DNV·GL

RECOMMENDED PRACTICE

DNVGL-RP-0290 Edition February 2017

Lay-up of vessels for ship and mobile offshore units

DNV GL AS

FOREWORD

DNV GL recommended practices contain sound engineering practice and guidance.

Any comments may be sent by e-mail to *rules@dnvgl.com*

CHANGES – CURRENT

This is a new document.

This document replaces DNVGL-CG-0290 February 2016.

Changes in this document are highlighted in red colour. However, if the changes involve a whole chapter, section or sub-section, normally only the title will be in red colour.

General

The content of the former document was updated and completed as follows:

— Included preservation recommendations for special equipment for MOUs such as drilling equipment and offshore cranes.
— New Sec.8 addressing statement of compliance for lay-up service providers.
— New Sec.9 addressing the rules and regulations about lay-up of vessels from the Society, ISM and ISPS, flag administrations and port authorities.
— New Sec.10 about the insurance for lay-up of vessels.

Editorial corrections

In addition to the above stated changes, editorial corrections may have been made.

CONTENTS

SECTION 1 INTRODUCTION

1.1 General

This recommended practice is based on the Society's observations and accumulated experience in advising ship owners on laying-up vessels and represents a full revision of the Society's recommended practices from the major lay-ups in the shipping industry up until now. Recent knowledge and experience of lay-up, preservation and re-commissioning of mobile offshore units is included.

1.2 Objective and scope

The objective of this document is to provide recommendations on a systematic and cost effective approach for preparing the vessel for lay-up and maintaining it in a safe and cost effective condition during lay-up. This document is applicable both for ships and mobile offshore units. It should be noted that the guidance herein are not classification requirements. The recommendations given are of a general character. Maritime, national or local authorities and insurance companies may have individual requirements not covered by this document. Furthermore, recommendations given by equipment manufacturers should also be considered.

1.3 Structure of the document

An overview of the various parties' involvement in laying-up of vessels is given in Sec.2 in order to assist owners in evaluating the different scenarios of lay-ups. If the vessel is laid-up in compliance with the recommendations given in Sec.4 and Sec.5, DNV GL may upon a successful verification, issue a lay-up declaration and lay-up preservation declaration respectively stating compliance with said requirements. If a vessel is laid-up in compliance with the additional requirements given in Sec.6, a declaration for clean lay-up may be issued. Practical procedures for re-commissioning the vessel are given in Sec.7. Requirement for obtaining statement of compliance for lay-up service providers is described in Sec.8. Rules and regulations are described in Sec.9 with the class regulations in [9.2]. Finally, recommendations about the insurance during lay-up period are provided in Sec.10.

1.4 Definitions

See Sec.2 for the definitions of different laid-up conditions.

1.5 Abbreviations

Term	*Definition*
IMO	International Maritime Organization
ISSC	international ship security certificate
ISM	international safety management code
ISPS	international ship and port facility security (IMO requirement)
SMC	safety management certificate
SSP	ship security plan
P&I club	protection and indemnity club
LFL	lower flammable limit
SSAS	ship security alert system
GM	metacentric height

Term	*Definition*
RH	relative humidity
ISO	international standard organization
H&M	hull and machinery
SOLAS	international convention for the safety of life at sea
PPE	personal protective equipment
SSAS	ship security alert system
ICT	information and communication technology
PLC	programmable logic controller
BOP	blowout preventer
LMRP	lower marine riser package
NORSOK	Norsk Sokkels Konkurranseposisjon, Norwegian standard
IEC	International Electrotechnical Commission
MARPOL	International Convention for the Prevention of Pollution from Ships
CM	condition monitoring
PMS RCM	plan maintenance system reliability based condition monitoring
NDT	non-destructive testing
SMS	safety management system
CA	condition of authorities
CRO	cancelling return only

SECTION 2 LAY-UP CONDITIONS

2.1 General

When vessels become idle, further operation is usually evaluated on a cost/benefit basis considering different technical and financial conditions. Key considerations for the choice of the lay-up condition are:

— Estimated time in lay-up condition.
— Operational cost savings.
— Re-commissioning time and cost.
— Next intended destination after re-commissioning e.g. normal trade, repair yard or scrap yard.
— Age of vessel and recycling value.

A summary of relevant lay-up considerations for each condition listed below is given in App.A.

2.2 Hot lay-up

In this lay-up condition, the machinery is kept in operation for the sake of fast re-commissioning, but measures may be taken to reduce various operational costs. Manning necessary for safety, operation and maintenance of systems in use should be on board. Vessels should normally be laid-up without cargo.

2.3 Cold lay-up

2.3.1 General

In cold lay-up condition the machinery is taken out of service and the vessel is kept electrically dead with the exception of power needed to provide basic function of safety and security of the vessel. This condition usually implies more comprehensive re-commissioning depending on the level of preservation and maintenance during lay-up. The level of preservation is mainly based on the age and value of the vessel and the most likely re-commissioning scenario. Examples of scenarios are:

— vessel returns to normal trade
— vessel sails to repair yard
— vessel sails to scrap yard in ballast condition.

It is recommended that minimum manning covering fire, leakage, moorings and security watches should be kept. The lay-up site may be in a remote site where access therefore is limited. Power will be kept to minimum level to ensure emergency equipment and operation of windlass and mooring winch. Usually, humidity is the challenge of cold lay-ups, hence, proper air dehumidifying is critical. If the vessel is intended to return to normal trade or repair yard, dry preservation is recommended and all preservation actions should be carefully documented, as the scope of re-commissioning required by the classification society will depend on the preservation.

2.3.2 Lay-up for more than five years

Re-commissioning after long term lay-up periods, more than five years, may be unpredictable and more depending on maintenance and preservation applied. Extensive re-commissioning work should be anticipated.

SECTION 3 DNV GL'S LAY-UP SERVICES

3.1 General

DNV GL's services on lay-up are available individually or in a combination best suited for the actual situation:

- General advisory services on lay-up scenarios.
- Development of lay-up specification and procedures.
- Supervision of the lay-up process.
- Lay-up declaration, lay-up preservation declaration, clean lay-up declaration, as requested by the various parties involved such as insurance and port authorities, (as further described in [3.2], [3.3] and [3.4]).
- Periodic inspection according to lay-up declaration.
- Supervision during re-commissioning.
- Location approval and mooring analysis.
- Statement of compliance for lay-up service providers.
- Towing declarations to or from lay-up location, including towing to scrapping yard.

3.2 Lay-up declaration

3.2.1 General

Upon request DNV GL may issue a lay-up declaration as may be required by parties involved in a lay-up situation such as for instance

- underwriters
- owners
- charterers
- national maritime authorities
- local authorities.

It is emphasized that the classification societies do not require a lay-up declaration. The declaration will be limited to items listed below and is not a classification requirement during lay-up. The DNV GL lay-up declaration may be issued based on the following overall conditions:

- The vessel is safely moored with periodical mooring watch, and emergency operation of mooring winches available at short notice.
- Navigation lights, fire and bilge alarms are in operation.
- Fire extinguishing and bilge systems are operable on short notice by competent personnel.
- Safety arrangements for personnel on board, if any, are in place.

Recommendations on how to achieve these are given in Sec.4. It is recognised that there may be alternative ways to achieve equivalent safety of a laid-up vessel, but in order to qualify for a lay-up declaration from DNV GL, the above overall requirements should be met. A summary of relevant lay-up considerations for different vessel types is given in App.B. For the request for lay-up declaration, see App.E.

3.2.2 Procedural requirements

3.2.2.1 Initial survey

If the vessel meets the recommendations laid down in this recommended practice, a lay-up declaration valid for a period of maximum 12 months may be issued.

3.2.2.2 Re-surveys

Subsequent lay-up declarations may be issued for the next 12 months period provided a survey is carried out satisfactorily. Such survey can be harmonized with class annual survey for laid-up vessels.

3.2.2.3 Scope of work

The lay-up declaration is based upon an evaluation of:

- seabed characteristics
- environmental conditions including weather and current statistics
- mooring arrangement, including structural strength of mooring lines and mooring fittings
- ballasting and stability
- the planned manning or watch-keeping personnel
- safety aspects
- fire protection, detection and extinguishing equipment and fire control plan
- precautions against flooding
- communication equipment
- navigation lights
- lifesaving equipment
- power availability
- emergency contingency plan
- anti-pollution measures
- security arrangements.

The vessel and the items above will be inspected by DNV GL before issuing of initial and subsequent lay-up declarations.

3.2.2.4 Documents to be submitted

The following plans and other documents should be submitted for evaluation:

- General arrangement plan (if not classed with DNV GL).
- Ballasting and draught for the vessel in the proposed lay-up condition.
- Area chart with indication of vessel location.
- Expected statistical weather conditions.
- Chart showing depth curves and bottom soil conditions.
- Proposed position and heading of vessel.
- Mooring arrangement:
  - number of anchors and length of chain cables to be used
  - proposed mooring pattern
  - chart indicating bollard position, bollard capacity and individual distances between bollards ashore if applicable.
- Planned manning and watch-keeping.
- Emergency contingency plan.
- Anti-pollution measures.
- Security arrangements and procedures.

3.3 Lay-up preservation declaration

Upon request, DNV GL may issue a lay-up preservation declaration confirming that a vessel has been laid-up in accordance with either of the standards below:

- Preservative measures and maintenance according to [5.2] and [5.3] or equivalent. for vessels preserved in a normal humidity condition.
- Preservative measures and maintenance according to [5.4] or equivalent, for vessels in dry preserved de-humidified atmosphere.

Recommendations on how to achieve the above are given in Sec.5. For DNV GL lay-up preservation declaration, the recommendations or actions with an equivalent preservation level should be implemented.

Proposed methods of preservation as well as a maintenance programme should be submitted before the initial survey. Re-surveys should take place every 12 months thereafter.

3.4 Clean lay-up declaration

DNV GL may issue a clean lay-up declaration confirming that a vessel has been laid-up in accordance with recommendations given in Sec.6.

3.5 Statement of compliance for lay-up service providers

DNV GL may issue a statement of compliance for lay-up service providers, in accordance with recommendations given in Sec.8.

SECTION 4 GUIDANCE FOR LAY-UP

4.1 Lay-up site

The lay-up site should be well sheltered from heavy wind, strong current and swell. The site should not be in tropical cyclone areas, unless sufficient tug assistance will be readily available, and there is a well-established weather forecast service for the area.

The seabed characteristics should be such as to provide adequate anchor holding power if anchors should be used. A diving report confirming the seabed condition may be required. The seabed should be free from obstructions, wreckage or other projecting objects. The site should not be exposed to significant amounts of moving ice.

The water depth on the site should give sufficient clearance between seabed and vessel's keel, including the lay-up initial position as well as the area in which the vessel or block of vessels may be moving due to environmental forces.

When shore moorings are used, mooring bollards of sufficient strength should be placed in such positions that proper lead of moorings is obtained. Suitable distance from vessel's bollards to shore should be proportional to the ship's length e.g. 50%. Sideways clearance in the laid-up initial position to shore or any seabed obstacles should be at least 60% of the distance between stern and shore bollards for vessels moored with bow anchors and stern mooring bollards to shore. If vessels are laid in block alternate bow to stern, with anchors in opposite directions, sideways clearance should be at least 30% of the anchor cable deployed.

The safe distance to shore, surrounding laid-up vessels and obstacles should be evaluated taking into account swing radius and/or stretching of mooring lines. However the minimum distance between separately laid-up vessels or block of vessels should not be less than 50 m.

The acceptable total number of vessels to be laid-up in one block should be considered. The total tonnage in a block of vessels should be considered against possible restrictions from any national or local authorities, or from underwriters involved.

For a self-elevated unit laid-up in jacked up condition, a site specific assessment including soil analysis, footprint analysis, leg penetration assessment and fixity assessment should be carried out.

4.2 Mooring arrangements

The mooring arrangement should be able to maintain a safe mooring of the vessel, or block of vessels. In the preparation for mooring, the following items should be considered:

- In general, a mooring analysis should be performed and verified as per relevant standard i.e. DNVGL-ST-N001 or equivalent for mooring arrangement as carried out.
- Vessels in lay-up position should be able to withstand wind loads from wind velocity up to normally 30 m/s, acting 90° and 45° to the vessel's centreline, without getting vertical forces on anchors, or unacceptable loads on shore moorings. Since lay-up moorings inshore and at quayside are often characterized by short mooring lines, the static wind loads 1 minute average wind speed. For short term moorings (≤30 days) a 10 year return period design wind speed should be applied while for long term moorings (>30 days) a 100 year return period design wind speed should be applied, see DNVGL-ST-N001 Sec.17.10.1.2.In closed harbours, and for vessels berthed quay side, lesser wind loads may be used if based on documented weather statistics.
- The effect of current speed and directions should be considered. Normally, current of 2 knots should be used for evaluation.
- Special attention should be paid to mooring line (loads) effects due to vessel vertical motions, e.g. due to tide variations and waves from passing vessels and also to other possible effects due to local conditions, e.g. increase in current force due to shallow water effects.
- For deep structures anchored to mooring systems in areas that are subjected to large current variations during the warranted installation phases, whether or not of tidal nature, a check should be made that the mooring response is safe with respect to potential in-line and transverse vortex shedding that can generate vortex induced motions. (See also ISO 19901-7, A.7.4.7, A.8.3.5 /100/).

- When the anchors are used, full length of chain cables should be deployed, and the length of chain cables deployed should be approximately seven times the depth of the water as a minimum. Chain cables should be laid in a straight line, parallel with the vessel's centreline with the vessel in the initial position. After pre-tension of chain cable, the angle between the water surface and the chain cables should be approximately 65°.
- The anchor windlass with braking system and anchor chain stopper should be checked.
- The number and size of moorings should be considered. A mooring line or bundle of moorings should not be stressed to more than 50% of the breaking load. Wire moorings are generally preferred, synthetic fibre ropes may be considered for short lay-up periods. Age, wear and corrosion of mooring lines should be considered for each single line.
- When vessels are laid-up berthed to a quay, an adequate number of head/stern lines, breasts and springs should be set. Special care should be taken to minimize loss of restraint capacity due to vertical inclination of mooring lines.
- When vessels are laid-up in a block alternate bow to stern, vessels should be of approximately the same size, and of even numbers in the block. Anchor positions should be marked with buoys where two or more vessels are moored together bow to stern as blocks, both forward anchors of the vessels should be deployed (at 30 degree leads).
- Provisions should be made for periodically clearing the chain of twists.
- When a vessel is laid-up with bow anchors deployed and stern moorings to shore bollards, all moorings ashore should preferably be concentrated in one bundle. Two bundles may be acceptable, in which maximum possible parallelism between the bundles should be obtained. All moorings should be tensioned in order to obtain even stress. All moorings should be of same property.
- The capacity of the vessel's chocks, bollards and possible winch brakes should be considered.
- When vessels are laid-up in a block with shore moorings, the bundles of moorings should be kept parallel to obtain even stress in the mooring lines. Bundles of mooring lines from the outer vessels in a block should be less tensioned than moorings from inner vessels, in order to obtain even loads during sideways movements of the block.
- Moorings between vessels in a block should be kept tightened. At least 8 lines consisting of breast and springs should be set between each vessel in a block.
- Heavy fendering should be used between each vessel in a block, positioned at different levels, preferably secured with chain cable.
- All moorings in use should be well protected against corrosion and chafing.
- Draft reference marks should be clearly painted forward and aft when only watchmen onboard.

4.3 Ballasting

The vessel should be ballasted in order to reduce exposure to wind forces, normally 30% to 50% of the loaded draught for ship-shaped vessels. The final ballast distribution should be documented. Consideration should be given to:

- depth of water at the lay-up site
- wind and current forces
- the stability and strength of the vessel
- slack ballast tanks should be avoided.

4.4 Power availability

4.4.1 General

It is generally assumed that in normal lay-up condition there will be no immediate need for propulsive power. Still lay-up site conditions or limited availability for tug assistance may require availability of propulsion machinery.

As a minimum, the following items/functions should be kept available when the ship is laid-up: navigation lights, fire and bilge alarms, fire extinguishing and bilge systems. This may be arranged by the use of a portable diesel generator set mounted on deck, or shore connection if possible. Emergency power sources to be kept ready for operation and tested regularly.

Adequate power for operation of windlasses and mooring winches should be available. If steam-driven, the anchor windlass and any necessary mooring winches should be fitted with emergency air connections, and sufficient air capacity should be available for their operation. If electric, an emergency source of power should be available for their operation.

4.4.2 Mobile generators

In cases where a mobile generating unit is utilised on board, considerations should be given to:

- Location on deck and cable requirements.
- Diesel oil service tank capacity and specifications, and that its location on board is acceptable to local authorities and/or other relevant institutions i.e. in relation to fire and pollution risks.
- The unit's consumption rate in relation to bunkering frequency and the purification and transfer of diesel oil to deck. The mobile generating unit will periodically have to be shut-down for maintenance, or even exchanged when a major overhaul is due.

4.4.3 Power supply to/from other vessels and shore connections

A separate junction box should be provided in the case of supplying power to/from other vessels. This junction box should have:

- Fitted fuses and an on-load switch, or a circuit breaker with overcurrent and short circuit protection.
- Where voltages of 50 V or above and/or currents of more than 16 A are transmitted, it should be ensured that connection can only be made from a dead condition.
- Vessel hulls should be conductively connected.
- Connecting cable suspensions should be tension relieved.

4.5 Safety precautions

4.5.1 Manning

Qualified personnel should be available in order to maintain full-time fire, leakage, moorings and security watch of the vessel, and should be capable of operating the related equipment.

4.5.2 Protection against explosions and fire

To protect against explosions and fire, the following precautions/measures are recommended:

- Fire sources should be removed or minimized as far as practical. All decks, accommodation and machinery spaces should be cleaned and all flammable or combustible materials should be removed or properly stored. Bilges should be kept dry and clean.
- A gas-free certificate issued by a recognized authority and applicable to the entire ship should be provided for laid-up tankers.
- All cargo tanks, pump rooms, cofferdams and pipelines should be clean and gas concentration of hydro-carbons should not exceed 0.40 of the lower flammable limit (LFL).
- Potential presence of flammable gas should be constantly monitored.
- Tankers which have been trading should, wherever possible, be laid-up with inerted tanks. O_2-content in inerted tanks should be below 5% by volume when going into lay-up. During lay-up, O_2-content should be kept below 8% by volume. If vessels are laid-up in areas where frost may be expected, water locks for inerted systems should be filled with anti-freeze coolant.

— Gas concentration, or O_2 content if inerted, should be measured regularly. Special attention should be paid to gas concentration with increase of temperature. Results should be recorded in the log book.
— If inert gas is not available, CO_2 may be used, e.g. for slop tanks.
— Hot work should be carried out only with a valid hot work certificate and appropriate safety precautions in place.
— Valves or cocks to oil tanks in machinery spaces are closed and drip trays should be cleaned. If machinery or boilers should be kept in operation during lay-up for power supply or heating, quick-closing devices for fuel oil valves should be checked.
— Wire gauze in air pipes to fuel tanks and spark arresters in exhaust pipes to be in proper condition.
— Any temporary installations like space heaters, driers or heaters for electrical equipment, stores etc. should be specially considered with respect to fire hazard.
— All fire dampers in ventilators are either to be closed or clearly marked and kept easily closable. Fire doors and watertight doors should be closed.
— Flash point on all residual and distillate fuels kept on board during lay-up should in compliance with the prevailing SOLAS regulation of minimum 60°C. Analysis results based on samples taken during bunker deliveries, if available, should be sufficient.

4.5.3 Fire detection and firefighting arrangement

The fire alarm system should be kept in normal operation during lay-up. It should be arranged in such a way that it is capable of alerting the crew or watch personnel. The vessel's normal firefighting equipment should be available and maintained with special attention to:

— Fixed firefighting installations should be kept ready for operation and checked regularly in case the vessel is manned during the lay-up.
— Fire mains should be ready for use. Power supply to be available for operating the fire pumps. These should be checked and run regularly.
— Emergency fire pumps shall be ready for use and be checked and run regularly.
— International shore connection shall be available and clearly marked.

4.5.4 Precautions against flooding

To protect against flooding, the following precautions are recommended:

— A double barrier towards flooding should be maintained for all overboard connections. Inspection hatches, etc. of equipment located below the waterline should be kept closed if connected to the seawater system.
— All overboard valves not in use and all sea inlet valves not in use (except for cooling of prime mover for emergency electric power generation and fire pumps) should be closed.
— Water level in ballast tanks, pump rooms and bilges should be checked regularly. Level and bilge alarms should be kept in normal operation.
— Bilge lines to holds, pump rooms, cofferdams and engine room to be kept ready for use. Sufficient electric power should be available for the bilge pump.
— All pipes liable to be damaged by frost should be drained or otherwise protected. Temporary bilge alarms should be arranged for in the engine room, if not already fitted.

4.5.5 Communication

Reliable means of communication should be always available for immediate contact for local assistance or rescue facilities. Two separate means of communication should be provided.

4.5.6 Navigation lights and fog signalling system

Anchor lights, and if necessary, additional position markings, e.g. lights marking the bow and stern, should be well maintained. Supplemental deck lighting should be used if the vessel is laid-up near shipping lanes. Fog signalling system should be kept readily available.

4.5.7 Lifesaving equipment

Lifesaving equipment and distress signals appropriate for the lay-up site and the total complement on board should be kept available. Periodical servicing of life-raft should be carried out as per normal requirement.

4.5.8 Emergency contingency plan

An emergency contingency plan should be available.

4.5.9 Personnel safety

Care should be taken when visiting laid up vessels. This applies for the transportation to the vessel, entering the vessel and also when doing on board work and inspections in particular in areas not regularly attended.

Attention should be paid to, but not limited to:

— poor ventilation, lack of oxygen
— confined spaces, lack of oxygen
— leakages of chemicals and gasses
— temporary entrances and walkways
— loose objects and obstructions
— temporary and damaged physical barriers
— Poor lighting.

Proper preparations and protective measures should be taken prior to entrance, and suitable personal protective equipment (PPE) should be applied.

4.6 Anti-pollution measures

Depending on the lay-up mode, bilge water and water accumulated on deck should be pumped into slop tanks or similar as far as applicable. Slop tank status should be monitored and contaminated contents transferred to appropriate vessel for transport to reception facility. On tankers the cargo tanks should be cleaned and dirty residues disposed of at a reception facility.

4.7 Security

Means to prevent unauthorized access to the vessel should be established. Doors and openings should be kept locked, bearing in mind emergency escape possibilities for the persons onboard. Regular watch-keeping routines, reflecting the security situation at the lay-up site should be established. Procedures for periodical testing of the ship security alert system (SSAS) should be established.

4.8 Stability and other risks after lay-up

The following represents a hazard to the crew and the vessel and should be assessed prior to departure from lay-up in rough weather:

- Stability:
  - vessels with a low metacentric height (GM) will be more exposed to longer periods of roll which increases the risk of a ship capsizing
  - certain vessels with a large metacentric height (GM) while being laid-up (e.g. container vessels) will be more exposed to waves with shorter periods. This might cause resonance and excessive roll.
- Course keeping:
  - Reduction in manoeuvrability when in ballast.
- Longitudinal strength:
  - Excessive bending moments when in ballast.

SECTION 5 GUIDANCE FOR PRESERVATION

5.1 General

5.1.1 Equivalent solutions

The following recommendations are based on DNV GL's experience with preservation of laid-up vessels, but it is recognised that there may be other ways to achieve good preservation. Manufacturers' specific recommendations on their equipment and machinery may replace the general content in this document.

5.1.2 Lay-up plan

A lay-up plan outlining the preservation and maintenance routines during the lay-up period should be available.

5.1.3 Lay-up log

All preservation and maintenance actions taken during the lay-up period should be logged, and may form a basis for reduced scope of the re-commissioning survey. The log should include required actions at re-commissioning for each item. A log of equipment and spares removed from the vessel should be kept.

5.2 Marine systems

5.2.1 Hull

5.2.1.1 General

All drain pipes and scuppers should be kept clear and open. Decks should be kept clean, and loose and foreign items removed or properly secured. Any corrosive products should be properly sealed and safely stored. Hatches and doors should be closed weather tight. Possible open cargo tank hatches should be protected with tarpaulins. Skylight should be closed and preferably covered with tarpaulins. Except for necessary ventilation to each compartment, ventilators, air pipes and similar should be closed. All sidelights, windows and deadlights, where fitted, should be closed. Dependent upon the machinery condition the funnel openings should be covered weather tight.

5.2.1.2 Underwater parts

The vessel's external coating systems should be in good condition prior to lay-up. If not, additional protection with either sacrificial anodes or an impressed current system is recommended used. For lay-up periods > 12 months, cathodic protection is recommended irrespective of coating condition. For vessels not protected by sacrificial anodes or an impressed current system, stainless steel propellers should be protected against corrosion by a sacrificial anode fitted to the boss. Impressed current systems, if fitted, should be maintained in an operational mode suitable for the lay-up situation, and controlled at regular intervals. The operational mode should be such as to avoid over-heating of anchor chains and mooring cables. A suitable criterion for cathodic protection may be 0.80 V vs. Ag/AgCl/seawater reference electrode. A logbook should be kept. If sacrificial anodes or impressed current systems are fitted, proper electrical earthing of propeller and rudder should be ascertained. Where two or more vessels are moored together, and where one or more of these vessels have cathodic protection as described above, the vessels' hulls should be electrically connected to each other. All valves to or from the sea should be wired or locked closed, except those required for use during lay-up in connection with fire extinguishing, pumping out or watch personnel service. In order to prevent excessive fouling and choking, the sea suction openings (except for fire pumps) should be covered over and/or protected with a slow-acting biocide or cathodic protection specially designed for sea water inlets.

5.2.1.3 Hull above waterline

All paint should be in a proper condition and necessary touch-up carried out prior to lay-up or issue of declaration. Special attention should be given to the area just above the waterline.

5.2.1.4 Tanks and holds

In the preservation of tanks and holds, the following measures are recommended:

- Chain lockers should be dry.
- Ballast tanks should be kept either full, or completely empty and dry.
- Ballast tanks and cargo tanks kept full should be protected by anodes, unless protected by coating in a GOOD condition, (see DNVGL-RU-SHIP Pt.7 Ch.1 Sec.1 Table 1). For lay-up periods > 12 months, cathodic protection is recommended irrespective of coating condition.
- The design of sacrificial anodes should be dimensioned for a realistic percentage of coating imperfections. Arrangement and age of possible existing anodes should be considered, and additional anodes fitted as found necessary.
- Impressed current system or magnesium anodes should not be used in tanks. Empty cargo tanks and cofferdams may be filled with dry inert gas. The dryness of the gas should be controlled and kept on a safe level with regard to corrosion. It is recommended that oil with no, or very low sulphur content is used for inert gas production.
- A suitable inhibitor may be applied in sludge tanks, dirty bilge tanks, etc. if these are not kept clean and dry.
- Adding of inhibitor is also recommended for bunker oil tanks for heavy oil if not kept completely full or empty. An inhibitor which does not cause harm to boilers or machinery should be used.
- Other tanks should be kept either completely full, or empty and dry. Due consideration should be given to preventing freezing of tanks.

5.2.1.5 Deck piping

In addition to protective measures against corrosion, deck and accommodation pipelines should be protected against freezing if relevant. Cargo oil pipes, deck steam pipes, Butter-worth lines, heating coils, exhaust, water and air pipes and ballast lines for dry cargo vessels should be well drained, preferably blown through with dry air or dry inert gas and left with drains open. If not subjected to freezing, above-mentioned pipes may alternatively be filled with inhibited water. It is recommended that cargo oil lines first be flushed clean. Fire lines and bilge lines should be drained and dried, but should be completely assembled again and ready for service. Sea valves for these systems should be easily operable and marked, or left open. Spindles on all valves should be well greased.

5.2.1.6 Deck machinery

Deck machinery should be carefully oiled and protected with grease. For reciprocating machinery, non-contaminating corrosion protection should be applied to cylinders and slide valves after draining carefully. Windlass and important mooring winches should after above treatment be kept ready for operation, to be tested at regular intervals, and not less than twice a month. Deck machinery should be turned at regular intervals.

5.2.1.7 Blocks, running gear and fittings

Wires and blocks for cargo gears not intended for use during lay-up period, should be dismantled and stored in a dry place or be left in place well-greased. All deck fittings such as hinges, rollers, valves, valve spindle boxes etc., should be well protected by grease or protective oil.

5.2.1.8 Accommodation

Accommodation including navigating bridge and radio room should be protected against corrosion and other deterioration by means of a suitable system, e.g. by a dehumidified atmosphere having a relative humidity below 60%.

5.2.2 Engine and boiler rooms

The temperature in engine and boiler rooms should be maintained about 3°C above the outside temperature and never below 0°C. Regarding general conditions of cleanliness, detection of fire and flooding, see [4.5] of this document.

5.2.3 Machinery

5.2.3.1 General

Prior to lay-up, all machinery should be maintained in a good condition. The following items should be considered:

- System lubrication oil for main systems should be thoroughly purified, and oil from each system should be analysed for water and alkalinity as well as acidity. The water content in the lubrication oil should not exceed a maximum limit of 0.1%.
- All lubricating oil ventilating pipes should terminate inside the machinery space, but above the freeboard deck level for double bottom tanks.
- Engines should be clean and it is advised to run all combustion engines on water free diesel oil prior to lay-up.

  Guidance note:

  A mixture of gas oil and 20% by volume anti-corrosion oil could be fed into the fuel system. While the engine is running at reduced revolutions with an increased lubricating oil pressure, the air intake apertures could be closed, causing the engine to come to a stop without ignition.

  ---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

  Movable parts, like valve spindles, links, hinges etc. should be well greased. Other vulnerable metallic parts directly exposed to atmosphere should be covered by protective oil.
- Rotating machinery, including electric motors and generators, should be turned at regular intervals. After turning, it should be checked that the shafts have changed positions.
- Lubricating oil pumps should be run. Lubricating oil priming should be carried out before turning. It is recommended to jack up the crankshaft of engines to facilitate good lubrication prior to turning.
- All air intakes and exhaust openings should be covered over. Supply and exhaust openings for necessary emergency diesel generator or fire pump engines should be arranged for immediate or automatic opening.
- Purifiers should be run before and after turning of machinery. Draining of water from tanks should be done regularly where possible.

5.2.3.2 Reciprocating machinery

Cylinder liners and pistons should be protected by means of inhibitors or non-contaminating oil. Lubricators should be hand turned at regular intervals. Crank cases should be regularly inspected to ensure absence of condensate or corrosion.

5.2.3.3 Turbine machinery and reduction gear plant

Turbine and gear housings should be dried out by dehumidified air and arrangements should be made to maintain dryness (RH < 50%). Alternatively special protective oil may be applied.

5.2.3.4 Condenser

The condenser should be filled with water. Regular inspections should be carried out to ensure absence of condensate or corrosion. Governing oil pumps should be run regularly and different parts moved.

5.2.3.5 Engine casing

Where an oil-change has been carried out, the engine should have run with the new oil for at least 15 minutes. If the shutdown period exceeds 6 months, the oil filter and filter casing require special attention.

They should be cleaned and filled with anti-corrosion oil. The engine casing of large engines shall be ventilated. A relative humidity of not more than 35% should be aimed at.

5.2.3.6 Stern tube

For water-lubricated stern tubes, gland packing should be sufficiently tightened to prevent water leakage. For oil-lubricated stern tubes, upper header tank should be used, and prior to lay-up it should be confirmed that the stern tube is free from water. For stern tubes with forced oil circulation, pumps should be run at regular intervals. When turning, larger stern tube bearings may sustain damage. It is therefore advised to limit the slow-turning to for instance a few (3-4) revolutions, and not do this operation for hours. For large vessels, long shafting and heavy propeller, it is recommended to have shaft arrangement plan analysed in order to make a plan for turning during lay-up.

5.2.3.7 Seawater system

All parts of the seawater systems not in use should be emptied, and pipes and heat exchangers flushed through with fresh water and completely dried out. For heat exchangers a thorough cleaning should be done to remove all growth and deposits. Both heat exchangers and pipe system should after cleaning and drying be kept open to the dehumidified atmosphere. Regular blow through by dehumidified air should be done. All sea suction and discharge valves not in use should be closed and secured. Spindles and turning gear should be protected by grease or protective oil. Vessel side valves should be moved at regular intervals. This implies that means of closing the system should be arranged inside the vessel side valves.

5.2.3.8 Fresh water system

Cooling water systems on engines may be left filled up with chemically treated water (in order to prevent corrosion as well as settlements) with head to expansion tank.

5.2.3.9 Starting air system

Starting air receivers may be kept fully charged or empty, clean, dry and open. At least one auxiliary starting air bottle, however, should be kept fully charged to maintain auxiliary engines ready for start. Charged air receivers as well as air piping should be drained at regular intervals.

5.2.3.10 Refrigerating plant

Before refrigerating plant is shut down, care shall be taken to ensure that there are no leaks in the coolant circuit. The coolant should be drawn off into the condenser or collector. Filters, oil separators etc. should be cleaned. Condensers should be opened on the water side and dried. Refrigerating spaces should be ventilated. Refrigerant and brine system should be kept tight and sealed.

5.2.3.11 Hydraulic systems

Hydraulic systems and governing oil systems should be completely full and care taken to ventilate air and drain all water out of the system. Movable parts should be well greased or protected with corrosion protective oil.

5.2.3.12 Steering gear

See precautions listed for hydraulic systems and electrical equipment. Steering gear should be tested at regular intervals, not less than twice a month. Rudder should be operated from hard over to hard over.

5.2.3.13 Fuel oil system

The following recommendations should be considered:

- Provided practicable bunker tanks containing residual and marine diesel oil (black oils) should be emptied and cleaned prior to lay-up, or during the initial stages of lay-up to.
- Fuel oil separators and filters should be emptied and cleaned.
- Fuel oil lines containing residual fuel oils should be emptied. Preferably all engines and systems should be flushed with marine gas oil prior to shutting down.
- If residual and marine diesel oils should be kept on board, these fuels should be analysed to establish the quality, with regards to water, sediments and abrasive particles. These contaminants will settle out over time and pose a potential damage risk to vital engine components during re-commissioning.

— If possible, fuels kept on board during lay-up should be circulated at regular intervals to prevent settling of contaminants, while representative samples should be taken and analysed.
— Special attention to be paid to the potential development of microbiological activity in distillate fuels during lay-up. Microbes in distillate fuels as well as in lubes and hydraulic systems may cause filter blockages and corrosion to tanks, pipes and equipment. There may be an increased risk of microbes developing in tanks and systems of idling or laid-up vessels due to settling out of water, hence such samples should, where practicable, be taken from the oil/water interface area.
— Draining of free water from fuel oil tanks, where practicable, should be carried out at regular intervals. This would also prevent the development of microbes. Application of biocides should be considered.

5.2.4 Boilers and steam systems

5.2.4.1 Fire side

The whole fire side, including economisers and air heaters, should be thoroughly cleaned prior to lay-up to remove all accumulation of deposits. Special attention should be given to super heaters. Following the cleaning, the boiler should be fired with Diesel oil to dry out insulation and brickwork and left open. If wet conservation method is employed for water/steam side, precautions should be taken to prevent sweating accumulating in insulation.

5.2.4.2 Water/steam side

Either dry or wet lay-up condition may be used. In both cases the boiler should first be carefully drained. Dry lay-up condition means that the boiler is protected by a dry atmosphere. Wet lay-up condition means that the boiler is filled with and protected by inhibited water. If the wet method is applied, the following should be carried out:

— The boiler and steam lines are re-filled with inhibited water. Steam lines filled with water should be suitably secured to take the additional weight, i.e. by anchoring spans and providing supports where necessary. Manufacturers should be consulted regarding water treatment.
— The boiler is fired (heated) and air vented to atmosphere.
— A temporary circulation of boiler water is arranged, circulation should be continuous, and the boiler left open to atmosphere with head for ventilation.
— Alternatively, the boiler may be kept slightly pressurized after careful removal of all air.
— Boiler water should be controlled at regular intervals.

Oxygen in the air can be prevented from penetrating by a blanket of nitrogen, if possible, at an excess pressure of about 0.1 bar. If dry method is applied, either of the following should be carried out to obtain dryness:

— Blanking off and evacuating to a vacuum giving desired dryness.
— Blanking off and pressurizing with dry air or inert gas, then blow down after stabilization time. This procedure should be repeated until desired dryness.
— Blanking off and charging with trays of drying agent, which should be frequently changed or reactivated until desired dryness is obtained.

Upon completion of the drying process, the following alternatives may be applied:

— The boiler is slightly pressurized with inert gas (nitrogen) with dew point below 0°C.
— The boiler is charged with trays of desiccant and sealed. Drying agent should be changed or reactivated at regular intervals.
— The boiler may also be left open for slight air circulation with a heat source inside the upper part of the boiler.
— Dehumidified air is circulated in the boiler.

5.2.4.3 Steam system

For the main steam systems, with high pressure steam pipes and feed water pipes, feed water heaters and de-aerator, the same methods as described for boilers are recommended. Other steam lines and exhaust lines should be well drained and dried and ventilated with dehumidified air.

5.2.5 Electrical installation

5.2.5.1 General

Electrical equipment should be protected against moisture absorption in insulation material and damage to rotating parts due to corrosion.

5.2.5.2 Insulation

All electrical equipment should be maintained with a temperature some degrees above surrounding atmosphere or in a dehumidified atmosphere (RH < 50%). Prior to lay-up or issue of declaration, insulation resistance should be confirmed acceptably high. If necessary, cleaning of insulation to improve resistance should be carried out. Built-in heating elements in generators and motors should be in use. Equipment not initially fitted with heaters should periodically be put into service, so that it is heated until moisture is removed. Insulation resistance should be confirmed each time.

5.2.5.3 Generators and motors

Brushes should be lifted from slip rings and commutators. Turning should be carried out at regular intervals.

5.2.5.4 Storage batteries

Automatically regulated trickle charging systems for storage batteries should be kept in operation. Batteries without automatic charging system should be recharged monthly. For liquid filled batteries, liquid level should be checked. Special precautions may be required in very cold weather. Battery manufacturer's recommendations should be consulted.

5.2.5.5 Electronic equipment and computers

Manufacturer's recommendations should be followed. It is advisable to maintain a dehumidified atmosphere on the navigation bridge, in control rooms and all other rooms containing computers and electronic equipment. The relative humidity should be controlled at regular intervals. Subject to manufacturer's recommendations it may be advisable to keep equipment under constant voltage, or to put it into service at regular intervals both for additional moisture removal and to recondition components. ICT/PLC system containing sophisticated software should remain powered as much as possible during lay-up. If certain equipment cannot be powered up during cold lay-up and the equipment contains PLCs or other devices with back-up batteries that ensure the programs remain stored will have to be backed up or a separate power supply will have to be arranged. Especially power management systems and integrated control systems with PLCs will have to be properly preserved and backed up.

5.2.6 Instrumentation and automation

5.2.6.1 General

Uniform guide lines for instrumentation and automation equipment cannot be given, but general considerations are given below. Manufacturer's recommendations should be consulted.

5.2.6.2 Electric and electronic equipment

Precautions should be taken to prevent damage from moisture. In addition to counter measures given in [2.5], it may be advisable to leave some types of instrumentation equipment with voltage on (e.g. smaller transformers and rectifiers). Instrumentation equipment placed in open machinery spaces should be cleaned prior to lay-up. Movable parts should be run over the full operation range, thereafter they should be protected with oil or grease according to Manufacturer's instructions.

5.2.6.3 Pneumatic equipment

Whole piping system should be thoroughly blown through, and all the water drain traps should be opened when the system is under pressure and kept open. Alternatively, the system may be in operation. Components, such as controllers and transmitters with delicately built mechanisms, e.g. flapper nozzle systems, should be cleaned and covered with protective covers. Regular controls should be carried out if the system is in operation.

5.2.6.4 Hydraulic systems

[5.2.3.11] applies.

5.3 MOU specific systems

5.3.1 General

In general, most of the preservation recommendations in [5.2] and [5.3] are also applicable to the topside processing system and equipment of mobile offshore units. Specific recommendations for preservation of well control equipment and offshore crane are presented in this section.

5.3.2 Drilling equipment

5.3.2.1 General

The below given recommendations should serve as a basis for the preservation of the specified drilling equipment during longer storage periods. The storage may take place either onshore or on board offshore installations. All drilling equipment should be subjected to annual inspections during the storage period, unless otherwise agreed between all involved parties. Additional preservation/storage procedures for components not specifically covered in this document should be agreed between all involved parties.

5.3.2.2 Blowout preventer equipment

5.3.2.2.1 Blowout preventer stack

In case the blowout preventer stack is left stacked-up on board during lay-up, the following measures should be taken (for the assembly):

- The wellbore and exterior should be cleaned of all grease and mud.
- All exposed outlets and hydraulic open/close ports should be plugged/covered.
- Unprotected steel and metallic surfaces should be coated with grease or similar to avoid excessive corrosion.
- Open end connections at the top/bottom of the blowout preventer stack should be blinded off/covered.
- Choke/kill-lines should be blinded off/covered in open ends.
- The wellbore and choke/kill-lines should be filled up with appropriate preservation fluid. The risk of freezing should be taken into consideration when choosing the preservation fluid.
- It should be evaluated to cover the full blowout preventer stack with a tarpaulin or similar.

5.3.2.2.2 Ram BOPs

- Pressure testing of the hydraulic operating system should be performed prior to storage. The results of this testing should be documented.
- The equipment should be cleaned of all grease and mud.
- Unprotected steel and metallic surfaces should be coated with grease or similar to avoid excessive corrosion.
- Hydraulic systems should be completely drained of all air/water and filled with preservation fluid. The risk of freezing should be taken into consideration when choosing the appropriate preservation fluid.
- All exposed hydraulic open/close ports should be plugged.

- Periodic operation/function testing of movable parts should be carried out.
- New grease/corrosion protection fluid to be re-filled/applied as necessary (at least annually).
- If the storage location is not fully closed to the environments, it should be evaluated to cover the equipment with a tarpaulin or similar.

5.3.2.2.3 Annular BOPs

- Pressure testing of the hydraulic operating system should be performed prior to storage. The results of this testing should be documented.
- The equipment should be cleaned of all grease and mud.
- Unprotected steel and metallic surfaces should be coated with grease or similar to avoid excessive corrosion.
- Hydraulic systems should be completely drained of all air/water and filled with preservation fluid. The risk of freezing should be taken into consideration when choosing the appropriate preservation fluid.
- All exposed hydraulic open/close ports should be plugged.
- Periodic operation/function testing of movable parts should be carried out.
- New grease/corrosion protection fluid to be re-filled/applied as necessary (at least annually).
- If storage time is expected to exceed 12 months, the packer and donut should be removed and stored separately according to manufacturer’s recommendations.
- If the storage location is not fully closed to the environments, it should be evaluated to cover the equipment with a tarpaulin or similar.

5.3.2.2.4 Ram blocks

- Ram blocks should be stored separately outside of the blowout preventer per manufacturer's recommendations.
- Top seals and packers should be removed from the ram assembly and stored per manufacturer's recommendations.
- The equipment should be cleaned of all grease and mud.
- Unprotected steel and metallic surfaces should be coated with grease or similar to avoid excessive corrosion.
- New grease/corrosion protection fluid to be applied as necessary (at least annually).

5.3.2.2.5 LMRP and wellhead connectors

- Pressure testing of the hydraulic operating system should be performed prior to storage. The results of this testing should be documented.
- The equipment should be cleaned of all grease and mud.
- Unprotected steel and metallic surfaces should be coated with grease or similar to avoid excessive corrosion.
- Hydraulic systems should be completely drained of all air/water and filled with preservation fluid. The risk of freezing should be taken into consideration when choosing the appropriate preservation fluid.
- All exposed hydraulic open/close ports should be plugged.
- Periodic operation/function testing of movable parts should be carried out.
- New grease/corrosion protection fluid to be re-filled/applied as necessary (at least annually).
- If the storage location is not fully closed to the environments, it should be evaluated to cover the equipment with a tarpaulin or similar.

5.3.2.2.6 Valves

- Pressure testing of the hydraulic operating system should be performed prior to storage. The results of this testing should be documented.
- The equipment should be cleaned of all grease and mud.
- Unprotected steel and metallic surfaces should be coated with grease or similar to avoid excessive corrosion.

- Hydraulic systems should be completely drained of all air/water and filled with preservation fluid. The risk of freezing should be taken into consideration when choosing the appropriate preservation fluid.
- Periodic operation/function testing of movable parts should be carried out.
- New grease/corrosion protection fluid to be re-filled/applied as necessary (at least annually).
- If applicable, plug off flanges/inlet ports.

5.3.2.2.7 Flex joints

- The equipment should be cleaned of all grease and mud.
- Unprotected steel and metallic surfaces should be coated with grease or similar to avoid excessive corrosion.
- Periodic operation/function testing of movable parts should be carried out.
- New grease/corrosion protection fluid should be applied as necessary (at least annually).
- If the storage location is not fully closed to the environments, it should be evaluated to cover the equipment with a tarpaulin or similar.

5.3.2.2.8 Riser adaptors, drilling spools & adapters

- The equipment should be cleaned of all grease and mud.
- Unprotected steel and metallic surfaces should be coated with grease or similar to avoid excessive corrosion.
- New grease/corrosion protection fluid to be applied as necessary (at least annually).
- If the storage location is not fully closed to the environments, it should be evaluated to cover the equipment with a tarpaulin or similar.

5.3.2.2.9 Accumulator bottles

- Accumulator bottles should be preserved per manufacturer's recommendations. For longer storage periods, it should be evaluated to disassemble the accumulator bottles from the BOP-stack and store these separately.

5.3.2.2.10 Electrical equipment

- Guidance in [5.2.5] and [5.2.6] should be adhered to.
- Back-up of software should be available as relevant for computer-based control systems.

5.3.2.3 Riser joint assemblies

If storage time is expected to exceed 12 months, riser joint assemblies should generally be demobilized from the MOU and stored onshore.

- The equipment is to be cleaned of all grease and mud.
- Thorough visual inspection and gauging of each riser joint should be performed, with particular focus on corrosion and wear on sealing areas. The observations should be recorded.
- Unprotected steel and metallic surfaces should be coated with grease or similar to avoid excessive corrosion.
- New grease/corrosion protection fluid to be applied as necessary (at least annually).
- The riser joints should be capped in both ends of the main bore, choke and kill lines, booster line and hydraulic lines.
- If the storage location is not fully closed to the environments, it should be evaluated to cover the equipment with a tarpaulin or similar.
- If the storage time is expected to exceed 12 months, it should be evaluated to remove non-metallic seals and store these separately per manufacturer's recommendations.

5.3.3 Offshore cranes

5.3.3.1 General recommendations and guidelines

Preservation should be performed in accordance with manufacturer's instructions and approved procedures. It is highly recommended that methods, principles, records and checklist follow and are based on recognized standards, (e.g. NORSOK Standard Z-006 *Preservation*). If there are any special precautions that shall be considered for equipment preserved, they should be described and placed in the record of preservation.
It is recommended to protect all spaces containing machinery and sensitive equipment by the use of a dehumidified atmosphere with a relative humidity below 50%. This is particularly important for spaces containing sensitive electronic equipment. For such equipment additional protection by the use of vapor phase corrosion inhibitors or similar is recommended. During lay-up the crane's components and structures to be secured against unintentional movements.

5.3.3.2 Hydraulic and pneumatic systems

The following measures for hydraulic and pneumatic systems of offshore cranes are recommended:

- In general, fittings, pipes, hoses, motors, pumps, accumulators and cylinders should be preserved with clean, operational type hydraulic oil. Oil should be drained, and hydraulic system should be blinded. For cleanness of oil a flushing procedure to be applied, see manufacturer procedures and instructions.
- Hydraulic pipe and fittings of stainless steel: Spray with corrosion inhibitor as instructed by the manufacturer.
- Hydraulic fittings and hose fittings: to be wrapped with Denso tape. A self-vulcanizing rubber tape may also be used, after spraying with corrosion inhibitor.
- Hydraulic gear, gearboxes and swivels should be filled with oil type and quantity specified for the gear in lubrication chart during storage.
- For hydraulic cylinders, if stored with piston rod in exposed position, it should be preserved with a wax type preservative to avoid corrosion during preservation period. Furthermore, the piston rod should be packed in rubber protection. Ensure that the wax type preservative is not in any way aggressive to seal materials used on the cylinder (if in doubt, sealing should be covered with vulcanization tape). Preservation instructions and procedures from manufacturer to be applied.
- All inlets/outlets on equipment should be plugged or blinded. Threaded openings for fluid or pneumatic service should be plugged with threaded steel plugs. Flanged openings should be blinded with matching gaskets and blind flanges of the corresponding pipe class standard. Open ends of hoses and piping/tubing should be plugged or blind flanged.
- For equipment or pipe systems where water is used for pressure testing, the water should be mixed with a suitable vapor corrosion inhibitor and completely drained off and air-dried after testing to avoid corrosion during storage period. Immediately after drying, the openings should be sealed and blinded. All valves spindles exposed should be preserved with a wax type preservative to avoid corrosion during preservation period.

5.3.3.3 Equipment, structural and machinery parts

The following measures are recommended:

- Crane boom to be placed in cradle/boom rest support and cranes to be in parked positions.
- Exposed wire ropes, sheaves and blocks should be coated with preservative grease, and where possible, removed and stowed out of the weather.
- All loose gears to be stowed off the deck and stored in-door. Trolleys and hoist not in use should be dismounted and stored in-door.
- Shafts should be preserved with a wax type preservative to avoid corrosion during preservation period. Furthermore, the shafts should be packed in rubber protection.
- Door hinges and grease nipples should be lubricated to avoid corrosion during preservation period. (For lubricant information see instruction from manufacturer or user manual). Plastic plugs should be installed on grease nipples.

- Crane cabs to be secured and sealed and control positions covered and secured. Whenever possible, machinery house and crane cabinet should be dehumidified. Complete dehumidification at 35% to 55% RH is normally required to prevent sweating or equipment damage.
- It is important that structural parts are clean and without corrosion prior to preservation. Preservation labels should be provided.
- Glasses in instrument panels and windows in cabins should be covered (preferably with aluminum sheeted glass fiber cloth and plywood).
- Bearings should be lubricated in accordance with lubrication chart provided in user manual. The exposed visible surface of bearing ring should be protected/painted (do not blast with high pressure water, but clean gently with detergent and water at the outer surface only, before applying protection/painting).
- Manometers and gauges should be covered with plywood and aluminum sheeted glass fiber cloth.
- Machined surfaces for sliding movement, such as runway beams axles and tooth racks, should be coated with grease or a wax type preservative.
- Painted structural steel and other surfaces painted according to manufacturer procedures/instructions do not need additional preservation.
- Structural bolted joints, faying surfaces should be protected (coated with primer). This also includes the compressed area under bolting washers. If black unprotected bolts are used, the bolts should be painted/ protected.
- If necessary/applicable, all equipment should be protected against welding and grinding dust. (Spray with corrosion inhibitor or alternative equivalent product, and then cover with aluminum sheeted glass fiber cloth or similar fire resistant material.)

5.3.3.4 Electrical and electronic equipment

The following items with regard to electrical and electronic equipment are recommended in the preservation of offshore cranes:

- Electrical system should be protected against insulation deterioration, primarily from water ingress or moisture absorption, and the rotating elements protected against corrosion damage in the bearings.
- Crane controls and motors should be provided with heaters or desiccant.
- All closed cavities containing electrical and electronic components should be protected with vapor corrosion inhibitor. In addition, vapor corrosion inhibitor should be used in all closed cabinets/junction boxes.
- External surfaces of electric equipment should be covered with aluminum sheeted glass fiber cloth or similar fire resistant material.
- Cabinets/junction boxes should be covered with protective coatings, protective tape or aluminum foil. Volume of cabinets/junction boxes should be determinative for the amount of vapor corrosion inhibitors. (See instructions by supplier of vapor corrosion inhibitor).
- Switchboards and distribution panels should be protected against moisture absorption by use of heaters, dehumidifier or by sealing with desiccant inside.
- Natural ventilated cabinets should be preserved to avoid corrosion during preservation period, furthermore, cabinets should be covered with aluminum foil.
- Top/end (vertical/horizontal) of motor should be wrapped with stretch film. Stretch film containing corrosion inhibiting vapor emitter added by the stretch film manufacturer should be used.
- Electrical equipment insulation resistance should be measured according to IEC 61892-6 pt.6 *Mobile & fixed offshore units electrical installations*, or supplier's instructions.
- All non-terminated cable ends should be fitted with shrinking shroud.
- All unused openings should be plugged with a certified plug. Plastic plugs can be used if IP rating shall be maintained.
- All space/motor heaters on motors, generators, panels etc. should be energized.
- All electrical instruments and junction boxes should be enveloped with aluminum sheeted glass fiber cloth.
- Cabinets with ventilation should have temperature above 10 degrees centigrade with de-humidifier or suitable air drier installed. Max 55% RH.

5.4 Dry preservation

5.4.1 General

All provisions under [5.2] apply, except that the temperature in the engine room and other spaces need not be kept above the ambient temperature, but not below 0°C. Spaces, equipment and machinery should be protected by the use of a dehumidified atmosphere with a relative humidity below 50%. A safe method for keeping this atmosphere under control with regard to humidity should be established, and arrangements should be made to maintain the relative humidity below the given limit. For tropical areas the operational limits of condensation type dehumidifiers should not be higher than 40°C. The de-humidifiers should be protected against rains and heat. Cooling water should be drained from machinery. Dry lay-up of boilers and steam system to be applied.

5.4.2 Hull

5.4.2.1 Ballast tanks

Ballast tanks in use should have efficient corrosion protection with coating in a GOOD condition (see [5.2.1.4]) throughout. For ballast tanks not in use, a dehumidified atmosphere should be secured, and the tanks sealed off.

5.4.2.2 Cargo tanks, pump rooms, etc.

For cargo tanks and holds not in use for ballast purposes, for pump rooms, cofferdams and pipe tunnels, a dehumidified atmosphere should be secured, and the tanks/rooms sealed off.

5.4.2.3 Deck piping

Cargo oil pipes, deck steam pipes, butter-worth lines, heating coils, exhaust, water and air pipes and ballast lines not in use should be cleaned, well drained, and kept protected by a dehumidified atmosphere.

5.4.2.4 Deck machinery

Deck machinery which is not needed for instant operation should be protected by a dehumidified atmosphere.

5.4.2.5 Accommodation

Accommodation, including navigating bridge and radio room, should be protected by a dehumidified atmosphere. Parts of the accommodation in use may be held at a comfortable atmosphere with moderate relative humidity.

5.4.2.6 Engine and boiler rooms

Engine and boiler rooms should be protected by the use of a dehumidified atmosphere. Air supply to the engine room for possible working of combustion engines should be arranged in such a way that the dryness of the atmosphere is not influenced.

5.4.3 Machinery

5.4.3.1 Reciprocating machinery

Crank case should be protected by the use of a dehumidified atmosphere.

5.4.3.2 Turbine plant

5.4.3.2.1 Method I

The turbine is kept dry by a hot air system. The direction of flow should preferably be from below upwards. At the exit points the air temperature should be about 15°C above the ambient temperature. The inlet temperature should be up to approximately 80°C.

5.4.3.2.2 Method II

The turbine is kept dry by a flow of air which passes through an air-drier before it is injected. Inside this unit, the air is filtered and dried and the drying agent is regenerated. The relative humidity of the air leaving the turbine or present in the engine room should be as low as possible. A limit of 50% RH should on no account be exceeded.

5.4.3.3 Gears

The venting lines should be sealed. The formation of condensate in the gears should be prevented by repeated separation and circulation of the lubricating oil. Another possibility shall apply preservation methods no.I and no.II described under [5.4.3.2]. Where applicable, the formation of condensed water in the gear case should be monitored, first at short and later at longer intervals.

5.4.3.4 Fresh water systems

Cooling water systems on engines not in use should be emptied and dried. Care should be taken to remove all water from cooling spaces, and thorough ventilation with dehumidified air is required.

5.4.3.5 Starting air system

Starting air receivers should be kept empty, clean, dry and open to the dehumidified atmosphere in the engine room. At least one auxiliary starting air bottle should be kept fully charged to maintain auxiliary engines ready for start. It should be confirmed prior to lay-up that drains are clear. Air piping should be drained and dried out.

5.4.4 Boilers and steam system

5.4.4.1 Fire side

Arrangements should be made to circulate dehumidified air through the boiler and maintain a dehumidified atmosphere.

5.4.4.2 Water/steam side

Dry lay-up condition should be used. After careful draining, drying should be executed by circulating dehumidified air through the boiler and the steam system.

5.4.4.3 Steam system

The whole steam system should be preserved by means of dehumidified air. An arrangement combined with the boiler should be established.

5.4.5 Electrical installation

5.4.5.1 General

Local arrangements with dehumidified atmosphere should be established for components such as switchboards, starter boxes, instrumentation units etc. Regular control of relative humidity on components as well as regular change/reactivation of possible drying agents should be carried out.

5.4.5.2 Instrumentation and automation control room

Control room in engine room and other rooms containing sensitive electronic equipment should be protected by the use of a dehumidified atmosphere.

SECTION 6 GUIDANCE FOR CLEAN LAY-UP

6.1 Introduction

The recommendations as presented in this section aim specifically to protect local environment and the community.

6.2 Emergency preparedness

The vessel should have shore based assistance (e.g. emergency response service) maintained during the laid-up period. The shore based assistance should ensure a quick response in case of emergencies such as oil-spill, dragging of anchor, collision/grounding, fire on board. The status of water ballast and consumables remaining on board during the lay-up should be available. The documentation should be suitable to assist the captain in case of emergency, such as fire, grounding and collision. A mooring quick release procedure should be available. This procedure should include the release of all mooring lines and anchors in case of emergency. The procedure should also include the fastening of towing lines (forwards/aft) for tug boat assistance.

6.3 Procedures to prevent pollution

As a principle, discharge to the sea should not be permitted. This includes items such as deck drainage, leakage from the stern tube and bunkering procedures. In case of leakage or oil spill, anti-pollution procedures should be in place. This may be arranged by shore based assistance. Provisions for the reception of garbage, sewage, sludge and other waste to shore should be arranged.

6.4 Air and noise pollution

Any emission to air should be minimized as far as possible. Generators in use should comply with the MARPOL annex VI requirements for air emission. Any noise pollution should be limited. This applies mainly to portable deck generators. If deemed necessary noise measurements should be taken in the nearest residential areas. Alternatively, the noise emission from the sources may be measured and noise level in the most exposed residential area may be calculated. Measured or calculated noise levels shall be compared with the acceptable noise limits (see IMO Res-A.468 XII) and should not exceed 60 dB. Noise reducing measures should be carried out if found necessary.

6.5 Antifouling coating treatment and marine growth

Generally marine growth should not be removed at the lay-up site. If removal of excessive growth will be necessary upon re-commissioning only such methods which will not release any paint particles into the water are acceptable. These methods include flushing and other methods proven not to have any abrasive effect on the coating.

SECTION 7 GUIDANCE FOR RE-COMMISSIONING

7.1 General

In general both the duration of the lay-up and the preservation and maintenance carried out during the lay-up determine the extent of re-commissioning work required. Therefore, all preservation actions should be logged during lay-up. The log should include required actions for re-commissioning of each item in order to enable an orderly re-commissioning process. Classification requirements regarding re-commissioning are outlined in [8.2.4] of this document and may be more extensive than what is outlined in [7.2] below.

The following steps should be taken by the owner upon re-commissioning of a vessel:

— Notify local port authorities in the lay-up area.
— Notify the classification society and check which class requirements have to be fulfilled prior to leaving the lay-up site.
— Ensure that the safety equipment certificate and all other statutory certificates are valid.
— Re-commission the vessel, using vessel's crew or other competent personnel (preferably with guidance and attendance of local class surveyor).

Notwithstanding the preservation and maintenance carried out, damages and failures are often experienced during the re-commissioning. Characteristic types of damage are listed in App.C.

7.2 Practical procedures

All temporary arrangements or installations in connection with the lay-up should be removed, such as temporary drying, heating and ventilation systems as well as locking of valves or temporary anode installations. Necessary consideration should be given to protective oils or inhibitors applied, that they are either removed or that it is confirmed that they will not have harmful effects if remaining in the systems.

7.2.1 Hull

If the vessel has been laid-up for more than 12 months the submerged hull should be checked by a diver. The sea chests should either be confirmed free from excessive marine fouling, or such fouling should be removed. Anchoring and mooring equipment should be checked and operated.

7.2.2 Cargo tanks

Temporary anodes should be removed. Tanks which have been filled with water ballast containing corrosion inhibitor should be emptied and cleaned in accordance with manufacturer's instructions. All tanks should be well ventilated and proved gas-free. Heating coils should be blown through by steam or air. All other tank equipment should be checked and verified to remain efficient.

7.2.3 Safety equipment

All equipment should be checked to the satisfaction of relevant authorities. Particular attention should be given to emergency and firefighting systems.

7.2.4 Machinery

Samples of lube oil should be submitted for full analysis. All systems should be checked for completeness and sufficient operation. Representative samples of all fuel oils kept on board during lay-up (residual and distillates) should be taken and thoroughly analysed prior to use in diesel engines. Depending on lay-up location (climate) representative samples of residual fuels may not be possible until steam is available to heat up the fuels.

7.2.5 Boilers

All burners should be dismantled and cleaned. Fuel oil should be circulated through the oil burning system. All safety measures and emergency shut-off should be tested. Care should be taken to proceed slowly when raising steam production.

7.2.6 Main engines

If rust-prevented oil has been used, this should be removed in accordance with manufacture's recommendations. Cooling water for pistons and jackets should be circulated and checked for leakage. A complete survey of one cylinder unit with gear as well as two main bearings should be carried out to check condition of contact surfaces. Fuel valves should be cleaned and adjusted and the fuel system checked for leakage. Checking of crankshaft deflection should be considered.

7.2.7 Electrical equipment

All circuits should be checked for insulation resistance to earth.

7.2.8 Navigation

All navigation equipment should be verified to be in good order. All required charts and publications should be up to date.

7.2.9 Spare parts

Spare parts removed from the vessel during the lay-up period should be replenished.

7.2.10 Testing

Testing should include at least the following equipment:

- main engine safety alarms
- engine should be run ahead and astern by engine room and bridge controls, including testing of shut-down and slow-down functions
- auxiliary engines with connected automation equipment
- all pumping, pneumatic and hydraulic systems
- all alarms covering main engine, auxiliaries with steering gear
- remote operation of fuel oil and lube oil, pumps and valves
- cargo and ballast pumps
- bilge pumping systems
- all communication systems
- steering gear, including emergency operation
- all deck machinery and equipment
- all navigation and sounding lights and signals.

7.2.11 Antifouling coating system

All vessels will experience fouling during lay-up. The extent of the fouling is dependent on time, location and duration among other factors. Hence there can be a need to clean the hull prior to re-commissioning the vessel. It is advisable to contact the coating supplier for the best cleaning procedure. The most common in-water cleaning methods are rotating brushes or flushing. Brushing is mainly used on conventional antifouling coatings and hard coatings. Rotating brushes can damage and remove some of the antifouling coating.

Depending on the local environmental legislation, one may be required to get a permit to carry out this kind of work as coating fragments are released to the environment. Foul release coatings are typically less resistant to mechanical damage, hence they are not suitable for brushing. For foul release coatings the most suitable cleaning method seems to be flushing. It is not unlikely that during the lay-up and in particular during the cleaning operation, the coating is damaged to such an extent that re-application of antifouling coating in a dry-dock will be necessary.

7.3 MOU systems

7.3.1 Drilling equipment re-commissioning

Relevant inspections, repairs and testing should be performed at the end of the storage period. These typically includes:

— visual inspection
— function testing
— test of safety functions
— preservation fluid should be flushed out of hydraulic systems and new hydraulic fluid re-filled
— pressure testing to work pressure of piping systems and pressure containing equipment.

For classification requirement regarding re-commissioning, see [9.2.4].

7.3.2 Elevating systems and cantilever hold downs

In addition to [7.3.1], the following should be carried out prior to the system is back to operation:

— Confirm condition of support structure including jack cases, hold downs, gear foundations, and guides.
— Visual inspection of elevating and skidding systems for damage and missing components.
— Renew lubricants as found necessary.
— Confirm integrity of electrical power systems.
— Inspection of braking mechanisms for moisture damage.
— Confirm integrity and operation of jacking and skidding sensors and control systems, including any computer controlled systems and associated software.
— Visual inspection of leg fixation systems and secondary locking devices, including rams, chocks, and other locking mechanisms.
— Testing of hydraulic power units.
— Testing of individual operation of brake release mechanisms and that gear trains move freely.
— Testing of operation of leg fixation systems and secondary locking devices.
— Testing of jacking and skidding systems in both directions.

SECTION 8 STATEMENT OF COMPLIANCE FOR LAY-UP SERVICE PROVIDERS

8.1 General

8.1.1 Introduction

For professional lay-up service companies which carry out lay-up service on behalf of vessel owner at a certain lay-up site, a statement of compliance can be issued provided that:

— lay-up site has been evaluated and found to be safe for the intended vessel lay-up
— operational practice of service provider has been reviewed and found to be in accordance with the principal of this document
— management system of the service provider has been assessed according to ISO 9000 standard or is based on the requirements described in this section.

8.1.2 Scope

The assessment program encompasses the service supplier's quality system for training and supervision of personnel being involved in providing lay-up service.

8.1.3 Objective

The programme is set to ensure that the service supplier is employing duly qualified personnel when conducting lay-up service according to the practice of this guideline.

8.1.4 Validity

The statement of compliance is valid for two (2) years (see [8.4]).

8.2 Requirements for the supplier

A statement of compliance will be awarded and maintained on the basis of compliance with the following:

8.2.1 Submission of documents

The following documents shall be submitted for review:

— An outline of the supplier's organisation and management structure, including any subsidiaries to be included in the assessment.
— A list of nominated agents.
— Experience of the supplier in the specific service area.
— A list of technicians and supervisors.
— Records of training and experience, including qualifications, of relevant personnel.
— Description of equipment used for performing lay-up service.
— A guide for operators of such equipment.
— Training programmes for technicians and supervisors.
— Procedures, instructions and checklists as specified in [8.3.8].
— Quality manual and/or documented procedures.
— Evidence of approval/acceptance by other certification bodies, if any.
— Information on other activities which may present a conflict of interest.

— Record of customer claims and corrective actions requested by DNV GL and/or other certification bodies.
— Documentation/evidence that the supplier has been authorised or licensed by port authority.

8.2.2 Extent of approval

The service supplier shall demonstrate, as required in [8.3.1] to [8.3.10], that the competence and control needed to perform the service has been implemented.

8.3 Quality assurance system

8.3.1 Requirements to the quality system

A documented quality assurance system complying with the most current version of ISO 9000 series and including the items given in this section [8.3], shall be considered acceptable. The supplier shall have a documented quality assurance system, covering at least:

— maintenance and calibration of the equipment
— training programmes for the supervisors and the technicians
— supervision and verification of operation to ensure compliance with the approved operational procedures
— quality management of subsidiaries and agents
— job preparation
— recording and reporting of information
— code of conduct for the activity
— periodic review of work process procedures, complaints, corrective actions, issuance, maintenance and
— control of documents.

8.3.2 Training of personnel

The supplier is responsible for the qualification and training of its supervisors and technicians as applicable (see [8.3.3] and [8.3.4].

8.3.3 Supervisor

The supplier shall have a supervisor responsible for the correct execution of annual surveys on board and for the professional standard of the technicians and their equipment as well as for the professional administration of the working procedures. The supervisor shall have passed the internal training as specified in the training programme and shall have minimum two (2) years education from a technical school and have minimum two (2) years experience as a commission/installation technician or equivalent experience.

8.3.4 Technicians

The technician carrying out the annual performance test shall have passed the internal training as specified in the training programme and have at least one (1) year's technical school in addition to at least one (1) year experience as a commission/installation technician.

8.3.5 Personnel records

The service supplier is required to keep records of approved supervisor/technicians. The record shall contain information on age, formal education, training and experience for the service.

8.3.6 Equipment

The service supplier shall have all the necessary equipment and facilities for the service. A record of the equipment used shall be kept. The record shall contain information on maintenance and date of calibrations as relevant.

8.3.7 Administrative procedures

The service supplier shall have an order reference system where each engagement is traceable to the service record/report.

8.3.8 Procedures and instructions

The service supplier shall have documented procedures, instructions and checklists stating how to carry out the service.

8.3.9 Verification

The service supplier shall have a system for monitoring that the services provided are carried out in accordance with approved procedures.

8.3.10 Sub-contractors

If any parts of the service shall be subcontracted, DNV GL shall receive information about such agreements and arrangements without delay. Subcontractors are subject to the requirements specified in this programme.

8.4 Approval procedures

8.4.1 Initial audit

The DNV GL surveyor will carry out an audit of the service supplier once all documentation and information received have been evaluated.

8.4.2 Renewal audit

Renewal of the statement shall be made at intervals not exceeding 2 years. Verification shall be through audits confirming, or otherwise, those approved conditions are being maintained. Annual audits may be required if found necessary by DNV GL. At least three months before the statement expires, the supplier shall apply to DNV GL for renewal of the statement.

8.5 Information of alteration to the certified service operation system

In case of any alteration to the service operation system of the supplier, then such alteration shall be reported immediately DNV GL. A re-audit may be required when deemed necessary by DNV GL.

8.6 Cancellation of the statement of compliance

8.6.1 Right to cancel

DNV GL reserves the right to cancel the statement in the following cases:

— Where the service was improperly carried out.
— Where a surveyor finds deficiencies in the approval of the service operation system of the supplier and appropriate corrective action is not taken.
— Where the supplier fails to inform of any alteration, as given in [8.5].
— Where renewal audits, as described in [8.4.2], have not been completed to DNV GL's satisfaction.
— Where willful violations or omissions are identified.

8.6.2 Information

DNV GL reserves the right to inform interested parties about the cancellation of Statement of Compliance.

8.6.3 Re-evaluation

A supplier whose statement has been cancelled may apply for re-evaluation after a period of six (6) months. Re-evaluation is not allowed if the cancellation was based on a grave violation, such as a violation of ethics.

SECTION 9 RULES AND REGULATIONS

9.1 Introduction

The requirements below provide an overview of the relevant DNV GL Rules for classification, statutory requirements and other governing regulations related to the lay-up of vessels.

9.2 Classification

9.2.1 General

Apart from the procedural requirements as listed below, it is underlined that classification does not prescribe specific maintenance and preservation for lay-up vessels.

Table 9-1 DNV GL procedural requirements for vessel lay-up

DNV GL rules for classification: Ships	DNVGL-RU-SHIP Pt.7 Ch.1 *Survey requirements for fleet in service*
DNV GL rules for classification: Offshore units	DNVGL-RU-OU-0101 *Offshore drilling and support units* DNVGL-RU-OU-0102 *Floating production, storage and loading units* DNVGL-RU-OU-0103 *Floating LNG/LPG production, storage and loading units* DNVGL-RU-OU-0104 *Self-elevating units, including wind turbine installation units and liftboats*

9.2.2 Entering lay-up condition

Owner shall notify DNV GL when the vessel is laid-up or otherwise taken out of service for a period of more than 3 months. A written notification by e-mail will be sufficient for DNV GL to change the status of the vessel to laid-up.

9.2.3 Surveys during lay-up condition

During lay-up, vessels shall be subjected to annual survey. The extent of the annual survey will be reduced compared to main class annual survey, but shall cover watertight integrity, bilge system, fire hazard and equipment in use. The following surveys apply for laid-up vessels laid classed with the Society:

1) Annual survey of laid-up vessel will be carried out at required intervals. Vessels manned during lay-up shall comply with class requirements regarding fire safety. The requirements may be limited to engine room areas and any high risk area in use, assuming vessels are laid-up in ballast condition and that the cargo area is clean and gas free.
2) Prolonged survey intervals may be applied to vessels being laid-up directly after completion of construction.
3) Maintenance and preservation during the lay-up period is not a class requirement, but will affect the scope of the re-commissioning survey. If during the lay-up period the vessel has been preserved and maintained according to a program accepted by the Society, the scope of the re-commissioning survey will be specially considered. For maintenance and preservation see Sec.4.
4) There is no time limit for how long a vessel can be laid-up provided the required surveys as above are carried out.

9.2.4 Re-commissioning

9.2.4.1 General

Re-commissioning survey of laid-up vessel will depend upon several factors such as time in lay-up, maintenance and preservative measures taken during lay-up, survey status at the time of re-commissioning, the reason for re-commissioning, the type and age of vessel. Approved survey arrangements need to be considered in each case e.g. PMS, offshore CM and PMS RCM.

9.2.4.2 Vessels laid-up for less than 12 months

Such vessels are considered as having traded continuously by the Society, i.e. being preserved like under normal operating conditions. In such case only overdue surveys shall be carried out during re-commissioning. For vessels not preserved, a sighting survey may be required. Function testing to be considered

9.2.4.3 Vessels laid-up for more than 12 months

Ships which have been out of commission, e.g. laid-up, for a period of at least 12 months, shall be surveyed and tested before re-entering service. The extent of the surveys and tests will be considered in each case depending upon:

— the time the ship has been out of commission
— the maintenance and preservative measures taken during lay-up
— the extent of surveys carried out during the time out of commission.

As a minimum, a sea trial for function testing of the machinery installation shall be carried out. All overdue surveys shall be completed prior to re-entering service. No maintenance or preservation is required, but if carried out, the scope of the re-commissioning survey will be specially considered. The scope of the re-commissioning survey may be increased if deemed necessary by the attending surveyor (e.g. in case of longer lay-up periods with no preservation or maintenance).

9.2.5 Prolonged survey intervals for MOU's going into lay-up

For mobile offshore units classed with DNV GL and which are going to lay-up for shorter or longer periods, the survey intervals will normally continue to run during the lay-up period. Since degradation of hull and equipment will progress also when the vessel is in lay-up mode. It may however be possible to prolong the time between consecutive surveys if sufficient preservation and maintenance is carried out to minimize deterioration of the vessel, its systems and equipment. The total time in actual operation shall however not exceed 5 years between consecutive surveys. Following requirement to be met in order for the vessel to be qualified for the prolonged survey intervals:

— Units are laid up for up to 36 months.
— Units are properly preserved. Preservation plan shall be reviewed, surveyed and accepted by DNV GL. As an alternative, vessel has a lay-up preservation declaration accepted by class.

Respective flag administration shall be contacted to seek acceptance for prolonging survey intervals with regard to validity of statutory certificates and if any additional lay-up or re-commissioning requirements are applicable. The scope of class annual survey laid up vessel will include a review of the vessel maintenance and preservation record and a check that the preservation measures taken are working as intended.

Upon completion of the lay-up period, all outstanding class and statutory surveys should be carried out to meet class requirements before the vessel returns to normal operation. In order to prolong the survey interval, a scope of survey shall be determined for each re-commissioning. This scope will, as a minimum, be equivalent to the scope of an annual survey. However all elements of a renewal survey shall be considered. The principle is that consideration will be given for effective preservation measures, taking into account:

— The condition at the time of re-commissioning.
— The class survey status at the time of lay-up.
— The age of the vessel.

— The length of the lay-up.
— The quality and effectiveness of the preservation measures.

The re-commissioning is expected to cover:

— A sighting survey of all areas/systems to confirm that the unit is not negatively affected by the lay-up.
— Visual inspection.
— Function testing.
— Test of safety functions.
— Pressure testing to working pressure of piping systems and pressure containers.
— Load test to SWL of lifting equipment and life boats.

In addition:

— Any systems which have been dismantled during lay-up shall be re-commissioned and tested as if new. Systems which have been preserved during lay-up shall be function tested and witnessed by DNV GL surveyor.
— Overload-testing, over-pressure testing and NDT is only required if this is included in the scope of the overdue survey to be carried out. All re-commissioning plans provided by the owner at the commencement of the lay-up are expected to be followed.

For systems or equipment which are dismantled and stored in warehouse, prolonged survey interval might be accepted provided:

— The system or equipment are dismantled and stored for a period up to 36 months.
— The system or equipment have been properly preserved. A preservation plan shall be reviewed and accepted by class. As an alternative the system or equipment may have a preservation declaration accepted by class.
— Re-commissioning survey confirms that no degradation has occurred during the storage period.

For equipment which is certified by a 3rd party such as fall or crane wires, life rafts, fire extinguishers etc., normal survey/service intervals are expected to be followed during lay-up if the equipment is maintained in service. Otherwise it is expected that any expired certifications are renewed during the re-commissioning. Deviations from this shall be specially considered by the surveyor and/or the flag. Following documents to be submitted:

— preservation plan
— preservation records
— maintenance plan
— maintenance records (at annual survey laid-up vessel)
— re-commissioning plan (at re-commissioning).

9.2.6 Newbuild vessels going to lay-up

Three different lay-up scenarios are described below.

9.2.6.1 Scenario 1: late/delayed delivery of newbuildings

In this situation, the yard or owner decides to put an uncompleted newbuilding into lay-up before delivery, or the vessel is not immediately commissioned upon completion of construction. There is no limitation to how long a vessel can be laid up before the commissioning/delivery. For the late/delayed delivery of newbuildings, all scopes of the survey from DNV GL will be completed to the greatest possible extent. A statement of completion may be issued, with all outstanding items outlined. The vessel will then be subject to a commissioning survey before entering into service:

— The scope of the commissioning survey shall be assessed case by case based on the length of the lay-up period and how effective the preservation of the vessel and equipment has been.
— Everything not covered during the newbuild phase has to be carried out before the vessel goes into operation.

— Provided satisfactory completion of the commissioning survey, subsequent periodical surveys will date from the time of the commissioning survey.
— The delivery date of the vessel will be the date when the commissioning survey is completed and the class certificate is issued.

Note:

The newbuilding vessel will formally be under the control of a newbuilding station or project manager (PM). A class status will not be created for the vessel, and no due dates will be assigned.

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9.2.6.2 Scenario 2: late commissioning

In this situation, the yard may not have been able to hand over the vessel with class certificates to the owner. The vessel is therefore not immediately delivered to the owner upon completion of the construction, but is laid up for a period of time. There is no limitation for how long the vessel can be laid up before the commissioning/delivery. As a result, DNV GL will issue interim class certificates for a vessel to the yard. When all scopes of the survey have been completed, an interim class certificate will be issued to the yard. The delivery date of the vessel is then the date on which the interim class certificate was issued to the yard. When the owner applies for entry into service, the vessel will be subject to a commissioning survey:

— The scope of the commissioning survey shall be assessed case by case based on the length of the lay-up period and how effective the preservation of the vessel and equipment has been.
— The yard may request the vessel to be recorded as laid-up.
— Provided the satisfactory completion of the commissioning survey, subsequent periodical surveys will date from the time of the commissioning survey.
— If the out-of-commission or lay-up period is more than one year, an annual condition survey should be carried out to confirm the vessel's condition.

9.2.6.3 Scenario 3: prolonged survey

In this situation, the yard has delivered the vessel to the owner and the owner has decided to put the vessel directly into lay-up, without having traded it. There is no limitation as to how long the vessel can be laid up after delivery, and the date of delivery will remain the original date. Because the vessel is delivered, DNV GL will issue class certificates for the vessel to the yard. Prolonged survey intervals may be applied to vessels that are laid up directly after completion of construction. When the owner applies for entry into service, the vessel will be subject to a commissioning survey:

— The scope of the commissioning survey shall be assessed case by case based on the length of the lay-up period and the effectiveness of the preservation of the vessel and equipment.
— Provided the satisfactory completion of the commissioning survey, subsequent periodical surveys will date from the time of the commissioning survey.
— If the lay-up period is more than one year, an annual condition survey will be carried out to confirm the vessel's condition as part of the annual survey for laid-up vessels.
— Flag to be consulted for statutory surveys.

9.3 ISM and ISPS

9.3.1 ISM

If the vessel has been laid-up more than 6 months the SMC becomes invalid. An interim verification audit will be required upon re-commissioning, with the vessel being treated as a new vessel to the company. Upon successful completion of the verification, an interim SMC will be issued. If the lay-up period is less than 6 months, but periodical audit window has expired during lay-up, the certificate will be considered invalid. The vessel will then be required to undergo interim verification upon re- commissioning. If the interruption period of the SMS on board the ship is more than three months but less than six months, then the flag state administration may require an additional audit, in which case the flag state administration will issue the instructions. Upon satisfactory completion of the additional verification, the existing SMC shall be

endorsed. If the flag state administration has issued any instructions in this respect, they will override these requirements.

9.3.2 ISPS

If the vessel has been laid-up more than 6 months the ISSC becomes invalid. An interim verification audit will be required upon re-commissioning, with the vessel being treated as a new vessel to the company. Re-approval of SSP may be required. Upon successful completion of the verification, an interim ISSC will be issued. If the lay-up period is less than 6 months, but periodical audit window has expired during lay-up, the certificate will be considered invalid. The vessel will then be required to undergo interim verification upon re-commissioning. If the vessel has been laid-up less than 6 months and the periodical audit window has not expired the certificate will still be valid. If the flag state administration has issued any instructions in this respect, they will override these requirements.

9.4 Flag administration and port authorities

9.4.1 General

Owner should notify the flag administration when the vessel is laid-up or otherwise taken out of service for a prolonged period of unemployment. Most flag administrations require an official notification with date and location of lay-up, so that the status of lay-up can be registered. Flag administration requirements for lay-up vary from notification only to more detailed documentation of the lay-up condition. For example, Hong Kong flag requires a copy of a lay-up survey report with the purpose of confirming that the quality of the vessel is maintained during the lay-up period. Another example is Liberian flag which requires vessel operators to submit a lay-up plan including lay-up procedures, proposed manning level, emergency response, etc. for short term lay-up. It is therefore important to consult the relevant flag administration and check relevant flag requirements prior to entering lay-up.

9.4.2 Safe manning

While the safe manning certificate sets the criteria for safe manning at all times for vessels in operations, there are no requirements which require minimum manning levels while vessels are within port limits, alongside or safely at anchor. For hot lay-up, flag administrations may authorize the vessel to have reduced crews depending on the requirements of the local port authorities. Since requirements vary from port to port, it is recommended to forward a lay-up plan for evaluation and authorization including:

— lay-up procedures
— proposed manning level
— emergency response (fire, collisions, pollution, hurricanes, floods, etc.)
— navigation watches (if at anchor)
— security plan
— completing class surveys and audits
— procedures for re-commissioning.

The following example given by the Liberian flag administration requires such a lay-up plan: at anchor or moored and required to get underway in an emergency, or when directed by the port authorities, the vessel should have the following navigation crew:

— 1 master, 1 mate, 1 ABS, 2 OS.

The following engineering crew if E0 certified:

— One chief engineer or second engineer.
— Two engine ratings, 1 of which will be an oiler.

For example, a vessel hot laid-up, safely moored alongside, may be allowed by the port authorities to reduce the crew to watch and minimum engineering crew only. In such a case the Society will issue a condition of authorities (CA) stating that the safe manning shall be re-instated before leaving port. Safe manning is a flag state responsibility, but as a general guideline the following may be considered sufficient for hot lay-up where the vessel may be required to get underway in an emergency, or when required by port authorities:

— 1 master, 1 deck officer, 3 deck crew.
— 1 chief engineer, 2 engineering crew.
— Sufficient crew to maintain all safety functions, i.e. explosion prevention etc.

For cold lay-ups the vessel should have at least fire, leakage, mooring and security watch. It is recommended that the owner seeks guidance from the vessel's flag state, insurer and local port authorities to agree the final manning levels onboard during cold lay-up.

SECTION 10 INSURANCE

10.1 Insurance

The relevant hull and machinery leading underwriter and the P&I club should be consulted for guidance and recommendations prior to sending a vessel in lay-up. A change from normal operation into lay-up implies reduced attention from class, flag, other authorities etc. In addition, changed maintenance and preservation strategy and most important, the permanent mooring close to shore may be considered by insurance as an alteration of the risk or warranty which means the changes should be explained and agreed before the insurance covers can continue.

It is a requirement on most insurance conditions that a lay-up plan is submitted to the lead H&M Insurer for information and approval. The lay-up plan should in general and as a minimum give description of where the vessel shall be laid-up, the mooring/anchoring arrangement and plans for supervision and manning. Once the lay-up plan is presented and cover agreed, the lay-up plan becomes part of the insurance conditions.

If changes are made to the lay-up plan during the lay-up, such changes shall be advised the insurers. It should be further noted that a change of the class status from in operation to laid-up in itself does not serve as a lay-up plan without further documentation as mentioned above. It is in addition considered of importance that maintenance and preservation is carried out in a planned way. The extent of maintenance and preservation is not a direct requirement for insurance, but what is done and planned for should be monitored and logged for documentation if any future breakdown or damage should occur. Such logging of maintenance and preservation activity will also have an important impact on the extent of re-commissioning work required by class and on the insurance conditions when the vessel goes back into operation.

Provided that the H&M conditions have not been agreed on a cancelling return only (CRO) basis, the owners of the vessel may have a right to negotiate a reduction of the premium for the time the vessel is laid-up. The reduction will depend on the change of the risk exposure, hot or cold lay-up and individual assessment of each vessel and/or lay-up. The P&I coverage may also vary by the individual P&I clubs, but a general requirement is that no cargo is allowed on board and that all tanks and spaces for cargo are in a clean and gas-free condition. Owners can, as for H&M, apply for lay-up returns for the idling period. A letter from the P&I club will normally be required by the local port authorities where the vessel is laid-up for confirmation that the laid-up vessel is covered for port risks, e.g. oil pollution, wreck removal, salvage costs etc.

APPENDIX A LAY-UP CONSIDERATIONS

Table A-1 Summary of lay-up considerations for ships

		Hot lay-up	*Cold lay-up*	*Comments*
Class requirement	Class status	Change status to: laid-up	Change status to: laid-up	
	Class attendance	Next annual survey of laid-up vessel	Annual survey of laid-up vessel	
	ISM and ISPS	Suspended after 6 month, interim audit needed	Suspended after 6 month, interim audit needed	
	Fire safety	As in operation, may be limited to E/R and high risk areas	low probability, but high consequence due to low manning	
	Lifesaving appliances	As in operation, may reduce due to reduced manning	Operational for lay- up personnel	
Other stakeholder's requirements	Insurance	Port risk only. Lay-up return may apply.	Port risk only. Lay-up return may apply.	
	Flag	Flag requirement for lay-up	Flag requirement for lay-up	
Guidance only	Manning	Engineering and navigation officers	Fire, leakage, mooring and security watch	Flag and local port authorities may have additional requirements
	Lay-up declaration	To be considered	To be considered	Applicable for lay-up returns/reduced insurance
	Clean lay-up declaration	To be considered	To be considered	Applicable for lay-up at environment sensible areas
	Preservation declaration	To be considered	To be considered	May be reflected in a reduced re-commissioning scope for DNV GL classed vessels. May have positive effect on insurance own risk.
	Re-commissioning period (approx.)	1 week- 1 month	1 month - 3 months	Depending on preservation and maintenance level

Table A-2 Summary of additional lay-up considerations for MOUs

		Hot lay-up	*Cold lay-up*	*Comments*
Class requirement	Lay-up period (approx.)	Normally less than 12 month	Normally more than 12 months	
	Prolonged survey intervals	Can apply for up to 36 month lay-up	Can apply for up to 36 month lay-up	Vessel to be well preserved and maintained during lay-up. Scope of re-commissioning to be agreed.
	Class attendance	Annual survey of laid-up vessel scope may be larger than for cold lay-up	Annual survey of laid-up vessel	For prolonged survey intervals, the annual survey scope may be extended
	Re-commissioning	Overdue surveys and necessary testing/sea trial. Re-commissioning scope to be agreed. Scope normally less than for cold lay-up.	Overdue surveys and necessary testing/sea trial. Re-commissioning scope to be agreed.	For prolonged survey intervals: re-commissioning scope to be agreed, considering preservation, maintenance and actual condition

APPENDIX B SUMMARY OF VESSEL TYPE LAY-UP CONSIDERATIONS

Table B-1 Summary of vessel type lay-up considerations

	Preparation of lay-up	*Lay-up*	*Re-commissioning*
Tanker	Gas free, especially for cargo tanks, slop tanks, pump room, cofferdams and cargo pipes. Cargo residues remaining in cargo tank should be properly cleaned to avoid corrosion. Maintaining oil major vetting status should be considered during planning. See [4.5].	Cargo Tanks to be kept either full or empty - dry. Inhibitors and anodes should be used if the cargo tanks are kept full. Cargo tanks should be either gas free and frequently monitored or inerted. See [4.5].	
Bulk carrier		It is preferably to have ballast holds fully ballasted to keep the draft and reduce wind load. See [4.3].	
Containership	Extreme rolling may happen in light/ballast condition of container ships during transit to and from lay-up site. Sea state limitations should be calculated and included in the lay-up plan to avoid such extreme rolling. See [4.8].		Extreme rolling may happen in light/ballast condition of container ships during transit to and from lay-up site. Sea state limitations should be calculated and included in the lay-up plan to avoid such extreme rolling. See [4.8].
Gas carrier		Particular attention to large sea openings of sea water coolers and condensers, if left open, the seawater connections should be blanked off. See [4.5.4].	
Offshore support vessels		Particular attention to be given to DP control system. It is recommended to have power on the system during the laid up period.	
Semi-submersible mobile offshore unit and FPSO	Certain drilling or subsea equipment can be taken on shore and properly stored in an enclosed environment.	Fairleads and winches used for mooring should be inspected regularly to ensure the mooring is secured. Enough bottom clearance to be given to avoid possible contact of thruster with sea bed.	It is recommended that at least one offshore crane to be kept in good condition and well maintained for easy re-commissioning.

	Preparation of lay-up	*Lay-up*	*Re-commissioning*
Jack-up	For a self-elevated unit, a site specific assessment including soil analysis, footprint analysis, leg penetration assessment and fixity assessment should be carried out.		

APPENDIX C SUMMARY OF POSSIBLE TYPES OF DAMAGES

The following types of damage are characteristic of laid-up or re-commissioned vessels:

— Corrosion damage to liners, pistons, piston rings, gears and crankpins.
— Oxidation of generator circuit-breakers.
— Inter-turn short-circuiting of solenoid coils.
— Oxidation of relays.
— Malfunctions of measurement transducers.
— Corrosion of valve spindles in lines carrying seawater.
— Leakage at brazed joints of pipelines.
— Extensive corrosion of seawater lines.
— Corrosion damage to the impellers, housing, seals and bearings of pumps.
— Embrittlement of plastic pipes (drinking water and pneumatic control system).
— Extensive corrosion of propeller.
— Corrosion of empty ballast tanks.
— Corrosion of hull below water line.
— Organic incrustation of hull below water line.
— Heavy internal rusting of the gears of winches and deck cranes.
— Swelling of timber decks in external areas and accommodation spaces.
— Rotting inside accommodation spaces.
— Corrosion of deck plates with standing water.
— Corrosion of lower hull not protected by anodes in transit draft, in particular special areas.

APPENDIX D WATCH OR INSPECTION ROUTINES

Watch/inspection routines should include, but are not limited to:

Frequent checks:

— moorings and fenders
— draining water from fuel tanks
— anchor/vessel position
— embarkation arrangements
— external hull/piping/deck coatings
— general visible corrosion
— lighting systems
— bilge levels
— oil levels of header tanks and machinery sumps
— tank soundings
— leaks in piping systems and header tanks
— sealing arrangements of spaces (for humidity control)
— batteries i.e. charging meters.

Measurement checks:

— humidity levels
— electrical insulation tests
— batteries
— oil analysis
— corrosion inhibitor residual.

Function checks:

— communication systems
— bilge alarms
— fire alarms
— fire pumps
— emergency lighting systems
— fire flaps.

APPENDIX E REQUEST FOR DECLARATION

E.1 Request form

DNV·GL

REQUEST FOR DECLARATION REGARDING LAY-UP VESSELS

Date of issue:
(yyyy-mm-dd)

Particulars of Vessel

Name of Vessel: "_____"
Signal Letters: _____
Port of Registry: _____
Gross Tonnage: _____
Deadweight: _____
Type of Ship: _____
IMO Number: _____
Owner: _____
Manager: _____

Lay-up information

Date of Lay-up: _____
Lay-up location: _____
Water depth on location: _____
Manning/Watchkeeping: _____
Draught fwd: _____
Draught aft: _____
Mooring arrangement: _____

The vessel is moored in block with:
Name of Vessel on Port Side: "_____"
Name of Vessel on Stbd Side: "_____"

Documents to be submitted for review (For Information)

- General arrangement plan (if not classed by DNV GL)
- Ballasting and draught for the vessel in the proposed lay-up condition.
- Area chart with indication of vessel location.
- Expected statistical weather conditions.
- Chart showing depth curves and bottom soil conditions.
- Security arrangements and procedures.
- Proposed position and heading of vessel.
- Planned manning and watch-keeping.
- Mooring arrangement:
  - number of anchors and length of chain cables to be used.
  - proposed mooring pattern.
  - chart indicating bollard position, bollard capacity and individual distances between bollards ashore if applicable.
- Emergency contingency plan.
- Anti-pollution measures.

Date of issue: **(yyyy-mm-dd)**

Place: **(place)** Date: **(yyyy-mm-dd)**

Authorized signature

(name)
(title)

This form is to be filled out by the owner's representative and sent to DNV GL Maritime Advisory MRNNO332

LCM@dnvgl.com

CHANGES – HISTORIC

There are currently no historical changes for this document.

DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our 16 000 professionals are dedicated to helping our customers make the world safer, smarter and greener.

SAFER, SMARTER, GREENER