

Lloyd's Register Lay-up Guide

Ship preparation and protection during lay-up

Marine Consultancy Services, London
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**Lloyd's
Register**

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EXECUTIVE SUMMARY

Overview

This guidance document was first published in August 1986 and subsequently revised in September 1990 and again in November 2008. The guidelines in this document are not Classification requirements and they are of a general nature so they may need to be modified to suit a particular ship type or lay-up location. Furthermore, ship owners should note that the specific requirements of original equipment manufacturers may take precedence over the general guidelines presented in this document. Finally, laid-up ships will be subject to supplementary national, port and other statutory requirements and the guidance presented herein may not fulfil all such location requirements.

Purpose

The aim of this document is to assist owners in the preparation of their ships for a period of lay-up and to provide guidance for maintaining the ships in a safe and cost effective condition.

Quick start guide

Ship owners considering ship lay-up will find it useful to read Appendix 1 of this document before proceeding to the detail in the main body of this document. Owners should not use the checklists in the remaining appendices without reading the associated detailed guidelines in the main body.

Lloyd's Register's lay-up services

Lloyd's Register Marine Consultancy Services is available to assist owners with lay-up activities via four Ship Inspection and Assessment (SIA) Centres in Southampton, Singapore, Piraeus and Houston.

These SIA Centres can provide a range of services including but not limited to:

- Advice on planning a lay-up;
- Preparation of detailed lay-up specifications and procedures;
- Revision of owners' lay-up specifications and procedures;
- Supervision of lay-up activities;
- Periodic inspections of laid-up vessels; and
- Over-seeing the reactivation of laid-up ships.

Contact details

Enquiries about Lloyd's Register's lay-up services may be directed to any of the four SIA Centres or the SIA Global Manager, Mr Ehud Bar-Lev. Contact details are provided on the back cover of this document.

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1. INTRODUCTION

This guidance document was first published in August 1986 and subsequently revised in September 1990 and again in November 2008.

It should be noted that the guidelines herein are not Classification requirements. The guidelines are of a general nature and may be modified to suit a particular ship type or lay-up location. Furthermore, the specific requirements of original equipment manufacturers may take precedence over the general guidelines presented in this document.

Laid-up ships will be subject to supplementary national, port and other statutory requirements and the guidance presented below is subject to compliance with all such requirements.

Preparations for a lay-up should be carried out by members of the crew, the owner's technical shore staff or a contractor's competent personnel and in consultation with a local Lloyd's Register office. On completion of the preparations, a Lloyd's Register surveyor, after a satisfactory examination on board, will issue a general report stating that the ship has been laid-up in accordance with the recommendations detailed in this guidance document.

Lloyd's Register recommends that ships should be laid-up with Classification fully maintained.

2. PURPOSE

The aim of this document is to assist owners in the preparation of their ships for a period of lay-up and to provide guidance for maintaining the ships in a safe and cost effective condition.

3. LLOYD'S REGISTER'S LAY-UP SERVICES

Lloyd's Register Marine Consultancy Services is available to assist owners with lay-up via four Ship Inspection and Assessment (SIA) Centres in Southampton, Singapore, Piraeus and Houston. Lloyd's Register can provide a range of services including but not limited to:

- General advisory services with regard to lay-up programmes;
- Preparation (or review) of detailed lay-up specifications and procedures;
- Independent supervision during lay-up;
- Third-party auditing of lay-up programme logs;
- Periodic inspections of laid-up vessels; and
- Independent supervision during reactivation.

Periodic inspections will have a particular emphasis on safety and fire extinguishing arrangements, emergency engines, pumps and generators, mooring and anchoring equipment.

After each visit the surveyor will issue a report stating whether or not the lay-up preservation procedures are being maintained and detailing those items requiring further attention. This examination would be additional to any surveys required for Classification, although both inspections may be undertaken simultaneously.

4. HOT, COLD AND LONG-TERM LAY-UP

4.1. Choice of lay-up condition

The choice of lay-up condition will generally be determined by a consideration of technical and commercial trade-offs (advantages and disadvantages) for the following factors:

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

4.2. 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 Classification and Flag State requirements although the number of crew may be reduced in line with the certified minimum safety manning limits. The machinery will be kept operational but various economies may be made. The vessel will be located in an area close to the potential cargo trade routes.

4.3. 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, eg. restrictions on the transfer oily bilge water.

4.4. 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 the crew changes may be significant.

4.5. 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, eg. renewal of alarm systems due to obsolescence. Several vessels will be laid-up in this condition side-by-side to minimise supervision costs.

5. LOCATION CONSIDERATIONS

The local requirements applicable to specific lay-up locations and mooring arrangements are normally determined by the relevant port authority and the appropriate salvage association. However, the owner 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 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; and
- The scope of local emergency preparedness plans and services for potential fires, flooding, security incidents, mooring failures or medical emergencies.

6. MOORING ARRANGEMENTS

6.1. General requirements

The mooring arrangements will depend on the selected lay-up site conditions, 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;
- Where 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 to be provided, ie. 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;
- The windlass and mooring winches, if electronically driven, should be provided with an adequate source of electrical power for intermittent and emergency operation; and
- Day and night anchor dragging GPS position fixing (or compass bearings) should be established and monitored on a regularly basis.

6.2. 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 shall be provided, sufficiently tensioned and be of similar stretch characteristics;
- Sufficiently sized fendering arrangements should be provided alongside at areas of possible contact with other ships or shore structures; and
- 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.

7. CLASS STATUS DURING LAY-UP

7.1. Class notation

Ships that are laid-up immediately after service will be maintained in Class without periodic survey until the due date for the special survey. If a ship remains laid-up beyond the due date for the special survey, the Class notation 'Laid-up Surveys Overdue' (LUSO) will be assigned. The owner will subsequently be given the option of having the ship disclassed, or carrying out inspections to maintain the 'Laid-up Surveys Overdue' notation.

7.2. ISM and ISPS certification

If the vessel is laid-up for a period of up to 6 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 a period exceeding 6 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.

8. INSURANCE ISSUES

8.1. 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 owner may expect to receive a 50% reimbursement of the P&I premium once a ship has been laid-up for more than a period of 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, eg. oil pollution, wreck removal, salvage costs, etc.

8.2. Hull and machinery cover

Typically, an owner may deal with a laid-up vessel's hull and machinery cover in two ways: (a) opt for a laid-up return of premium; or (b) with the underwriter's agreement, cancel the trading policy and substitute this with a ports risk policy.

9. MANNING LEVELS

Ideally, owners should conduct a risk assessment for the expected hazardous events that may occur at any time of the day, during lay-up with regard to the planned manning level. 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 planning manning level, eg. maintain a reduced crew on one vessel for vessels moored in a group.

Port authorities may have their own requirements for the number of staff onboard, eg. the Maritime and Port Authority of Singapore (MPA), Table 1.

Technical attendance onboard 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 that critical to the lay-up operation, eg. electrical generating sets, pumps, fire-fighting equipment, etc.

Owners should assess the flooding risks in the machinery spaces posed by various manhole doors being left open to 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 onboard during lay-up.

10. 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 cannibalisation of spares to sister ships in the fleet, that are still trading.

11. NAVIGATION

Where 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.

12. 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 that 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.

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 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.

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 prior to 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, eg. at three month intervals.

13. PROTECTION DURING LAY-UP

13.1. 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, eg. 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 the further chemical dosing is required.

13.2. External hull protection

The hull should always be protected against 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.

13.3. Internal hull protection

Hold, 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, hold, 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 is dependent upon 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 check for liquid loss should be made. A biocide may be added to the fuel to prevent microbiological degradation; specialists should be consulted to assess any adverse side effects.

Fresh water tanks should be cleaned and recoated where necessary.

Chain lockers should be cleaned, dried and coated.

13.4. 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.

13.5. Accommodation areas and outfitting

13.5.1. 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.

13.5.2. 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.

13.6. Machinery

13.6.1. 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 would be advantageous if these were double air lock doors.

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, 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 and where 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.

13.6.2. Diesel machinery

Main engine crankcases should be supplied with dehumidified air which is suitably vented at the opposite end of the engine.

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 (eg. 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 a two hour period.

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

13.7. 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 neutralizes 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-up in excess of 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.

13.8. 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.

13.9. Propeller and shafting

If the vessel is to be laid-up for a period of 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 prior to laying-up. (This will ensure that the vessel meets standard towing requirements on departure for the dry dock).

13.10. Electrical, electronic and software systems

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

- The equipment containing printed circuit boards are kept dry and free of moisture, and excessive temperatures are avoided. The electric supply systems in modern ships built

after 2000 consist of shaft generators which include sophisticated electronic DC to AC conversion systems (with diode bridges, triac-diac, thyristors, etc). This equipment may require specialist protection and specialist testing during reactivation.

- Precautions need taken with respect to the large amount of computer software onboard so that back-ups are 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.

Heating or dehumidification techniques should be employed to prevent condensation within: (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) all radio and navigational equipment; and (c) all engine, boiler and wheelhouse control consoles, etc. Anti-condensation heaters should be provided for major components outside the heated or dehumidified areas.

Electrical apparatus on deck should be covered and sealed with desiccant bags inside to absorb moisture. Bags should be changed/reactivated at the manufacturer's recommended intervals.

Heaters should be distributed throughout the machinery space to maintain reasonable temperatures and prevent condensation. Electric motors, starters, switchboards, control equipment, etc must be provided with heating arrangements. (If all electrical areas are covered by dehumidifiers then the extent of heating may be reduced).

Deck electrical apparatus should be covered and sealed containing desiccant bags within.

Batteries should be cleaned and greased, and the electrolyte topped up if they are not of the maintenance-free type. Lead acid batteries should either be removed from the vessel, or should be trickle-charged onboard at a rate recommended by the battery manufacturer. Alkaline batteries should be fully charged and disconnected from any possible load.

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

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

14. SPARES

Experience has shown that when vessels are in lay-up they are likely to be cannibalised for spare parts to sister vessels still trading. 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 13 above.

15. PERIODIC MAINTENANCE AND OPERATION

A programme for regular maintenance, inspection, and periodic operation (or turning) of machinery should be prepared at the commencement of the lay-up.

A record of all maintenance work should be kept.

Regular maintenance should be carried out at approximately six monthly intervals, or more frequently in line with the guidelines in Section 13 above. Any regular maintenance programme should focus on but not be limited to the following equipment and systems:

- At least one stores or cargo crane should be kept operational (and regularly tested) for lay-up duties, eg. lifting diesel oil onboard for deck generator, etc;
- Sea valves should be periodically operated;
- 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 onboard 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, prior to 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.
- Air conditioning and reefer plant refrigerant circuits should undergo regular leak testing;
- The main electrical circuit's insulation continuity should be periodically measured; and
- Other additional activities as deemed necessary by original equipment manufacturers.

16. PERIODIC INSPECTIONS

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 focus on but not be limited to the following:

- 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 (eg. 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 for boilers) for dryness;
- Electrical measurements of the cathodic protection system; and
- Visual checks of essential fire, flooding, and security.

17. ACKNOWLEDGEMENT

Lloyd's Register kindly acknowledges the advice provided by *BP Shipcare* during the revision of this ship lay-up guidance document.

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

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	3	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	9	2	1	3	1	7
10,001 – 20,000	2	2	3	2	10	2	1	3	2	8
20,001 – 35,000	2	2	3	2	11	2	1	4	2	9
35,001 – 60,000	2	2	3	3	12	2	2	4	2	10
60,001 – 100,000	2	2	3	3	13	2	2	5	2	11
> 10,0001	2	2	3	4	14	2	2	5	3	12

* Deck Officers, including the Master.

Appendices

App 1. Summary of lay-up considerations

	Hot ship, <1 month	Hot ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Lay-up period	Up to 1 month	1-12 months	12-60 months	>60 months
Reactivation period	~24 hours	~1 week	~3 weeks	~3 months
Class status	Full trading certificates	Maintained in Class laid-up	LUSO ^A after passing special survey due date	LUSO ^A after passing special survey due date
Class attendance frequency	Normal trading, annual attendance	Next special survey ^B	After special survey annual attendance ^B	After special survey annual attendance ^C
Insurance status	Full trading insurance	Port risks only	Port risks only	Port risks only
ISM and ISPS certificates	Full certification	Suspended after 6 months	Suspended after 6 months	Suspended after 6 months
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
Optimum manning levels	Minimum safe manning certification	Engineering and navigation officers	Fire, flood, mooring, security watch only	Fire, flood, mooring, security watch only
Vessel spares control	Owners crew onboard to control spares removal	Owners crew onboard 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	Deck generator	Deck generator
Lay-up equipment onboard dehumidifier	None	As required	De-humidifiers with trunking	De-humidifiers with trunking
Combustible materials control	Normal operation	Normal operation	All combustibles removed	All combustibles removed

Notes:

- A. Class notation changes to Laid-Up Surveys Overdue (LUSO), once vessel passes special survey due date.
- B. Next special survey or reactivation, which ever takes place first.
- C. Next special survey or re-activation which ever takes place first but a general inspection to be carried out at each annual survey due date, to maintain LUSO notation and to ascertain hull integrity.

App 2. External hull lay-up checklist

	Hot ship, <1 month	Hot ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Painting scheme	Routine maintenance	Maintained by lay-up crew	Painted prior to lay-up	Painted prior to 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

App 3. Internal hull lay-up checklist

	Hot ship, <1 month	Hot ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Ballast tanks (hull stress allowing)	Normal operating condition	Emptied (or 100% filled* of water plus corrosion inhibitor)	Emptied (or 100% filled* of water plus corrosion inhibitor)	Emptied (or 100% filled* of 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.

App 4. Equipment lay-up checklist

	Hot ship, <1 month	Hot 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.

App 5. Accommodation lay-up checklist

	Hot ship, <1 month	Hot 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 to pumped down to condenser	Freon gas to pumped down to condenser

App 6. Machinery lay-up checklist

	Hot ship, <1 month	Hot 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 & 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 of 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 of 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 of 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 of 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

* Different requirements apply for oil and water tanks.

Automation lay-up checklist

	Hot ship, <1 month	Hot 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, eg. uninterrupted power supply (UPS) lithium batteries	Normal operation	Normal operation	Lithium batteries disconnected but kept charged	Renew batteries on reactivation
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

App 7. Electrical system and navigation gear lay-up checklist

	Hot ship, <1 month	Hot ship, <12 months	Cold ship, <5 years	Long-term, >5 years
Alternators, transformers & 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 dry space	Motors turned and removed* into dry space
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 & able to relay alarm as required	Fully operational & able to relay alarm as required
CO ₂ 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.

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