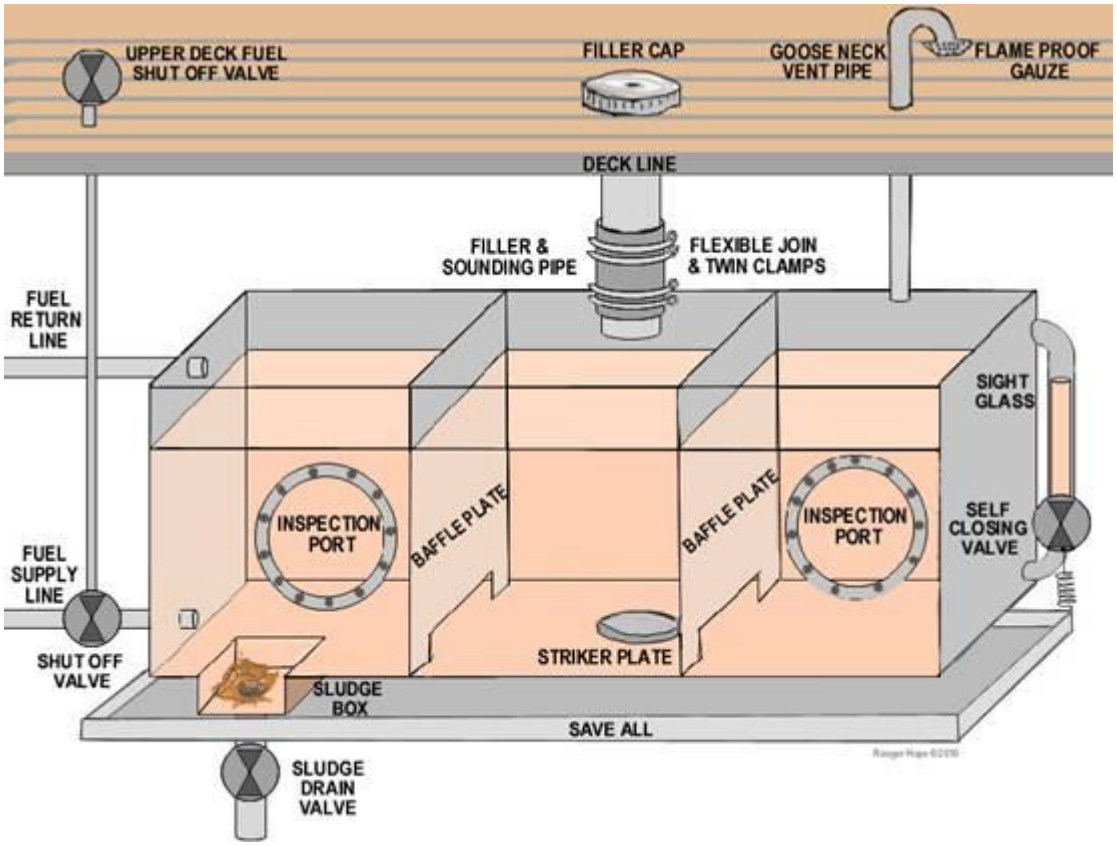
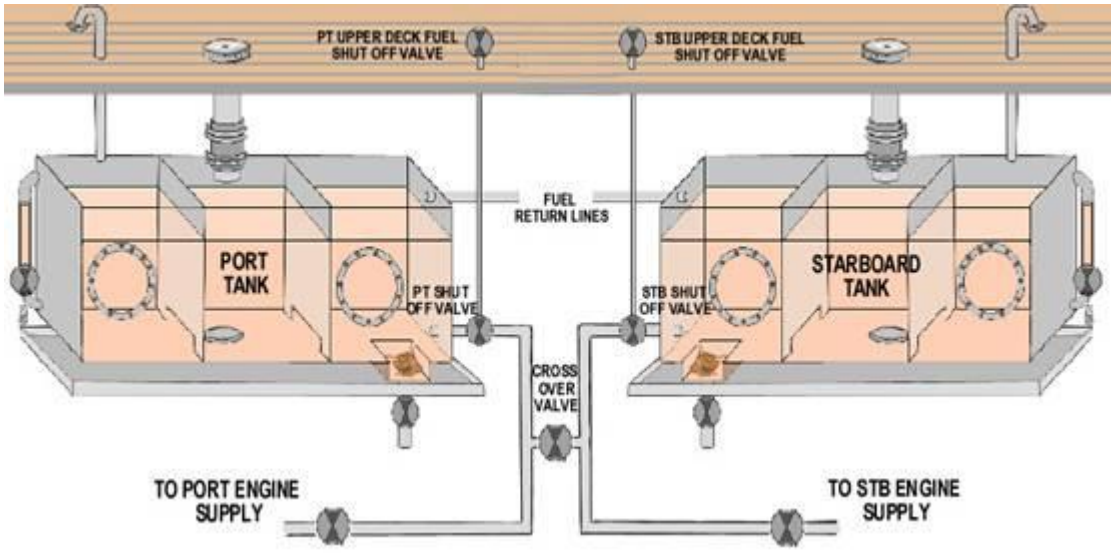
Fuel Storage Arrangements

1. Fuel Storage Arrangements

Fuel storage arrangements are largely dependent on the vessel's intended service and location of refuelling stations within the vessel's area of operation.

Fuel tanks should be located so as to minimise the possibility of fuel coming into contact with a hot surface or electrical equipment, resulting from overflow, leakage or rupture.





Twin, or more, tank installations are very common on board commercial vessels. This allows for greater weight distribution throughout the vessel as well as the other advantage of keeping fuel isolated should contamination occur.

Multiple tanks can have a cross over valve fitted to either the fuel supply or return lines enabling the engines to be run from either tank or in the event of contamination, to isolate an offending tank. Care must be taken if redirecting a fuel return line to one tank only as this effective fuel transfer can be rapid and may affect the vessels stability or even overflow the tank. Some vessels may have two day tanks, thus the fuel return from the engines injectors should be changed over when the delivery is changed. Similarly, it is wise to close cross over fuel supply lines when refuelling from a high pressure fuel pump. The thrust of fuel entering the port tank filler pipe may depress the fuel in the tank and even force fuel up to overflow the starboard tank. The reverse will occur when the filling stops as fuel from the starboard tank can surge back to spill out from the port filler pipe.

Specifications for installations of fuel tanks are included in the NSCV Part C Section 5 Subsection 5.

2. Safe Refuelling

The USL Code requires all vessel fuel filling points are to be located outside of the machinery spaces and arranged so that any overflow cannot come into contact with any hot surface. Fuel is normally supplied to small vessels from road tanker/s or an approved facility at a marina or dock. The amount of fuel required can be measured by the fuel meter in the supply discharge line and spillage should not occur, providing care is exercised.

No.	Component	Description
1	**Fuel tank**	A reservoir for holding diesel fuel in storage. Tanks should have a low spot in which sediments and contaminants settle and can be removed. Large tanks require baffles to be installed internally. All openings should be at the top of the tank only.
2	**Baffles**	These are internal dividers built into the tank to contain movement of the fuel in rough conditions.
3	**Fuel fill line**	Line through which fuel is pumped into the tank. The line should continue to within centimetres of the bottom of the tank to reduce any foaming effect as fuel is delivered. The gap between the end of the line and the fuel tank bottom should be large enough to allow fuel to be delivered unrestricted. Fill lines vary in diameter depending upon the tank size.
4	**Shut off valve**	Positioned between the deck and the tank. Can be closed to seal off the tank. Tanks also require a remote shut off valve which can be operated from a remote location.
5	**Grounding cable**	Provides an earth to discharge the static electricity which may occur during refuelling.
6	**Deck fill**	The mouth of the fuel fill line which is fastened to the deck.
7	**Vent**	The vent allows air and fumes to escape from the tank. The end of the vent hose should be set high on the vessel and kept well away from the engines, the cabin space and any source of heat. The vent pipe should include a gauze flame arrester.
8	**Sump pump**	Used to clean foreign materials, contaminants and the last fuel dregs from the sump in the fuel tank.
9	**Fuel supply line**	The size of the fuel supply line will vary depending upon the size of the engines used and the volume of fuel required. The fuel supply should be near the lowest part of the tank, but high enough to avoid sucking foreign matter and contaminants from the sump. This line continues to the engine via the fuel lift pump, fuel filter, injection pump and injectors.
10	**Fuel return line**	Diesel engines have fuel return lines which deliver excess fuel back to the tank.

3. Refuelling Procedures

When refuelling, these basic procedures should be followed as a minimum:

- Bring the vessel alongside of the refuelling facility and secure the vessel.
- Ensure that the distance between the fuel facility and the dock filling point is the shortest possible.
- Prior to filling, ensure that all engines have been turned off and there are no signs of leaks from the tanks or fuel lines.
- Place no smoking signs on the ship and on the wharf in the vicinity of the ship and fuel facility.
- Have fire extinguishers (suitable for oil fires) available near the filling station.
- Supply a container to catch spillage when the fuel supply line is disconnected.
- Take care to contain any fuel spillage from entering the water.
- Avoid any build up of static electricity during the refuelling process.
- Constantly monitor the fuel level in the tank/s to ensure they are not over-filled.
- Ensure the vessel remains stable throughout the refuelling process.
- Ensure there is no build up of fumes surrounding tanks, and that fresh air is ventilating the refuelling area. When disconnecting the fuel supply line, empty residual from the line into the tank.
- Seal fuel tanks immediately after the fuel line has been disconnected.
- Allow adequate time for any fumes to be dispersed before starting the engine.

4. More Refuelling

- Take portable tanks out of the vessel for filling.

(Do not carry spare fuel in plastic containers. They can rupture without being noticed.)

- Hoist flag B for refuelling internal tanks.
- Keep watch.
- No smoking, No fires and no motors running.
- Disconnect the battery, Turn off gas.
- Have a suitable fire extinguisher available near the filling station.
- Check for leaks, Block off deck scuppers and freeing ports to contain any spill on deck. Clean up any spill immediately.
- Secure vessel properly alongside.
- Keep the fuel nozzle in contact with the filler pipe to prevent static electricity build up.
- Make sure the fuel goes into the correct tank.
- Constantly monitor the tank being filled. Fill slowly towards the end.
- Consider stability when filling side tanks.

On disconnection of fuel line, catch any spillage in a container. Keep the vessel well ventilated, and close up enclosed spaces. Ventilate for some time before starting engine.

5. Static Electricity - A Fire Hazard During Refuelling

Static is the electricity produced on dissimilar materials through physical contact and separation. A spark generated by it can ignite flammable vapour.

A static electrical charge can build up during refuelling when the fuel moves through a pipe. The fuel may become negatively charged and the pipe positive. The negatively charged fuel, in turn, causes the tank to become positively charged. The risk of ignition thus continues.

The risk also exists when sounding, sampling or washing a fuel tank. The positively

charged sounding tape or the sampling container strikes against the negatively charged very fine particles of fuel in the tank. A positively charged water nozzle may react with the negatively charged oily residue during the washing operation.

To safeguard against build up of static electricity charge during refuelling, the refuelling system must be bonded and grounded. It is then said to be electrically connected. The filler attachment is connected to the tank either by a direct metal-to-metal connection or by means of a copper wire (ground cable) of suitable size. The filler pipe must extend into the bottom of the tank, and the tank should be connected to the vessel's bonding system.

Foam fire fighting hoses are rubber lined to eliminate the risk of static resulting from friction with foam.

6. If Spillage Occurs

Fuel spills are a major cause of marine pollution and must be avoided wherever possible through planning and careful operation. If a fuel spill occurs, you should follow these basic steps:

7. Diesel Fuel Spilled Aboard Vessel

- All steps should be taken to contain spilt fuel on board and away from any source of heat.
    - The vessel's master should immediately be made aware of the fuel spill. Under normal circumstances the fuel will move to the bilge, but should not be pumped to sea.
- If there is a fuel leak, try to stop any further discharge by whatever means possible. Seek guidance from the vessel's master or assistance, as required.

8. Petrol And LPG Leaks Aboard Vessel

· The survey requirement for such installations is to minimise any leaks that could occur in the engine compartment.

- Should a leak occur, shut down all machinery and electrical systems.
- Shut off the supply of fuel.
- Petrol vapours and LPG should be cleared in a manner that will not cause sparking.
- Repair the leak.

9. Fuel Spilled Overboard

· Take action to stop any further fuel from entering the water.

- Fire-fighting equipment should be readily available. Ensure fire extinguishers are suitable for use on fuel fires.
- Inform the relevant Port Authority and carry out their instructions.
- Advise vessels tied up or moored nearby of the spillage (pending the arrival of the Port Authority).
- Clean up on board the vessel.
- Do not attempt to clean the water by using detergents or similar products, unless advised by the Port Authority.
- If the vessel is at sea when the spill occurs, report the matter to the nearest port authority or the state pollution authority.

· If safe, the bilge should not be discharged until the vessel returns to a shore based waste facility.

- If the fuel spill is large, full safety precautions should be exercised.
- Post “no smoking” signs (if available) or warn people in the vicinity not to smoke.

10. Changing the Fuel Supply Source

Larger vessels often have more than one fuel tank and during any voyage, you may be required to change the fuel supply from one tank to another.

When changing from one fuel tank to another, you need to avoid starving the engine/s of fuel if they are running.

The supply valve on the tank about to be used should be opened first.

The supply valve on the tank coming off line should then be closed.

If the engine/s have spill returns from the fuel injection system to the tank, these should also be changed over so that the spill line discharges to the tank in use.

11. If The Tank Has Run Out Of Fuel

If the tank has run out of fuel and the engine has stopped at the minimum it will be necessary to:

- shut off the empty tank and open the supply valve on another fuel tank
- bleed all vents on the supply line to the engine until fuel flows

Engine makers usually specify a fixed sequence for bleeding the engine and the sequence should be followed.

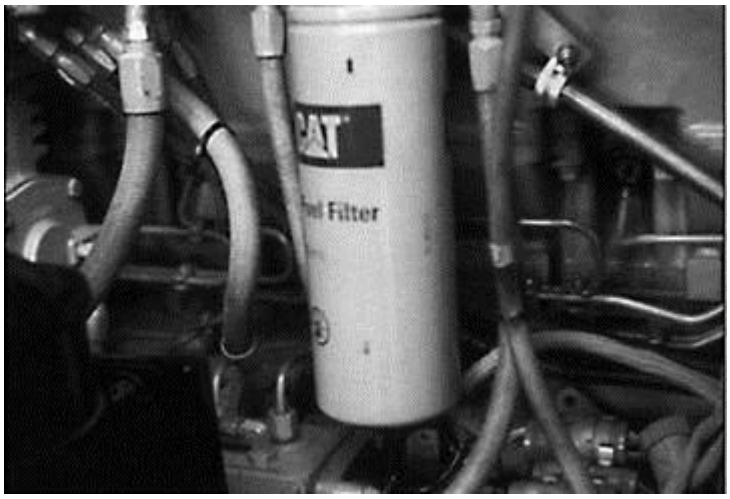
In general this will involve:

- venting filters
- opening vent or bleed screws on the fuel pump operating the priming lever until bubble-free fuel begins to flow.

On some engines the hydraulic governor may need priming. When the whole system has been primed the engine can be restarted.

Changing Fuel Filters And Bleeding Air From The System

Fuel filters are a critical part of the fuel system. They remove dirt, water and other foreign matter from the fuel supply, which could otherwise cause considerable damage and expense.



Fuel Filter (Courtesy: Caterpillar)

As the quality of fuel can never be guaranteed, it is necessary to change the fuel filters as part of the vessel’s maintenance program. This will ensure that the fuel supply remains uncontaminated.

Follow this common procedure to change a single in-line filter and bleed air from the system:

.

Close the nearest valves either side of the filter.

- Open both vent and drain valves (if provided) and drain filter.
- Provide a container to catch any spillage.
- Remove filter cover or body as appropriate.

Removing Spin - On Fuel Filter (Courtesy: Caterpillar)

- Clean filter body and filter or renew filter (if the renewable type).
- Re-assemble filter.
- Shut drain.
- Open valves either side of filter.
- Close off vent when fuel appears.

Note: It may be necessary to prime other equipment downstream of the filter (such as fuel pumps on the engine).

The quickest and most reliable way to bleed air out of the system is to fill the filter and casing with fuel oil prior to bolting or screwing the filter cover down.

Given the many different types of filters (both single and duplex), such a method is not always possible.

Priming the Fuel System on a Caterpillar Engine

12. Draining a Fuel Tank

There are occasions when you will be required to drain the contents of a fuel tank. Often this will be a part of a maintenance for your vessel, or it may be necessary to remove contaminated fuel from the tank.

To drain a fuel tank, transfer the contents by pumping the fuel to another tank or tanks.

First, ensure the second tank contains sufficient space to take the contents of the tank which is being drained.

When you have completed the fuel transfer, the remaining fuel from the first tank can be drained into a container. Use the valve normally used for draining water from the tank.

Anytime you handle fuel, ensure that there are fire extinguishers readily available and are suitable for use on fuel fires.

13. Measuring Fuel Tank Content Levels

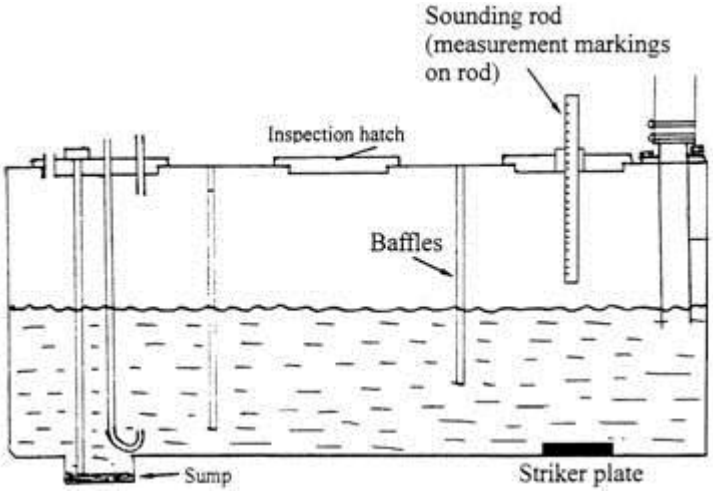
It is important to always know the amount of fuel available on your vessel, particularly when travelling at sea.

The level of fuel in the vessel's fuel tanks can be determined by various methods:

- by **sounding rod or tape**. This may give a depth measured from the bottom of the tank to the surface of the fuel, or measurement from a reference point at or above the top of the tank to the surface of the fuel.

The rod or tape will show a linear measurement which will assist you in calculating the volume in the fuel tank, or it may have already been marked to equate the physical level of fuel in the tank to a volume. For example, if the level of fuel in the tank reaches half way up the rod, this may equate to a reading of 50 litres of available fuel in a 100 litre capacity tank.

- by **gauge glass**, usually with a scale alongside indicating the height above the inner bottom of the tank.
- by **mercury balance gauge** in which pressurised air is balanced against a column of mercury.
- a **direct reading dial gauge**, which may be electrical or diaphragm operated.

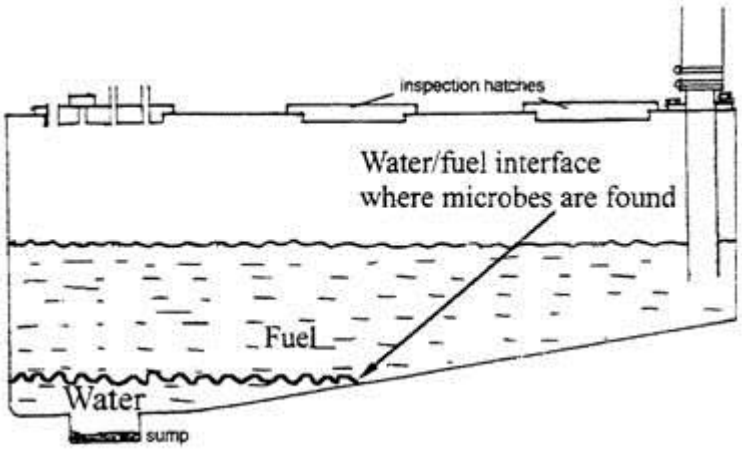


Fuel tank and sounding rod

14. Microbial Infection

Microbial infection is a common problem in diesel fuels, and is more common in vessels which are not used regularly or where the fuel is not renewed frequently. In this case, extra care should be taken to check for infection each time the vessel is commissioned.

Microbes can only propagate in the presence of water, which may accumulate in the fuel tank/s and feed on the fuel at the interface between the water and oil. Infection can occur due to taking infected fuel on board, and the problem is aggravated by failing to regularly drain any water from the fuel tank/s.



Location of microbes in a fuel tank

On board a vessel, microbes are first detected in the fuel filters which will have a tendency to clog up more frequently. The waste microbes generate is deposited as a black slimy sludge and can block the fuel system. Tests are also commercially available to identify the presence of microbes.

In some cases the slime gets past the filters and causes the fuel pump plungers or the injector nozzle valves to malfunction due to either rusting or partial blockage.

If a vessel is not to be used for an extended period, the tanks should be filled to restrict any possible condensation. The fuel tank vent should be sealed. Ensure a reminder notice is placed at the driver controls to unseal the vent at a later date.

Commercially available fuel conditioners can be added to a vessels fuel tanks that in addition to deterring microbe growth also improve combustion, reduce corrosion and the alleviate the problems of condensation within the fuel.

15. Preparing a Fuel Tank for Inspection

The USL Code does not require the internal survey of fuel tanks until the vessel is 10 years old.

However, given the possibility of microbial infection, internal inspection of fuel tanks should form part of the regular maintenance program.

16. Inspection Procedure

When preparing to inspect a fuel tank, the following basic procedure should be followed:

1. Post “no smoking” notices prior to opening up doors giving access to the space containing the fuel tank/s.

2. Pump out or drain the tank to another fuel tank.

3. Open the water/test drain to ensure the tank is empty (drain residue into a container).

4. Shut all valves and cocks on the tank.

5. Remove the manhole or inspection door.

6. Ventilate the tank. The period will depend on the size of the tank and method of ventilation.

7. Obtain a “gas free” certificate from a recognised authority if intending to enter the tank.

This procedure may differ depending on the type of vessel you are on, and you should confirm this with your facilitator.

19. The Fuel Tank

On board, fuel storage is largely dependent on the intended service of the vessel and location of re-fuelling stations within the area of operation of the vessel.

Typical arrangements are:

1. Short Distance

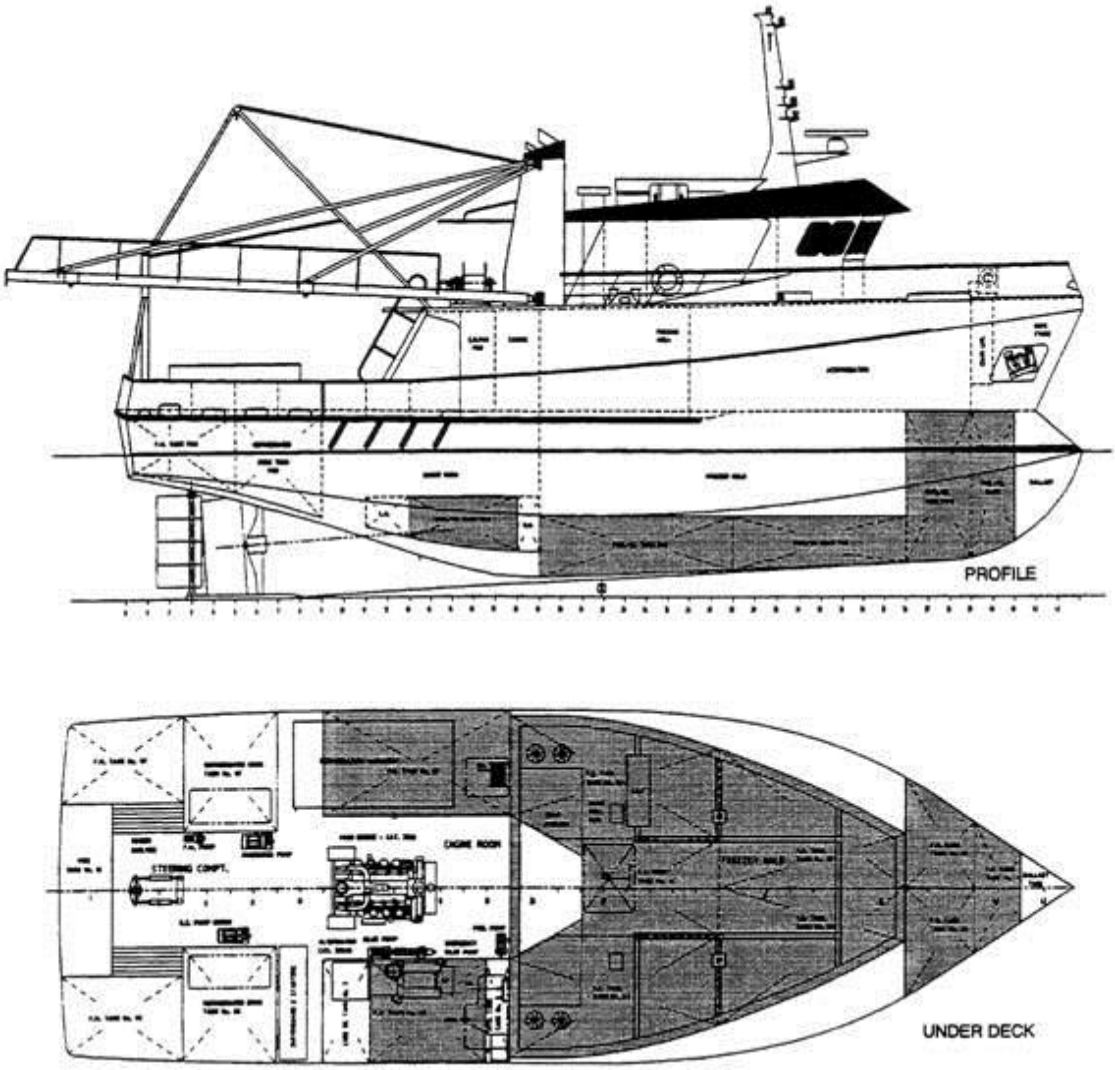
Port and starboard tanks within the machinery space, which may be free standing or form part of the hull structure. In addition, a smaller tank is used for direct supply to the main and generator engines. Fuel from the larger tanks is transferred to the smaller tank as required.

2. Medium Distance

Either a bunker or deep tanks, divided into port or starboard and positioned forward of the machinery space. The tanks should be capable of supplying fuel to the main engine and generator engine each with independent fuel lines. In the case of dual tanks, these should be used alternatively.

3. Long Distance

Fuel storage arrangements for long distance work are the same as for medium distance, but with the addition of a double bottom fuel tank.



Sample location of fuel tanks (shaded in grey)

(Plans courtesy of A. Raptis and Sons Pty Limit

20. Simplified Stability Data

Much of the information discussed here can be found in the Simplified Stability Information Booklet that may be provided on your vessel.

21. Stability Booklet

The booklet is set out in an approved format and contains the following information.

1. The vessels name, official number, port of registry, gross and net tonnages, dimensions, operating displacement, deadweight and draught.
2. A profile view of the vessel showing and naming all compartments, including tanks.
3. The capacity and the centre of gravity, vertical and longitudinal, of all spaces used to carry fish, water, fuel, stores etc.
4. Tank calibrations for every tank holding 2 tonnes or over, plus the free surface effect of every tank.

5. Information about the following hydrostatic particulars.

(a) Displacement in salt and fresh water.

(b) K M

(c) T P C

(d) L C B

(e) L C G

(f) Trim information

These values are recorded for various draughts.

5. Sample loading conditions such as Lightship, Loaded departure from port, worst operating condition, etc.
6. Guidance notes and warnings dealing with such things as recommended distributions for fuel, water, cargo etc., recommended operating procedures and warnings about dangerous practices.

The purpose of this information is to let the master of the vessel know under what conditions the vessel will have sufficient stability. If you operate a vessel so that its condition is better than the worst condition that is still safe, then you will know that your vessel has sufficient stability for normal conditions.

22. Safe Practices

The following rules for safer stability are taken from MV “Twosuch” simplified stability booklet.

The sheets which follow are general comments to enlarge on good seamanship and house-keeping and issued only to enable the operators to use the stability data to best advantage.

23. Tank Usage and Slack Tanks

(1) Tanks which are not in use, must at all times be full and pressed up, or empty where possible. Remember that slack tanks create free surface and the effect of slack tanks results in actual and often large reductions of stability.

Free surface effect is explained in 11.2.3.

(2) When manipulating tank contents by pumping from one tank to another, make every effort to maintain level trim. Develop a system of tank usage which keeps the trim of the vessel from becoming excessive. Remember that the calculations for stability are accurate only within a small range of trim.

(3) Transference of fuel or fresh water and the ballasting of tanks should only be carried out in favourable weather conditions.

(4) There is in this book a recommended sequence for the use of liquids in tanks, departure from which may be dangerous. These recommendations should be followed unless there are specific reasons at the time for not doing so.

(5) Occasionally, conditions of loading and tank manipulations can lead to trim by the bow. This can be avoided by coordinating the operations; in other words, the effects of loading can be offset by correctly manipulating the contents of the tanks.

(6) Excessive trim by the bow can lead to difficulties in handling the vessel and may result in poor seakeeping.

24. Free Surface Effect

All liquids in partially filled tanks have a free surface, which is free to slop backwards and forward with the motion of the ship. This free surface effect can cause a serious stability problem if the movement of the liquid is not contained. You might like to conduct a simple, practical experiment to demonstrate F.S.E. for yourself:

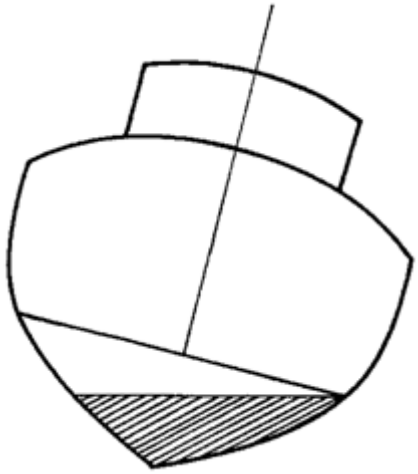
(a) Take a flat tray with raised sides and partially fill it with water. (A flat baking pan will work.)

(b) Now hold it level, supported by the palms of your hands, held horizontal at arms length and at shoulder height.

(c) Now gently raise your right hand a few centimetres.

As the water runs to the left of the tray/pan you will feel a marked increase in weight, tending to push your left hand down further and so aggravate the condition.

This is Free Surface Effect (F.S.E.). A ship reacts in the same way. It first rolls slightly to a small angle of heel as a result of the wave forces. The internal forces of the shifting water in slack tanks then increase the list further as the liquid flows to the low side. If this F.S.E. causes the vessel to list so that its deck edge is immersed below the waterline, it could well capsize. The figure below shows a vessel with a partially filled tank. Free surface effect reduces the size of GM. Therefore the size of GZ is reduced, and consequently the ability of the vessel to return to the upright position is reduced.



Free surface effect is at a maximum in tanks which extend right across the breadth of the vessel. By partitioning the tank longitudinally, the flow of liquids to the low side when the ship is heeled can be restricted. It is not removed completely, but the F.S.E. can be reduced to acceptable limits. Obviously, correct loading and ballasting of the ship is also important, but this is an operational consideration and not a design one. Practically all tanks, with the exception of the fore peak ballast tank, are longitudinally subdivided for this reason.

Tank subdivision is effected by a continuous watertight divider extending in a fore and aft direction to each end of the tank and vertically from the inner bottom of the tank to the underside of the tank top.

Fore peak tanks are usually narrow and do not present a very large free surface problem. For this reason, it is unusual to find any longitudinal subdivision in them.

Where tanks are not longitudinally divided by a watertight divider, there are usually longitudinal wash bulkheads which act as baffle plates. While these do not stop the sideways motion of fluids in the tank, they are designed to retard the flow so that the heeling force created by the free surface effect is out of phase with the rolling of the vessel. This tends to damp the vessel's rolling instead of aggravating it, which can be quite beneficial.

The depth or quality of the liquid in the tank does not affect the free surface to any great degree. Free surface area is the main factor. Only a completely empty or completely full tank will have zero free surface.

Remember: The number of slack tanks at any one time should be kept to a minimum. To restrict the amount of Free Surface, it may be necessary to transfer liquids between tanks, bearing in mind the trim required and the weather conditions at the time.

25. Marine Pollution

The enormous growth in the maritime transport of oil and the size of tankers, the increasing amount of chemicals being carried by sea and a growing concern for the world's environment as a whole made many feel that the 1954 OILPOL Convention was no longer adequate, despite the various amendments which had been adopted. In 1969 the IMO Assembly (again prompted partly by the TORREY CANYON incident two years previously) decided to arrange an international conference to consider a completely new convention. The Conference duly met in London in 1973.

The Convention which resulted - the International Convention for the Prevention of Pollution from Ships (MARPOL) - is the most ambitious international treaty covering maritime pollution ever adopted. It deals not only with oil but with all forms of marine pollution from ships except the disposal of land-generated waste into the sea by dumping (which was covered by another Convention adopted the previous year).

Australia is a party to the 1973/78 International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) as well as the 1972 Convention on the prevention of Marine Pollution by dumping of Wastes and other Matter. Australian maritime pollution laws apply to vessels of all nations within 200 nautical miles offshore.

As a result, we have two major Acts of Parliament in this country regarding pollution from ships:

1 The Protection of the Sea (Prevention of Pollution from Ships) Act 1983.

2 The Environmental Protection (Sea Dumping) Act 1981.

In New South Wales and other States, there is a parallel legislation (e.g., NSW Marine Act 1987).

Under the International Convention for the Prevention of Pollution from Ships 1973/78 (known as MARPOL), all of the above applies. In Australia, this convention is enacted in the Protection of the Sea (Prevention of pollution from ships) Act 1983 and the Navigation Act 1912.

The MARPOL Convention includes 6 technical Annexes. Annexes I and II, dealing with oil and bulk noxious liquid substances respectively, are mandatory, in the sense that ratification of the Convention is impossible without ratification of these Annexes. Annexes III, IV, V and VI, dealing respectively with harmful substances in packaged forms, sewage, garbage and air pollution are optional. The Convention also has two Protocols, dealing respectively with reports of incidents involving harmful substances and arbitration.

Entry into force is as follows:

MARPOL 73/78 2 October 1983 (international) 14 January 1988 (Australia)

Annex I 2 October 1983 (international) 14 January 1988 (Australia)

Annex II 6 April 1987 (international) 14 January 1988 (Australia)

Annex III 1 July 1992 (international) 10 January 1995 (Australia)

Annex IV 27 September 2003 (international) January 2004 (Australia)

Annex V 31 December 1988 (international) 14 November 1990 (Australia)

Annex VI Interantional 2003 Australia 2004

The Annexes can be summarised as follows:

Annex I **Oil** - oil mixtures, distillates, gasoline, jet fuels, etc.

Annex II **Noxious liquid substances** - mainly chemicals including acids, alcohols, castor oil, hydrogen peroxide, pentane, etc. Also citric juice, glycerine, milk, molasses, wine, etc.

Annex III **Harmful substances in packaged form** - includes freight containers, portable tanks, road and rail tank wagons, etc.

Annex IV **Sewage** - wastes from toilets, drainage from medical premises, drainage from spaces containing live animals, etc.

Annex V **Garbage** - plastic bags, synthetic ropes, food wastes, paper products,

glass, metal, crockery, packaging material, synthetic fishing nets, etc.

Annex VI **Air Pollution**

Annex VII **Oil**

Except where otherwise stated, these regulations apply to all tankers of 50 gross tons (about 30 metres in length) and above and other ships of 400 gross tons (about 40 metres) and above.

A complete ban on operational discharges of oil from ships except under the following conditions:

For all ships,

1 The rate at which oil may be discharged must not exceed 60 litres per mile travelled by the ship;

2 The oil content of any bilge water discharged must be below 100 parts per million;

3 Ship must be more than 12 miles from nearest land; and

4 Ship must have in operation an approved oil discharge monitoring and control system, oily water separating equipment or oil filtering equipment.

For tankers,

1 No discharge of any oil whatsoever must be made from the cargo spaces of a tanker within 50 miles of the nearest land;

2 The total quantity of oil which a new tanker may discharge in any ballast voyage must not exceed 1/30,000 of the total cargo carrying capacity of the vessel. For existing tankers the limit is 1/15,000 of the cargo capacity.

The definition of oil includes petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products (other than petro-chemicals).

‘Nearest land’ is defined as the baseline used to establish the territorial sea. However, the Convention makes a special case for the Great Barrier Reef where nearest land means a line shown between a series of co-ordinates on the outer edge of the reef. All distances relating to discharge prohibitions are measured from these lines.

The discharge of oil is completely forbidden in certain ‘special areas’ where the threat to the marine environment is especially great. These include the Mediterranean Sea, the Black Sea, the Baltic Sea and some areas in the Middle East.

Parties to the Convention are obliged to provide adequate facilities for the reception of residues and oily mixtures at oil loading terminals, repair ports, etc.

Oil tankers must have the equipment necessary to operate the load on top system or to retain oily residues on board until they can be discharged into shore reception facilities. This equipment includes slop tanks, oily-water separating equipment or filtering systems, oil content meters, oil discharge monitoring and control systems, sludge tanks and suitable pumping and piping arrangements.

All ships of 400 gross tonnage and above - including non-tankers - must be equipped with oily-water separating equipment or a filtering system for the discharge of machinery space bilges.

Every oil tanker of 150 tons gross tonnage and above, and every other ship of 400 tons gross tonnage and above will be subject to the survey specified below:

(a) an initial survey before the ship is put in service, or before the Certificate is issued for the first time, to ensure that the structure, equipment, systems, fittings, arrangements, and material fully comply with the requirements of the Annex;

(b) a period survey at intervals of five years before the re-issue of the Certificate, for the same reasons stated in (a);

(c) one intermediate survey held not before six months prior to, nor later than six months after the halfway date of the Certificate's period of validity, to ensure that the equipment and associated pump and piping systems, including oil discharge monitoring and control systems, crude oil washing systems, oily water separating equipment and oil filtering systems, fully comply with the requirements of the Annex;

(d) an annual survey held within three months before or after the anniversary date of the Certificate; except when the annual survey coincides with the intermediate survey, then the annual survey will not be necessary.

26. Limitations on Tank Size.

The sizes vary according to factors such as the arrangement of tanks, the fitting of double bottoms, the interposing of clean ballast tanks and so on but on normal tankers centre tanks are limited to 30,000 cubic metres and wing tanks to 15,000 cubic metres.

Segregated Ballast Tanks (SBTs) are required on all new crude oil tankers of 20,000 dwt and above and new product carriers of 30,000 dwt and above. SBTs must also be protectively located - that is, they must be positioned in such a way that they will help protect the cargo tanks in the event of a collision or grounding.

The fact that SBTs are not used for carrying oil means that no oil-water mixtures are produced - and consequently no pollution.

Subdivision and stability requirements ensure that tankers can survive assumed side or bottom damage to a degree which is specified on the basis of the ship's length.

Tankers and other ships must carry and maintain an Oil Record Book in which all operations involving oil are to be recorded. The book can be inspected by the authorities of any State which is a Party to the Convention.

Crude Oil Washing (COW) is accepted as an alternative to SBTs on existing tankers and is an additional requirement on new crude tankers.

Under COW, tanks are washed not with water but with crude oil - the cargo itself. The solvent action of the crude oil makes the cleaning process far more effective than when water is used and at the same time the mixture of oil and water which led to so much operational pollution in the past is virtually ended. (There is usually a final water rinse but the amount of water involved is very low). At the same time, the owner is able to discharge far more of his cargo than before, since less of it is wasted.

For existing crude oil tankers a third alternative was permissible for a period of two to four years after entry into force of MARPOL 73/78. This was called dedicated ‘clean ballast tanks’ (CBT) and was a system whereby certain tanks where dedicated solely to the carriage of ballast water: This was cheaper than a full SBT system, since it utilised existing pumping and piping, but when the period of grace expired (2 October 1987), other systems had to be used.

27. National Plan to Combat Marine Pollution

This was set up after the grounding of the Oceanic Grandeur in Torres Strait in April 1970.

Stockpiles of dispersant materials and equipment are set up at 9 ports around Australia. The material and equipment can be taken by sea or air rapidly to any area where it may be needed. Sydney also has a separate stockpile of transfer equipment, which can be used to lighten tankers in the event of collision or stranding. It consists of submersible pumps, hoses, generators, fenders, etc. The cost of this is met by the Pollution of the Sea by Oil (Shipping Levy) and (Shipping Levy Collection) Acts.

12.3 Pollution Prevention From “Small” Vessels

- Observe anti-spill and fire precautions when re-fuelling.

- Don’t discharge oily bilges within 12 nautical miles from coast. Observe the above guidelines when discharging outside 12 miles. Oily bilges must be discharged into a mobile or a shore based pump-out facility. Observe the above “large vessel” guidelines when discharging at sea. Bilge water can easily be cleaned by installing an oil absorbent pad or a oily water separator near the bilge pump. Bilge sponges are available from most chandlers.

- Engine oil must only be discharged into an oil reception barge or a shore facility.

- If a vessel is not fitted with a separate oily waste tank, oily bilge water should be pumped into a container on deck for disposal when ashore.

- No discharge of any type is permitted in the specially protected area of the Great Barrier Reef. This means that vessels are prevented from discharging unprocessed garbage within 12 nautical miles of the outer edge of the reef - in some places this is as much as 162 nautical miles from the Queensland coast.

- You are required to report any polluting spill from your own vessel, and, requested to report sighting of any other.

In Case Of An Oil Spill

- Cease operation

- Ease pressure on overflowing tank.

- Sound emergency alarm

- Ban smoking anywhere on board
- Take all fire precautions
- Control spill
- Inform authorities
- Clean up on deck

Fuel Expansion In Hot Weather

Fuel expands in volume about 0.5% per 1°C rise in temperature. Therefore, with a 10° rise in air temperature - a common daily fluctuation in Australia - the fuel in a tank, sitting in open air, may expand by 5%. Ignoring some expansion of the tank itself, this amounts to 5 cm rise in the sounding in a tank full of fuel, measuring 1 x 1 x l metre. Without sufficient ullage (space between the liquid and tank top), the fuel could overflow. Due to pollution hazards associated with fuel, it is usual for fuel tanks to be fitted with a venting pipe.

28. Great Barrier Reef

Under MARPOL, no discharge of any type is permitted in the area of Great Barrier Reef. In some cases this can be as much as 150 nautical miles from the Queensland coast. Where discharges are prohibited within a certain distance from the land these distances are measured from the outer edge of the reef.

Area Where No Discharges Are Permitted

12.6 A POLPREP Described In NSW Marine Pollution Act

(1) Each report shall contain in general:

(a) identity of the ship;

(b) the time and date of the occurrence of the incident;

(c) the geographic position of the ship when the incident occurred;

(d) the wind and sea conditions prevailing at the time of the incident; and

(e) relevant details respecting the condition of the ship.

(2) Each report shall contain, in particular:

(a) a clear indication or description of the harmful substances involved, including, if possible, the correct technical names of such substances (trade names should not be used in place of the correct technical names);

(b) a statement or estimate of the quantities; concentrations and likely conditions of harmful substances discharged or likely to be discharged into the sea; and

(c) where relevant, a description of the packaging and identifying marks; and

(d) if possible, the names of the consignor, consignee or manufacturer.

(3) Each report shall clearly indicate whether the harmful substance discharged, or likely to be discharged is oil, a noxious liquid substance, a noxious solid substance or a noxious gaseous substance and whether such substance was or is carried in bulk or contained in packaged form, freight containers, portable tanks, or road and rail tank wagons.

(4) Each report shall be supplemented as necessary by any other relevant information requested by a recipient of the report or which the person sending the report deems appropriate.

Spill Or Discharge By Ship

A1 Ship: name, size, type, call sign/ship station identity and flag

A2 Name, address and contact details of owner and agent of ship/place on land/purpose-built pipeline/apparatus

A3 Position of discharge and position of place on land/purpose-built pipeline/apparatus

B Date and time of event

Note: Express as Universal Co-ordinated Time

C Position: latitude and longitude, or

D Position: true bearing and distance

Note: Give C or D

E True course

F Speed in knots

L Route information: intended track

M Radio communications: means of communication

N Time of next report

Note: Express as Universal Co-ordinated Time

P1 Type of oil or the correct technical name of the noxious liquid substances on board

2 UN numbers

3 Pollution category (A, B, C or D) for each noxious liquid substance

4 Names of manufacturers of substances or consignee or consignor

5 Estimate of the quantity of each substance

Note: Include item P in the case of probable discharge

Spill As Result Of Damage To Ship

Q1 Structural condition of ship, as relevant

2 Ability to transfer cargo/ballast/fuel

R1 Type of oil or the correct technical name of the noxious liquid substance discharged into the sea

2 UN numbers

3 Pollution category (A, B, C or D) for each noxious liquid substance

4 Names of manufacturers of substances or consignee or consignor

5 Estimate of the quantity of each substance

6 Whether discharged substances floated or sank

7 Whether discharge is continuing

8 Cause of discharge

9 Estimate of the trajectory of the discharge, giving weather conditions, if known

10 Estimate of the sea surface area covered by the discharge

Note: Include item R in the case of actual discharge

S Weather conditions (i.e. brief details of weather and sea conditions prevailing)

X1 Action being taken with regard to the discharge and the movement of the ship

2 Assistance or salvage efforts which have been requested or which have been provided by others

Note: The master of an assisting or salvaging ship should also report the particulars of action undertaken or planned

Form 2 Notice of alteration or damage to ship

(Clause 22)

(Marine Pollution Act 1987, sections 37 and 42)

To: NSW Maritime Authority

1 Name of ship:

2 Official number (if any):

3 Home port/port of registry:

4 Call sign:

5 Name of owner(s) or agent:

6 Address of principal place of business of owner(s) or agent:

7 (a) Date of issue and reference number of International Oil Pollution Prevention Certificate (in the case of a ship constructed in accordance with Annex I of the Convention):

(b) Date of issue and reference number of International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (in the case of a ship constructed in accordance with Annex II of the Convention):

8 Description of nature and extent of alteration or damage to the ship (including date(s) on which damage occurred and date(s) on which repairs or alterations, as the case may be, were commenced and completed):

9 Name and address of person or corporation effecting alteration or repairs:

10 Reason(s) for, or cause(s) of, alteration or repairs:

11 Particulars of changes in the construction of the ship:

12 (a) Additional information (if any) affecting the compliance of the ship with the provisions of Annex I of the Convention (in the case of a ship constructed in accordance with Annex I):

(b) Additional information (if any) affecting the compliance of the ship with the provisions of Annex II of the Convention (in the case of a ship constructed in accordance with Annex II):

Signature of master or owner:

Date:

NSW Marine Pollution Act Penalties

10 Duty to report certain incident s involving oil or an oily mixture

(1) Where a prescribed incident occurs in State waters in relation to a ship, the master of the ship shall, without delay, notify, in the prescribed manner, the Minister of the incident.

Penalty: 500 penalty units.

(2) In a prosecution of a person for an offence against subsection (1) in relation to a prescribed incident, it is a defence if the person proves that the person was unable to comply with the subsection in relation to the incident.

(3) Where a prescribed incident occurs in State waters in relation to a ship and:

(a) the master of the ship is unable to comply with subsection (1) in relation to the incident, or

(b) the incident occurs in circumstances in which the ship is abandoned, the owner, charterer, manager or operator of the ship or an agent of the owner, charterer, manager or operator of the ship shall, without delay, notify, in the prescribed manner, the Minister of the incident and, if the Minister is not so notified, each of those persons is guilty of an offence punishable, upon conviction, by a fine not exceeding:

(c) if the offender is a natural person - 500 penalty units, or

(d) if the offender is a body corporate - 2 500 penalty units.

(4) In a prosecution of a person for an offence against subsection (3) in relation to a prescribed incident in relation to a ship, it is a defence if the person proves:

(a) that the person was not aware of the incident, or

(b) in the case of a prescribed incident to which subsection (3) (a) applies, that the person neither knew nor suspected that the master of the ship was unable to comply with subsection (1) in relation to the incident.

(5) Subsection (4) shall not be taken to limit by implication any defence that would, but for that subsection, be available to a person charged with an offence against subsection (3).

(6) A master of a ship who, pursuant to subsection (1), has notified the Minister of the occurrence of a prescribed incident shall, if so requested by the Minister, furnish, within the prescribed time, a report to the Minister in relation to the incident in accordance with the prescribed form.

Penalty: 200 penalty units.

(7) Where subsection (3) applies in relation to a prescribed incident in relation to a ship, a person who, pursuant to that subsection, has notified the Minister of the occurrence of the prescribed incident shall, if so requested by the Minister, furnish, within the prescribed time, a report to the Minister in relation to the incident in accordance with the prescribed form.

Penalty: 200 penalty units.

(8) A person shall not, in a notice given to the Minister pursuant to subsection (1) or (3) or in a report furnished to the Minister pursuant to subsection (6) or (7), make a statement that is false or misleading in a material particular.

Penalty: 200 penalty units.

(9) A notice given to the Minister pursuant to subsection (1) or (3), and a report furnished to the Minister pursuant to subsection (6) or (7), shall not, without the consent of the person charged, be admitted in evidence in a prosecution for an offence against section 8 (1).

(10) In this section, prescribed incident, in relation to a ship, means:

(a) a discharge from the ship of oil or an oily mixture, not being a discharge to which section 8 (4) applies, or

(b) an incident involving the probability of a discharge from the ship of oil or an oily mixture, not being a discharge to which section 8 (4) would apply.