

CHAPTER 14

Special Ship Types

14.1 Combination carriers

This chapter adds guidance and recommendations for special ship types, including Oil/Bulk/Ore (OBO), frequently called combination carriers, which may differ from the recommendations for conventional tankers. An OBO carrier is a ship designed to carry oil, chemical or solid cargoes in bulk.

Other types of ship, which may, for example, carry oil in bulk at the same time as containers or general cargo, should be treated as a conventional tanker.

Some Liquefied Petroleum Gas (LPG) carriers are certified to carry other petroleum products, e.g. light naphtha, jet fuel and motor gasolines.

14.1 Combination carriers

A combination carrier is capable of carrying its full deadweight when trading as an ore carrier with cargoes of heavy ore concentrates. Other types of dry bulk cargo, e.g. grain, coal or liquid cargoes, can also be carried by these ships. Cargo tanks have smooth sides and bottom, similar to bulk carriers.

Combination carriers have a double hull construction. Side tanks and double bottom tanks are used for segregated ballast or arranged as void spaces. The double bottom, lower hopper, double side and top wing tanks have direct access to the weather deck, but there is no direct access from ballast tanks or void spaces to cargo holds.

A cargo pumproom type combination carrier would require a pipe tunnel located above the double bottom and combination carriers typically have deepwell pumps for each cargo hold.

Ballast piping is located inside the ballast tanks or pipe tunnels. Ballast pumps are, typically, located in a ballast pumproom.

Combination carriers typically have cargo holds without a centreline bulkhead.

Combination carriers above 70,000 tonnes DWT must have two protected slop tanks when carrying dry bulk cargo, but these tanks can be used for cargo when carrying liquid cargoes. The slop tanks are surrounded by cofferdams.

Conventional bulk carrier hatches, normally of the side rolling type, are fitted with special sealing arrangements that make them suitable for liquid cargoes.

14.1.1 General guidance

SOLAS prohibits the carriage of petroleum and dry bulk cargoes simultaneously.

The atmosphere in wing tanks should be monitored as any damaged bulkheads may allow flammable gas mixtures to enter the ballast tanks.

Void spaces around cargo holds can allow protected routing of piping systems and provide access to tank valves and double bottom tanks.

A duct keel or pipe tunnel is fitted about the centreline. Such spaces may not contain cargo pipelines, but may contain:

- Ballast pipelines.
- Fixed washing systems.
- Fixed gas monitoring systems.
- Fixed lighting.
- Mechanical ventilation arrangements.
- Trolleys on rails.
- Cargo hold bilge lines.

With restricted natural ventilation, these spaces may be oxygen deficient. As they are adjacent to cargo holds and ballast tanks, both hydrocarbon and IG may pass into them, making those spaces dangerous. Enclosed space entry requirements given in chapter 10 should be followed.

14.1.2 Slack holds in combination carriers

Because of the broad beam and size of the holds, the very large free surface in slack holds, i.e. holds not filled to within the coaming, permits substantial movement of liquid, which can result in both loss of stability and sloshing.

14.1.2.1 Loss of stability

Particular care should be taken when loading or discharging liquid cargo and ballast on combination carriers to ensure that the total free surface effect of cargo and ballast tanks is kept within safe limits, or a sudden list may occur.

Stability data, loading and unloading instructions should be understood and complied with and should specify the maximum number of cargo holds or tanks that may be slack at any one time. It may be necessary to adjust the final quantity of cargo to be loaded to avoid slack holds. Where double bottom ballast tanks extend across the whole width of the ship, the free surface effect of water when these tanks are slack will be as great as that of full cargo holds and should be considered when creating the cargo plan.

Some combination carriers have a valve interlocking system that limits the number of tanks that may be loaded or discharged simultaneously. A notice should be clearly displayed at the cargo control station, warning of the danger of free surface effect and stating the maximum number of holds that can safely be slack at any time.

A pre-arrival cargo plan should show the loading or discharging sequence and the distribution and free surface effect of all cargo, fuel and ballast at each stage of the operation.

Terminal operators should understand that combination carriers may be subject to cargo transfer rate limitations for stability and free surface management requirements.

If a loss of stability becomes evident during cargo operations, all cargo, ballast and bunker operations should be stopped and the loading arms or hoses disconnected. A plan should be prepared for restoring positive stability and this should also be agreed with the terminal.

The ship's specific stability information for the condition should be used.

To prevent a loss of stability:

- The ship's vertical centre of gravity should be lowered in the quickest and safest manner.
- Slack double bottom tanks should be filled, starting with those on the low side, followed by those on the high side.
- Do not correct a list by initially filling compartments on the high side, as this may result in a violent change of list to the opposite side.
- If the filling of slack double bottom tanks does not regain stability, consider filling empty double bottom ballast tanks. This will initially result in a further reduction of stability caused by the additional free surface effect, but will quickly be corrected by the added mass below the ship's original centre of gravity.
- Control of a list by adjusting mooring ropes tensions could also result in a violent change of list to the other side, and very slack moorings, and should be avoided.

On completion of loading, the number of slack holds should be at a minimum and no more than that specified in the stability information book.

14.1.2.2 Sloshing

Sloshing is the movement of liquid within a hold when the ship is rolling or pitching. It can cause:

- Structural damage caused by the slamming effect of the liquid against the bulkheads or hatch covers.
- An electrostatically charged mist in the ullage space in holds partially filled with a mixture of oil and water, e.g. dirty ballast or retained tank washings. Cargo tanks and protected slop tanks should always be inerted except when empty and gas free.

Sloshing danger can be limited by reducing the number of slack holds. Cargo quantity may need to be limited to achieve this.

14.1.3 Longitudinal stress

Cargo care planning should address the distribution of the weights along the ship, taking account of the ship's longitudinal strength.

14.1.4 Venting of cargo holds

The vent system on combination carriers is similar to that of conventional tankers, with the vent lines from the cargo holds leading to either individual P/V valves on each tank vent outlet or to a main cargo vent/IG common line that expels the hydrocarbon vapour through a riser at a safe height above the deck or to an IG system pipeline. Typically, the P/V valves are located on the top of the hatch covers. They are disconnected and stored when carrying dry cargo. The cargo tank vent and IG line connection to the cargo holds is arranged to prevent liquid ingress.

During the carriage of dry bulk cargoes, the holds are isolated from the liquid cargo pipeline and gas venting systems.

14.1.5 Inerting of holds

Best practice is for OBOs to maintain their holds in an inerted condition. Agitation of slops or dirty ballast in a slack hold may result in the generation of static electricity. Slack holds should be avoided.

The cargo holds of OBOs are adjacent to ballast tanks, cofferdams, void spaces, duct keels and pipe tunnels. A fracture in the cargo hold boundary plating may cause oil, IG or hydrocarbon gas to enter. Although these spaces should be provided with fixed gas detection, personnel should be aware of the potential formation of gas pockets when ventilating them for entry.

If slops are retained on board due to a lack of reception facilities, the slop tank or tanks should be maintained in an inert condition and the oxygen level should be checked and maintained at not more than 8% under positive pressure.

When the ship is in the dry trade, the slop tanks containing oil or oil residue should be completely isolated from the cargo holds, with piping systems blanked off using blind flanges or line blinds. The P/V valves, IG supply and cargo tank monitoring system serving the slop tanks, as well as the gas detection system in the cofferdams surrounding the slop tanks, should be operational (see the IMO's *Inert Gas Systems*).

14.1.6 Hatch covers

The hatches of OBOs are much larger than on oil tankers, but as they need to remain gas and liquid tight when carrying oil cargoes they are normally of the dual seal type.

Closing device maintenance and operation is critical. Their tension should be checked regularly and adjusted evenly and the screw threads should be cleaned and lubricated.

When closing hatch covers, the closing devices should be evenly and progressively pulled down in the correct sequence and in accordance with the manufacturer's instructions.

The sealing arrangements should be positively tested prior to loading a liquid cargo, by pressurising the holds with IG and applying a soapy solution to the sealing arrangements. Any leakage noted should be fixed by further adjusting the closing devices in the affected area.

The cover joints should also be examined for gas leakage when the compartment is loaded with liquid cargo. Any gas or liquid leaks that cannot be stopped by adjusting the closing devices should be marked or noted, so that the jointing material can be examined at the earliest opportunity and the joint made good. Additional sealing, e.g. by tape or compound, may be needed. A risk assessment should be conducted to identify the measures necessary to mitigate the risk.

The gas-tightness of the hatch covers and vent system will determine the frequency with which the IG needs to be topped up.

It is normal to use synthetic rubber for the hatch seals and it is best practice to carry a stock of this seal material to allow repairs to be carried out as required.

The hatch covers on OBOs can move slightly against the coaming when the ship is flexing in a seaway. The steel hatch cover can rub on the steel coaming, or remnants of a previous dry bulk cargo, but this is unlikely to provide a source of ignition. To minimise wear on the seals it is important to keep hatch cover runways clear of foreign matter. Using a compressed air hose with a suitable nozzle can be an effective approach when clearing the trackways of foreign matter.

Owing to the height of hatch coamings, which can be partially filled when carrying a liquid cargo, all main deck openings into cargo holds may have to withstand positive pressure. All seals and gaskets on tank cleaning covers, access hatches, trimming hatches, etc. need to provide an oil tight and gas-tight seal. The seals should be cleaned when refitting and all securing bolts should be hardened down. The seals should also be tested with a soapy solution before loading a bulk liquid cargo.

14.1.7 Tank washing

Tank washing should be carried out after carrying oil, or when converting from oil to dry bulk cargoes, see section 11.3.

When non-oil cargoes are to be carried, all holds and cargo tanks, other than slop tanks, should be emptied of oil and oil residues and cleaned and ventilated until completely gas free. Hatch covers should not be opened until the hold is gas free. All closing devices should be kept secured to prevent movement of the hatch covers.

Holds should then be inspected internally to confirm their condition. All other spaces should be checked to ensure that they are free of oil and hydrocarbon gas.

Most dry bulk ports require a gas free certificate to be issued for a combination carrier preparing to load or discharge dry bulk cargo. Such certificates will normally relate to holds and other spaces, but not to pumps and pipelines.

14.1.8 Carriage of slops when trading as a dry bulk carrier

Before a combination carrier operates as a dry bulk carrier, any oil contained in the slop tanks should be discharged ashore. After discharging the slops, the empty tanks should be cleaned and inerted before loading any dry bulk cargo.

If slops cannot be discharged, the following precautions should be taken:

- The slop tank should be fully inerted at all times.
- All slops should be transferred to the slop tank designated for this purpose.
- Blanking plates, or similar, should be fitted in all pipelines, including common vent lines leading to or from this slop tank.

Unless the ship reverts to carrying oil, oil slops should not be retained on board for more than one voyage. If, however, it is impossible to remove the slops because of a lack of shore reception facilities for oily residues, the slop tank should be treated as indicated above and appropriate reports forwarded to the company and the relevant administration.

14.1.9 Cargo leakage into ballast tanks

Leakage of oil from the cargo holds into the ballast tanks can create similar operational problems to those for a conventional tanker.

Further guidance can be found in section 11.7.

14.1.10 Testing of cargo tanks and enclosed spaces on dry bulk voyages

Before loading a dry bulk cargo, all spaces that have previously contained oil should be cleaned, gas free and inspected. Hydrocarbon gas checks should be carried out daily in all empty cargo holds, cargo tanks, double bottom and ballast tanks, as well as pipe ducts, cofferdams, stool tanks and similar void spaces. If no hydrocarbon gas has been detected after 14 days, the checks can be every two days unless the ship passes through areas with higher sea or air temperatures, in which case daily checks should continue.

The readings can be taken every three days if the following voyage is to continue with dry bulk cargoes.

14.1.11 Cargo changeover checklists

The following checklists are a generic guide to help each OBO develop its own specific checklists.

14.1.11.1 Oil to dry bulk cargo

When changing the cargo from oil to dry, the following should be done:

- Wash cargo holds and tanks, including access trunks.
- Flush all main suction into cargo holds and tanks and strip dry.
- Ensure all cargo holds and tanks are gas free.
- Ensure that cargo deck heaters or fixed heating coils are free of oil before blanking ends.
- Complete hand hosing and digging of holds and sumps.
- Drain cargo holds and cargo suction wells.

- Blank off cargo suctions and drop lines to holds by fitting watertight bolted covers inside cargo holds.
- Ensure sounding pipes to bilge wells are open and clear of obstructions.
- Fit main and stripping suction recess doors. Also, fit heating coil connecting pipe recess doors.
- Wash cargo pipeline system, including pumps, deck lines and bottom lines.
- Ensure gauging system is stowed or blanked as necessary, in accordance with manufacturer's recommendations.
- Drain, vent and verify all gas lines and risers are gas free.
- Blank off gas lines to holds.
- Set up venting system.
- Check hatch cover sealing arrangements and closing devices.
- Check ballast tanks, void spaces and cofferdams for flammable gas. Ventilate and verify as gas free.
- If slops are retained, ensure designated pipeline blanks are fitted, slop tanks are inerted and the venting system is in operation.

14.1.11.2 Dry bulk cargo to oil

When changing the cargo from dry to oil, the following should be done:

- Sweep holds clean, and lift cargo remains out of hold for disposal.
- Wash cargo remnants from bulkheads, stripping slowly to remove water, but let solid residues settle.
- Remove remaining solid residues from the tank top and sumps and verify that the stripping suction is clear.
- Remove suction doors and attach securely to stowage positions.
- Close off sounding pipes to sumps.
- Lower and secure heating coils in place, connect and ensure tight.
- Remove requisite blanks from gauging system and render fully operational.
- Remove blanks from main cargo suctions and stripping discharges to after hold.
- Wash all stripping lines thoroughly to remove solid residues. Check valve seats are not damaged by solid residues and test stripping valves for tightness.
- Check and clean all cargo system strainers.
- Check and clean all hatch cover sealing arrangements, closing devices, trackways, etc.
- Remove blanks from gas lines.
- Set up venting system.
- Prove all valves and NRVs in cargo system.
- Inert cargo holds prior to loading.
- Verify tightness of hatch covers, tank cleaning covers, access hatches and all openings into cargo spaces.