

CHAPTER 13

Carrying and Storing Hazardous Materials

- 13.1 Liquefied gases
- 13.2 Ship's stores
- 13.3 Cargo and bunker samples
- 13.4 Other materials
- 13.5 Packaged cargoes

This chapter looks at hazardous materials carried and stored on board tankers as cargo, ship's stores or cargo samples.

ISGOTT does not offer guidance on the many hazardous chemical cargoes that may be shipped from time to time. General guidance on the properties of such cargoes can be found in the ICS publication *Tanker Safety Guide: Chemicals*. The shipper must also supply an SDS for all chemicals. The *International Maritime Dangerous Goods (IMDG) Code* provides requirements and guidance on the handling and storage of packaged dangerous goods in accordance with the SOLAS Convention.

13.1 Liquefied gases

As well as observing the general precautions in section 13.5 for handling packaged petroleum and other flammable liquids, follow these safeguards when handling packaged liquefied gas cargoes:

- Protect pressurised cylinders against physical damage from other cargo, stores or equipment.
- Do not over-stow pressurised cylinders with other heavy goods or items.
- Do not stow pressurised cylinders in positions where the safety relief device is in contact with the vapour space in the cylinder.
- Use a suitable protection cap to protect valves against physical damage when the cylinder is not in use.
- Cylinders stowed below deck should be in compartments or holds that can be ventilated and are away from accommodation, working areas and all sources of heat.
- Stow oxygen cylinders separately from flammable gas cylinders.

- Keep temperatures down. Do not allow hold temperatures to rise above 50°C. Check hold temperatures frequently. If they approach 50°C, take the following measures:
 - Ventilate storage areas.
 - Spray liquefied gas containers with water if loading or discharging in direct sunlight.
 - Create a shade for the gas cylinders, e.g. rig a cover over the hold.
 - Dampen the deck over the hold containing any cylinders, e.g. by spraying with water.

13.2 Ship's stores

13.2.1 General

Any chemical or hazardous material on board a ship as stores should have an SDS. If an SDS is not provided, the material should be isolated and stored in line with the guidance on its container or packaging. Do not use it until satisfactory user information is available.

Assess what PPE, first aid and eye wash equipment should be kept at each location. Ensure it is appropriate to the product stored.

All containers and packages should be stowed closed. Keep the storage location clean and tidy.

13.2.2 Paint

Stow paint, paint thinners and associated cleaners and hardeners in approved storage areas that are protected by fixed fire-extinguishing systems approved by the administration. (SOLAS Chapter II-2 Regulation 10, section 6.3 covers spaces containing flammable liquid.)

13.2.3 Chemicals

Stow all chemicals in a designated storage area. Take care to ensure that incompatible chemicals are stowed separately. Information on the firefighting medium for each chemical should be in the product SDS.

13.2.4 Cleaning liquids

Use non-toxic, non-flammable and environmentally friendly cleaning liquids where possible. If flammable liquids are used, they should have a high flashpoint. Never use highly volatile liquids, e.g. gasoline or naphtha, in engine and boiler rooms.

Keep flammable cleaning liquids in closed, unbreakable, correctly labelled containers. Store them in a suitable compartment.

Use cleaning liquids only in areas with good ventilation and take into account the volatility of the liquids. All such liquids should be stowed and used in line with the manufacturer's instructions.

Do not let cleaning liquids touch the skin or contaminate clothing.

13.2.5 Spare gear storage

Spare gear is not inherently hazardous. However, large items of spare gear stowed on deck have, on occasion, broken free of their lashings, damaging the ship and endangering the crew. When stowing spare gear, ensure that it:

- Gives safe access to any safety equipment.
- Does not interfere with mooring or other operations.
- Is properly lashed, especially in bad weather.

13.3 Cargo and bunker samples

The operator's SMS should include guidance on managing and storing cargo and bunker samples. The quantity of samples kept on board should be carefully managed and reduced to the minimum number required. When they are no longer required they should be disposed of in an appropriate cargo or slop tank on board or landed ashore.

13.3.1 Sample disposal

After the cargo has been discharged, unless the company or charterer says otherwise, it is suggested that cargo samples are kept for no longer than three months. MARPOL requires that bunker samples are kept on board for at least 12 months from the time of delivery.

If disposing into a cargo or slop tank, sections 12.8.2 and 12.8.3 cover the hazards of electrostatic discharges between two static accumulator surfaces and the necessary precautions. Use appropriate fixed full length piping, e.g. full length vapour lock piping, full length sounding pipes or similar. Manifold drip trays fitted with drainpipes leading to a cargo tank are also suitable. In both cases, precautions should be taken to ensure there is no vapour blow-back.

If landing samples ashore, records of disposal should be kept, along with landing receipts, in line with operator procedures.

13.3.2 Sample storage

All cargo and bunker samples should be stored securely in lockers that cannot be accessed from the accommodation. Consider storing samples in an area protected by a fire detection and fixed firefighting system, such as a paint locker or midship storeroom. If no fixed firefighting system is fitted, portable firefighting equipment should be provided nearby. Keep samples away from high temperatures and do not expose them to direct sunlight. Before entering any storage space, make sure it is properly ventilated.

In some cases, oil tankers may be equipped to carry certain MARPOL Annex II cargoes and have a relevant certificate of fitness. In such cases, follow the guidance in the IBC Code section 16.5, *Stowage of Cargo Samples*.

13.4 Other materials

13.4.1 Sawdust, oil absorbent granules and pads

Avoid using sawdust to clean up small oil spills on board, as moist sawdust is susceptible to spontaneous combustion (see section 4.10). If sawdust is carried on board, make sure it is stowed dry and in a cool location.

If sawdust is used to clean up a minor oil spill, store the contaminated product separately, in a sealed container and in a safe location, clear of the accommodation and hazardous areas.

Stow any oil impregnated absorbent granules or pads in dedicated containers, clear of the accommodation and hazardous areas.

Dispose of oil impregnated sawdust and absorbent granules as early as possible, ashore or in the ship's waste incinerator (if compatible).

13.4.2 Linseed and other oils

Rags soaked in boiled linseed oil can spontaneously combust when drying. Their temperature rises as a result of an exothermic reaction with the air. Place any rags or paper towels soaked with linseed oil in water filled metal cans until they can be incinerated or disposed of ashore.

Boiled linseed oil can be safely stowed in cans if kept away from heat sources (drying linseed oil is safe when used on wood because it is spread out and does not create enough heat to self-combust).

Other products that can produce heat and self-combust include turpentine, fish oil, lard, coconut oil, cod liver oil and castor oil. Rags soaked in these products should also be kept in water filled metal cans until they can be incinerated or disposed of onshore.

13.4.3 Garbage

The regulations for the handling, storage and disposal of garbage can be found in MARPOL Annex V, with further information in the ICS publication *Guidelines for the Preparation and Implementation of Garbage Management Plans*.

Carefully choose the storage areas for garbage to ensure it presents no potential hazard to nearby spaces.

Be particularly careful when storing garbage that is designated as special waste, e.g. batteries, sensors and fluorescent tubes) and ensure that only compatible materials are stowed together.

13.5 Packaged cargoes

13.5.1 Petroleum and other flammable liquids

Packaged petroleum cargoes are usually shipped in steel drums that can carry around 200 litres. Products transported in this way include gasoline, kerosene, gas oils and lubricating oil.

As well as complying with the IMDG Code and the general safety precautions for handling bulk petroleum, observe the following procedures when handling packaged petroleum products.

13.5.1.1 Loading and discharging

Handling steel drums increases the risk of spark generation. Do not handle packaged petroleum and other flammable liquids while bulk loading volatile petroleum, except with the express permission of both the Responsible Officer and the Terminal Representative.

13.5.1.2 Precautions during handling

A Responsible Officer should supervise the handling of packaged petroleum and other flammable liquids. Take the following precautions:

- When on board the ship they must comply with smoking restrictions and other safety regulations that are mandatory requirements.
- If no permanent hatch protection is fitted, provide temporary protection to avoid the risk of hoists striking the hatch coamings, hatch sides or hold ladders and causing sparks.
- All hoists should be able to pass through hatches with plenty of clearance.
- Handle loose drums with fibre rope slings, cargo nets, drum hooks on wire rope or chain slings. Include lifting gear in the equipment register and test it regularly.
- Goods should be palletized and secured. Use pallet lifting gear with safety nets to lift pallets. If goods are not on pallets, use cargo trays or fibre rope slings. Using cargo nets for packaged goods is generally discouraged as they may damage the packaging.
- Handle loose gas cylinders with cargo nets that have a suitably small mesh. Never handle cylinders by the valve or protection cap. Never use lifting magnets, chains, slings or strops to lift cylinders on board. Always use a cylinder trolley or similar device when moving cylinders, even over short distances.

- Before stowing, inspect each package for leaks or damage. Reject any that are defective and may pose a risk.
- Place packages on dunnage on the deck or in the hold.
- Do not drag packages across the deck or hold, do not allow them to slide or roll free.
- Stow cans and drums with caps and end plugs uppermost.
- When securing the cargo, separate each tier by dunnage. The nature, size and strength of the packages will determine the height to which cargo can be safely stowed. Seek advice from the terminal or shipper.
- Use enough dunnage to prevent possible damage during the voyage.
- Secure the cargo to prevent any movement during the voyage. If drums are stowed on deck, part-filled and empty ones may float free of the stow. Consider covering and lashing them with cargo netting.
- During darkness, provide sufficient approved lighting over the ship's side and into the hold.
- Treat empty cylinders as filled unless they have been gas freed.
- Do not use any materials susceptible to spontaneous combustion as dunnage and do not stow them in the same compartment as the packages. Be wary of combustible protective packaging, e.g. straw, wood shavings, bituminised paper, felts and polyurethane.
- After loading or discharging and before closing hatches, inspect the hold to check that everything is in order.

13.5.2 Dangerous goods

Dangerous goods are classified in Chapter VII of the *International Convention for the Safety of Life at Sea (SOLAS)*.

The Master should allow on board only packaged dangerous goods that have been properly identified by the shipper of the goods and declared as properly packaged, marked and labelled in line with the appropriate provisions of the IMDG Code, taking into consideration the IMO's *Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas*.

Before accepting the cargo, the Master should have received the appropriate SDS from the shipper and be aware of advice on any special properties of the cargo, procedures for entering an enclosed space containing the cargo, and guidelines for dealing with any leak, spill inhalation, skin contact or fire.

See the advice for dealing with spills or fire in the IMO's *Emergency Procedures for Ships Carrying Dangerous Goods: Group Emergency Schedules*.

The Master should also ensure that dangerous goods loaded on the ship are properly stowed and segregated as recommended in the IMDG Code, taking into consideration the IMO's *Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas*.

13.5.2.1 Tetraethyl lead and tetramethyl lead

Tankers may carry these anti-knock chemicals in small quantities as packaged cargo. Take extreme care when handling anti-knock compounds, as contact with the skin or vapour inhalation poses a toxic risk. Before handling packaged cargoes of TEL and TML, the Master should know the nature and properties of the substance and have the appropriate SDS from the product manufacturer.

13.5.2.2 Additives (anti-static, inhibitors, dyes, hydrogen sulphide knockdown)

These cargo additives are often loaded on tankers in small containers and delivered with the cargo. So that they can be stowed correctly, they should be accompanied by the appropriate SDS.

13.5.3 Entering holds and storage spaces

Before entering any hold or storage spaces that contain or have contained packaged petroleum and/or other flammable liquids, take all the precautions for entering enclosed spaces (see chapter 10).

Ventilate holds during all cargo handling operations. If handling is interrupted and hatches are closed, re-test the atmosphere before resuming work.

13.5.4 Portable electrical equipment

Other than approved air-driven lamps, portable electrical equipment is prohibited in holds or spaces containing packaged petroleum or other flammable liquids. It is also prohibited on deck or in spaces over or next to such holds or spaces unless the ship complies with the conditions for using such equipment on tankers (see section 4.12).

13.5.5 Smothering type fire-extinguishing systems

When handling packaged petroleum or other flammable liquids, make sure the control valves of any smothering system in the holds are closed and take precautions to prevent unauthorised or accidental opening of these valves.



When loading or discharging is completed, and after hatches have been secured, return any previously isolated fixed smothering system to operational readiness.

13.5.6 Firefighting precautions

As well as taking the precautions outlined in section 19.4 when handling cargo, have at least two dry chemical fire extinguishers and fire hoses equipped with spray nozzles ready for use.

13.5.7 Forecastle spaces and midship stores

Do not carry packaged petroleum or other flammable liquids in the forecastle spaces, midship stores or any other space unless they have been specifically designed and classified.

13.5.8 Deck cargo

Protect any drums or other receptacles carried on deck against the sea and weather. They should normally be stowed only one tier high.

Stow all packages well clear of deck fittings, including tank and valve controls, fire hydrants, safety equipment, steam pipes, deck lines, tank washing openings, tank vents, hatches, doorways, emergency exits and ladders. Use sufficient dunnage and secure them properly to strong points on the ship's structure.

13.5.9 Barges

Barge personnel should comply with the relevant requirements of chapter 4, particularly restrictions on smoking, naked lights and cooking appliances. When alongside a tanker they should also comply with the requirements in chapter 24.

During darkness, barges carrying packaged petroleum or other flammable liquids should remain alongside a tanker only if there is enough safe lighting and they can comply with smoking restrictions and other safety requirements.