



**財團法人驗船中心**

CR CLASSIFICATION SOCIETY

**GUIDELINES FOR LAY-UP OF SHIPS**

**CR CLASSIFICATION SOCIETY**

*April 2016*



## **REVISION HISTORY**

( This version supersedes all previous ones. )

Revision No.	Editor	Date (yyyy-mm )
001	Rules Section	2016-04

# GUIDELINES FOR LAY-UP OF SHIPS

## CONTENTS

<b>CHAPTER 1</b>	<b>GENERAL.....</b>	<b>1</b>
1.1	General.....	1
1.2	Requirements for Lay-up .....	2
<b>CHAPTER 2</b>	<b>REQUIREMENTS FOR PRESERVATION.....</b>	<b>5</b>
2.1	General.....	5
2.2	Preservation for Hull.....	5
2.3	Preservation for Machinery.....	6
2.4	Preservation for Eletrical Installation .....	7
<b>CHAPTER 3</b>	<b>SURVEYS.....</b>	<b>9</b>
3.1	Lay-up Surveys .....	9
3.2	Re-commissioning Survey .....	9

## CHAPTER 1 GENERAL

### 1.1 General

#### 1.1.1 General principles for lay-up

A ship put out of commission for a certain period may be subject to specific requirements for maintenance of class, as specified below, provided that the Owner notifies CR Classification Society (hereinafter referred to as "the Society") of the fact. If the Owner is to submit a lay-up scheme to the Society for review, the normal survey requirements may no longer apply to the laid-up ship. Where the Owner does not notify the Society of the lay-up of the ship or does not implement the lay-up scheme, the ship's class may be suspended and/or withdrawn when the due surveys are not carried out by the validate date on the Certificate of Classification.

#### 1.1.2 Lay-up scheme

The lay-up scheme provides for a "Initial lay-up survey" to be performed at the beginning of lay-up and subsequent "annual lay-up surveys" and "renewal lay-up survey" to be performed in lieu of the normal annual surveys and special surveys as long as the ship remains laid-up. The minimum content of the lay-up scheme as well as the scope of these surveys are given in 1.2, chapter 2 and 3.

The other periodical surveys which become overdue during the lay-up period may be postponed until the re-commissioning of the ship. Where the ship has a reviewed lay-up scheme and its period of class expires, the period of class is extended until it is re-commissioned, subject to the satisfactory completion of the annual lay-up surveys and the renewal lay-up survey as described in 3.1.2 and 3.1.3.

Documents of the lay-up scheme submitted to the Society for review shall at least include following:

- (a) Preservation measures and maintenance plan for hull, machinery and electrical installaion
- (b) Lay-up site and mooring arrangement
- (c) Fire protection and firefighting installation
- (d) Protection against explosion
- (e) Lay-up manning and security plan
- (f) Safety equipment
- (g) Power availability and emergency power

#### 1.1.3 Re-commissioning

The surveys carried out during the lay-up period may be credited, either wholly or in part, at the discretion of the Society, having particular regard to their extent and dates. These surveys will be taken into account for the determination of the extent of surveys required for the re-commissioning of the ship and/or the expiry dates of the next periodical surveys of the same type. When a ship intends to re-commissioning, the Owner is to notify the Society and make provisions for the ship to be submitted to the re-commissioning survey. The scope of survey depending on the duration of the lay-up period is to be determined prior to the commencement of re-commissioning survey.

Where the previous period of class expired before the re-commissioning and was extended as stated in 1.1.2, a complete class renewal survey is included in re-commissioning survey and to be carried out prior to re-commissioning. Those items which have been surveyed in compliance with the class renewal survey requirements during the 15 months

preceding the re-commissioning may be credited. A new period of class is assigned from the completion of the re-commissioning survey.

## **1.2 Requirements for Lay-up**

### 1.2.1 General

In order to maintain its class during a normal operation period, a ship is to be submitted to the surveys described in Part I of CR Rules for Steel Ships at their due dates and to the satisfaction of the Society, and is to be free of overdue surveys and conditions of class during the considered period. When a ship stops trading and is put out of commission for a certain period, i.e. is laid-up, the normal survey requirements may no longer apply provided that the Owner notifies the Society of this fact.

The choice and suitability of the lay-up site, the type of mooring conditions, the mooring arrangements and their efficiency, power availability, lay-up manning, fire protection and safety equipment during the lay-up period remain the responsibility of the Owner. However, at the Owner's request, the mooring arrangement may be reviewed by the Society.

### 1.2.2 Lay-up site

The following recommendations are to be considered by Owners regarding the choice and suitability of the lay-up site. The site should be:

- sheltered from open sea, strong currents and waves
- not exposed to whirling winds or turbulent tidal waves
- not exposed to moving ice
- clear of corrosive waste waters
- provided with adequate ship/shore communications.

### 1.2.3 Mooring arrangements

The following recommendations are to be considered by Owners with respect to the mooring arrangements:

- ground holding should be adequate
- vessels laid-up to buoys or anchored should be moored in such a way as to be prevented from swinging with normal wind and tidal changes
- chain cables should not be subject to cross-contact or twisting and stern anchorage should generally be provided
- laid-up ships should be in ballast condition in order to reduce the effects of wind. Due consideration should be given to the still water bending moment. For guidance, normal ballast draft should be roughly between 30% and 50% of the maximum draft.

Ships should normally be moored singly. However, when several ships are moored together, the following provisions are to be made:

- ships are to be moored bow to stern

## CHAPTER 1 GENERAL

### 1.2 Requirements for Lay-up

- ships are to be of approximately the same size
- the number of ships moored together is, in principle, not to exceed six
- breast-lines are to be of similar elasticity
- fenders are to be provided.

#### 1.2.4 Review of the mooring arrangements

The mooring arrangements may be reviewed by the Society as owner request. The proposal for the mooring arrangements is in such case to be submitted by the Owner and is to include the following information.

##### (a) Mooring site:

- geographical area (to be specified on a map)
- characteristics of the sea bottom
- water depth
- preferential angular sectors (effects of wind / tide / current) indicated according to statistical studies
- wave characteristics (amplitude, periods)

##### (b) Geometry of mooring arrangements:

- ship's position and direction
- shore anchorage
- diagram showing mooring equipment (fore and aft)
- angle between chain cables and ship's centreline

##### (c) Characteristics of mooring equipment:

- maximum holding strength of each anchor
- type of mooring lines (chains, cables, sinkers, etc.)
- length of each section
- weight of each section
- mechanical characteristics of each section (breaking load)
- weight of sinkers.

#### 1.2.5 Power availability and emergency power

Adequate power supply is to be supplied, or readily available, all around the clock, either from independent means on board the ship or from shore. The following safety conditions are to be kept throughout the lay-up period.

The emergency source of power, emergency generator and/or emergency air compressor are to be kept in working order and tested weekly.

#### 1.2.6 Lay-up manning

Watch personnel are to be provided. The number of the watch personnel will depend on the size of the ship, the lay-up site and mooring arrangements, the shore assistance available in case of fire, leakage or flooding, the maintenance required to provide adequate preservation. A permanent shore communication installation (radio, telephone) is also to be available.

#### 1.2.7 Fire protection and firefighting arrangement

The following is to be complied with:

- automatic fire alarm systems, where provided, are to be in working order and in operation
- fire-fighting installations are to be tested regularly and readily available
- the fire main is to be readily available and periodically tested under pressure
- ventilation trunks, air inlets and watertight doors are to be kept closed.

#### 1.2.8 Protection against explosion

Cargo spaces and piping systems are to be cleaned and ventilated to prevent gas from forming any pockets. An inert gas system in operation is recommended for the cargo spaces of oil and chemical tankers.

All flammable materials, sludge, etc. are to be removed from the ship's bilge, tank tops, double bottom tanks, engine room, pump rooms and similar spaces. Hot work is not to be carried out during lay-up, unless special precautionary measures are taken.

#### 1.2.9 Safety equipment

All the equipment usually recommended for the safety of the watch personnel is to be provided, kept in working order and tested regularly. The usual life-saving equipment such as liferafts, life-buoys, breathing apparatus, oxygen masks and distress signals is to be provided and made accessible. The requirements of the flag Administration and of the local port authorities of the lay-up site are usually to be applied.

#### 1.2.10 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. On tankers the cargo tanks should be cleaned and dirty residues disposed of at a reception facility.

#### 1.2.11 ISM, ISPS and MLC

If the ship with Certificate of ISM has been laid-up within 6 months, an ISM occasional audit will be required prior to re-commissioning. Where the lay-up period is more than 6 months, an ISM occasional audit regarded as initial audit will be carried out prior to re-commissioning. For ships with Certificate of ISPS and MLC, the effectiveness of the Certificate shall be maintained during the lay-up period.



## CHAPTER 2 REQUIREMENTS FOR PRESERVATION

### 2.1 General

A lay-up log-book is to be kept on board, in which the maintenance work and tests carried out during the layup period are to be entered with the corresponding dates. The nature and frequency of the maintenance, inspections and tests are also to be defined in the lay-up log book.

The following measures for preservation and maintenance during the lay-up period are to be taken by Owners according to the type of ship, hull equipment, machinery installations and the specific cases of lay-up conditions.

### 2.2 Preservation for Hull

#### 2.2.1 Hull above the waterline

The coating of the hull above the waterline, exposed decks, access doors or covers on exposed decks, and hatch covers is to be maintained in satisfactory condition. All accesses leading to internal spaces are to be kept closed. All vent pipes and ventilation trunks are to be kept closed.

#### 2.2.2 Underwater parts of the hull

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 more than 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. The condition of sacrificial anodes is to be evaluated at the annual lay-up surveys. 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.

#### 2.2.3 Internal spaces

Cargo tanks and cargo holds are to be emptied, cleaned and kept dry. Ballast tanks are to be kept either full or empty. When ballast spaces are kept filled with sea water, special care is to be taken to keep such spaces topped up and protected against corrosion. When provided, sacrificial anodes are to be renewed when deemed necessary. The topping up is to be regularly verified.

Chain lockers are to be drained, cleaned and kept dry. Coating with bituminous paint is recommended. Fuel oil and lubricating oil tanks are to be drained regularly. Lubricating oil analysis is to be performed regularly and the oil renewed when the result is not satisfactory. Prior to being refilled, tanks are to be cleaned. Empty lubricating oil tanks are to be cleaned and kept dry. Fresh water or distilled water tanks are to be kept full or empty. Empty tanks are to be cleaned and kept dry. Where cement wash is used as a coating, this is to be examined and repaired prior to filling.

The bilge and tank top in engine rooms are to be cleaned and kept dry. Hull sea inlet and outlet valves not in use are to be kept closed.

## 2.3 Preservation for Machinery

### 2.3.1 Machinery - General

Exposed mechanical parts of machinery are to be greased. All rotating machinery such as diesel engines, reciprocating engines, pumps, turbines, electric motors and generators are to be turned at regular intervals with a limited number of revolutions (the lubricating oil system should be put in operation or proper priming applied). Units are not to be stopped in the same position as the previous one. Bearing boxes are to be emptied, cleaned and refilled with new oil.

### 2.3.2 Machinery spaces

The air temperature inside the machinery spaces is normally to be kept above 0°C. Humidity is to be kept as low as possible and within acceptable limits.

### 2.3.3 Main turbines

Turbines are to be kept dry. All steam inlets are to be sealed. Expansion arrangements (sliding feet) are to be suitably greased. Electric heaters are to be put inside the turbines. Heat drying is to be made in open circuit, all valves shut and gland closing devices withdrawn. Turbines are to be turned weekly, the lubricating oil system being put in service. The shaft line is to be stopped after turning an integer number of revolutions plus one quarter of a revolution.

### 2.3.4 Diesel engine

Daily tank fuel oil outlet pipes and all injection equipment are to be filled with filtered gas oil. Fresh water circuits are to be filled with water mixed with rust inhibitors. Fresh water pH is to be checked monthly. Oil of hydraulic regulators is to be replaced. Sea water cooling pipes are to be drained. Crankcases are to be provided with desiccant. Starting valves are to be lubricated (internally and externally). Motor oil is to be sprayed in cylinders and on all external parts liable to corrosion. Cams and cylinders are to be motor oil sprayed monthly.

Turbo-compressor/charger ball bearings are to be oil sprayed and rotated for an integer number of revolutions plus one quarter of a revolution. Engine air inlets and exhaust gas pipes are to be sealed. Scavenge spaces are to be cleaned.

Engines are to be turned weekly.

### 2.3.5 Auxiliary machinery

Air receivers are to be drained, opened up and cleaned. Pressure relief valves are to be cleaned and slightly lubricated. Air compressor crankcases are to be drained, cleaned and refilled with clean oil. Cylinders and valves are to be lubricated. Coolers are to be drained and dried. Air drains are to be opened and the system dried. Air start lines are to be drained and dried. Hot-wells/return tanks are to be drained and dried. De-aerators are to be drained and dried. Feed pumps and extraction pumps are to be drained and dried. Air ejectors are to be drained and dried. Main circulation pumps are to be drained and dried. Evaporators are to be drained, cleaned and dried.

### 2.3.6 Auxiliary turbine-driven machinery

Stators are to be drained and kept dry. Shaft sealing glands are to be lubricated. Lubricating oil is to be analysed and renewed when deemed necessary. Prior to oil renewal, the oil casings are to be cleaned. Exhaust steam pipes are to be kept dry. Stuffing boxes are to be dismantled. Turbines are to be turned weekly an integer number of revolutions plus one quarter of a revolution.

### 2.3.7 Steering gear and deck machinery

Exposed mechanical parts are to be greased or oil sprayed. For electrical parts the same preservation measures given in 2.4 are to be taken. It is recommended that the steering gear should be operated monthly.

The windlass, capstans and winches are to be regularly greased and turned once a week. All wire cables are to be kept greased. Visible parts of chains are to be coal-tarred and examined regularly. Chocks and hawse pipes are to be coated with bituminous paint or equivalent if deemed necessary. Cargo piping on deck is to be drained, blown through if deemed necessary and kept dry by opening up drains. Electrical machinery and navigational equipment are to be protected by watertight covers.

## CHAPTER 2 REQUIREMENTS FOR PRESERVATION

### 2.4 Preservation for Eletrical Installation

#### 2.3.8 Reduction gears

For large reduction gears, a fan activating the circulation of hot air in closed circuit with air hoses is to be fitted (intake at lower part of casing and discharge at upper part).

#### 2.3.9 Condensers and heat exchangers

Condensers and heat exchangers are to be drained and kept dry. Desiccant is to be placed in steam spaces. Water sides are to be washed with fresh water. The condition of the zinc anodes is to be periodically checked. When tubes are fitted with plastic or fibre packing, water sides are to be filled with alkaline distilled water. When tubes are expanded or fitted with metal packing, water sides are to be provided with desiccants and kept dry.

#### 2.3.10 Shaft lines

Shaft lines are to be coated with grease. Shaft bearing cooling pipes are to be drained.

For sea water lubricated propeller shafts, the packing gland of the engine room stuffing box is to be tightened.

For oil lubricated sterntubes, lubricating oil is to be analysed and renewed if not satisfactory. The oil level in the tank is to be verified regularly.

Propeller shaft lines are to be rotated an integer number of revolutions plus one quarter of a revolution.

#### 2.3.11 Boilers

Smoke sides of boilers are to be swept, washed clean with basic hot water and hot air dried.

Water and steam sides should preferably be preserved using the dry method, keeping the moisture at the lowest possible level, the ideal level being between 30% and 35%. It is advisable to ensure that no residual water remains to cause rapid corrosion. Drum doors are to be kept closed.

In other cases, it is advisable to keep the boilers, superheaters and economisers filled with water having a pH around 10.5. Hydrazine hydrate treatment of the water is preferable to reduce risks of corrosion caused by dissolved oxygen. The water is to be regularly analysed.

Air heaters are to be cleaned and kept dry.

Uptake, shell and fan outlets are to be cleaned and kept closed with watertight hoods. Burners are to be dismantled, and atomisers greased. Desiccant is to be provided in furnaces where deemed necessary. Expansion arrangements (sliding feet) are to be suitably greased.

The internal condition of boilers is to be checked every three months.

Boilers may also be preserved sealed with inert gas (nitrogen), provided that cocks and valves are tight and the installation allows an internal pressure of at least 0.05 bar to be maintained to prevent air penetration. Regular checks of the overpressure are to be carried out and results recorded in the log-book.

#### 2.3.12 Piping

Pipes not in use are to be drained and kept dry.

## **2.4 Preservation for Eletrical Installation**

#### 2.4.1 Electrical installations

Main and secondary switchboards, sub-feeder panels, fuse panels and starters are to be made tight. Desiccant is to be provided. Contacts of relays, breakers and switch-breakers are to be coated with neutral vaseline. Bearings of generators are to be cleaned of old grease and protected with new oil or grease. Carbon brushes are to be lifted off their commutations.

Electrical insulation of each item is to be kept at a minimum 200 kilo-Ohms and general insulation is to be not less than 50 kilo-Ohms. Local electric heating may be necessary to improve the level of insulation, particularly in the generators/alternators and large motors. A insulation resistance test is to be performed regularly.

2.4.2 Automated installation

Recommendations for electronic components are the same as those given in 2.4.1. For pneumatic parts the manufacturers' recommendations are to be followed and the system is to be checked regularly. Pressure, temperature or level sensors are generally not affected by damage when not used. However, when available, the manufacturers' recommendations are to be followed.

## CHAPTER 3 SURVEYS

### 3.1 Lay-up Surveys

#### 3.1.1 Initial lay-up surveys

The lay-up declaration may be issued by the attendant surveyor of the Society when the lay-up condition is verified based on the approved lay-up scheme. The initial lay-up survey is to be carried out including following items:

- (a) Mooring arrangement shall be maintained in compliance with the reviewed lay-up scheme during the survey with special attention to maintaining an even stress on the stern moorings, if any.
- (b) Fire protection and firefighting arrangement  
Automatic fire alarm systems, firefighting installation and the fire main are to be tested. Emergency fire pumps should be checked and run at regular intervals.
- (c) Protection against explosion specified in 1.2.8
- (d) Safety equipment
- (e) Power supply and emergency power
- (f) Lay-up manning is maintained.

Upon satisfactory completion of the initial lay-up survey, the ship's status is to be entered that the ship is in lay-up condition.

#### 3.1.2 Annual lay-up survey

Annual lay-up survey is to be carried out within three months either way of each anniversary date based on original validate date on the Certificate of Classification.. The purpose of this survey is to ascertain that the lay-up scheme implemented is continuously complied with. The scope of the annual lay-up survey should cover confirmation of preservation, pollution prevention, condition of corrosion prevention device, mooring arrangement including chain cables conditions. It is to be checked that the arrangements made for the lay-up are unchanged and that the maintenance work and tests are carried out in accordance with the maintenance manual and recorded in the lay-up log-book. check the record in lay-up log-book.

#### 3.1.3 Renewal lay-up survey

Renewal lay-up survey is to be carried out at intervals not exceeding five years since the completion date of initial lay-up survey and the anniversary date is defined in 3.1.2 The scope of the renewal lay-up survey is to cover confirmation of preservation, pollution prevention, condition of corrosion prevention device, mooring arrangement including chain cables conditions. It is to be checked that the arrangements made for the lay-up are unchanged and that the maintenance work and tests are carried out in accordance with the maintenance manual and recorded in the lay-up log-book. check the record in lay-up log-book. Thickness measurement may be carried out if deemed necessary by the attending surveyor.

### 3.2 Re-commissioning Survey

#### 3.2.1 General

Owners are to make the necessary arrangements to remove the temporary lay-up installations provided for preservation measures and the protective materials and coatings (oil, grease, inhibitors, desiccants), before the survey is commenced. It is the Owners' responsibility to verify that the ship parts that are not covered by class are reactivated in satisfactory operational condition.

### 3.2.2 Scope

The scope of the re-commissioning survey is to include:

- (a) a general examination of the hull, deck machinery and steering gear, safety systems, machinery installations (including boilers whose survey is not due), electrical installations.
- (b) all periodical surveys due at the date of re-commissioning or which became overdue during the lay-up period
- (c) dealing with the recommendations due at the date of recommissioning or which became due during the lay-up period.

### 3.2.3 Survey for hull

- (a) examination of shell plating above the waterline, deck plating, hatch covers and coamings
- (b) examination of load line items
- (c) overall survey of all cargo tanks/holds
- (d) overall survey of representative ballast tanks when the lay-up period does not exceed two years
- (e) overall survey of all ballast tanks when the lay-up period is two years and over
- (f) function tests of bilge and ballast systems.

### 3.2.4 Survey for machinery

- (a) the analysis of lubricating oil of main engines, auxiliary engines, reduction gears, main thrust bearings and sterntube
- (b) the general condition of crankcase, crankshaft, piston rods and connecting rods of diesel engines
- (c) the crankshaft deflections of diesel engines. In addition when engines have been laid-up for more than two years, one piston is to be disconnected and one liner is to be removed for examination. Dismantling is to be extended if deemed necessary
- (d) the condition of blades of turbines through the inspection doors
- (e) the condition of the water side of condensers and heat exchangers
- (f) the condition of expansion arrangements
- (g) the condition of reduction gears through the inspection doors

## CHAPTER 3 SURVEYS

### 3.2 Re-commissioning Survey

- (h) the condition after overhauling of pressure relief devices
- (i) the test of bilge level alarms, when fitted
- (j) where possible, examination of deck piping under working pressure
- (k) function tests of class items for deck machinery and steering gear
- (l) checking inert gas installation under working condition after inspection of water seal and function test of deck non-return valve and pressure/vacuum valves.

#### 3.2.5 Survey for electrical installation

The main and emergency electrical installations are to be tested. The parallel shedding of main generators and main switchboard safety devices are to be checked. An insulation resistance test of the electrical installation is to be performed. The automated installation is to be checked for proper operation.

#### 3.2.6 Survey for fire prevention, detection and firefighting systems

- (a) remote control for quick closing of fuel oil valves, stopping of fuel oil pumps and ventilation systems, closing of fire doors and watertight doors
- (b) fire detectors and alarms
- (c) fire-fighting equipment
- (d) examination of the fire main under working pressure.

#### 3.2.7 Survey for cargo installation

When classed, the installations for refrigerated cargo are to be examined under working conditions. Where the lay-up period exceeds two years, representative components of the installation are to be dismantled.

For cargo installations on liquefied gas carriers, the following is to be carried out:

- (a) inspection of the primary barrier in tanks
- (b) for membrane tanks, a global gas test of tanks whose results are to be compared with those obtained at ship's delivery
- (c) testing of gas piping at working pressure using inert gas.

#### 3.2.8 Sea trials

On completion of the above surveys, sea trials are to be performed in the presence of the Surveyor of the Society. The sea trials are to include:

- (a) verification of the satisfactory performance of the deck installations, main propulsion system and essential auxiliaries, including a test of the safety devices
- (b) an anchoring test

- (c) complete tests of steering gear
- (d) full head and full astern tests
- (e) tests of automated machinery systems, where applicable.

Upon satisfactory completion of the re-commissioning survey, the Certificate of Classification will be re-issued and a new period of class is assigned from the completion of the re-commissioning survey. The ship's status is to be entered that the ships is re-activated from lay-up condition.