



Ship lay-up.

A guide for owners on preparing ships for lay-up and protecting them while out of service



Lloyd's
Register



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1. Introduction

This is the fourth edition of Lloyd's Register's lay-up guide, produced to help owners prepare their ships for lay-up and maintain them in a safe and cost-effective condition during lay-up.

The guidelines this document contains are general – they are not classification requirements. Therefore, they may need to be modified to suit a particular ship type or lay-up location. The specific requirements of original equipment manufacturers may take precedence, and ships may also be subject to national, port and other statutory requirements, which this guide doesn't cover.

Preparations for lay-up should be carried out by crew members, the owner's technical shore staff or a contractor's competent personnel, and in consultation with a local Lloyd's Register office. Once the preparations are complete, a Lloyd's Register surveyor will carry out an examination on board. If this is satisfactory, the surveyor will issue a general report stating that the ship has been laid-up in accordance with the recommendations detailed in this guide.

Lloyd's Register recommends that ships are laid-up with classification maintained; this may either be as normal for a hot lay-up or with 'Laid Up' status assigned for a longer term lay-up. We gratefully acknowledge the advice provided by International Shipcare Sdn. Bhd of Labuan Malaysia during the revision of this guidance document.



1.1 Using this guide

We recommend reading Appendix 1 of this document on page 23 before proceeding to the main body. Please read the detailed guidelines in the main body before using the checklists in Appendices 2 to 8. If you have any queries or feedback about this guidance, please contact one of LR's Ship Inspection and Assessment (SIA) Centres, located in Piraeus, Ottawa, Singapore and Southampton. See the back cover for contact details.



2. Choosing a lay-up condition

The lay-up condition you choose will be determined by a combination of technical and commercial factors, including:

- the time the vessel will be in lay-up condition
- the time that will be needed to reactivate the vessel
- the need to reduce overhead running costs
- the relocation of the vessel to its next intended destination, and
- the age of the vessel and its scrap value.

2.1 Hot ship lay-up (24-hour reactivation)

This lay-up condition is suitable for up to one month out of service. In this condition, the vessel is held within normal classification survey and flag state requirements although the number of crew may be reduced in line with the certified minimum safe manning limits. The machinery will be kept operational but various economies may be made. The vessel will usually be located in an area close to potential cargo trade routes.

2.2 Hot ship lay-up (one-week reactivation)

This lay-up condition is suitable for up to 12 months out of service. In this condition, the vessel manning is reduced below the trading limit and in agreement with the flag state, the classification society and other local authorities and insurance companies. In this condition, most ports will only grant a temporary permit to lay-up a vessel in port, provided that class and flag surveys are carried out. Under these circumstances there may be local restrictions on vessel operations, e.g. restrictions on the transfer of oily bilge water.

2.3 Warm ship lay-up (one-week reactivation)

This lay-up condition is suitable for up to 12 months out of service and is similar to 2.2, with the exception that the vessel would usually be moored at a recognised lay-up location and the owners would have discussed the class status being changed to 'Laid up'; especially if any surveys are falling due while the ship is out of service. Class survey requirements will need to be confirmed with the class society (see also 5.1).

2.4 Cold ship lay-up (three-week reactivation)

This lay-up condition is suitable for up to five years out of service. In this condition, the vessel manning is in line with emergency requirements to deal with fire, flooding, mooring and security watch. Cold ship lay-up locations are generally remote, so access to the vessel is likely to be limited. On reactivation, the vessel may need to go directly to dry-dock before trading, depending on the extent of hull marine growth.

It is important that all preparations during cold ship lay-up are well documented because crew changes may be significant. The owners should request the class status is changed to 'Laid up' before actual lay-up, as the class survey requirements will need to be confirmed with the class society (see also 5.1). Before reactivation, the survey and certification requirements for the initial voyage to a dockyard will need to be discussed with the class and the flag.

2.5 Long-term lay-up (three-month reactivation)

This lay-up condition is suitable for over five years out of service. In this extended condition, the preparations will be comprehensive, to the extent that original equipment manufacturers should be consulted for critical equipment. Furthermore, any remedial work required on reactivation is likely to be extensive and unpredictable, e.g. renewal of alarm systems due to obsolescence. Several vessels will be laid-up in this condition side-by-side to minimise supervision costs. The owners should request the class status is changed to 'Laid up' before actual lay-up, as the class survey requirements will need to be confirmed with the class society (see also 5.1). Before reactivation, the survey and certification requirements for the initial voyage to a dockyard will need to be discussed with the class and the flag.

3. Location considerations

The local requirements that apply to specific lay-up locations and mooring arrangements are normally determined by the relevant port authority and the appropriate salvage association. The classification society should also be advised in advance in case they have any special recommendations. However, the shipowner should consider the following factors before selecting lay-up locations:

- the extent of shelter from open seas, strong winds, swell, surge and strong currents
- the proximity to shipping routes or open roadstead anchorages
- the proximity to known tropical cyclone or hurricane areas, moving ice, etc.
- the proximity to wrecks, submerged pipes, cables and other bottom projections
- the proximity to corrosive waste or effluent discharges
- the water depth with regard to keel clearance at extreme low tides versus excessive water depth with regard to anchor chain limitations
- the characteristics of the seabed with regard to anchor-holding capability (which may require confirmation by diving inspection)
- the availability of local tug and fireboat assistance
- the characteristics of the windage area (including cargo container considerations, if applicable) in relation to changes in wind, tidal and swell conditions
- the weaknesses and limitations of the specific type, design and condition of mooring equipment, as well as access to and the readiness of additional moorings, if required
- the suitability of the mooring pattern with respect to the number of lines, lengths, angles and leads and the ability to maintain even tensions on the lines
- the capacity and capability of the crew during normal and adverse weather conditions
- the reliability and frequency of local weather forecasts and warnings
- the proximity to other vessels and related traffic hazards in the vicinity
- the scope of local emergency preparedness plans and services for potential fires, flooding, security incidents, mooring failures or medical emergencies, and
- the risk of theft and piracy.

4. Mooring arrangements

4.1 General requirements

The mooring arrangements will depend on the selected lay-up site conditions, the readiness of main machinery, and manning levels. The arrangements will include a ship's own anchoring equipment augmented by stern anchoring arrangements, permanent buoying facilities or mooring to specially sited bollards on shore.

The choice of mooring arrangements should be in line with the following general requirements:

- When ships are laid-up to buoys or anchored, they should be moored to prevent swinging in wind or as a result of tidal changes.
- When ships are anchored, the chain cables must not be capable of twisting or cross contact, and anchors must be placed to avoid tripping.
- Additional stern anchoring arrangements will be required for single anchor ships.
- Anchor cables should be led and protected to prevent chaffing against the ship.
- If laid-up ships are subjected to wave movement or surge, anchor cables should be periodically moved at intervals to shift points of wear on the cables.
- Anchored ships should have ample chain scope – i.e., cable lengths should ideally be around seven times the water depth. In any event, the local port authorities should be consulted for their knowledge of prevailing conditions.
- Anchor lights and fog signals should be fully operational and additional deck lighting will be required if lay-up is near shipping lanes.
- Ships should be sufficiently ballasted to reduce windage, roll and surge, with due regard to hull stresses. Furthermore, when draught is finally established, it is advantageous to paint clearly visible reference marks at bow and stern, just above the water line as an external indicator of hull integrity (leakage).
- An emergency means for the quick release of all moorings should be provided and arrangements for towing should be readily available if propulsion machinery cannot be brought into operation.
- All anchors should be provided with marker buoys, depending on the local port and harbour authority requirements.
- The windlass and mooring winches, if electronically driven, should be provided with an adequate source of electrical power for intermittent and emergency operation.
- Day and night anchor dragging GPS position fixing (or compass bearings) should be established and monitored regularly. Consideration should be given to installing a drift alarm which alerts a designated person ashore.

4.2 Ships moored in groups

When ships are to be laid-up in groups, mooring arrangements should be in with the following additional requirements:

- Adjacent ships should be similar in size to avoid differential surging motions and they should be ballasted to similar freeboards to permit breast lines to be directly led.
- Ships should ideally be anchored in alternate directions (alongside bow to stern), in even numbers to provide equal anchor holding power at both ends of the group.
- The fore and aft direction of each vessel should be parallel to prevailing strong winds.
- Breast mooring lines should be provided, sufficiently tensioned and of similar stretch characteristics.
- Sufficiently sized fendering arrangements should be provided alongside at areas of possible contact with other ships or shore structures.
- If the auxiliary engine on one vessel is used to supply power to other vessels, it is recommended that all vessels are electrically connected to avoid stray currents.

5. Class status during lay-up

5.1 Class status

Ships that are laid-up immediately after service will be maintained in class without periodic survey until the due date for the annual survey. However, the ship-owner should request continuance of class when a vessel is taken out of service by requesting the classification status 'Classed (Laid Up)' to be assigned in case there are any requirements to be fulfilled before 'Laid Up' status is granted.

→ **Note:** in the case of hot ship lay-up, the normal classification and statutory survey regime continues.

If the ship is to remain laid-up beyond the due date for the annual survey, the 'Laid Up' status can be maintained provided that the class surveyor has attended for general examinations of hull and machinery before the end of the annual survey range dates.

If the next survey after going into lay-up is the Special Survey then an underwater examination is to be held in addition to the general examinations of hull and machinery. The owner will be given the option of having class withdrawn, or carrying out surveys to maintain the status 'Classed (Laid Up)', with surveys overdue.

5.2 ISM and ISPS certification

If the vessel is laid-up for **up to six months**, Lloyd's Register will suspend the vessel's International Safety Management Code (ISM) and International Ship and Port Facilities Security Code (ISPS) certificates. In the event the vessel is later brought back into service, a 'reactivation audit' will be required for ISM and ISPS.

If the vessel is laid-up for **more than six months**, the ISM and ISPS certification will be withdrawn. In the event the vessel is later brought back into service, an interim survey will be required before Lloyd's Register can reactivate the ISM and ISPS certificates.

The exception is a situation where the shipowner has maintained the ship in a hot lay-up condition and maintained the crew in accordance with flag requirements for safe manning, and the ship has not changed class status to 'Laid Up'.

6. Insurance issues

6.1 Protection and indemnity cover

Under all circumstances, the owner should keep the relevant protection and indemnity (P&I) club fully informed about a vessel's changing status.

P&I club rules will vary but owners may expect to receive a 50% reimbursement of the P&I premium once a ship has been laid-up for more than one month.

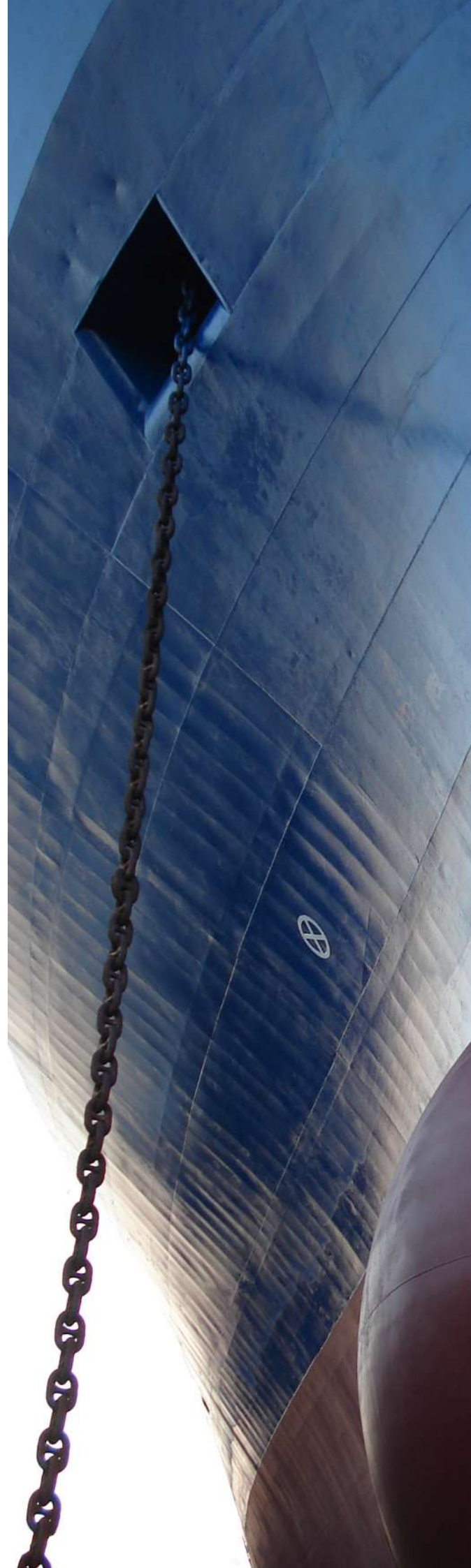
If the vessel is laid-up for an extended period of time, most P&I clubs will reserve the right to inspect the condition of the vessel on reactivation.

Most port authorities will require a letter from local P&I club representatives to confirm that the laid-up vessel is covered for port risks, e.g. oil pollution, wreck removal, salvage costs.

6.2 Hull and machinery cover

Typically, an owner may deal with a laid-up vessel's hull and machinery cover in two ways:

1. Opt for a laid-up return of premium; or
2. With the underwriter's agreement, cancel the trading policy and substitute this with a ports risk policy.



7. Manning levels

Ideally, owners should conduct a risk assessment with regard to the planned manning level. This should cover any hazardous events that might occur at any time during lay-up. The risk assessment should account for the following onboard scenarios:

- fire
- flooding
- severe weather, and
- security breach.

The extent to which onboard risks can be mitigated is largely determined by the planned manning level - e.g. maintaining a reduced crew on one vessel for vessels moored in a group.

Port authorities may have their own requirements for the number of staff on board. Table 1 on page 14 gives example minimum manning requirements.

Technical attendance on board will usually be necessary and the extent of this will depend on the location and expected duration of the lay-up, as well as the nature of the ship's dehumidification programme and the number of adjacent ships in a group.

Staff will be required to carry out routine maintenance and monitoring which may be performed on a regular visitation basis. It is recommended that at least one engineer officer and one navigating officer be stationed on each vessel, unless vessels are laid-up in a group.

The deck and engineer officers must be capable of operating essential equipment critical to the lay-up operation, e.g. electrical generating sets, pumps, fire-fighting equipment.

Owners should assess the flooding risks in the machinery spaces posed by various manhole doors being left open to facilitate drying of salt water coolers and other equipment in the engine room.

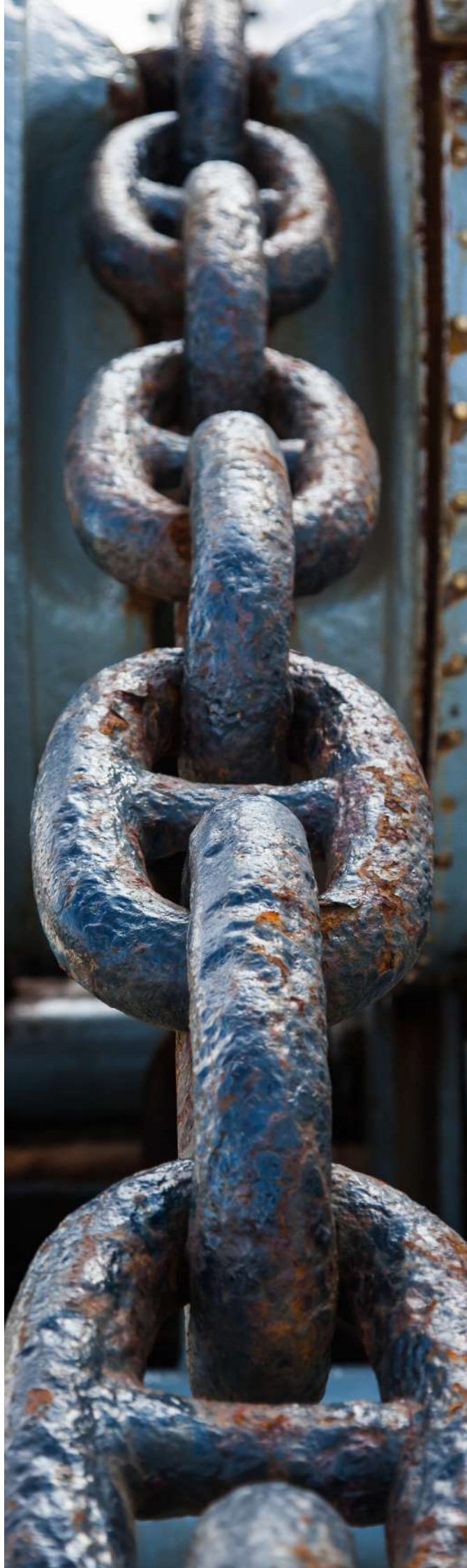
It is recommended that the owner seeks guidance from the vessel's flag state, insurer and local authorities to agree the final manning levels on board during lay-up.

8. Record keeping

The owner should carefully prepare a log of all the measures taken during the implementation of a lay-up programme, to ensure easy and orderly reactivation in future. In particular, an inventory of the entire vessel's equipment that is moved ashore should be prepared, to monitor the extent of any transfers of spares to sister ships in the fleet that are still trading.

9. Navigation

If there is a permanent lay-up crew onboard the vessel, they should be provided with an updated chart of the lay-up area, whereas all remaining chart folios may be landed ashore. The correct navigation shapes and lights for the condition of the ship should be provided.



10. Safety equipment, systems and alarms

All safety equipment considered necessary for the safety of the vessel and the crew should be periodically examined and maintained in a satisfactory condition. For example, sufficient breathing apparatus and floatation escape devices should be provided and maintained.

Fire extinguishers should be regularly inspected and where foam or CO₂ systems are installed, the system should be maintained in a fully operable condition.

All fire dampers should be inspected to be freely operable and regularly greased whereas dampers not required for essential ventilation should be closed.

The emergency fire pump should be regularly inspected and maintained in a fully working condition to ensure its reliable operation. An international shore connection should be retained in an accessible position. The fire main should be drained via a small-bore drain to prevent freezing (and subsequent overpressure).

Bilge level and fire alarm systems should be arranged to operate audible and visible alarms, as follows:

- a. within the living quarters when the vessel is permanently attended; or
- b. where the vessel is unattended, to operate the ship's whistle or an equivalent alarm.

If a laid-up vessel is in 'electrical dead ship' condition, bilge and fire alarms must be independently powered. Consideration should be given to installing a remote alarm which alerts a designated person ashore.

Warning notices should be placed in conspicuous places advising staff of the dangers of entering enclosed spaces. Pump rooms, tank spaces, cofferdams, etc., should not be entered unless they are proved to be gas free and with an atmosphere safe to enter, and the normal safety precautions have been taken.

Furthermore, no repairs should be carried out in cargo or fuel tanks, pump rooms, etc., unless special arrangements have been made, and dangerous spaces have been proved gas free.

The owner should provide approved oxygen and explosion meters where the type of ship requires such safety equipment. It should be noted that reduced or nil ventilation increases the areas which could be lacking in oxygen and also the potential for pockets of other gases to accumulate.

A sufficient number of approved safety torches should be available onboard.

In many ports, the harbour master will require bulk carriers and tanker vessels to be issued with a gas free certificate before lay-up and will expect that the gas free status be maintained during the lay-up. Some authorities may require the periodic renewal of the gas free certificate throughout the lay-up period, e.g. at three month intervals.

11. Protection during lay-up

11.1 Wet or dry ballast tanks

Ballasted tanks should be laid-up in either a wet or dry condition. Ballast tanks can be stored in a completely empty and dry condition with as much water removed from the tank as possible, e.g. the tanks can be dried by forced venting.

Alternatively, ballast tanks should be completely filled by flooding (including deck headers and vent pipes) with chemically treated water to inhibit corrosion. Filled ballast tanks should then be checked at the air pipes for liquid loss on a weekly basis, and topped up as required. Ideally, owners should hang corrosion coupons (steel plates) within filled ballast tanks to monitor the effectiveness of the chemical corrosion inhibitor. These coupons will enable the crew to monitor the inhibitors' effectiveness and to determine when further chemical dosing is required. Corrosion inhibitors should comply with local environmental requirements.

→ **Note:** the vessel must undertake ballast water exchange before arrival at the lay-up location, to comply with local requirements.

11.2 External hull protection

The hull should always be protected against corrosion. The paintwork of the parts above the water line, deck and superstructures should be made good and should be examined and maintained at regular intervals during lay-up. To protect the external hull below the waterline (particularly in contaminated waters) it is recommended that the impressed current system (if fitted) should be continuously operated.

Impressed current cathodic protection systems should be regularly examined, maintained and monitored (specifically, current outputs and hull potentials). Sacrificial anodes mounted on the hull should be renewed where necessary before lay-up and these should be regularly examined.

If a laid-up vessel has no impressed current protection, sacrificial anodes can be suspended at regular intervals around the hull below the waterline. This precaution is particularly important if a laid-up vessel is moored near a structure with its own impressed current protection system (such as a jetty or another vessel). In the event, the hull's electrical potential should be periodically checked along the underwater side area with portable voltmeters.

11.3 Internal hull protection

Holds, cargo tanks and other hatch covers, watertight doors and closing appliances should be securely closed and sealed, unless required for access or ventilation. Flame screens on fuel tank air pipes should be in good condition.

Empty tanks, holds, pump rooms, small machinery spaces, storage spaces, lockers and other similar areas should be kept in a dry condition. For this purpose, dehumidification is recommended but the extent of its use depends on the type of ship, its condition, the lay-up location and the climatic conditions.

Fuel oil bunker tanks should be kept full or should be cleaned and gas freed. When kept full, a regular quality check should be made to assess ongoing suitability for use. A biocide may be added to the fuel to prevent microbiological degradation. Good housekeeping onboard is essential such as draining of excess accumulated water in bottoms of the fuel tanks.

Fresh water tanks should be cleaned and recoated where necessary.

Chain lockers should be cleaned, dried and coated.

11.4 Deck equipment

For deck machinery, all bright parts exposed to atmosphere should be greased and machinery internals should be protected with oil and sealed to prevent ingress of moisture and air.

Any mooring ropes or soft fibre materials which are sensitive to ultraviolet (UV) light degradation should be stowed out of the sun.

Cargo and other lifting gear wires and blocks not retained in use should be dismantled, greased and stored, and gear which is not dismantled should be protected with grease and covered.

11.5 Accommodation areas and outfitting

11.5.1 Accommodation areas

Personnel living onboard should be accommodated in one area to allow all other areas to be dehumidified, or at least provided with heaters, to reduce humidity to an acceptable level.

If the ship's galley is being used by lay-up staff, the galley exhaust fans and grease trap should be regularly inspected and cleaned.

For all unoccupied areas, the humidity level in accommodation areas should be reduced and maintained at 45-55% relative humidity (RH) by dehumidifiers.

This is particularly important for spaces such as the radio room, navigation bridge and other spaces housing electrical machinery or electronic control equipment.

Ships' linen and napery should be stored in one single dry compartment with mattresses stowed on their edge to assist free air circulation.

All provision room, cabin and cabinet doors should be secured in the open position.

Water services in unoccupied areas should be shut off and drained and sanitary fittings and toilet bowls should be sealed.

Scuppers and liquid seals should be treated to prevent freezing under normal climatic conditions.

11.5.2 Outfitting

'On hire' equipment such as gas bottles, etc., should be returned to suppliers, or an agreement may be reached regarding reduced hire charges and insurance premiums.

Electricals on deck and telephones, telegraphs, etc., should be covered and sealed, with moisture-absorbing desiccant bags within.

All loose navigational equipment, chronometers, sextants, etc., not required during the lay-up period should be removed and placed in locked storage.

The engine workshop, electrician's workshop and deck workshop tools and loose equipment not required during the lay-up should be cleaned, greased and put into locked storage.

All loose gear, lifeboat gear, rescue boats and similar equipment should be removed, protectively coated and placed in locked storage, except for retained safety equipment.

Medical and lifeboat perishables should be removed ashore (or to another vessel, as required).

Any food stuffs, pyrotechnics (particularly expiry date stamped), cotton waste, matches, etc., not required during lay-up should be removed ashore.

Broached drums of chemicals are to be removed ashore.

11.6 Machinery

11.6.1 General machinery

The temperature in machinery spaces should be maintained above 0°C (32°F).

Dehumidifying equipment should be installed to protect machinery spaces from atmospheric corrosion, by maintaining relative humidity within the range of 30-50% RH. Power should be available for continuous operation of the dehumidifiers and the occasional turning of machinery.

To achieve humidity control of the machinery space, funnel openings, grills, ventilator openings, doors, etc., should be closed and sealed. Access to the space should be restricted to two openings only and it is advantageous if these are double air lock doors. For cold lay-up, main and auxiliary engine, boiler and incinerator exhausts are to be closed off with 'top hats' to prevent rain or moisture building up in the exhaust trunkings, exhaust gas economisers, etc. Suitable warning signage is to be provided at local and remote control stations.

Certain types of gasket and seal materials in the machinery room may subsequently degrade if they are exposed to dry dehumidified air over an extended period of time.

All bilge valves should be cleaned, overhauled and proved operable.

Tank tops in engine rooms, boiler rooms, pump rooms, and hold areas should be hosed down, and bilges cleaned and dried. Any liquid leaks should be repaired.

Air conditioning and refrigerant systems should be pumped down to the liquid receiver and all valves secured and tagged with a note of the liquid level.

All lubricating oil in systems and used oil storage tanks should be thoroughly centrifuged at temperatures above 82°C (180°F) to kill any microbes. Samples should be taken and analysed by the oil suppliers to confirm stability, freedom from moisture and microbiological contamination.

Contaminated oil should be renewed.

Where lubricating oil sumps and storage tanks are vented to atmosphere above deck-level, the venting arrangements should be sealed, and alternative ventilation should be arranged into machinery spaces.

All sea inlet valves and overboard discharge valves should have spindles greased, valves closed and hand wheels removed and wired to valves, except those required for use during lay-up in connection with fire extinguishing, pumping out or watch personnel duties.

In order to prevent excessive fouling, the sea suction openings (except for emergency fire pump) should be blanked at the shell opening or protected with a slow acting biocide.

Service tanks for fuel oil should be filled with centrifuged oil to ensure an ample supply of reliable fuel for reactivation. Inlet and outlet valves on oil tanks that are not in use should be shut and their hand wheels removed and wired to valves.

Air receivers should be drained and mopped dry. If dehumidifiers are used, air bottles should be left with the manhole covers removed. (Depending on the lay-up strategy one air bottle may be kept at full pressure at all times to facilitate starting the auxiliary or main engines. In this case, the emergency air compressor should be operated weekly to top up the receiver.)

The steering gear should be power operated hard-over to hard-over weekly and stopped with a tiller amidships. The rams, bearings and rudder carrier should be greased.

Machinery space ventilators should be closed and sealed.

11.6.2 Diesel machinery

Main engine crankcases should be supplied with dehumidified air which is suitably vented at the opposite end of the engine. Reference should be made to the engine maker's recommendation for laying up.

Water cooled systems for the main engine should be completely drained, washed with fresh water and left open to atmosphere.

Air starting valves should be dismantled and lubricated.

Fuel valves should be removed, overhauled and stored outside the engine.

All bright work should be protected with a smear of grease or oil.

Engines including all shafting should be turned weekly to circulate oil (e.g. one complete turn plus one quarter turn). Cylinder lubricants should be operated by hand before turning.

Ideally diesel generators should be maintained in operational condition and operated (rather than simply turned) once per week for about two hours.

The emergency generator should be operated on a weekly basis under load.



Note: long term de-pressurisation is likely to affect certain seal types and this needs to be considered when re-pressurising.

11.7 Steam plant

The fireside of boilers should be cleaned – particularly the areas where soot accumulates. Fireside water washing is best carried out with a water alkaline solution that neutralises the acidic deposits, and on completion the fireside insulation and brickwork should be thoroughly dried.

For periods of up to three months, a wet method can be used for laying-up boilers. This involves filling with boiler feed water and venting the boiler drum through the air vents, until the boiler is completely full. A slight hydraulic pressure may be maintained to preclude the ingress of any air into the boiler. The quality of the fill water should be checked regularly.

For lay-ups over three months, boilers should be drained and stored with the drums and header doors open to ensure maximum air circulation.

The fuel oil system should be drained and filled with gas or diesel oil.

11.8 Water systems

All SW and FW systems and pumps which are not in use should be washed with fresh water, drained and left open to the atmosphere when a dehumidifier is in use. (Otherwise they should be left full of suitably treated clean water.)

Any pumps, for which power is not available, should be turned weekly by hand.

Dehumidifiers should be suitably equipped with vent trunking to forcibly ventilate heat exchangers, condensers and steam piping, after the removal of appropriate inspections covers, crank doors, non-return valves, etc.

11.9 Propeller and shafting

A routine system of regularly turning the shafting to prevent brinnelling of bearings should be instigated for ships in long-term lay-up. At the time of the lay-up the stern tube oil should be replaced with a fresh charge and the condition of the oil should be monitored regularly.

If the vessel is to be laid-up for more than one year, then it should be anticipated that the vessel may subsequently be towed to a dry dock on reactivation, depending on hull marine growth. In this event, it will be prudent to prepare and have ready some means of locking the vessel's main shafting before laying-up. (This will ensure that the vessel meets standard towing requirements on departure for the dry dock). If the vessel to be self-propelled out of the lay-up location to dry dock, it is advisable to clean the propeller, rudder and other apertures (sea-chests, inlets, etc.). There is a particular concern in the case of yachts and certain types of smaller vessels which have exposed stainless steel shafting. These steels suffer greatly from accelerated pitting from crevice corrosion when shafting is not in use and flow of water over the exposed material is negligible. Areas prone to corrosion are tail shaft seals, exposed propeller/tailshaft tapers and water-lubricated bearings. Oil lubricated shafting may be prone to corrosion in way of the bearings due to water held in suspension in the stern tube oils.

If possible, propulsion shafting should be regularly operated using the main engines when a vessel is in a shorter lay-up.

11.10 Electrical, electronic and software systems

11.10.1 Electronic and software systems

Of particular concern when laying-up modern ships is the large amount of computer processing equipment on board. It is very important that the following preventative measures are taken:

- Equipment containing printed circuit boards should be kept dry and free of moisture, and excessive temperatures should be avoided. The electric supply systems in modern ships consist of electrotechnical components, equipment and systems which could be susceptible to deterioration if the environmental conditions are inappropriate. These systems may require specialist protection and specialist testing during reactivation.
- Software back-ups should be made available for reactivation should computers fail to boot up or restart on their own. This may take the form of keeping all programs and databases (for planned maintenance, etc.) duplicated ashore.

11.10.2 Electrical equipment and machinery

Heating or dehumidification techniques should be employed to prevent condensation within electrotechnical systems where degradation could occur if the environmental conditions are inappropriate. These systems include:

- a. main and emergency generators and switchboards
- b. all motors and starters associated with propulsion machinery, pumping duties, steering gear, cargo handling, deck machinery and domestic services
- c. converters, harmonic filters and transformers

- d. all radio and navigational equipment, and
- e. all engine, boiler and wheelhouse control consoles.

It is concluded that an inventory of these systems will be prepared by the shipowner before lay-up, as each vessel will have different requirements.

Where required, anti-condensation heaters should be provided for those systems that are located outside any of the heated or dehumidified areas.

Electrical equipment on deck should be covered and sealed, with a suitable method in place to ensure that any moisture within the sealed equipment is absorbed, such as the use of a desiccant material.

Heaters should be distributed throughout the machinery spaces and those spaces that contain the electrical and control/software-based systems to maintain reasonable temperatures (above 0°C) and prevent condensation.

Batteries should be maintained in accordance with the recommendations from the original equipment manufacturer (OEM). Where possible, the electrolyte should be topped up. Lead acid batteries should either be removed from the vessel, or should be trickle-charged on board at a rate recommended by the battery manufacturer. Alkaline batteries should be fully charged and disconnected from any possible load.

Lithium battery systems are to be laid up and maintained in accordance with the requirements of the OEM. Particular care is necessary where stored energy remains within these systems which may be necessary as some cell types can be harmed by a full discharge.

Consideration should be given to the battery life and the duration of the lay-up. See Appendix 8 (Electrical System and Navigation Gear Lay-up Checklist) on page 28 for guidance on maintenance of batteries.

All circuits supplied from the main and emergency switchboards and section boards should be isolated in turn and the insulation resistance (IR) between cores and earth should be measured and recorded from each circuit on a regular basis.

All circuits of the inventoried systems are to have the IR recorded at the time of lay-up.

Ideally, electrical circuit breakers should be left in the open position.

11.10.3 High-voltage installations

Breakers, busbars and switchboards

Pre lay-up

All high-voltage (HV) breakers must be withdrawn for a detailed visual inspection of terminations, spouts and mechanical linkages

Electrical tests should be undertaken including contact resistance, insulation resistance and dielectric strength. This will provide equipment condition integrity and a fingerprint datum point.

All protective relays and master trip relays should be inspected and electrically tested in accordance with the Rules. They should then be removed, sealed and kept in dry storage. The exposed openings in the switchboard should be sealed to prevent ingress of moisture and contamination.

During lay-up

The HV breakers should be racked into their circuit earth positions during lay-up.

This will mean that the termination/busbar shutters are locked and closed and essentially sealed to a suitable level of ingress protection.

If the interlock system permits, bus couplers should all be closed. If for any reason a switch cannot be closed onto circuit earth or a cable tie between switchboards, the HV trucks should be withdrawn, the spouts cleaned by approved means according to OEM recommendations, and covered with plastic film to prevent ingress of moisture or contaminants and stored in the de-humidified switchroom.

Regeneration

Breakers should be closed and testing requirements for switchboards, busbars, etc., should be carried out. See also the next section on system re-commissioning.

HV equipment – propulsion motors, converters and generators

Pre lay-up

With the equipment de-energised and isolated, a fully detailed visual inspection should be undertaken.

As a result of the internal inspection, the systems may need cleaning.

During lay-up

Following the visual inspection, electrical tests should be carried out in accordance with an approved test schedule, including: IR/polarisation index (PI); Tan Delta¹; rotor and exciter winding IR/PI; AC impedance; and off-line partial discharge analysis (where applicable) to determine machine insulation integrity and fingerprint datum point.

Regeneration

Before re-commissioning an HV installation, full inspection and testing should be carried out as per the requirements during lay-up, and depending on the duration of the lay-up. Any identified deviation from the initial lay-up datum point(s) should be addressed. As a minimum there should be a general inspection, IR testing, and safety system testing, including control systems and stops (testing intensity will vary depending on whether the lay-up is hot (or warm), cold or long-term). Re-commissioning should be carried out by competent and authorised personnel.

Special requirements for oil filled transformers

Heat exchangers need to be drained.

Oil coolant such as MIDEAL needs to be drained.

Anti-condensation heaters need activating.

Regular IR checks are required.

De- humidifiers must be installed.

Temperature monitoring is to be used.

Uninterruptible power supplies

See requirements for electronics and for batteries in 11.10.2.

11.11 Additional protection for LNG carriers (cold ship lay-up only)

11.11.1 Cargo containment and handling systems

- a. All cargo tanks must be in a gas-free state, either fully filled with nitrogen gas with slight pressure above atmospheric pressure or aerated with dry air at atmospheric pressure. The cargo tanks may be maintained with dehumidifying units with dry air condition where feasible according to the tank maker's recommendation for cold lay-up.
- b. All insulation barrier spaces must be in a gas-free state, either fully filled with nitrogen gas with pressure safely for protection or aerated with dry air at atmospheric pressure. The insulation barrier spaces may be maintained using nitrogen quads for replenishing or with dehumidifying units with dry air condition where feasible according to the tank maker's recommendation for cold lay-up.
- c. All cargo system-related pipelines are to be either filled with nitrogen gas with pressure monitoring or aerated with dry air and/or with dehumidifying machines at an appropriate positive atmospheric pressure.
- d. Cargo valves are to be operated at regular intervals to prevent seizures.
- e. The pressure and dew point of cargo tanks and insulation barrier spaces are to be checked regularly through the sampling points. If filled with nitrogen, oxygen content is to be measured separately.
- f. Arrangements are to be made for bilge detection (and condensation monitoring) in the insulation barrier space either by using the installed detection system or by using a manual device.
- g. Gas compressors and heaters are to be sealed off and filled with nitrogen or dry air.

¹ Tan Delta is a diagnostic test conducted on the insulation of cables and windings

h. Gas compressors are to be turned over at regular intervals and the associated lube oil system is to be operated where feasible to prevent static seizure.

11.11.2 Refrigeration and liquefaction plant

a) All refrigerant is to be pumped down and collected inside the main condenser. Regular leak tests are to be carried out during the lay-up period.

b) Electric motors driving refrigeration compressors are to be disconnected and the electric motor is to be hand turned at regular intervals to prevent static load damage.

c) Liquefaction plant is to be either filled with nitrogen gas and preserved or aerated using dry air and / or maintained using a dehumidifying machine.

11.11.3 Main turbines (gas and steam)

a. All turbines are to be properly cooled down and secured according to the maker's recommended procedures. All drain systems are to be properly operated to remove any fluid inside the turbine casings and to make ready for lay-up preservation.

b. The Lube oil system is to be centrifuged to remove water accumulation before complete shutdown of the system. Lab analysis of the lube oil system is to be carried out at regular intervals.

c. All steam valves associated with the turbines are to be left in the open position once the steam plant has been completely shut down to prevent cold down damage.

d. The gas turbine fuel system is to be properly flushed, removed and serviced. The fuel system is to be completely shut down and all associated valves are to be secured.

e. Turbine internals are to be dehumidified using dry air circulation. Sufficient safe opening is to be provided with protection gauze to prevent ingress of foreign debris.

f. The main turbine lube oil system is to be operated at regular intervals and all lubrication points are to be proved functional.

g. The main turbine is to be turned using turning gear to at least one full turn ahead and one full turn astern alternately, with all the associated lube oil systems operating and stopping the shaft at a different position every time after operation to prevent static load damage. Axial displacement of the main rotor shafts of the turbine are to be checked before, during and after the operation.

h. Turbine manoeuvring valves are to be operated manually at regular intervals.

11.11.4 Gearboxes

a. Main engine gearboxes are to be inspected during shutdown before lay-up of the vessel.

b. The lube oil system is to be centrifuged to remove water content and a sample is to be sent for lab analysis.

c. Arrangements are to be made to introduce dry air into the gearbox during the lay-up period to replace moisture in the gearbox casing which may cause corrosion.

d. The lube oil system is to be operated at regular intervals and all lube oil sprays are to be checked to make sure they are functioning.

e. The gearbox is to be turned with the main engine system as described in 11.11.3 (g).

f. Six-monthly gearbox inspections are to be carried out where feasible to confirm the lube oil protection remains satisfactory and there has been no corrosion formation.

g. Lube oil is to be sent for lab analysis at regular intervals.



12. Spares

Experience has shown when vessels are in lay-up that equipment can be used as a source for spares for existing fleet requirements. The removal of spares from a laid-up ship needs to be strictly recorded and controlled to determine spares purchases at the time of reactivation. (Additionally, if the laid-up vessel is inspected by potential purchasers, the obvious absence of machinery components may affect any valuation of the vessel.) If the vessel keeps spare main shafts such as turbo charger, pumps, etc., bolted and hung from bulkheads, it may be prudent before a long lay-up to rotate these through 180 degrees to balance distortion ('age droop'). Finally, all spares should be protected in line with the guidelines in Section 11 above.

13. Periodic maintenance and operation

A programme for regular maintenance, inspection, and periodic operation (or turning) of machinery should be prepared at the beginning of the lay-up, and a record of all maintenance work should be kept.

Regular maintenance should be carried out every six months approximately, or more frequently in line with the guidelines in Section 11 above. Any regular maintenance programme should include the following, in addition to any activities deemed necessary by original equipment manufacturers:

- At least one stores or cargo crane should be kept operational (and regularly tested) for lay-up duties, e.g. lifting diesel oil on board for deck generator, etc. Note: certification may be required to be maintained as per flag or port authority requirements.
- Sea valves should be periodically operated if the sea water system is intact without any leaks and the overboard openings are blanked.
- Ballast, cooling water and steam systems in wet lay-up should be periodically sampled to verify the effectiveness of the chemical inhibitor, and corrosion coupons in ballast water tanks, etc., should be periodically checked to monitor the extent of any corrosion.
- All safety equipment needed for the personnel on board should be regularly examined, including fire extinguishers and fire dampeners. (CO₂ bottles and foam tank contents may be examined less frequently, for example, on an annual basis.) Oxygen levels should be measured in any sealed spaces containing CO₂ bottles, before entry.
- The ship's whistle should be operated periodically.
- All rotating machinery, electric motors, hydraulic motors and radar scanners should be turned or operated at monthly intervals by hand, mechanically or with normal power. This includes propulsion shafting (see 11.9).
- Air conditioning and reefer plant refrigerant circuits should undergo regular leak testing.
- The main electrical circuit's insulation continuity should be periodically measured.

14. Periodic inspection

In addition to periodic maintenance and operations activities, owners should conduct specific inspections and testing on structures, machinery and equipment through established techniques, to ensure that the standard of preservation is maintained.

The owner should receive detailed monthly reports from the crew or contractors on the findings of scheduled inspections and tests. The report should also contain details of any essential remedial work considered necessary to repair faults or restore adequate lay-up protection.

Ideally, the owner will periodically prepare consolidated summary reports detailing such repairs (or decisions to postpone repairs until the time of reactivation).

Any repairs or remedial work to equipment or lay-up protection that is essential to maintaining the integrity and safety of the vessel or crew should be immediately undertaken.

A regular inspection and testing programme should include:

- visual checks on controlled space sealing arrangements
- measurements of relative humidity levels within controlled spaces
- visual checks on protective coatings of all external machinery and equipment
- visual checks on oil levels in machinery sumps
- visual checks on all filled or wet systems for leaks (e.g. hydraulic fluids, fuel, lubrication oil, refrigerant, water, etc.)
- electrical measurements of batteries
- visual checks during testing of emergency fire pumps, life boats engines, emergency generators, bilge and fire alarms, etc.
- visual checks of mooring, fenders, etc.
- visual checks of storage tank levels
- visual checks of open machinery, pressure vessels, heat exchangers, etc., within dehumidified spaces
- underwater visual checks of the external hull by a qualified diving contractor
- visual checks of boiler fire sides and water sides (for drained boilers) for dryness
- electrical measurements of the cathodic protection system
- visual checks of essential fire, flooding, and security arrangements fire (including fire dampers, fixed and portable equipment, and detection systems)
- checks of engine exhaust and boiler flue covers, to make sure they are in place and secured.

Table 1: Example minimum manning requirements for laid-up ships in port at anchorage

Vessel gross tonnage (gt)	Tanker or chemical carrier					Other motorised vessel				
	Deck officers*	Engineering officers	DK/GP crew	ER/GP crew	Total	Deck officers*	Engineering officers	DK/GP crew	ER/GP crew	Total
< 500	2	1	2	1	6	1	1	1	1	4
500-3,000	2	1	1	1	7	1	1	2	1	5
3,001-6,000	2	2	3	1	8	2	1	2	1	6
6,001-10,000	2	2	3	1	8	2	1	3	1	7
10,001-20,000	2	2	3	2	9	2	1	3	2	8
20,001-35,000	2	2	3	2	9	2	1	4	2	9
35,001-60,000	2	2	3	3	10	2	2	4	2	10
60,001-100,000	2	2	3	3	10	2	2	5	2	11
> 100,001	2	2	3	4	11	2	2	5	3	12

Note: check with flag state, local port and harbour authority for specific lay-up location requirements.

* The number of deck officers includes the master.

Appendix 1 – Summary of lay-up considerations

	Hot ship, <1 month	Hot ship, <12 months	Warm ship <12 months	Cold ship, <5 years	Long-term, >5 years
Lay-up period	Up to 1 month	1-12 months	1-12 months	12-60 months	60 months or longer
Reactivation period	~24 hours	~1 week	~1 week	~3 weeks	~3 months
Class status	Classed – full trading certificates	Classed – full trading certificates or short term certificates	'Laid Up' status	'Laid Up' status	'Laid Up' status
Class attendance frequency	Normal survey regime	Normal survey regime if crew on board and 'Laid Up' status not assigned – flag to be consulted regarding statutory certification	<p>After 'Laid Up' status assigned and any survey requirements fulfilled. Annual General Examination of hull and machinery to be held within survey window period plus an underwater examination to be held at Special Survey due date.</p> <p>For reactivation, all overdue surveys are to be brought up to date and any conditions of class (recommendations) are to be dealt with. If the vessel is required to sail to a dockyard to complete overdue surveys then the class society to be contacted for permission and any special requirements before sailing. Flag requirements are also to be confirmed.</p>		
Insurance status	Full trading insurance	Port risks only	Port risks only	Port risks only	Port risks only
ISM and ISPS certificates	Regular scheduled audit when due	Regular scheduled audit when due if crew on board	<p>Reactivation after 3- 6 months out of service – Additional Verification Audit.</p> <p>Reactivation after more than 6 months out of service – Interim Verification Audit*</p>	Interim Verification Audit before reactivation	Interim Verification Audit before reactivation
MLC	Regular scheduled inspections when due	Regular scheduled inspections when due if crew on board	Regular scheduled inspections when due if crew on board. If no crew on board then Interim MLC Inspection before reactivation.	Interim MLC Inspection before reactivation	
Port authorities	Normal trade status in port	Refer to local lay-up requirements	Refer to local lay-up requirements	Refer to local lay-up requirements	Refer to local lay-up requirements
Optimum manning levels**	Minimum safe manning certification	Engineering and navigation officers and some crew	Engineering and navigation officers	Fire, flood, mooring, security watch only	Fire, flood, mooring, security watch only
Vessel spares control	Owner's crew on board to control spares removal	Owner's crew on board to control spares removal	Owner's crew on board to control spares removal	Strict procedures to be in place to control spares removal	Strict procedures to be in place to control spares removal
Lay-up equipment onboard generator	None	As required	As required	Deck generator	Deck generator
Lay-up equipment onboard dehumidifier	None	As required	As required	Dehumidifiers with trunking	Dehumidifiers with trunking
Combustible materials control	Normal operation	Normal operation	Normal operation	All combustibles removed	All combustibles removed

Note: this table assumes that the same owner/manager reactivates the ship under the same flag

* The type of audit will depend on the number of ship's crew on board and, consequently, whether the SMS has been maintained

** Refer to local port and harbour authority requirements

Appendix 2 – External hull lay-up checklist

	Hot ship, <1 month	Hot ship or warm ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Painting scheme	Routine maintenance	Maintained by lay-up crew	Painted before lay-up	Painted before lay-up
Impressed current cathodic protection	Routine monitoring	Routine monitoring	Frequent monitoring	Frequent monitoring
Sacrificial anodes	Routine monitoring	Routine monitoring	Frequent monitoring	Frequent monitoring
Hull condition	Visual examination above waterline	Diver examination before lay-up	Periodic diver examination	Diver examination

Appendix 3 – Internal hull lay-up checklist

	Hot ship, <1 month	Hot ship or warm ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Ballast tanks (hull stress allowing)	Normal operating condition	Emptied (or 100% filled* with water plus corrosion inhibitor)	Emptied (or 100% filled* with water plus corrosion inhibitor)	Emptied (or 100% filled* with water plus corrosion inhibitor)
Internal tanks and spaces	Normal operating condition	Certified gas free	Certified gas free	Certified gas free

* Subject to limitations on hull stresses

Appendix 4 – Equipment lay-up checklist

	Hot ship, <1 month	Hot ship or warm ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Steering gear and bow thruster	Routine maintenance	Operated monthly	Operated or turned monthly	Operated or turned monthly
Anchoring and mooring equipment	Routine maintenance	Operated monthly	Operated or turned monthly	Operated or turned monthly
Deck outfitting	Routine maintenance	Routine maintenance	All moving parts grease coated	All moving parts grease coated
Hatch covers	Routine maintenance	Routine maintenance	All moving parts grease coated	All moving parts grease coated
Life-saving appliances*	Fully operational	Fully operational	Operational for lay-up personnel	Operational for lay-up personnel
Ventilation fire shut-off dampers	Routine maintenance	Routine maintenance	Sealed but exercise regularly	Sealed but exercise regularly
Fire-fighting system*	Fully operational	Fully operational	Fully operational	Fully operational
Deck cargo and stores crane	Fully operational	Fully operational	At least one crane operational	At least one crane operational

* Or as required by flag of ship, or local flag administration in the lay-up location

Appendix 5 – Accommodation lay-up checklist

	Hot ship, <1 month	Hot ship or warm ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Cabins and public rooms	Normal operation	Normal operation	Dehumidifiers in selected spaces	Dehumidifiers in selected spaces
Accommodation alleys	Normal operation	Covered in polythene sheets	Covered in polythene sheets	Covered in polythene sheets
External doors and windows	Normal operation	Unused spaces sealed	Sealed spaces, controlled access	Sealed spaces, controlled access
Cabin linen, towels and napery	Normal operation	Normal operation	Stored in one dry location	Stored in one dry location
Cabin mattresses	Normal operation	Normal operation	Stored on edge	Stored on edge
Sanitary fittings in accommodation	Normal operation	Normal operation	Blanked-off and sealed	Blanked-off and sealed
Refrigerated provision chamber	Normal operation	Routine maintenance	Chambers empty and doors open	Chambers empty and doors open
Refrigeration and air conditioning	Normal operation	Routine maintenance	Freon gas pumped down to condenser	Freon gas pumped down to condenser

Appendix 6 – Machinery lay-up checklist

	Hot ship, <1 month	Hot ship or warm ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Engine room ventilating system	Routine maintenance	Reduced air flow	De-humidifiers deployed	De-humidifiers deployed
Main and auxiliary engines	Routine maintenance	Operated monthly	Lubricated and operated or turned monthly	Lubricated and operated or turned monthly
Main and auxiliary engine crankcase condition*	Routine maintenance	Routine maintenance	Opened and force ventilated with dry air	Opened and force ventilated with dry air
Propeller and shafting	Routine maintenance	Operated monthly	Operated or turned monthly	Shaft locking devices installed
Steam generating plant	Routine maintenance	Emptied (or 100% filled with water plus corrosion inhibitor)	Emptied and opened for natural ventilation	Emptied and opened for natural ventilation
Purifiers and gearboxes	Routine maintenance	Oil changed and run monthly	Oil changed and gear case left open for drying	Oil changed and gear case left open for drying
Sea water cooling system pumps and coolers	Routine maintenance	Emptied (or 100% filled with water plus corrosion inhibitor)	Emptied and opened for natural ventilation	Emptied and opened for natural ventilation
Fresh water cooling system pumps and coolers	Routine maintenance	Emptied (or 100% filled with water plus corrosion inhibitor)	Emptied and opened for natural ventilation	Emptied and opened for natural ventilation
Fuel oil system	Flushed with diesel oil	Flushed with diesel oil	Flushed with diesel oil and fuel oil injectors removed	Flushed with diesel oil and fuel oil injectors removed
Lubricating oil system	Routine maintenance	Routine maintenance	Visual check level and condition	Visual check level and condition
Hydraulic oil systems	Routine maintenance	Operated monthly	Operated or turned monthly	Operated or turned monthly
Compressed air system	Routine maintenance	Routine maintenance	Emptied and opened for natural ventilation	Emptied and opened for natural ventilation
Exhaust gas system	Routine maintenance	Routine maintenance	Engine exhaust line blanked	Engine exhaust line blanked
Steam and condensate system	Shut down	Emptied (or 100% filled with water plus corrosion inhibitor)	Emptied and opened for natural ventilation	Emptied and opened for natural ventilation
Tanks in ER**	Routine maintenance	Emptied (or 100% filled)	Emptied (or 100% filled)	Emptied (or 100% filled)
Engine room bilges	Routine maintenance	Clean for visual leak detection	Clean for visual leak detection	Clean for visual leak detection
Engine and cargo space bilge alarms	Routine maintenance	Routine maintenance	Fully operational with alarm relay	Fully operational with alarm relay
Exhaust stack outlet pipes	Routine maintenance	Routine maintenance	To be sealed air tight	To be sealed air tight

* In accordance with the maker's recommendation

** Different requirements apply for oil and water tanks

Appendix 7 – Automation lay-up checklist

	Hot ship, <1 month	Hot ship or warm ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Automation equipment and computers	Normal operation	Normal operation	Turned off and kept in a dry atmosphere	Turned off and kept in a dry atmosphere
Power, e.g. uninterrupted power supply (UPS) lithium batteries	Normal operation	Normal operation	Lithium batteries disconnected but kept charged	Lithium batteries disconnected but kept charged
Main engine remote control wheelhouse	Normal operation	Normal operation	Turned off and kept in a dry atmosphere	Turned off and kept in a dry atmosphere
Main engine remote control on bridge wing	Normal operation	Normal operation	Kept dry with desiccant bags	Kept dry with desiccant bags
Main engine control room	Normal operation	Normal operation	Turned off and kept in dry atmosphere	Turned off and kept in dry atmosphere
Emergency control at engine side	Normal operation	Normal operation	Turned off and kept in dry atmosphere	Turned off and kept in dry atmosphere

Appendix 8 – Electrical system and navigation gear lay-up checklist

	Hot ship, <1 month	Hot ship or warm ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Alternators, transformers and switchboards	Routine maintenance	Routine maintenance	De-humidified atmosphere	De-humidified atmosphere
Lead acid engine start batteries	Routine maintenance	Routine maintenance	Disconnected and trickle-charged	Renew batteries on reactivation
Electric cabling	Routine maintenance	Routine maintenance	Regular electrical insulation checks	Regular electrical insulation checks
Electric motors and starters	Routine maintenance	Local heating of spaces	Local heating of spaces	Local heating of spaces
External electric motors	Routine maintenance	Local heating plus motors turned	Motors turned and removed* into dryspace	Motors turned and removed* into dryspace
Vessel lighting system	Normal operation	Reduced in unmanned spaces	Turned off except for inspections	Turned off except for inspections
Fire detection and alarm	Routine maintenance	Routine maintenance	Fully operational** and able to relay alarms required	Fully operational** and able to relay alarms required
CO₂ alarm	Fully operational	Fully operational	Fully operational	Fully operational
Nautical equipment	Normal operation	Normal operation	Turned off and kept in dry atmosphere	Turned off and kept in dry atmosphere
Radar scanner array	Normal operation	Operated monthly	Operated monthly or turned by hand	Operated monthly or turned by hand
Radio equipment	Normal operation	Normal operation	Turned off and kept in dry atmosphere	Turned off and kept in dry atmosphere
VHF radio	Operational	Operational	Operational	Operational
EPIRB and radar transponders	Normal operation	Normal operation	Removed ashore	Removed ashore

* If insulation is inadequate

** Or other alternative measures in place



For further information please contact us in the normal way to discuss any questions or help you would like from us

info.lr.org/layup



May 2020

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