gas free, the operation must be carried out in the "closed" condition. This means:

- venting must be via the masthead or local high velocity vents
- cargo tank hatches must be closed and secured
- tank cleaning openings must be closed and secured
- ullage ports must be closed and secured
- all ullaging and sampling must be accomplished using the central gauging system or the local vapour lock standpipes.

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Where fitted, all cargo tank high-level alarms must be tested prior to commencing any loading or ballasting operation. This test must be recorded in the pollution prevention checklist. When using closed loading systems transfer rates must be limited so that they do not exceed the capacity of the venting system.

Pressure/vacuum valves must be manually opened, where the design is such that this can be accomplished, before loading, discharging or ballasting is started. They must remain in this condition until the operation has been completed when they must be returned to the automatic setting.

High velocity vents must be operated manually prior to each cargo operation to verify that they are free to operate.

During freezing weather conditions cargo/ballast operations must not be started until both the over and under pressure sides of high velocity vents have been proved free to operate. In such conditions the chief officer is responsible for implementing a programme to ensure that they remain free to operate throughout the cargo/ballast operation.

5.b)3.20. Pumproom Entry

The procedures detailed in checklist 'T4' must be complied with prior to personnel entering the pumproom whilst cargo or ballast is being handled. The mechanical ventilation system must be in operation during the entire period that personnel are required to enter or remain in the pumproom.

5.b)3.21. Inspection of Cargo Pumps and Systems

During cargo and ballast operations the cargo and ballast systems must be closely monitored to detect any system leaks or equipment malfunction. When discharging cargo or ballast, periodic inspections of the cargo pumps must be made at intervals of not more than one hour.

5.b)3.22. Pressure Surge in Pipelines

To avoid pressure surges, valves at the downstream end of a pipeline system have to be operated with great care.

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Whilst loading, special care must be exercised in the sequence of opening and closing of valves, particularly at the topping up stages. Before changing tanks, valves on the next tanks to be opened must be checked for operation.

When the flow of oil is to be diverted from one tank to another the valves on the tanks to be loaded **MUST** be opened before the valves on the previous tanks are shut. This is especially important when loading at high capacity and where mechanically operated valves are involved.

Valves, which control the flow of liquid, must be closed slowly. The time taken for valves to move from the open to closed position and vice versa must be checked six monthly. Ideally valves being closed against the flow of liquid should take at least 30 seconds to move from the open to closed position.

It is important to check that valves are fully open when used during cargo operations. Butterfly valves should never be used to throttle the flow when handling cargo at high rates. If it is necessary to control the flow, it is preferable to reduce the rate.

Prior to connecting hoses or loading arms must always visually inspect the manifold valves.

In order to reduce the risk of pressure surge, before commencing operations information should be exchanged and written agreement reached between the tanker and the terminal concerning the control of flow rates, the rate of valve closure and pump speeds. This should include the closure period of remote controlled and automatic shutdown valves. This information must be included in the vessels plan.

5.b)3.23. Cargo and Ballast Pipe Lines

The cargo officer must inspect the pipelines of the ship and hoses (vessel or shore) and be satisfied that they are suitable for the intended purpose. The maximum allowable working pressure (MAWP) of the lines and hoses must be noted and never be exceeded during normal operations. The MAWP for the ship's cargo systems can be assumed to be either the pressure at which the transfer piping relief valve is set or, where no relief valve(s) are fitted, the maximum discharge pressure that can be developed by the vessel's pump as given in the pump-curve.

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All cargo discharge pipelines (including Marpol line) and tank cleaning lines must be tested to their Maximum Allowable Working Pressure (MAWP) annually and also after any repairs to the cargo line system. All cargo discharge pipelines must be pressure tested to 1.5 times their MAWP at least twice every five years i.e. each dry docking or repair period. Those vessels with longer drydock intervals must make arrangements to conduct the 150% MAWP tests at least twice in any five year period. Pipelines must be marked with the date of test and test pressure.

Accurate records should be maintained in the PMS. These tests are to be carried out in accordance with the SIRE-VIQ / ISGOTT / USCG Marine Safety Manual (Vol: II) recommendations. Detailed risk assessment should be carried out and suitable safety precautions undertaken prior commencing the pressure testing.

Pressure testing above the MAWP should not be carried out with oil or other cargoes which can cause pollution. Fresh water shall be used for tests whenever possible so as to avoid undue corrosion. Alternatively, seawater may be used. All lines should be immediately drained and blown through after the test.

A piping system for liquid is to be tested by a static, hydraulic pressure using a cargo pump, stripping pump or a hydraulic test pump to produce the required pressure. During such tests it is important to ensure that the piping system is full of liquid and free from air locks. The test pressure shall be held for 10minutes and all exposed section of the pipe lines shall be inspected for any leaks.

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During the test procedures crew should be warned of possible gas hazard in pump room and tanks & precautions should be taken.

When carrying out the test on board ensure the gauges to be used are calibrated prior use on board and the tolerance of the gauges taken into consideration. During the inspection of piping systems particular attention should be given to expansion joints, flanges & valves. Any defects found during the test shall be corrected & re-tested.

Pressure testing of piping in cargo tanks may be carried out in conjunction with the tank-cleaning programme to permit the inspection of the piping in those tanks, which are gas- free for entry.

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Testing and Inspection of Segregated Ballast and Bilge Piping

In general, routine pressure testing of segregated ballast piping is not required. However, where sections of this piping pass through cargo oil tanks or fuel oil tanks, these sections are to be pressure tested once every 6 months.

All ballast piping, except sections which pass through fuel oil tanks, is to be inspected once every twelve months.

All bilge piping systems are to be pressure tested and inspected once every twelve months.

5.b)3.24. Calm Weather Conditions

During periods of calm weather additional safety precautions must be taken during the loading of volatile cargoes or ballasting into a non-gas free tank. Such precautions may include monitoring with a gas detector in those areas where gas may accumulate (e.g. around the accommodation). Hydrocarbon gas readings in excess of 5% of the LFL must be considered as an indication that potentially dangerous concentrations of gas are building up.

If these limits are reached the loading operation must be temporarily stopped or the loading patterns should be adjusted to prevent such a build up of gas.

In these conditions monitoring for toxic gases such as hydrogen sulphide, mercaptans and benzene must be carried out.

5.b)3.25. Electrical Storms

Regardless of whether or not a ship is inerted, in the event of an electrical storm occurring in the vicinity, all cargo, ballast, tank cleaning, gas-freeing or purging operations must be stopped immediately. All tank vents, tank openings and pumproom doors must be secured until the storm has passed.

5.b)3.26. Craft Alongside

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Tugs and other small vessels must not be permitted to come alongside a ship which is handling cargo, ballasting, tank washing, venting or gas freeing tanks until the master is satisfied that they pose no hazard to the ship.

5.b)3.27. Multi-grade/Multi-hose

When loading or discharging multi-grade cargoes the OOW must ensure the correct arm/hose is connected to the correct ships manifold.

5.b)3.28. Superstructure Doors and Windows

When loading, discharging, ballasting, tank cleaning or gas freeing tanks, all doors, windows and ports in the superstructure, including Engine Room skylights, must be closed and dogged. Access must be through side doors which must kept closed at all times when not in use.

5.b)3.29. Air Conditioning and Ventilation Systems

When loading, discharging, ballasting, tank cleaning, gas freeing or purging operations are being carried out, intakes must be operated to prevent the entry of flammable gas, if possible by recirculation of air within the enclosed spaces.

If at any time it is suspected that gas is being drawn into the central air conditioning and/or mechanical ventilating system, the systems must be shut down and/or the operations from which the gas is coming must be stopped until such time as it is ascertained safe to resume.

5.b)3.30. Window Type Air Conditioning Units

Window type air conditioning units are prohibited except where they are located completely inside the accommodation without any external connection to draw air from the outside.

5.b)3.31. Radio Transmission during Cargo/ Ballast Operations

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The use of the ship's radio transmitting equipment is prohibited at any time when dangerous concentrations of flammable gas exist around the deck. Such conditions may occur when transferring cargo, ballasting, tank cleaning, and gas freeing or purging tanks.

Approved satellite communication equipment, which utilises low powered beamed signals, may be used at any time providing national communication authorities approve such usage when in port waters.

5.b)3.32. Bonding Cable

Ship to shore bonding is not effective as a safety device and may even be dangerous. If local regulations require the use of a bonding cable, then the chief officer must ensure that it is connected before the first hose is put aboard and not disconnected until after the last hose has been removed. The connection must be at the shipside, well clear of the manifold area.

When a ship-shore bonding cable is used, it must be used in the following manner:

(a) When connecting:

- open switch
- connect bonding cable to ship away from any possible source of ignition such as drip trays
- close switch
- connect hose.

(b) When disconnecting:

- disconnect hose
- open switch
- remove bonding cable.

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5.b)3.33. Impressed Current Cathodic Hull Protection System (CAPAC)

Switching off cathodic protection systems of the impressed current type either ashore or in the ship is not, in general, considered to be a feasible method of minimising ship/shore current potential differences in the absence of an insulation flange or hose.

Only if the jetty is without an insulating flange and is devoid of cathodic protection should consideration be given to switching off the ship's system.

The ship's system should only be switched off as provided for the above or if required by terminal regulations.

5.b)4. SHIP TO SHIP TRANSFER (STS) OPERATIONS

STS operations must always be carried out in Accordance with the guidelines contained in the OCIMF/ICS booklet "Ship to Ship Transfer Guide". In addition, STS operations must at all times comply with the instructions contained in this manual. This chapter refers to additional precautions, which might be necessary when dealing with barges.

5.b)4.1. Lightening Equipment

Ships must carry sufficient ANSI standard reducers, clearly marked with their size, to allow 2 x 6, 8 or 10 inches to be connected to the manifold (for an "x" inch manifold, provided there are sufficient to connect two hoses, the combination of reducers could be x/10, x/8, x/6 or 10/8, 8/6), together with bolts and gaskets for these reducers and an extra set of bolts and gaskets per reducer set.

These reducers must be stored in a centre castle store, which must be clearly marked with the words "Emergency Lightening Equipment".

A box containing the necessary bolts and gaskets and marked "Reducer Bolts and Gaskets" must be stored with the reducers. It is recommended that bolts and gaskets be strung together in sets to enable easy verification that sufficient sets are available.

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5.b)5. CARGO HANDLING

5.b)5.1. Volatile and Non Volatile

Volatile petroleum has a flash point below 60°C as determined by the closed cup method of testing. Non-volatile petroleum has a flash point of 60°C or more as determined by the closed cup method of testing.

5.b)5.2. Permitted Cargoes

The ship must only carry those grades of cargo which are permitted by the classification society rules.

For the purpose of practical safety, ships which are certified to carry up to and including class B cargoes must not load a cargo unless the true vapour pressure (TVP) is less than 14 PSI at ambient temperatures. However, the RVP limit established by regulations must not be exceeded.

5.b)5.3. Cargo Orders

The quantities of cargo to be loaded or discharged are determined by The Charterer and will be specified in the voyage orders. Departure from the quantities indicated in voyage orders is permitted only to the extent indicated in those orders.

5.b)5.4. Cargo Layout: Trim, Stability and Stress

The following factors must be considered:

- hull stress at all stages of the loading/discharging operation and the voyage
- trim and stability at all stages of the loading/discharging operation and the voyage

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- loading/discharging sequence
- safeguards against contamination
- dead freight and draft
- draft limitations in loading and discharging ports, including air draft where appropriate
- condition of ship's cargo tanks and system
- avoidance of slack tanks
- simultaneous transfer of cargo and ballast
- Washing requirements.

5.b)5.5. Segregation and Contamination Prevention

Every care must be taken to avoid admixture of cargo grades. The cargo layout must conform to the limitations of the ship cargo, venting and inert gas line systems. The use of split sections for non-kindred products should be avoided.

Unless otherwise specified by the Ship Manager there must always be at least two-valve segregation between different grades of clean products and single valve segregation between different grades of crude oil and black products.

Tank bulkheads, pipelines and valves must be tight, in keeping with the proposed cargo layout.

Tanks, lines and pumps must be prepared in Accordance with The Charterer's instructions.

The setting of cargo valves must be done with the utmost care and critical valves must be secured against inadvertent operation.

Pressure/vacuum valves must be in good operating condition.

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Deck valve stuffing boxes, tank lids, tank cleaning plates, fixed machines, ullage cover packing and all other deck penetrations must be in good condition to prevent water entering the tanks.

Shore hoses and rigid loading arms must be checked to ensure proper connection to the correct shipboard manifold.

Ships are required to carry segregated grades and be able to handle them simultaneously. A high priority must therefore be placed on the regular pressure testing of segregation valves to ensure their integrity. Valves found leaking must be repaired or replaced prior to loading. The chief officer must maintain a record of the testing of valves. Segregation valves must be tested at intervals not exceeding six months and the date of these tests must be recorded in the PMS.

Spare valves carried on board must be kept ready for replacing leaking valves in the cargo system. Sufficient spare parts must be carried at all times.

If for any reason a ship is unable to repair or replace segregation valves prior to arrival at the load port, the Ship Manager must be informed at the earliest opportunity.

5.b)5.6. Draft

The draft/freeboard to which the load line regulations apply is the observed draft/freeboard amidships and not a figure obtained by taking the mean of the fore and aft drafts.

Due allowance must be made for consumption of fuel, water and stores before reaching the limiting zone, and for fresh water allowance, if any.

On receipt of voyage orders from The Charterer the master must always check that the depth of water at loading/discharging ports and en route is sufficient for the ship to undertake the voyage, always remaining safely afloat with an adequate under keel clearance. The Ship Manager must be advised immediately if any problems are anticipated.

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5.b)5.7. Allowance for Expansion

Sufficient ullage must be left to allow for expansion of the cargo due to temperature increase if the ship is to enter warmer water during the voyage, or if the cargo is to be heated.

5.b)5.8. Loading Overall

Loading overall, i.e. with cargo hoses lashed into tank hatches or other openings is prohibited.

5.b)5.9. Cargo Heating and Loading Temperatures

Cargo must be heated in accordance with the Charterer instructions or any special instructions contained in the voyage orders.

Unless specifically instructed to do so in the voyage orders, cargo must not be heated above 58°C.

The following procedures must be followed when loading cargoes at temperatures in excess of 65.5°C:

- tanks must be preheated by putting steam on the coils for six hours before loading commences (except coated tanks).
- loading to be commenced at a very slow rate, approximately one foot innage per hour, until the innage reaches one foot after which loading can proceed at the normal rate.
- loading to commence simultaneously into all tanks that are to receive the high temperature cargo.
- such cargoes must not be loaded next to tanks containing ballast.

The limitations set by tank coating manufacturers with regard to acceptable cargo temperatures must not be exceeded. Tanks coated with epoxy coating should not

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be loaded with cargo at temperatures in excess of 73.5°C without the coating manufacturer's approval.

Coated tanks must not be pre-heated.

5.b)5.10. Static Electricity Hazards

Most refined petroleum products are poor conductors of electricity and may develop electrostatic surface charges when handled. Such products are known as static accumulators and require special precautions in handling. They must always be handled in Accordance with the recommendations contained in ISGOTT.

5.b)5.11. Loading Rates

Loading must be started at a slow rate. When it has been determined that the cargo system is operating properly, the loading rate should then be increased to a safe maximum rate. In establishing a safe rate consideration must be given to safety of operations, the condition of the ship's pipeline system, the capacity of the ship's venting system and the ability of the ship's personnel to handle the loading rate without undue risk of overflow.

The loading rate must be reduced as necessary when topping off tanks and in order to permit completion of loading without risk of overflow.

Ship personnel must be alert to the possibility of unexpected changes in loading rates or the malfunction of gauging equipment. Cargo tank ullages must be closely monitored by the OOW so that unplanned changes in rate are identified at an early stage.

5.b)5.12. Loading and Discharge Pressures

Loading and discharge pressures should be the lower of either the maximum pressure permitted by the terminal or that which is considered safe aboard the ship, having due regard for the condition of the cargo system, and any precautions required under this chapter.

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5.b)5.13. Cargo Watch: Personnel on Duty

At all times while cargo is being transferred, a licensed deck officer and a sufficient number of other personnel must be on duty to assure the safe handling of the operation, and the safety and security of the ship.

5.b)5.14. Hose and Cargo Arm Connection

Regardless of whether hoses and cargo arms are connected by ship or terminal staff, the chief officer must check that connections are properly made with adequate gaskets and bolts in every hole, and that arms are properly supported. Where unbolted connections are used then he should carry out this check in so far as it is possible for him to do so.

Drip trays must be in place under the shipboard end of all hose or loading arm connections.

Cargo hoses should not be disconnected until tanks have been inspected.

Freeboard limitations for hoses and cargo arms should be established and observed.

5.b)5.15. Lifting Cargo Hoses

When lifting floating or submerged cargo hoses with the ship's equipment a deck officer must be present at the manifold to ensure that the operation is carried out safely. He must not hesitate to stop the operation if he considers that it is being carried out in a manner, which might endanger the ship, personnel or the environment. A cargo hose that is lifted for any reason must have a blank on the free end(s) of the hose.

5.b)5.16. Ship/Shore Communications

Before beginning cargo operations an effective means of communication between ship and shore personnel must be established. In particular the means and signals

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to be used to control the flow rate and the procedures for an emergency shut down must be agreed and understood by both ship and terminal staff.

5.b)5.17. Emergency Cargo Pump Shutdown

All deck officers standing watch during cargo transfer must know how to stop the cargo pumps so that immediate action can be taken in an emergency. This includes use of the regular operating controls situated in the pumproom, cargo control room and the remote control emergency stops.

5.b)5.18. Clearing Lines

Cargo lines and hoses can only be cleared by blowing air if the procedures detailed in ISGOTT are complied with.

5.b)5.19. Cargo Discharge: Stripping Lines and Tanks

On completion of discharge of both refined and crude oil cargoes all lines and tanks must be stripped as dry and possible to ensure that the maximum amount of cargo is delivered and in transit losses are minimised. Line stripping must not be neglected in order to reduce discharge time.

5.b)5.20. Cargo Records and Reports

Complete and accurate records of all cargo carried must be maintained by the chief officer. Copies of all cargo records, including bills of lading, notice of readiness, ullage reports, tank dry certificates and voyage orders must be filed by voyage and retained on board.

5.b)5.21. Discharge Masters

A discharge master appointed by the Company may attend crude oil ships involved in international trade during cargo discharge operations. The function of a discharge master is to help achieve an efficient port turnaround by assisting the chief officer to supervise the cargo discharge operation. The chief officer must

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have his cargo discharge plan ready prior to arrival and should discuss this with the discharge master when he arrives on board.

The presence of a discharge master in no way relieves the chief officer of his responsibilities for cargo operation, nor the watchkeeping officers of their responsibility for the security of the ship or their duty to assist with the discharge operation.

The discharge master is required to maintain records relating to his visit. He will discuss the appropriate forms with the master and obtain his signature prior to the ships departure.

5.b)5.22. Discharge/Loading Advisors

When discharge/loading advisors are assigned to the ship by third parties such as the charterers or cargo receivers the master must offer them full co-operation within the limits of Company instructions. However the presence of such an advisor never relieves the master of his responsibility for the safety of the ship and the prevention of pollution.

5.b)6. CARGO PUMP OPERATIONS

5.b)6.1. Starting Cargo Pumps

The deck officer in charge of cargo operations must always try to give the engine room at least one hour's notice for the cargo plant requirements. However the duty engineer should always be aware of the requirement for the cargo plant on arrival at a terminal and make preparations as necessary.

Under no circumstances are any cargo/ballast pumps to be started without the express permission or request of the deck officer in charge of the cargo operations. The duty engineer must always re-confirm the request for pumps with the deck officer to ensure that no confusion or misunderstanding exists.

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When starting cargo or ballast pumps the duty engineer must be in direct contact with the deck officer. The duty engineer must operate the cargo pump controls until handing over control to the deck officer.

Control of the pump load should take into account the plant load. Pumps should not be speeded up so quickly so as to overload the boiler and cause smoke emissions or overload the engine if diesel driven. The duty engineer is to always be aware of the possibility of the pumps tripping unexpectedly without notice and the possible effects on plant operating conditions.

5.b)6.2. Test and Maintenance of Pump Monitoring Equipment

Cargo pump trip and alarm settings must be tested on a regular basis as per manufacturer's recommendations. Where no such recommendations exist these tests must be carried out at least every month with the exception of the over speed trips, which are to be done at 6 monthly intervals. The method of testing all trips (inc. overspeed) must be as per manufacturer's recommendations.

The function of all cargo pump remote shut down trips must be verified on a monthly basis and the date of the test must be recorded in the PMS.

The integrity of the engine room/pump room gas seal must be verified at least once per month and the date of the test must be recorded in the PMS.

All cargo system pressure gauges should be operational and their accuracy must be verified on an annually.

The chief officer must ensure that any problems with cargo systems are reported promptly to the chief engineer.

Any leaks from shaft seals, gland packings, valve spindles, pipe flanges etc. must be repaired as soon, as is operationally possible. Should any major leaks develop, the relevant system is to be isolated until the integrity of the system is restored.

5.b)6.3. Cargo Pump Shaft Bearings (Where fitted)

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The cargo pump deckhead or bulkhead bearing between the engine room and pumproom and pump bearing temperatures must be closely monitored and temperatures must be recorded at two-hour intervals while pumps are in operation. Should bearing temperatures rise above the manufacturers recommended limits, the pump must be stopped and the cause of the overheating investigated.

The deckhead or bulkhead bearing must be inspected on a yearly basis. The bearing need not be removed. A visual inspection will suffice based on the running temperatures being within limits. A jack test should be used to ascertain any play in the bearing.

The chief engineer should ensure that at least one replacement set of seals and bearings is available on board at all times.

The inspections and maintenance referred to above must be recorded in the Cargo Pump Work Book.

5.b)6.4. Deepwell Pumps

Vessels equipped with Deepwell pumps such as Framo must be inspected and maintained as per the manufacturer's instructions.

5.b)7. BALLAST HANDLING

5.b)7.1. Arrival Ballast

Ships should arrive at loading terminals with the minimum cargo tank ballast required for safe navigation and handling.

At a port where mandatory draft or dead-weight requirements are in force, such requirements should be considered as being a minimum, and the master must not hesitate to take more ballast if he thinks it necessary for the safe handling of the ship.

Only clean or segregated ballast may be discharged overboard in port.

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Certain ports will not allow the discharge of any ballast overboard, even clean segregated ballast. In such cases the master should have the ballast arranged so as to facilitate is quickest discharge to shore.

Ships arriving at a loading port with dirty ballast must discharge it ashore. In such cases the master must always check that reception facilities for the required quantity of dirty ballast are available before arriving at a port with dirty ballast to discharge.

5.b)7.2. Carriage of Ballast

Ballast must be carried as necessary for the safe and efficient operation of the ship. Ballast patterns contained in the COW and/or loading manual should be followed insofar as it is safe and practicable with due consideration being given to the weather conditions and tank cleaning requirements.

Factors to be taken in to account when loading ballast include:

- the requirement to comply with the statutory draft requirements
- minimizing ship vibrations
- minimizing the number of slack tanks to reduce the effect of sloshing
- The most effective draft and trim for efficient and economic speed.
- Weather

5.b)7.3. Minimizing Stress

Ballast must be handled and distributed so as to minimize hogging and sagging stresses.

Stresses must be kept to a minimum and ballast patterns must not be used if they result in hogging or sagging stresses, which exceed 90% of the allowable maximum in port or at sea without prior approval from the Ship Manager. It is

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recommended that the stresses do not exceed 80% of the allowable maximum in port or at sea.

Stress calculations must be made prior to the transfer of any ballast and these must be kept as part of the ship's records. Entries showing stresses calculated for each of the following conditions are required:

- prior to commencing transfer
- 50% ballast loaded
- completion of loading ballast
- 50% ballast discharged
- Completion of transfer operations.

5.b)7.4. ODME Failure – CBT Tankers/Heavy Weather Ballast

In the event of a failure of the oil discharge monitoring equipment every effort must be made to ensure that ballast operations are carried out in a manner which minimizes the risk of any oil pollution. This must include the use of part flow systems and manual interface detectors. Discharge must be stopped with at least one metre sounding in the tank and this should be stripped back to slop tank.

Ballast operations must be limited to daylight hours and the overboard discharge must be constantly and visually monitored.

Details must be entered in the oil record book.

In addition to entering the defect into the Defect Reporting System, the Ship Manager must be advised immediately of the situation and the precautions in hand to deal with it.

5.b)7.5. De-ballast with Cargo Pumps

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It is not only necessary to ensure that the ballast water is clean, but also that all pipelines, main and stripping and cargo pumps are completely free of discoloured water.

It is essential that, in addition, de-ballasting be effected for a short period using the main and stripping cargo pumps shortly before arrival at the load port. This should ensure that all lines and pumps are completely clean when de-ballasting starts in port.

5.b)7.6. Segregated Ballast

When segregated ballast is discharged the possibility of contamination due to bulkhead or line leakage must always be considered. Prior to discharge the surface of the ballast water must be visually checked and during discharge the sea around the ship must be monitored for any sign of oil. Discharge must be stopped if oil is seen to be entrained in the ballast. On ships where the segregated ballast system is connected to the oil content monitor, this must be in operation throughout the discharge.

5.b)7.7. Dedicated Clean Ballast

Ships that are designed to operate with dedicated clean ballast (CBT) must operate in Accordance with the procedures detailed in their CBT Manual. The oil content monitor must be in operation throughout the discharge of dedicated clean ballast.

5.b)7.8. Simultaneous Cargo/Ballast Operations

Because the complexity of the operation gives it a higher pollution potential, the simultaneous handling of cargo tank ballast and cargo is prohibited except under the controlled conditions.

5.b)8. HEAVY WEATHER BALLAST

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5.b)8.1. Masters judgment

Additional ballast to meet the requirements of heavy weather must be taken whenever the master considers it necessary. When additional ballast is required because of severe weather conditions, particular attention shall be given to avoiding slack tanks and to minimising longitudinal stresses.

5.b)8.2. Ballasting Large Ships

Ships exceeding 100,000 tonnes dead-weight must apply additional precautions.

Weather conditions should be such that in the master's judgment, the transfer can be safely accomplished without adverse effects of vibrations or sloshing. In the event of actual or anticipated heavy weather it may be necessary to alter course, reduce speed and/or heave in order to avoid these conditions if the timing of ballast operations cannot be changed.

Checker board loading patterns using alternate wing and centre tanks should be avoided if possible for any passage.

5.b)8.3. Ballast Discharge: Stripping Lines and Tanks

To avoid contamination of cargo by water, tanks and lines must be properly stripped upon the completion of ballast discharge. The requirement applies to ships engaged in the crude oil trades as well as to those engaged in refined product trades. When stripping lines and tanks, great care must be taken to avoid contamination of the sea, and if necessary such strippings should be discharged into the slop tank or to shore.

Some charterers have requested that the last remnants of clean ballast tanks are pumped to the slop tank and this water is de-canted overboard during the loaded passage. This practice does not comply with the intent of MARPOL and will not be allowed under any circumstance.

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5.b)8.4. Starting Ballast

To prevent oil from leaking overboard by way of the sea suction when commencing to take ballast, the pumproom, line and tank valves must be properly set, and the pumps must be running with a vacuum established on the sea line before the sea valves are opened. This operation must always be carried out in accordance with the instructions.

5.b)8.5. Ballasting: Sequence of Valve Operations

When loading ballast the tank valves must be the first valves opened and the initial flow of ballast must be restricted so that the entrance velocity is less than one metre per second until:

If a double bottom exists under the tank being ballasted, there is a sounding of 1.5 metres in the tank.

If there is no double bottom under the tank being ballasted, the longitudinals are covered.

These precautions are essential to avoid a geyser effect and the build up of an electrostatic charge in a mist or spray near the point where the ballast enters the tank. When sufficient charge exists, the possibility of a discharge and ignition cannot be excluded.

5.b)9. CRUDE OIL WASHING

5.b)9.1. Crude Oil Washing Requirements

Crude oil washing (COW) must comply with the requirements contained in each ship's Crude Oil Washing Manual.

All cargo tanks intended for the carriage of dirty or clean ballast must be crude oil washed. In addition, 25% of the remaining tanks must be crude oil washed. Ballast must not be loaded into a cargo or slop tank, which has not been crude oil washed.

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This is the standard COW operation and it must not be exceeded unless otherwise instructed by the Company, The Charterer. The "+25%" should be planned to take into account any heavy weather ballast, which might be required or any repairs planned during the voyage.

The arrival and departure ballast patterns described in the COW manual are recommended patterns and there is no absolute requirement that they are used on every occasion. Ballast patterns can be varied for operational or maintenance purposes and this should be taken into account when planning the COW programme.

In certain circumstances it will be necessary to COW all cargo tanks in order to minimise residues:

- during a discharge prior to carrying a non the Company cargo
- in accordance with the requirements of a particular charter party
- prior to a shipyard repair period
- during the first crude oil discharge after a reduced crude cargo
- when a high pour crude oil is carried.

In all such cases, the Company, The Charterer will issue specific instructions. In the absence of such instructions COW must be limited to the standard operation.

5.b)9.2. Crude Oil Washing Operations

The chief officer must prepare a written COW plan. This may form part of the overall plan referred to in this chapter. Details of all crude oil washing operations must be recorded in the cargo/ballast records.

Prior to arrival at the discharge port the COW pipelines must be pressure tested to 125% of working pressure. This test must be recorded in the pollution prevention checklist.

COW is only permitted if the oxygen content of the tank atmosphere is less than 8% and there is a positive pressure in the tank of at least 500mm wg. Prior to

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During a tank its atmosphere must be tested at point's one metre below the deck and in the middle of the ullage space. If there is a mid length wash bulkhead in the tank these readings must be taken on each side of that bulkhead. All these readings must be logged in the cargo/ballast records.

Whilst washing is being carried out the COW pipelines must be kept under constant observation in order to detect any leaks which may occur.

Prior to starting COW operations the following precautions must be taken in order to avoid generating the high electrostatic charges, which may arise when washing with a mixture of crude oil and water: At least the bottom one metre must be discharged from any tank used as a source of COW oil to remove any water, which may have settled out of the oil during the voyage.

When a slop tank is the source of COW oil it must be discharged completely and then be refilled with "dry" oil.

It is essential that crude oil ships are able to carry out the required COW operations. Any problems, which effect the ship's ability to COW, must be reported to the Ship Manager immediately and be recorded in the defect reporting system.

5.b)10. TANK CLEANING AND GAS FREEING

5.b)10.1. Tank Cleaning Safety

The safety precautions detailed in ISGOTT apply to the cleaning of all cargo and bunker tanks on Company ships.

On ships fitted with an inert gas system all tank cleaning operations must be carried out with the tank in an inert condition.

On non-inerted ships all tank cleaning operations must be carried out in Accordance with the ISGOTT "undefined atmosphere" procedures.

5.b)10.2. Tank Cleaning Responsibility

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The chief officer is responsible to the master for ensuring that cargo tanks and the cargo system are in a suitably clean condition for the cargo to be loaded and that the cleaning operations are conducted in a safe and proper manner.

5.b)10.3. Cleaning Requirements

Cargo tanks must be cleaned in order to:

- meet clean ballast requirements
- meet cargo requirements as specified by the Charterer
- gas free for sludge removal
- gas free for repairs at sea
- gas free for shipyard repairs.

Although tank cleaning for the foregoing reasons may be necessary, excessive tank cleaning is uneconomic and the increased volume of water may lead to increased difficulty in meeting pollution control requirements relative to load on top operations.

Ships must not wash tanks in anticipation of cargo grades for which orders have not been received.

Ships engaged in the clean oil trade, with definite loading orders, are to wash tanks to meet the grade requirements as specified in the Charterer instructions in accordance with Tank Cleaning Guide.

5.b)10.4. Line Washing

On completion of tank cleaning all lines and pumps must be washed prior to loading clean cargo tank ballast. This washing operation must be repeated on completion of all ballast handling operations. Lines and pumps must never be flushed directly to sea and must always be flushed into a cargo tank. The contents of this tank must then be stripped back to a slop tank.

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5.b)10.5. Discharging into Slop Tanks

The free fall of liquid into a slop tank is prohibited.

The transfer of gas and air from tanks being washed to the slop tank must be minimised. If this objective cannot be met by the careful control of eductors, then stripping pumps are to be used. Notwithstanding these precautions, it is possible for an electrically charged mist to form in a slop tank. Unless the atmosphere in the slop tank is proved to be inert, then the restrictions specified in ISGOTT regarding the introduction of sounding rods and other objects following tank washing must be observed.

Due to the smaller volume of liquid throughput, the use of stripping pumps is preferable to eductors as it aids in the separation process in cascade slop tank systems.

5.b)10.6. Tank Cleaning Hoses: Bonding

The chief officer must ensure that tank cleaning hoses are tested for electrical continuity before each use. If the test results indicate any break or continuity or should any reading exceed one ohm/per foot, the hose must be withdrawn from service. The hose must be dry when tested.

5.b)10.7. Gas Freeing Safety

The safety precautions detailed in ISGOTT apply to the gas freeing of all cargo, bunker and ballast tanks on Company ships.

Prior to gas freeing an inerted tank it must first be purged with inert gas until the hydrocarbon content of the tank atmosphere is less than 2% by volume. This will ensure that during the subsequent gas freeing the tank atmosphere will never enter the explosive range.

Any chutes or ducts used for gas freeing purposes must be fully bonded in order to avoid the build up of a static charge on the chute or duct.

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5.b)11. INERT GAS OPERATIONS

5.b)11.1. Inert Gas System Failure

In all cases of inert gas system failure which cannot be repaired Accord Marine Management must be informed immediately.

5.b)11.2. General Requirements

The purpose of an inert gas system (IGS) is to provide protection against the risk of fire or explosion in cargo tanks by reducing the oxygen level in the tank atmosphere to a level substantially below that necessary to support combustion. Where ships are fitted with an IGS it is the Company's requirement that they operate with their cargo and slop tanks in the inert conditions at all times unless prior approval has been received from the Ship Manager or when there is an operational requirement to enter a tank for inspection or maintenance purpose. It is recognised that certain cargoes, which are not required to be inerted under SOLAS, may be contaminated by inert gas. The Ship Manager approval is necessary to isolate such cargo tanks from the inert gas system.

The IGS is one of the ship's primary safety systems and it must be capable of producing gas, under all conditions of operation, with an oxygen content in the main line of not more than 5%. Anything, which reduces the capability of the system to operate at optimum efficiency, must be reported to the Ship Manager immediately and an appropriate entry made in the defect reporting system.

The chief engineer is responsible for the repairs necessary to maintain the IGS fully operational at all times. The chief engineer must ensure that all alarms and trips are fully operational and all alarm/trip testing records are kept up to date.

5.b)11.3. Inert Gas Valves

Unless risk of cargo contamination requires to the contrary, cargo and slop tank IG inlet valves must be kept open at all times. This will permit the pressure in the tanks to be monitored by the IG line gauges and alarms in the cargo control room, engine control room and wheelhouse.

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Tank IG inlet valves must be kept locked in the open or closed position. A valve status board must be maintained in the cargo control room and the keys, which must be clearly identified, are to be kept close to this board under the control of the Chief Officer of the Officer of the Watch.

During cargo loading and when ballasting cargo tanks, regardless of the type of vent system with which the ship is equipped, the IG inlet valves must be open. This will ensure that the tanks are connected to the water filled pressure vacuum breaker, which will become a last resort fail safe device against over pressurisation in the event of any undetected problems with the vent system. In addition, vent line valves (if fitted) should be open and any pressure-vacuum valves set to "open".

During cargo discharge and when deballasting cargo tanks IG inlet valves must be open and any pressure vacuum valves set to "automatic". Tank vent valves (where fitted) must be open, unless the terminal operates a no vapour emission policy, in which case they should be closed.

During a voyage, and unless a tank is gas free, all IG inlet valves must be open so that the tank pressure can be monitored. Cargo tank pressure must be maintained at more than 100 mm wg at all times.

Any deviation from these requirements is only permitted if authorised by the Ship Manager. If tank inlet valves are closed for any reason there must be in place an alternative method for monitoring the pressure in the tank.

5.b)11.4. Tank Pressure

Inerted tanks must be maintained at a pressure in excess of 100 mm wg at all times. Topping up the pressure with IG of not more than 5% oxygen content may be necessary to achieve this. If problems are encountered in relation to this requirement, the Ship Manager must be advised of the reason and of the action required to rectify the situation.

5.b)11.5. De-Pressurisation

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It may be necessary to depressurise tanks for gauging and sampling purposes both prior to and after cargo loading or discharging operations. This is acceptable provided that:

- no cargo or ballast operations are taking place
- a minimum number of openings are used for as short a time as possible
- the tanks are immediately re-pressurised with IG on completion of gauging or sampling
- the equipment used is properly earthed.

5.b)11.6. System Operation

Prior to starting IG operations:

- the fixed oxygen analyser is checked and calibrated

The IGS must always be operated and maintained in Accordance with the detailed instructions contained in the **Manufacturer's instruction manual**. This is the instruction manual required by SOLAS and must always be considered as the primary IGS operating instruction.

- all alarms, recorders and gauges must be tested and working
- there must be an adequate supply of water for the scrubber and deck seal
- any fresh air inlets must be securely closed.

After IG operations have been completed:

- wash the blowers
- flush the scrubber and effluent lines for at least one hour

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- ensure that the water supply to the deck seal is running and that any associated alarms work
- close the flue gas valves and ensure that the air seal system is working
- ensure that the deck line non return valve has shut
- ensure that the main supply valve is fully closed.

Whenever the IGS is operating, the oxygen content and pressure in the main line must be continuously recorded.

When the plant is started the recorders must be synchronised and a notation of time/date must be made on the recording paper. During cargo discharge operations the OOW must make a similar notation at the end of his watch.

If, during any operation the oxygen content in the main line exceeds 5%, immediate steps must be taken to rectify the situation. If this cannot be done, the operation must be suspended, and the main supply valve closed until good quality inert gas is once again available.

5.b)11.7. Voyage Status

At the start of a voyage, unless otherwise required for a specific purpose, all cargo and slop tanks should be inerted with an oxygen content of less than 8% and a pressure in excess of 100 mm wg. The chief officer must make an entry in the deck log book to this effect. If there is any deviation from this requirement this must be noted at this time.

Any subsequent changes to the status of the cargo or slop tanks must be recorded in the deck log book.

During the voyage the tank and line pressure as recorded on the wheelhouse pressure gauge must be logged in the deck log book at the end of each watch.

5.b)11.8. Tank Entry

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If a tank has to be gas freed for entry it must be securely isolated from the IG and vent lines. Once the tank is gas free the hatch must be opened and must remain open throughout the period the tank is in that condition. Prior to reinerting, the tank must be reconnected to the inert gas and vent lines.

NO TANK MAY EVER BE ENTERED UNTIL AN ENCLOSED SPACE ENTRY PERMIT HAS BEEN ISSUED.

Prior to gas freeing a tank it must first be purged so that the hydrocarbon content is less than 2% by volume. This will ensure that, as gas freeing proceeds, at no time will the tank atmosphere enter the flammable range.

5.b)11.9. Pressure Vacuum Breaker

In order to ensure that the fail safe nature of the p/v breaker is not compromised, the level must be maintained as specified by the system manufacturer, and this must be checked prior to cargo operations. In the event of the ship operating in a climate where freezing temperatures could be encountered, the breaker must be emptied and refilled with a mixture of 60% water and 40% anti freeze (ethylene glycol).

The sight glass must be kept clear at all times so that the liquid level can be easily ascertained.

5.b)11.10. Tank Cleaning

When cleaning with portable machines the inert gas system must be in operation and supplying IG to the tanks being washed and, in order to minimise the risk associated with air entrainment, before starting the operation the tank should be purged until the hydrocarbon content is less than 2% by volume and purging should continue whilst washing is in progress. The hydrocarbon content prior to commencing operations must be recorded in the cargo/ballast records.

When cleaning with fixed machines, before starting the operation the oxygen content of the tank atmosphere must be verified as being less than 8% and there must be a positive pressure of at least 500 mm wg. These details must be recorded in the cargo/ballast records. Pressure and oxygen content must be

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monitored throughout the operation and should the tank atmosphere fail to meet these parameters washing operations must be suspended and the tank be supplied or purged with IG until the required atmosphere has been re-established.

5.b)11.11. Simultaneous Cargo and Ballast Operations

Simultaneous cargo and cargo tank ballast operations require special care to ensure that vent and IG valves are set correctly. Under normal circumstances such operations are prohibited unless prior approval has been received from the Ship Manager.

5.b)11.12. Failure of Inert Gas Plant

An atmosphere where the concentration of hydrogen sulphide exceeds that of oxygen is often found in an inerted tank which contains, or has contained, crude oil. In such an atmosphere iron oxide, which is likely to be present in the form of rust, is converted to iron sulphide. If this iron sulphide is subsequently exposed to oxygen it is oxidised back to iron oxide and this process can involve the generation of considerable heat. Such pyrophoric oxidation can generate enough heat to turn particles incandescent, which could ignite a flammable mixture.

In the event of any operational or equipment failure of the IGS which results in an inability to maintain the oxygen levels in the tanks below 8% by volume, crude oil handling operations must be stopped at once. Operations must not be resumed until the IGS has been restored to normal operations or an alternative source of inert gas has been provided.

In the event of such a situation arises the Ship Manager must be advised immediately and the following information should be available:

- nature of fault and estimate of repair time
- availability of alternative inert gas supply and its capacity
- whether specialist assistance required
- spare parts requirement

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- restrictions, if any, on prolonged berth occupancy
- cargo quantity remaining in each tank
- oxygen, hydrocarbon and pressure levels in each tank.

The connection point on the IG line for an alternative emergency supply must be clearly identified.

The failure of the IGS may result in potential hazards due to static electricity. If air has, or may have, entered a tank no dipping, ullaging, sampling or other equipment may be introduced into the tank until at least thirty minutes after the supply of IG stopped. After this time, such equipment can be used provided that it is correctly earthed. This restriction must then be complied with until five hours after the supply of IG has stopped.

5.b)11.13. General Safety and Health Considerations

By its very nature inert gas is an asphyxiant due to the low oxygen content. In addition, some of its components (e.g. carbon monoxide, sulphur dioxide, etc.) are toxic in their own right. It is thus essential that personnel are alert to the potential hazards, which may arise due to leakage of gas. This particularly applies to the scrubber house, which must be kept mechanically ventilated at all times during which the plant is being operated.

Inert gas does not affect hydrocarbon or toxic gas levels in a tank atmosphere. Dilution of an inerted atmosphere when vented may result in pockets of gas which are within the flammable range and which may be toxic. Safety precautions must never be relaxed because a tank atmosphere is inert.

When gauging or sampling operations are taking place personnel should avoid standing in the path of vented gas.

Whenever a tank is kept inerted at a positive pressure personnel should be alert to the potential hazards of this pressure. Pressure should be reduced prior to opening tank lids, ullage ports, tank cleaning hatches, etc.

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5.b)11.14. Gauging and Sampling

So far as possible all gauging and sampling must be carried out via the tank vapour locks. When sampling or gauging an inert tank any metallic components of the equipment must be electrically continuous and properly grounded. This is to avoid the potential hazard of a spark at the ullage cap lip igniting a pocket of flammable gas, which might exist.

5.b)11.15. Oxygen Liberation

Some petroleum products, notably aviation kerosene (e.g. Jet A1) and diesel oil, may absorb oxygen during the refining process which can later be liberated into the ullage space of an inerted cargo tank. After departure from the load port the chief officer should monitor the oxygen content of such tanks and purge/re-inert if the oxygen content exceeds 8%.

5.b)11.16. Clean Product Ships

Clean product carriers fitted with IGS should normally be presented for loading in an inerted condition unless otherwise advised. The master must advise the terminal, via the agency, in his initial ETA message that "the ship will be presented for loading in the inert condition". If the terminal (or shipper/consignee) requires a physical inspection of the tanks, the master should advise them that all time and costs to purge, gas free and reinert will be for their account and this must be confirmed by a Letter of Protest. The master must keep a record of all times, fuel consumption and any other costs involved.

5.b)11.17. Protection Against Over/Under Pressurisation

It is the combination of vent and inert gas systems which protects the ship against over or under pressurisation of tanks. The maintenance of vent and IGS valves in a fully operational condition is thus a high priority and the Ship Manager must be informed immediately of any problems, which might affect the system's efficiency.

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5.b)11.18. Maintenance and Testing

All IGS functions, alarms and cut outs must be tested before use or at intervals not exceeding one month. Details must be recorded in the appropriate section of the ig log book.

The chief/second engineer must examine components of the IGS at the intervals specified in the appropriate section of the IG log book and confirmatory entries must be made.

Inspection of the internals of the scrubber and deck seal is only permitted when these are gas free and is subject to the issue of an enclosed space entry permit. Prior to entry the internals should be flushed with water to remove any acidic deposits which might be present on the structure.

The efficiency test should be carried out once every three months and the appropriate section of the IG log book must be completed.

5.b)11.19. IG Records

The chief officer and chief engineer/ second engineer are responsible for ensuring that the IG log book is maintained in accordance with requirements. It must include details of:

- purging and inerting operations
- test of alarms and cut outs
- maintenance and inspection
- efficiency tests

5.b)12. EMISSION FREE DISCHARGE – Annex VI of MARPOL

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5.b)12.1. Terminal Requirement

A terminal may require that cargo discharge and ballasting operations be carried out in a manner that prevents the emission of hydrocarbon and other cargo tank vapours to the atmosphere. The largest volume of noxious emissions occurs when ballasting cargo tanks. This problem can be overcome by two different methods of operation, both of which result in the displaced vapour being retained onboard.

5.b)12.2. Operating Methods

Vapour Balancing is a simultaneous cargo and ballast transfer operation, with vapour from the ballasted tanks being transferred to those tanks from which cargo is being discharged.

Vapour Compression involves ballasting in the normal manner, but with all cargo tank outlets, which would permit the release of vapour to the atmosphere, secured, and the displaced vapour being dispersed through and absorbed within the empty cargo tanks.

5.b)12.3. Authorization

Because of the potential hazards associated with each method, regardless of which option is used, 'no emission' cargo discharge operations are not permitted unless the planned operation has been discussed with, and authorised by, the Ship Manager. This section gives details of the factors which masters must take into account when planning such an operation.

When requesting authority to carry out a 'no emission' ballast operation, masters must confirm that the requirements of paragraphs 5 or 6 have been taken into consideration in developing the operating plan. Authority to conduct the operation may then be granted by the Ship Manager.

5.b)12.4. Gauging and Sampling

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Another source of vapour release is during gauging and sampling operations. Whilst SOLAS regulations permit depressurisation for this specific purpose, all Company ships are fitted with vapour lock gauging and sampling points which permit these operations to be carried out without releasing the tank pressure. It would be illogical for a terminal, which prohibits vapour emissions to then require 'open' gauging. However it is not unknown, and in such cases masters should only comply on receipt has written instructions from the terminal.

In this respect masters should note that SOLAS regulations require that a minimum pressure of at least 100mm wg be maintained in cargo tanks at all other times. Any request from a terminal to depressurise below this level prior to arrival at a berth must be declined.

5.b)13. BARGE OPERATIONS

5.b)13.1. Barge Transfer Operations

When transferring cargo to or from barges it is essential that there is no relaxation of normal safety precautions and procedures. In addition, the operation should be carried out, so far as possible, in Accordance with OCIMF/ICS "Ship to Ship Transfer Guidelines".

When conducting operations with barges due consideration should be given to the possibility that the barge procedures may be significantly different to those used onboard the ship. It may also be the case that the barge personnel are not experienced seafarers or tankermen. Extra vigilance by the ship's staff may therefore be necessary to prevent an incident.

5.b)13.2. Communication

Prior to commencing the operation there must be a pre-transfer meeting between the chief officer and the person in charge of the operation on the barge. In addition to routine operational procedures, this meeting must be used to establish:

- communication procedures

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- product identification
- emergency signals to be used by ship and barge
- emergency stop procedures
- routine stop procedures.

Throughout the operation there must be reliable and efficient communication between barge and ship personnel. In order to ensure that this is the case the ship should, if required, loan the barge a portable radio.

In addition, when the barge is suitably equipped, there must be direct contact via an agreed VHF channel between the barge and the ship's cargo control room.

During the operation routine test transmissions must be made every 20 minutes.

An emergency signal indicating that a problem is being experienced must be established for both ship and barge.

These must be demonstrated prior to commencing operations.

If communication between ship and barge is lost for any reason the transfer operation must be stopped immediately.

Operations must not be resumed until communications have been re-established.

All communications between ship and barge must be logged in the cargo/ballast records.

5.b)13.3. Product Identification

Clear and consistent product identification is essential to ensure that there is no confusion between ship and barge with regard to the product being handled. Unfortunately, local nomenclature for a particular market may result in the barge personnel using product names, which differ from those on the bill of lading.

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It is essential that this item is addressed in the pre-transfer meeting and that there is no ambiguity as to the grade being handled. If there is a difference, then the terminology used by the barge should be used during the operation.

Where there is a difference in terminology the ship must ensure that the names to be used for the products being handled are clearly posted in the cargo control room.

The ship's manifold must be clearly marked with the agreed name of the product being handled. This should be mounted so that it is clearly visible from the barge. The barge personnel should be encouraged to ensure that similar signs are in place at their manifold.

The ship's duty officers must allow for the change in freeboard between their own ship and the barge caused by the cargo transfer when

positioning product identification boards. These must always be visible to barge personnel.

5.b)13.4. Emergency Stop Procedures

In the event of the barge requesting an unplanned stop, the ship must comply with this request immediately.

Operations must not resume until the reason for the stop has been resolved to the satisfaction of both barge and ship personnel.

If the previously agreed emergency signal is sounded by either ship or barge, operations must stop immediately.

They must not be resumed until the situation has been resolved to the satisfaction of barge and ship personnel.

In some cases the barge may be equipped with audible/visual tank high level alarms. This should be ascertained during the pre-transfer meeting, when they should be demonstrated to ship's staff. If these alarms are operated at any time other than during topping off operations on the barge, operations must be stopped immediately.

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5.b)13.5. Routine Stop Procedures

During the pre-transfer meeting notification times for stopping discharge of each grade should be agreed. As a minimum these should include 15 and 5 minutes notice.

At 15 minutes notice the transfer rate should be reduced. The chief officer should assume control in the cargo control room and the deck OOW should be stationed at the manifold. Personnel to operate the valves must also be stationed at the manifold.

At 5 minutes notice both ship and barge personnel must be prepared to stop the transfer and close the manifold valves.

When the request to stop is made it should be carried out immediately. As soon as pumps are stopped the ship's manifold valve must be closed immediately. Subsequent draining of transfer hoses and lines should not take place until agreed by both ship and barge.

When discharging into a barge, ship's personnel must be aware that the barge tanks are relatively small and will fill up quickly. What seems to be a slow rate to the ship may not appear that way the barge.

At the pre-transfer meeting the ship must point out to the barge staff that there will be a short time interval between stopping the pump and closing the valves. The barge should be requested to make allowance for the small quantity of product which may siphon into the tank during this time.

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