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# DRY DOCK / REFIT

Taking a vessel out of service for dry dock or refit requires Management approval. This includes prior approval of the anticipated cost of the dry dock or refit.

Dry dock or refit is planned and arranged by the Ship Manager taking cognisance of such things as Class and Statutory requirements, condition of the vessel and its maintenance requirements, vessels speed and consumption, the needs of the Charterer and availability of suitable shipyard facilities.

## 1. REPAIR LISTS AND SPECIFICATIONS

1.1. A separate repair list shall be maintained for dry dock/refit jobs. The repair list shall include jobs to be undertaken by ships personnel while the vessel is in dry dock or refit.

1.2. During the ships normal service, some jobs submitted for approval may be identified as being more suitable to be done in dry dock or refit. The reallocation of these jobs to dry dock or refit must be approved by the Ship Manager. On approval, the job card must be withdrawn and placed in the dry dock/refit file and the job listed on the dry dock/refit repair list.

1.3. Job details on job cards for dry dock/refit jobs must be sufficiently detailed to provide sufficient information to enable a shipyard to quote effectively.

1.4. Dry dock/refit repair lists must be submitted well in advance to provide sufficient time for the Ship Manager to obtain quotations from the shipyards, and to select and arrange a shipyard.

1.5. Shipyard personnel may call on board in order to assess dry dock/refit jobs in order to quote on the job. They must be accompanied while on board and given free access to sight the jobs and be provided with necessary information from the manufacturer’s manuals if applicable.

1.6. Prior to dry dock or refit, the Ship Manager will discuss the repair lists with the Master, Chief Engineer and Chief Navigating Officer and confirm work to be performed and by whom.

## 2. JOB AUTHORISATION

All jobs to be performed by shore contractors must first be authorised by the Ship Manager before work may commence.

## 3. ADDITIONAL JOBS

3.1. A job card must be made out for any additional job and be given to the Ship Manager who will submit it to the shipyard for a quote.

3.2. The Ship Manager will review the shipyard quote and if acceptable will authorise the job card. The job must then be included on the repair list.

3.3. The Ship Manager must keep Management appraised of any anticipated overrun on expenditure or time.

## 4. PREPARATION FOR DRY DOCK OR REFIT

4.1. The vessel shall be free of hazardous cargo or hazardous cargo residues, and gas free before commencing dry dock or refit.

4.2. Prior to dry dock or refit the Ship Manager shall hold a meeting on board with the Master and his senior staff, preferably together with shipyard supervisory personnel to review safety procedures, dry dock/refit preparations, job sequence and work area preparations required to ensure that jobs can be performed safely and started without delay (includes scaffolding, gas free certificates etc.).

4.3. A progress meeting shall be held daily with ships staff and shipyard supervisors, the emphasis of which shall be on safety, job co-ordination and preparation.

## 5. SAFETY DURING DRY DOCK OR REFIT

5.1. Safety cannot be over emphasised during a dry dock or refit.

5.2. The Master must take care to ensure that all reasonable safety precautions are implemented to safeguard the ship, its crew and shipyard personnel throughout the dry dock/refit period.

5.3. Reference must be made to the HSE Manual, Section 4.24 “Shipyard Safety).

5.4. All ship's Officers are to be observant and check that safe working practices are employed and that proper safety precautions are taken. Any infringement must be rectified immediately and reported to the Master.

5.5. Particular attention must be given to good housekeeping and ensuring that work areas and walkways are kept clear and free of debris that may pose a risk of fire or trips or falls.

5.6. Careful attention must be paid to the elimination of fire hazards.

5.7. Whenever repair work requires the removal of handrails, ladders, deck plates, gratings, floor plates etc, the personnel carrying out the repair are to cordon off the unsafe area and take such other safety measures that will preclude the occurrence of an accident. On completion of the repair all the removed items are to be replaced and properly re-secured.

5.8. Infringements of safety regulations by shipyard/contractor personnel must be referred to the Ship Manager who will address the matter with the shipyard/contractor concerned.

## 6. PROCEDURES FOR DRY DOCKING

6.1. Before dry docking the Dock Master should be provided with a docking plan and details of the vessel's draught, trim, and quantities and distribution of ballast, fuel oil, lube oil and fresh water on board. Care must be taken to avoid placing blocks in the way of echo-sounder and speed log transducers, and areas known to require access for work.

6.2. While the vessel is in dry dock the Chief Navigating Officer should advise the Dock Master of any changes to be made to the distribution or quantity of water ballast, fuel oil, lube oil or fresh water.

6.3. The Chief Navigating Officer shall ensure that the distribution and quantity of liquids in tanks on board should be returned to the same condition as when the ship entered the dry dock. If this is not possible the Chief Navigating Officer shall carefully calculate the new condition with particular attention to heel and trim and shall check whether this is acceptable to the Master and the Dock Master.

6.4. Whenever a vessel is placed in dry dock a thorough inspection of the underwater body of the vessel is to be performed by the Master, Chief Engineer, Chief Navigating Officer and the Ship Manager.

6.5. Special attention is to be paid to the condition of the following.

a. Extent and nature of marine growth covering the hull and fouling of the sea intakes.

b. Condition of the shell plating with regard to indentations, damage, and corrosion of weld seams.

c. Condition of paintwork and corrosion of the hull.

d. Effectiveness of anodes and corrosion inhibiting devices.

e. Sea valve inlet box strainers.

f. Propeller, check for damage, erosion, cracks electrolytic corrosion and leaking seals.

g. Very careful attention should be given to the inspection of the Rudder for signs of damage or cracks. Inspection cover plates should be removed to enable inspection of stock and pintle taper nuts and their locking devices, to ensure there has been no movement. The pallister bearing must be checked for any outward signs of damage.

h. Stern tube and rope guard, with particular attention to the stern gland seal for possible leakage.

i. Bow and stern thruster propellers and their seals and gratings.

j. Echo sounder transducers (cover during blasting/painting operations).

k. Speed log transducers.

l. Anchors and cables (check for loose studs).

6.6. The Chief Navigating Officer is responsible for all tank and drain plugs and shall ensure that the removal and replacement of each plug is logged in the Chief Officer's logbook, and that all plugs are refitted prior to flooding. Each plug that is removed must be labelled and carefully stored to prevent any loss. On completion of dry docking, he shall ensure that the plug spanners are stowed away so they will be readily available for the next dry docking.

6.7. Accurate measurement of the tail shaft clearance (wear down) and the rudder and pintle clearances are to be taken by the shipyard and witnessed by the Chief Engineer who shall record the details in the ship's calibration file.

## 7. PAINTING OF THE UNDERWATER AREA IN DRY DOCK

7.1. The Ship Manager will decide in consultation with the paint supplier on the painting specification to be followed.

7.2. Grit blasting operations shall not take place when sensitive machinery is open for repair or inspection. The Ship Manager will prioritise work, and accordingly schedule time for the grit blasting operations (engine work might have to be deferred).

7.3. An Officer will be given the task of supervising the painting and will report directly to the Ship Manager who will advise and guide him accordingly.

7.4. Careful attention must be given to ensure that contractors closely follow the painting and grit blasting specification.

7.5. During grit blasting operations, it is essential that sea intakes or over boards which are open to the engine room (valves removed), are plugged to prevent any grit from entering the engine room spaces. If the tailshaft is removed, the stern tube must be efficiently sealed to prevent ingress of destructive grit. On tankers, the tank lids should be closed to prevent grit and dust from entering the tanks.

7.6. Paint stocks must be securely locked away and only sufficient paint issued from time to time to the contractors to enable them to perform their immediate task without delay. If necessary, the paint should be stored and locked in a container that can be conveniently placed near the contractor's operations.

7.7. Paint drum residues must be kept to an absolute minimum to ensure there is no wastage of expensive paint.

7.8. All overboard discharges and scuppers must be securely plugged to prevent any leakage that may allow water to run down the hull during painting or grit blasting operations. Where an overboard discharge is necessary the plugs shall be fitted with extension pipes to carry the water well clear of the hull. Some of the deck scupper plugs shall be so arranged to drain off any water that may accumulate on deck.

7.9. Sea chest gratings should be very well coated with anti-fouling paint, particularly the edges of the grating intake slots. A picture report of before and after painting must be made up, sent to the office on the day of completing the maintenance.

7.10. Prior to the refitting of gratings, the sea chests should be inspected to ensure that they are clean, well painted with anti-fouling paint, anodes fitted and that air blow-down pipelines are clear and positioned correctly to clear the intakes.

## 8. PRECAUTIONS WHEN FLOODING THE DRY DOCK.

8.1. Prior to flooding the dry dock, the Chief Engineer and the Chief Navigating Officer shall check that all underwater hull fittings have been properly replaced and where necessary closed. This includes;

a. All sea valves and sea chests.

b. All overboard storm valves and sewer valves.

c. All tank drain plugs.

d. Rudder inspection plates and drain plugs.

e. Rope guards.

f. All sea intake and discharge gratings.

g. Bow and stern thruster guards in place and tunnels clear of debris.

h. Echo sounder and speed log transducers free of grease.

i. Anchors and cables re-stowed.

j. Stern tube oil refilled as appropriate, and inner and outer seals free of leakage. (same for thrusters).

k. Dry dock floor clear of (floating) debris which may enter openings such as thruster tunnels.

8.2. Once the Chief Engineer and the Chief Navigating Officer have completed their inspection of the hull and are satisfied that all is in order they shall inform the Master who will sign the ship off the blocks with the Dry Dock Master.

8.3. During the flooding of the dry dock, the Chief Engineer will position his staff in strategic points within the machinery spaces to check that there are no leaks or signs of sea ingress. Every overboard valve must be checked for signs of leaks, including those outside of the engine spaces e.g. emergency fire pump suction.

8.4. The Chief Navigating Officer must ensure that all cargo spaces, void spaces and compartments (e.g. bow thruster compartment) are free from leaks. Tanks should be inspected where possible or sounded to check for ingress of water.

8.5. All shell plating repairs must be checked for leaks.

8.6. Should there be any signs of sea water entry broaching the integrity of the hull the flooding of the dry dock is to be stopped and the fault corrected before flooding can continue. It may be necessary to empty the dry dock again in order to effect the necessary repairs.

8.7. Should the vessel take a list the flooding of the dry dock is to be stopped immediately and the cause of the list investigated, and stability of the vessel checked. The underwater hull should be inspected by divers for damage and the dry dock blocks checked for shifting. Once this has been done the Ship Manager shall decide the best course of action in close liaison with the Master and the Dock Master.

8.8. The vessels moorings shall be attended during the flooding of the dry dock.

## 9. PROPELLER CLEANING

9.1. Cleaning and buffing of the propeller in the water produces a higher polish than when attempted out of the water in dry dock.

9.2. Unless the propeller is removed ashore for repair by a propeller repair specialist the policy shall be to clean and buff it under water with the vessel safely afloat, but this shall be at the discretion of the Ship Manager.

9.3. This does not apply to bow or stern thruster propellers which shall be cleaned and buffed in dry dock.

## 10. COMPLETION OF DRY DOCK OR REFIT

10.1. The Master shall ensure that a thorough inspection is made of all spaces, particularly those in which repairs have been carried out.

10.2. All debris which has accumulated over the repair period is to be placed into waste bins provided and removed ashore. If areas are excessively dirty or oily from repair work this is to be brought to the attention of the Ship Manager who may organise cleaning contractors.

10.3. All tanks that have been opened shall be inspected for cleanliness, and thereafter the tank lids securely closed and checked. Water ballast and fresh water tanks shall be pressed up and checked for leaks. The head must then be taken off the tanks.

10.4. All water ballast or fresh water tanks with tank accesses within the cargo space area shall be pressed up and inspected for leaks irrespective of whether they were opened or not. Thereafter the pressure head must be removed but slack tanks must be avoided.

10.5. Special care is to be exercised on board Tankers where debris left in a tank could act as an insulated conductor during tank washing operations and cause a build-up of static sufficient to create a spark when discharging posing a threat of ignition of the combustibles in the tank.

10.6. The Master shall ensure that his ship is in condition ready to receive cargo and shall give due notice of readiness to the Charterers or their Agents.

10.7. The Master through the Agents shall make the necessary arrangements for shifting the ship to a working berth.

10.8. The Chief Engineer shall complete form 6.5.1(Post Dry Dock Checklist). This form contains final checks and the commissioning of equipment aboard, post docking to ensure the quality and integrity of equipment and systems that may have been repaired or compromised during the repair period. This form is to be countersigned by the Ship Manager once he assessed and agreed the content.

## 11. ALTERATIONS

11.1. Alterations to the ship's structure or mechanical outfit shall be controlled and managed by the Ship Manager.

11.2. Alterations required to be capitalised, shall be approved by the CEO[1].

11.3. The design criteria shall be clearly established to suit the intended purpose of the alteration and shall give due consideration to the efficient working of the ship, and to requirements relating to safety, Class, Statutory regulations and environmental issues.

11.4. Prior to detailed design work a preliminary design should be undertaken sufficient to provide a budget project cost. The project or alteration shall be financially and commercially evaluated before proceeding further.

11.5. The design work shall be performed by a competent specialist and shall be approved by the ship's Classification Society and Flag State Statutory Body.

11.6. The effects of the alteration on the vessel’s stability shall be calculated, and if necessary, allowance shall be made and the ship's stability information updated. The design specialist

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shall establish in conjunction with the Classification Society Surveyor if the vessel must be re-inclined.

11.7. Once detailed design work is completed quotations shall be obtained from subcontractors who will perform the work.

11.8. The final design shall be verified as suitable for the intended need, and financially viable prior to commencing any work.

11.9. The alteration or modification work shall be closely supervised to ensure that it conforms to the design and satisfies the need.

11.10. The relevant ships plans will be modified or annotated to reflect the alteration.

11.11. If required, the ship will be re-inclined after the alteration is complete and a new light ship centre of gravity established. The stability data will be amended accordingly.

## 12. PREPARATION AND CHECKS BEFORE CHANGIN OVER TO SHORE POWER (IN SERVICE & DRY DOCK)

A Chief Engineer needs to make sure the ship's power receiving terminal is prepared well in advance so that it can be connected to the shore power without mishap.

Chief Engineer/Electrician will prepare the ship's power receiving terminal box and the breaker in the main switch board:

- Ensure the receiving box is not obstructed with any object, pipes or spares. It is usually located either on the deck near accommodation entrance or the emergency generator room.
- Ensure the box, door hinges and locks are maintained.
- Ensure all the terminals inside the box are present and in good working condition.
- Ensure measuring instrumentation such as voltmeter, phase sequence indicator, and tester etc. are present.
- Ensure the panel light indication for shore power is working.
- Ensure details of shore power requirement is posted near the shore receiving terminal box, which includes required voltage, frequency, and method of connecting the shore supply.
- Ensure the ship's back up batteries are tested and fully charged.

The process of receiving shore supply to ship is critical as unprotected connection may lead to accidents and wrong shore supply will hurt the efficiency and increase heat generation from onboard equipment.

## 13. CONNECTING TO SHORE SUPPLY

The following procedure is to be completed prior to connecting to shore supply and again when connecting back to ships power. The process of connecting and disconnecting shore supply should take no longer than 30 minutes. After the changeover procedure has been completed, all Safety Systems equipment mentioned below are to be made operational. The other equipment may be made operational to the Chief Engineer's discretion, this being the ship/shore breaker trip load dependent:

- Carry Out Risk Assessment
- Check the breaker to confirm KW/Amps the shore supply breaker is able to protect and which ship equipment can be safely run on shore supply.
- All Bridge Equipment is to be shut down and isolated/ (Eg Gyro / GMDSS / Radar / MFHF / GPS / ECDIS / Speed Log / Echo Sounder / VDR etc
- Fire alarm system/WIAS any other systems that could be sensitive to power fluctuations.
- Switch off the vessel Server and VSAT Equipment.
- All the vessel PCs are switched of and disconnected from the power supply (Including Loading Computer)
- Engine Room Alarm system and PLCs
- Check the shore power cable drawn to ship is in good condition.
- Check the insulation resistance of the cable provided for the shore supply.
- Check the insulation resistance of the shore supply box.
- Check the polarity of shore supply using a voltmeter.
- Check and ensure the frequency and voltage of shore supply are matching with the specifications required by the ship.
- Check the phase sequence of the shore supply using phase sequence tester.
- Check the tightness of the shore cable terminals to ensure they are not loose.
- Ensure to display Risk of Electric Shock notice near the vicinity of ship's receiving terminal box.
- Check and ensure the ship's generators are disconnected from the Main Switch Board of the ship.
- A responsible officer must check and record the energy meter reading provided on shoreside.
- Ensure ship's hull is earthed to the shore before supplying shore power to the ship (Cable normally 4 cores i.e. 3 phase + earth)

Once all checks are performed by ship's engineer and the ship is ready to take the shore power, take the following steps:

- Once the shore supply power is made available to the vessel, the light indicator provided in the terminal box will be ON.
- Close the Shore breaker to start the supply of the shore power to ship.
- For checking the phase sequence, a bulb type phase sequence indicator can be used in which two lamps are connected to unbalanced load across the 3 phases via capacitor and resistors. The phase sequence will be considered “OK” when the right-side lamp is bright, and the left side one is dark.
- Alternatively, a small portable 3 phase induction motor driven meter with a rotary pointer to measure PSI can be used.
- Check the frequency of the supply from the provided frequency meter or on the Main Switch Board of the ship.
- Ensure to keep the emergency generator in the manual mode to use the same if the shore power goes off abruptly and electricity supply is needed.
- Close the vessel shore power circuit breaker on the main switch board.

## 14. COMMON PROBLEMS FACED BY SHIP’S STAFF WHILE TAKING SHORE SUPPLY

### 14.1. Shore supply switched on, but the ship is not getting power

- Check the three fuses connected between the ship’s terminal and Main Switch Board (MSB).
- Check the circuit breaker located in shore supply switchboard.
- Check circuit breaker interlocks which are arranged in the system to avoid paralleling of shore and generator power.

### 14.2. Shore power trips during supply

- Faulty shore cable. Ensure the cables used for supplying power is of proper size and as per the maximum protective current value of the ship.
- Overload in the system. Ensure to correctly calculate the electrical load of the ship during the drydock using electric power balance table to avoid overload trip.
- Generator circuit breaker trip: It is possible that the safety breaker for the generator trips the shore supply during the inspection or maintenance of generator’s interlock.

### 14.3. Wrong Shore Supply

Most countries have their local regulations which make the shore supply compulsory to avoid emission problems. If the voltage and frequency of shore power do not match with the ship’s rating, the machinery will operate at lower efficiency and may face overheating

problems. i.e. Vessels are normally 440 Volt, 60 Hz. Some shore facilities offer 380 Volt 50 Hz supply.

The ship manager must ensure to choose a drydock, which can provide shore supply as per the ship's requirement.

Sensitive electronic equipment such as controllers, navigational equipment etc. are prone to damage from power fluctuation. Try to switch off these systems while the using shore supply. If the equipment needs to be switched on, it is recommended to use battery supply for their operation.