INTERNATIONAL CONFERENCE ON MARINE POLLUTION, 1973

INFORMATION MATERIAL RELATED TO THE CONSIDERATION OF THE DRAFT INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973 AND ITS ANNEXES

Submitted by the International Chamber of Shipping

The attached note and a copy of the draft revision of Chapter 5 of the IOS Tanker Safety Guide (Chemicals) are submitted by the International Chamber of Shipping for information of delegates in connexion with consideration of Regulation 5 of Annex II of the draft Convention.

Due to the limited number of the attachments available, only two copies per delegation (English only) will be distributed during the Conference.
IMCO MARINE POLLUTION CONVENTION

ANNEX II.

PROCEDURES AND ARRANGEMENTS TO CONTROL THE
DISCHARGE OF NOXIOUS SUBSTANCES CARRIED IN BULK

Note by International Chamber of Shipping (ICS)

Resolution (4) before the Conference recommends that IMCO "should ensure the necessary studies concerning the procedures and arrangements referred to in Regulation 5 of Annex II are undertaken with a view to providing a uniform basis for the guidance of Contracting Governments in approving them".

ICS has studied this problem in depth and submits, for the information of delegates, the attached draft revision of Chapter 5 of the ICS Tanker Safety Guide (Chemicals). The aim of this Chapter is to set out in detail the measures to be taken by a ship's Master to enable him to comply with the terms of the Convention. This draft Chapter draws on the existing text of Chapter 5 in the Guide; the recommended safety measures therein have not been deleted. Account has also been taken of work conducted on this subject by a number of Administrations.

The text is, of course, based on the regulations currently laid down in Annex II of the draft Convention; ICS therefore appreciates that some revision may be necessary, depending on the final text of the Convention. Additionally, it will be necessary to include more details on the procedures and arrangements that will be required to comply with the regulations.

ICS submits the present draft to the Conference as an indication of the positive attitude that shipowners have adopted with a view to the practical implementation of the requirements of the Convention on a voluntary basis before it comes into force. Should the Conference decide to instruct IMCO to develop the appropriate procedures and arrangements, ICS would then be prepared to develop Chapter 5 as necessary, and subsequently submit it to IMCO for consideration as early as possible.
FOURTH DRAFT

INTERNATIONAL CHAIRMAN OF SHIPPING

ICS TANKER SAFETY GUIDE (CHEMICALS)

CHAPTER 5

TANK CLEANING, GAS-FREEING & AVOIDANCE
OF POLLUTION OF THE SEA

5.1 GENERAL

This Chapter is concerned with the safe conduct of tank
cleaning and gas-freeing operations and the avoidance of pollution
of the sea. It does not seek to establish procedures to meet the
degree of cleanliness that may be required for reasons of product
quality.

5.2 INTERNATIONAL, NATIONAL & LOCAL REGULATIONS

5.2.1 International Regulations

The discharge into the sea of slops and tank washing
[will be/is] strictly controlled under the terms of the
International Convention on the Prevention of Pollution
from Ships, 1973. Until such time as the Convention comes
into force, Masters are advised to follow the regulations it
contains wherever practicable. These regulations (Annex II
of the proposed Convention) are reproduced in full in
this guide. Additionally, the data sheets include the
pollution category of each chemical.
5.2.2 National or Local Regulations

There may be national or local regulations regarding tank cleaning and gas-freeing and the discharge of tank washings. These should be strictly complied with.

5.3 OVERALL PRECAUTIONS

5.3.1 Supervision

A responsible officer should supervise all gas-freeing and tank cleaning operations. Information of the work programme should always be available to the Officer of the Watch both on deck and, if at sea, on the bridge.

5.3.2 Emergency Procedure

The data sheet giving the emergency procedure should be readily available to all concerned.

Essential protective clothing equipment (as recommended in 9.3.2) and clean water shower/or spray arrangements in the event of contamination of personnel should be ready for immediate use.

Fire appliances should be in good order for immediate use.

5.3.3 Equipment

A responsible officer should check that all safety, rescue and resuscitation equipment is in safe working order and readily available to all concerned.

5.3.4 Portable Electric Lighting and Equipment

When the ship is not wholly free of flammable vapour the recommendations set out in 3.4 should be observed.

5.3.5 Atmospheres in Tanks and Surrounding Spaces

A flammable vapour mixture should be suspected within a tank or at any of its openings after the discharge of a
flammable cargo, of a combustible cargo carried at a temperature above its flashpoint, or of any cargo loaded into a tank that was not free of flammable vapour. Similarly, flammable vapour should be suspected in cofferdams or any other space into which such cargoes may have leaked.

Harmful concentrations of vapour should be suspected in all of the above spaces when the cargoes that have been discharged have an inhalation hazard.

5.3.6 Working/Entering Enclosed Spaces

A responsible officer should take all safety considerations into account when deciding if a space is sufficiently free of vapour for any particular purpose (see Chapter 6).

5.3.7 Opening up of Cargo Handling Equipment

It should always be suspected even if spaces have been cleaned and made gas-free that some cargo liquid or vapour or both will be released whenever pumps, cargo lines, valves, heating coils etc., are opened up. Precautions should be taken against the effect of such releases.

5.3.8 Disposal of Tank Washings

Tank washings, slops and dirty ballast may be discharged ashore, into barges, and in certain circumstances under the terms of the International Convention (see 5.2.1 and 5.2.2) to the sea. When washing tanks which have contained cargoes which react with one another (see data sheet) [then each tank should be washed and the tank washings be disposed of independently in order to avoid a reactive mixture in a slop tank/barge]. If tank washings or slops are to be transferred to a barge alongside it should be ensured that the necessary
hose connections are properly made and that barge personnel are acquainted with the nature of the hazards and with the safety precautions (see 4.7)

5.4 PREPARATIONS FOR TANK CLEANING OR GAS-FREEING IN PORT AND AT SEA

Before gas-freeing and tank cleaning commence the responsible officer should in port, or when appropriate at sea, be satisfied that the precautions in Chapters 2 and 3 are being observed and also that:

(a) no unauthorised work is being done in way of the cargo space;

(b) in port, appropriate personnel ashore have been contacted to ascertain that permission to operate alongside has been granted, that conditions are safe on the jetty and that notice has been given that operations are about to start (in seeking permission to tank clean alongside involving transfer of washings ashore, shore representatives should be advised of the nature of all grades in the present and/or previous cargo);

(c) appropriate personnel on board have been duly instructed and notified that gas-freeing or tanks cleaning is about to start;

(d) no unauthorised craft is alongside, and authorised crafts that are alongside are warned that cleaning is about to begin;

(e) any necessary hose connections to shore or to craft alongside are properly made and supported;
(f) all cargo tank lids, tank washing openings, ullage openings, sighting ports and vent pipes, except those in the tank(s) first to be cleaned, are closed;

(g) all cargo lines which are not to be used are isolated, if possible, and appropriate valves closed;

(h) all lines and pumps are drained of cargo; dependent upon the design of the ship this may be effected either by draining the pumps and lines into the cargo tank, blowing the cargo direct to shore (see 4.4.1), or transferring to a "drain" or "holding" tank or to the shore using a line stripping pump;

(i) the P/V valves in a vent system are properly set to minimise passage of flammable or harmful vapour back to a tank that has been processed;

(j) all sea and overboard discharge valves connected to cargo and bunker systems are shut and secured, except those in use, (any cargo pumps taking suction from the sea should be started before the sea valve is opened to safeguard against cargo leakage);

(k) scuppers are properly plugged, and spill pans or trays are in place beneath the manifold connections and hose connections;

(l) pumproom precautions (see 2.9) are being observed and will continue to be observed throughout tank cleaning and gas-freeing.

5.5 TANK CLEANING OPERATIONS
5.5.1 Cargo Residues after Discharge

The quantity of liquid residue remaining in the tanks of a chemical tanker after discharge of cargo depends upon:

(a) the characteristics of the liquid;
(b) design and materials of construction of the cargo tanks;
(c) tank coatings;
(d) design and efficiency of the cargo heating system;
(e) design and efficiency of the vessel's pump and piping system;
(f) back-pressure on cargo pumps;
(g) suitable trim and heel during cargo discharge to ensure satisfactory drainage to the suctions;

and will consist of:

(i) the unpumpable quantity remaining in the bottom of the tank;
(ii) the contents of the cargo pump and piping system;
(iii) the quantity adhering to the internal surfaces of the tank structure.

5.5.2 Methods of Cleaning

(a) General

The initial cleaning of chemical tankers should be carried out using tank washing machines, steam, mechanical ventilation and cleaning fluids as is found necessary. Hot or cold, fresh or salt water may be used in the washing machines with or without suitable cleaning solvents.

Steam may also be used as required to assist in cleaning operations, particularly when dealing with viscous products (but see 5.5.2(d)). Substances which are volatile may
be wholly or partly evaporated by ventilation. In general "approved cleaning fluids or chemicals" will be among those listed in Appendix 3 of Annex II of the Marine Pollution Convention. Approved cleaning fluids or chemicals are generally solvents, detergents or emulsifiers and are especially useful when cleaning tanks which have contained substances which are not water soluble.

(b) Washing with Water or with Water Containing Cleaning Aids

Water is the most common washing medium. It is used either for flooding the bottoms of tanks, hand hosing or delivering through washing machines. The water may have a small amount of special chemical added to it to improve the cleaning effect.

[This section, on precautions to be taken when using either fixed or portable washing machines, will be reviewed in the light of investigations into explosions in large tankers]

If portable machines are used:-

1) the hoses should be connected to the hydrant and the machines properly secured to the hose before lowering into the tank by a rope which is made fast on deck, (no machine washing should be undertaken and machines removed from the tanks if rolling of the ship is likely to cause them to strike against the steel structure;

ii) hoses should be tested for electrical continuity;

iii) machines should be removed from tanks before disconnecting the hose from the hydrant.

If fixed machines are used:- [to be developed].
(c) **Washing with a Pure (Undiluted) Solvent**

Washing or float washing with a solvent may be required either at the beginning of cleaning operations or finally to prepare the tank for the next cargo. Normally such washing will involve slushing tank bottoms through the cargo system and all precautions for handling the solvent should be observed.

Unless the tank is inerted, washing through machines or hoses should not be permitted if the solvent generates static electricity and it or the residual cargo is flammable or the tank contains flammable vapour.

If washing machines are to be used the precautions under 5.4.1 should be observed.

(d) **Steaming**

Steam is a well-known generator of static electricity. It should never be injected into the tank until the tank has been washed to remove liquid and made free of flammable vapour.

Steam should NEVER be injected into a tank in which a washing machine is suspended, unless the tank is free of flammable vapour. If steam has already been injected no washing machines should be lowered into a tank if the steam is still visible.

(e) **Animal, Vegetable Oils, Etc.**

These substances present a special problem due to solidification at moderately high temperatures. Certain oils of the animal, vegetable and fish variety present an additional problem due to rapid oxidisation, and unless the cargo space is washed immediately after discharge with
unheated water, the residues may dry to a hard varnish-like film on the internal surfaces. A number of hot washings may be necessary to remove all traces adhering to the internal surface and the addition of approved chemicals may also be required.

5.5.3 Precautions to be taken whilst Discharging Overboard

To ensure adequate dilution in the wake of the ship and to minimise the risk of vapour or liquid cargo blowing back on board, water contaminated with cargo should whenever possible be discharged overboard through approved equipment (see 5.12) and via a sea valve on the side of the ship away from essential water inlet valves. Fresh water generators should not be in use when discharging cargo residues. When the above recommendations cannot be observed and there is risk of harmful cargo vapour or liquid blowing back on board, protective clothing should be worn by personnel on deck. Alteration of the ship's course and/or speed should be considered to reduce the risk.

5.6 Tanks Used for Cargo Residues

Where it is not possible to achieve the correct dilution of residues in the tank being washed tank washings should be transferred to another tank for subsequent disposal. This tank may be a specially designated slop tank or a cargo tank. Any tank used to contain tank washings before discharge to sea should be capable of discharging these residues in accordance with the terms of the Convention via the procedures and equipment outlined in 5.12.
5.7 DISCHARGE OF DIRTY BALLAST

The discharge of dirty ballast should be carried out following the procedures laid down in 5.10.3, using the equipment specified in 5.12 and observing the precautions set out in 5.4 and 5.5.

5.8 TANK WASHING AFTER DISCHARGE OF CATEGORY A CARGOES

5.8.1 Definition of Category A Substances and their Sub-Division

Category A substances are defined as substances which, if released into the sea from tank cleaning or deballasting operations, would present a major hazard to either marine resources or human health, or cause serious harm to amenities or other legitimate uses of the sea and therefore justify the application of special measures to prevent their escape into the marine environment.

Category A substances (see data sheet) are sub-divided into those which are bioaccumulative and those whose hazard is one of high toxicity to the marine environments.

If it is intended to wash a tank previously containing a Category A substance (see data sheet) arrangements must be made to transfer the tank washings to shore reception facilities.

The disposal of Category A substances can be summarised as follows:-

(a) Bioaccumulative - discharge to reception facility until percentage concentration in the effluent is 0.01% by weight or less.

Highly toxic - discharge to reception facility
until percentage concentration in the effluent is 0.1% by weight or less.

(b) Subsequent dilution with 5% of tank volume of water. (see 5.8.3).

(c) Discharge to sea, "en route" at a speed of at least 7 knots, below the waterline, at least 12 miles from nearest land in a depth of water of not less than 25 metres.

5.8.2 Pre-Cleaning (to meet the requirements of 5.8.1(a))

(a) Pre-cleaning is aimed at reducing the concentration of substance in the tank to the residual concentration levels specified in the International Convention. It may be carried out using either installed or portable washing equipment.

(b) Dependent on the nature of the cargo residues in the tank to be washed, water with or without an emulsifying or saponifying agent may be used as the washing agent. The Master should at all times consult closely with his owners and/or shore officials before deciding on which washing agent to use having regard to the capability of the shore reception facility.

(c) Residual concentration levels can be confirmed by one of two methods, namely:

(i) Measurement by shore officials, who will take samples of the cargo residues and washing agent as it is being discharged. This will either be analysed on the spot or taken to a laboratory for concentration levels to be determined. The Master or Cargo Officer will be
advised when the appropriate residual concentration level is reached.

(ii) By reference to the following table, which gives the quantity of wash water to be used for every square metre of the surface area of the tank to be washed together with the temperature of the wash water. When determining the surface area account must be taken of the piping and pumping system. (Note: it is important that the tank cleaning machines completes a global turn within the tank during the introduction of this wash water even though the quantity of wash water specified below may be achieved before a global turn is completed.)

<table>
<thead>
<tr>
<th>Category A Substance</th>
<th>Quantity of wash water per square metre of surface area</th>
<th>Temperature of wash water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone Cyanohydrin</td>
<td>2.4 litres</td>
<td>Ambient</td>
</tr>
<tr>
<td>Acrolein</td>
<td>2.4 litres</td>
<td>Ambient</td>
</tr>
<tr>
<td>Carbon disulphide</td>
<td>[To be calculated]</td>
<td>Ambient</td>
</tr>
<tr>
<td>Creosote</td>
<td>14.7 litres</td>
<td>40°C</td>
</tr>
<tr>
<td>Cresols</td>
<td>14.7 litres</td>
<td>40°C</td>
</tr>
<tr>
<td>Cresylic Acid</td>
<td>14.7 litres</td>
<td>40°C</td>
</tr>
<tr>
<td>o-Dichlorobenzenes</td>
<td>7.8 litres</td>
<td>Ambient</td>
</tr>
<tr>
<td>Dichlorobenzenes</td>
<td>7.8 litres</td>
<td>Ambient</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>11.5 litres</td>
<td>90°C</td>
</tr>
<tr>
<td>Naphthenic Acids</td>
<td>7.8 litres</td>
<td>Ambient</td>
</tr>
<tr>
<td>Phosphorus (elemental)</td>
<td>11.5 litres</td>
<td>60°C</td>
</tr>
<tr>
<td>Sodium pentachlorophenate</td>
<td>4.9 litres</td>
<td>Ambient</td>
</tr>
<tr>
<td>TEL</td>
<td>) Special treatment. Consult shippers.</td>
<td></td>
</tr>
<tr>
<td>TML</td>
<td>}</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** These figures are preliminary and owners and Masters are requested to advise ICS of the results of any practical tests undertaken which could up-date this information.
The table has been based on practical tests and assumes normal draining of the tank has been achieved. If there has been an unusual build-up of cargo remains in the tank then the residual concentration must be ascertained using the method in (1) above.

When the residual concentration level is reached discharge of the tank washings to the reception facility may be discontinued and the cargo record book will be endorsed accordingly by the surveyor.

5.8.3 Further Dilution

If it is necessary to further tank clean at sea, the residues remaining in the tank should be diluted with a quantity of water equivalent to not less than 5% of the total volume of the tank. This further dilution may be carried out before leaving the discharge port or at sea and may form part of a vessel's normal tank cleaning programme. It is important to remember, however, that before any discharge of residues to sea takes place a volume of water equal to at least 5% of the tank volume should have been introduced into the tank. Appropriate entries should be made in the Cargo Record Book prior to leaving the discharge port.

Having been further diluted residues may be discharged to the sea through approved equipment, (see 5.1) under the following conditions:-

- the ship is "en route" at a speed of at least 7 knots;
- below the waterline;
- the ship is not less than 12 nautical miles from the nearest land and in a depth of water of not less than 25 metres.
5.8.4 Subsequent Cleaning

In order to prepare the tank for the next cargo it may be necessary to perform further cleaning to achieve the necessary standard of cleanliness. The resulting residues should be discharged under the conditions laid down in 5.8.3.

5.8.5 Alternative Means

As an alternative to the procedures outlined in 5.8.2, 5.8.3 and 5.8.4, in certain cases, disposal of Category A residues may also, where permitted by the local authority if undertaken alongside, be expedited by complete evaporation by ventilation (see 5.14). If further cleaning is required following removal of the residues by ventilation this may be achieved as outlined in 5.8.4

5.9 TANK WASHING AFTER DISCHARGE OF CATEGORY B CARGOES

5.9.1 Definition of Category B Substances

Category B substances are those which, when released into the sea from tank cleaning or deballasting operations, may present a hazard to either marine resources or human health or cause harm to amenities or other legitimate uses of the sea, and therefore justify the application of special anti-pollution measures.

The disposal of such residues at sea is permitted under the conditions outlined in 5.9.3.

5.9.2 Maximum Cargo Remaining in Tank

The Master or Cargo Officer must ensure that the quantity of cargo remaining in the tank after discharge does not exceed...
either 1 cubic metre or 1/3000 of the tank capacity, whichever is the greater. This figure is inclusive of the cargo remains in the pump and cargo lines.

5.9.3 Discharge Criteria

When the cargo remaining in a tank is at or below the level specified in 5.9.2 the tank may be washed using either water or a suitable washing agent. The tank washings should be discharged in accordance with the procedures and equipment outlined in 5.12 so that the concentration in the wake does not exceed 1 ppm under the following conditions:

- the ship is "en route" at a speed of at least 7 knots;
- the ship is not less than 12 nautical miles from the nearest land and in a depth of water of not less than 25 metres;
- the total quantity of substance discharged does not exceed 1 cubic metre per cargo tank or 1/3000 of the tank capacity in cubic metres whichever is the greater.

5.9.4 Alternative Means

As an alternative to the procedure outlined in 5.9.3 disposal of Category B residues may also, in certain cases, where permitted by the local authority if undertaken alongside, be expedited by complete evaporation by ventilation (see 5.14). If further cleaning is required following removal of the residues by ventilation this may be achieved as outlined in 5.8.4.
5.10 TANK WASHING AFTER DISCHARGE OF CATEGORY C CARGOES

5.10.1 Definition of Category C Substances

Category C substances are those which, when released into the sea from tank washing and deballasting operations, may present a slight hazard to either marine resources or human health or cause slight harm to amenities or other uses of the sea, and therefore require special operational conditions.

The permitted disposal of such residues at sea is permitted under the conditions outlined in 5.10.3.

5.10.2 Maximum Cargo Remaining in Tank

The Master or Cargo Officer must ensure that the quantity of cargo remaining in the tank after discharge does not exceed either 3 cubic metres or 1/1000 of the tank capacity, whichever is the greater. This figure is inclusive of the cargo remains in the pump and cargo lines.

5.10.3 Discharge Criteria

When the cargo remaining in a tank is at or below the level specified in 5.10.2 the tank may be washed using either water or a suitable washing agent. The tank washings should be discharged in accordance with the procedures and equipment outlined in 5.12 so that the concentration in the wake does not exceed 10 ppm under the following conditions:-

- the ship is "on route" at a speed of at least 7 knots;
- the ship is not less than 12 nautical miles from the nearest land and in a depth of water of not less than 25 metres;
- the total quantity of substance discharged does not
exceed 3 cubic metres per cargo tank or 1/1000 of the tank capacity in cubic metres whichever is the greater.

5.10.4 Alternative Means

As an alternative to the procedure outlined in 5.10.3 disposal of Category C residues may also, where permitted by the local authority if undertaken alongside, in certain cases, be expedited by complete evaporation by ventilation (see 5.13). If further cleaning is required following removal of the residues by ventilation this may be achieved as outlined in 5.8.4.

5.11 TANK WASHING AFTER DISCHARGE OF SUBSTANCES OUTSIDE CATEGORIES A, B AND C, INCLUDING BALLAST CONTAMINATED WITH SUCH SUBSTANCES

5.11.1 Limitations on Discharge

The discharge of undiluted substances listed in Appendix III of Annex II of the International Convention is prohibited. There are, however, no limitations or restrictions on the discharge of tank washings etc. or ballast containing such substances.

5.11.2 Discharge of Tank Washings

Following the draining of lines and pumps tank washings may be pumped direct to sea.

5.13 DISCHARGE PROCEDURES AND EQUIPMENT FOR TANK WASHINGS CONTAINING CATEGORY B AND C CARGOES

5.13.1 General

Practical and theoretical investigations have shown that when discharging a chemical/water mixture into the sea from a moving vessel, the maximum rate of discharge (Q) of the
mixture to avoid exceeding the permitted concentration of the chemical in the wake astern of the vessel can be ascertained by taking account of various factors including:

- Concentration in ship's wake - ppm (Cw)
- Breadth of vessel - metres (B)
- Draft - metres (T)
- Speed - knots (V)
- Concentration of mixture before release into sea - percent wt. (Ct)

[Length of vessel]

These factors can be expressed in a practical formula [such as: ]

\[ Q = \frac{Cw \times B \times T \times V}{5.5 \times Ct} \]

5.12.2 Determination of Concentration in Slop Tank (Ct)

When ascertaining the concentration of product in a slop tank it should be assumed unless verified otherwise, that the maximum allowable amount of cargo is left in each tank before washing. This concentration can be ascertained from the following formula:

\[ Ct = \frac{\text{Wt. of substance in collecting tank}}{\text{Total Wt. of mixture in collecting tank}} \times 100 \]

(a) Example for Category B Cargo

3 tanks containing Acrylonitrile (AN) are washed using 100 tons of clean sea water.

\[ \text{Wt. of AN in slop tank} = (3 \times 1) \times 0.808 = 2.42 \text{ tons} \]

(S.G. AN = 0.808)

and Total Wt. of mixture = (100 x 1.025) + 2.42 = 104.92 tons

(S.G. Sea Water = 1.025)

\[ Ct = \frac{2.42}{104.92} \times 100 = 2.3\% \]
(b) Example for Category C cargo

3 tanks containing Acetic Acid are washing using 30 tons of sea water.

\[ \text{Wt. of Acetic Acid in slop tank} = (3 \times 3) \times 1.0493 \]
\[ \text{(S.G. Acetic Acid} = 1.0492) \]
\[ = 9.45 \text{ tons} \]

and total Wt. of mixture = (30 \times 1.025) + 9.45

\[ = 40.2 \text{ tons} \]

\[ \text{Ct.} = \frac{9.45}{40.2} \times 100 = 23.4\% \]

NOTE: When more than one substance of the same category is present in a slop tank the concentration will be the highest concentration of the individual substances.

5.12.3 Limitation and Control of Effluent Concentration and Discharge Rate

The degree of limitation and control will depend on whether or not a cargo is soluble in water. For the purposes of this chapter all substances having a solubility in water of 2% or more by weight are considered soluble. Those having a solubility less than 2% are considered to be non-soluble, unless their slops have been treated with a chemical agent(s) which gives a uniform dispersion.

(a) Soluble Cargoes

Tank washings or slops containing soluble cargoes shall be discharged using the vessels normal cargo pumping system below the water line away from essential water inlet valves. The concentration in the sea astern of the vessel should be restricted by controlling the concentration of cargo in the effluent and the

...
introduced into the tank being cleaned during the washing process or
into the resulting slops after the tank has been cleaned either by
adding water to the holding tank or by introducing a controlled
stream of water into the slops as they are being discharged but
before they leave the ship. The rate of discharge should be
adjusted to take account of the concentration of cargo in the slops.
(Agreed methods of procedures and arrangements will be outlined -
preliminary examples are attached as Appendix I)
(b) Non-Soluble Cargoes

Tank washings or slops containing non-soluble cargoes shall
be discharged below the water line and on the side of the ship away
from essential water inlet valves by means of special approved
equipment, which will restrict the concentration in the sea
astern of the vessel, and which is connected either directly to
tanks being washed or to a slop or cargo tank into which the
slops from such tanks should be transferred before being
discharged. (Agreed methods of procedures and arrangements will
be outlined - preliminary examples are attached as Appendix II)

5.13 GAS-FREEING AND VENTILATION TO REMOVE CARGO RESIDUES

5.13.1 Local Regulations

Local regulations may prohibit gas-freeing when alongside
a berth,

Masters should ascertain from shore officials whether gas-
freeing or ventilation is allowed alongside the berth.

5.13.2 Tank Openings in an enclosed space

Where tank washing openings in an enclosed space such as
the centre castle, need to be opened, any pressure in the
tank should first be relieved by some means outside that space.

When tanks under such enclosed spaces are being made free of flammable and harmful vapours the vapour should be vented through an opening outside that space.

Ventilation of the enclosed space should be maintained at all times during gas-freeing operations.

5.13.3 Tank Cleaning Openings

To minimise the escape of vapours, covers should be removed only from the tanks being gas-freed.

5.13.4 Gas Venting System

The P/V valves in a vent system are properly set to minimise passage of flammable or harmful vapours back to a tank that has already been processed.

5.13.5 Cofferdams or Double Bottoms

Leakage of liquid or vapour into cofferdams etc., should always be suspected. The same precautions should be observed as when cleaning cargo tanks.

5.13.6 Tanks Supplied with Inert Gas

On completion of washing the inert gas/vapour mixture should be replaced by air using gas-freeing equipment until the oxygen level in the tank is restored to the normal level and the content of any prevailing hazardous gas is checked to be below stipulated safe level if entry or inspection is required for any purpose (see Chapter 6).

When tanks are inerted because the cargo is reactive with air, the inert gas/vapour mixture should be replaced by inert gas which in turn should be replaced by air if entry is required (see Chapter 10).
5.15.7 Ventilation to remove Residues

Forced ventilation may be used to remove cargo residues following discharge. If the substance is toxic personnel should wear appropriate protective equipment (see 9.3) and/or the ship should be manoeuvred so that the relative wind is across the beam.

Prior to ventilation, lines and pumps should be effectively drained back to the tank.

5.15.8 Disposal of Sludge, Scale and Sediment

Scale and sediment should not be left to build up in a tank. A build-up may adversely affect stripping or cargo from tanks and gas-freeing and entrapped cargo may cause re-gassing.

When removed from the tanks, sediment and scale should be disposed of as soon as possible; if kept in drums before disposal, the drums should be stowed on deck. Drums should be kept wetted down to minimise release of vapour and the risk of spontaneous combustion only if the contents are non-reactive with water.

5.16 TESTING OF SPACES FOR VAPOUR

Gas-freeing equipment should be operated as long as is necessary to ensure that the cargo tank or other space is sufficiently free of flammable and harmful vapours for the particular purpose.

Appropriate gas indicators should always be used for testing the atmosphere in the space (see Chapter 6).
Adequate samples should be taken from separated points about the space to ensure that it is free of vapour throughout. It is important to remember that, depending on its density, vapour may accumulate preferentially at the top or bottom of the space and also in locations where the flow of ventilating air is least.
POSSIBLE DISCHARGE ARRANGEMENTS FOR SOLUBLE PRODUCTS

1. Using Vessel's Cargo Pump

Condition: Concentration of effluent in cargo tank must be controlled to ensure a concentration to suit the capacity of the cargo pump using the following formula:

\[ Q = \frac{\text{Constant}}{C_t} \]

where \( C_t \) = Concentration of effluent in tank.

Example

Vessel: Beam (B) = 15M, Draft (T) = 5M, Speed (V) = 7KTS, Wake concentration (CW) = 1 p.p.m., Cargo Pump Cap (Q) = 200 M³/hr, Cargo remains = 1 M³.

Tank volume = 1000 M³
Volume of wash water = 10 M³

\[ Q = \frac{CWBTV}{5.5C_t} \]

or \( C_t = \frac{15 \times 5 \times 7 \times 1}{5.5 \times 200} = 0.48\% \)

Water to be added before pumping equal \( Q \) M³

\[ 100 \left( \frac{Q}{10} \right) = 0.48 \]

Total volume to be discharged = \( 220 \) M³

Time of Discharge \( T \) = \( \frac{220}{200} = 1.10 \) hours
2. Using Cargo Pump with Further Dilution Equipment Before Discharging

Cargo Manifold

From Ballast Pump

Cargo Tank

Cargo Pump

Mixing Ejector

Overboard

Condition: The ballast pumping rate to be such as to obtain a satisfactory concentration when cargo pump operating at a fixed capacity and concentration of effluent to be regarded as 10% for a Category B product.
APPENDIX II

POSSIBLE DISCHARGE ARRANGEMENTS FOR NON-SOLUBLE PRODUCTS

1. Re-circulation by ejector

A = Inlet from cargo tank during washing
B = Outlet from slop tank to overboard (below sealevel)
C = Outlet for 100% concentration for emptying the tank
2. Re-circulation by circulation pump

A = Inlet from cargo tank during washing
B = Outlet from slop tank to overboard (below sealevel)
C = Outlet for 100% concentration for emptying the tank
3. Re-circulation by an agitator

A = Inlet from cargo tank during tank washing
B = Outlet from slop tank to overboard (below sealevel)
C = Outlet for 100% concentration for emptying tank

4. Mixing Nozzle