| FAREAST SHIPMANAGEMENT HONGKONG LIMITED | Revision# 1 | Page 1/2 |
| SAFETY AND QUALITY MANAGEMENT SYSTEM | Date 01/07/2017 | |
| FLEET OPERATION MANUAL | | Section 11E.0 |
| OPERATIONS – TOWING & ANCHOR HANDLING | | |

11E. OPERATIONS – TOWING & ANCHOR HANDLING
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>No. of Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.0</td>
<td>Operations – Towing &amp; Anchor Handling</td>
<td></td>
</tr>
<tr>
<td>11.1</td>
<td>Scope</td>
<td>1</td>
</tr>
<tr>
<td>11.2</td>
<td>Reference</td>
<td>1</td>
</tr>
<tr>
<td>11.3</td>
<td>Responsibilities</td>
<td>1</td>
</tr>
<tr>
<td>11.4</td>
<td>Procedure</td>
<td>1</td>
</tr>
<tr>
<td>11.5</td>
<td>Connecting Tow</td>
<td>1</td>
</tr>
<tr>
<td>11.6</td>
<td>Engine Revolutions During Tow</td>
<td>1</td>
</tr>
<tr>
<td>11.7</td>
<td>Towing Self Propelled Rigs</td>
<td>1</td>
</tr>
<tr>
<td>11.8</td>
<td>Disconnecting Tow Wire</td>
<td>1</td>
</tr>
<tr>
<td>11.9</td>
<td>Towing In Bad Weather</td>
<td>1</td>
</tr>
<tr>
<td>11.10</td>
<td>Towing In Shallow Water</td>
<td>1</td>
</tr>
<tr>
<td>11.11</td>
<td>A Typical Wire To Rig Configuration</td>
<td>1</td>
</tr>
<tr>
<td>11.12</td>
<td>Towing By Two Or More Vessels</td>
<td>1</td>
</tr>
<tr>
<td>11.13</td>
<td>Placing Rigs On New Location</td>
<td>1</td>
</tr>
<tr>
<td>11.14</td>
<td>Anchor Handling</td>
<td>1</td>
</tr>
<tr>
<td>11.15</td>
<td>Lifting Up The Anchor</td>
<td>1</td>
</tr>
<tr>
<td>11.16</td>
<td>Running Anchor</td>
<td>1</td>
</tr>
<tr>
<td>11.17</td>
<td>Problems Likely To Be Encountered</td>
<td>1</td>
</tr>
<tr>
<td>11.18</td>
<td>Anchoring Operations</td>
<td>7</td>
</tr>
</tbody>
</table>
TOWING & ANCHOR HANDLING PROCEDURE

11.1 SCOPE:
The scope of this section is to have a clear guidelines and understanding on how to perform the towing and anchor handling operations.

11.2 REFERENCE:
ISM 7 – DEVELOPMENT OF SHIPBOARD PLANS AND PROCEDURES

11.3 RESPONSIBILITY:
The Responsibility to perform and follow this procedure lies on the Master of the vessel.

11.4 PROCEDURE:
Different shapes of rigs have different towing systems but it is usual for square rigs to tow off a bridle from each forward leg. Ship shapes and triangular rigs are towed from one towing pennant at forward end of rig. Or you may even be asked to tow from an anchor pennant. Each different method of connection presents different problems. Before connecting all gear should be checked and ready, i.e, gog eye bolted down, quarter bars and side gate bars bolted in position, tow gate shut and bolted down.

Nylon towing spring should be flaked out on one side of the deck; work wire should be through the gog eye and shackled over the towing wire, see drawing no.6. 75 ton, or 100 ton in weather class ships, shackles should be used in all towing connections and 50 or 35 ton shackles for gog wire.

Note. In rough weather when it is not possible to fit the towing shoe aft of the gog eye, a 75-ton shackle fitted to the gog wire over the tow wire will allow the towing shoe to be fitted to the wire at the winch house and then passed through the 75-ton gog shackle to reach the towing rail. Length of gog wire from gog eye to tow wire should be from 4 feet to 6 feet, however, in bad weather with ship pitching, it should be sufficiently long so as not to put a downward pull on the wire when the ship's stern goes down in the trough of a wave. When maneuvering on short tow wire it may be an advantage to length the gog to allow you to turn faster but the gog should never be lengthened past the point where the gog shackle will reach the crash barrier.
11.5 CONNECTING TOW:

If the tow is to be connected to a single pennant this will usually be handed to you on the crane. This wire should be fastened to a strong point with lashing strop while nylon towing spring is being shackled to it.

Once the connection is made disconnect pelican hook, all crew to stand clear and using engines pull nylon spring over stern. Pay out tow wire with winch in high gear gradually moving away from rig but do not put strain on two wires while paying out. It is not advisable to run tow wire out with winch out of gear; you may end up loosening the wire. If possible wire should be paid out running over the side or quarter so that it does not rough up the tow bar, this will protect your crash rail, however, if the crash rail is cut up it is useful to run a file over it to take the sharp edges off, this should be done before the crash rail is greased. When the tow wire is out to required length the dog is applied on the winch so that the winch is locked. Brakes should then be put on towing drum and if winch is fitted with looking pawls these should be put in place.

If you are to connect to a towing bridle from the forward end of the rig a heaving line will be passed to you connected to a messenger. The messenger should be taken to your cargo winch or drum end on towing winch. The bridle will consist of a large monkey faceplate or a jumble of shackles; great care should be taken when pulling this lump of ironwork over the tow bar/stern roller. Once the bridle is on board connection is the same, as single pennant towing except care is again needed putting the connection over the crash rail.

The length of wire used in towing depends on weather conditions / dist of the tow and maneuvering requirements. In general the worse the weather the longer the tow wire and if in doubt put the lot out, always keeping at least one full wrap on drum. When maneuvering with the rig to enter new location, about three miles off, tow should be slowed down and wire shortened as per the instructions of the rig mover to give a smaller turning circle when holding rig on location.

11.6 ENGINE REVOLUTIONS DURING TOW

When starting the tow after streaming the tow wire the engine should be gradually worked up to full towing revs. The revs for towing depend largely on the engine exhaust gas temperatures and you should be advised by the Chief Engineer as to what the maximum revs can be, they will probably be about 30 percent less than normal full running revs but it depends on type of rig and weather conditions.
11.7 OWING SELF PROPELLED RIGS

Some rigs are now self-propelled and often use their engines while being towed. There are two things to watch when towing a self-propelled rig using her own engines.

The engines on rigs quite often break down or are shut down for a variety of reasons, if this happens you may find that your engine exhaust temperatures rise and a reduction of revs required, while rigs power is off. Always ask the rig to let you know when their propulsion units are off so that you can watch the engine temperatures.

Do not tell the rig you are going to alter course until you have done so, otherwise you may find some over enthusiastic barge master has altered the rigs course at the same time, you will then have the rig steaming beside you instead of behind.

11.8 DISCONNECTING TOW WIRE:

Disconnecting tow is the reverse procedure of connecting. Gog wire should be left on the tow wire while recovering till the nylon towing spring is on deck, anchor work wire can then be connected to towing spring and after disconnecting tow wire the spring can be wound up on anchor drum. If towing pennant/bridle from rig has recovery wire connected to it, towing shackle can be disconnected and pennant/bridle dropped over the side, If no recovery wire is fitted you will have to pass wire up on crane or send messenger back to rig so they can retrieve the bridle.

11.9 TOWING IS BAD WEATHER:

In bad weather the tow wire should be as long as possible and engine revs adjusted to keep a good catenary on the wire. In very poor weather conditions it will probably be necessary just to hold the rig into the wind and you will probably make no progress or even go backwards but as long as you maintain steerage way this should be no problem.

If towing shoe is lost the tow bar should be kept well greased and tow wire shortened up about four feet every four hours. (While towing do not pay out wire always heave in a little to ‘freshen the nip’.) This should also be done in fine weather if you are towing without a shoe. If it is possible, avoid running before the wind and seas while towing or you will find that with your stern tied down by the tow wire very heavy seas run right up the deck.
11.10 **TOWING IN SHALLOW WATER:**

The highest cause of damage to a tow wire, after chafe on the tow bar, is the tow wire dragging on the seabed in shallow water. It has been calculated that a tow wire of 2500 feet can have a cantenary of up to 200 feet in the middle, towing at slow speeds.

The length of two/four power used ratio should always be sufficient to keep the wire well clear of the seabed when navigating in shallow water.

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**Boat means – OSV and**

**BARGE SHOWN means any Rig or installation.**
11.11 A TYPICAL WIRE TO RIG CONFIGURATION

Boat means – OSV and BARGE SHOWN means any Rig or installation.

11.12 TOWING BY TWO OR MORE VESSELS

When two or three vessels are used to tow, one of them should be designated lead tug and should co-ordinate the actions of all the vessels. The second and third towing vessels should take up station astern of and to the side of the lead tug so that in the case of steering difficulties or mistaken orders they will at least pass over the lead tags tow wire and not collide with it. Once on location it is usual to release all other tugs except the lead tug.
11.13 PLACING RIGS ON NEW LOCATION

Making approach
Course should be set to a point, five or six miles from the location, on the course that the rig wishes to enter the location on. When this point is reached tow should be slowed, entrance course steered and tow wire shortened up to 800-1000 feet. Careful observations of set and drift should also be made on the run in course.

Methods of Position Fixing
There are now two methods of positioning a rig on location. These are by a precision fix in association with pre-laid buoy pattern or by the GPS System. As far as towing is concerned this method is the easiest because you can only act on instructions from the rig. The GPS system is installed on the boat and gives a constant position on a chart. The rig decides on its run in course and anchor drop positions and should keep you informed of all course and speed alterations necessary to steer the required course and arrive at their predetermined position. All you can do is follow their instructions. GPS Fix and buoy pattern is a little more complicated as the success of the operations depends on your ability to get the rig into the right position in the buoy pattern.

When the rig is about 5-8 cables from the position of the plan location the control of the tow is handed over to the rig mover. Now all directions are given by the rig mover and he decides the direction and power.

11.14 ANCHOR HANDLING:

Before Anchor handling a good amount of preparation has to be done. All the gear required for Anchor handling has to be made ready and if required to be procured prior the Boat sails out of the harbor. Personnel handling Anchor also should be well-rested prior commencement of the task.

All the shackles to be greased and the tools assembled. Dead lines should be connected to the pad eyes and pelican hook shackled on with the required SWL. The Anchor work wire should be run out to after end and all systems on the winch checked prior operation.

There are two probabilities in which anchor handling is done. One is when the Anchoring is done and secondly when the rig shifting is to be done and the Anchor is to be lifted up.
11.15 LIFTING UP THE ANCHOR:

First preparations are made on deck and the wire and the pelican hook are made ready for lassoing the buoy to take up the pendent wire on board for commencement of heaving of Anchor. It will be decided by the anchoring plan as per rig mover which anchor is to be hauled in first. Depending on this fact the Buoy to approach is decided.

The Stern is approached towards the Buoy slowly. It may be considered to maneuvers with the Thruster only so that the buoy is not washed up with the wake of the engine.

Approaching the buoy with lasso wire is slipped over the buoy and the same is taken on board. Once the Buoy is on board the pelican hook should be placed on the first anchor pennant and the work wire paid out until the pelican hook takes the entire weight. The pennant should then slip over to the pelican hook side of the roller. Engines could be worked to work safely and avoid accidents.

The Buoy can now be disconnected and pulled up on deck. The Buoy is lifted up the railings and is tied up. The other crew removes the lasso and connects the work wire to the anchor pendent with the Shackle to handle the Anchor SWL. Weight to be then taken on the work wire and pelican hook removed.

Now with the winch in low gear lift the Anchor off bottom. The wire is slowly taken on board on drum with the help of hooks. Care is taken that the wire is clear of all the obstructions and clear so that it is not fouled when the rig heaves it in. The Anchor is kept hanging outboard on the stern roller. The Boat approaches the rig and instructs the rig to heave the wire on board. When it comes towards the end the anchor, the anchor is lowered slowly with the wire. When the Anchor is housed on to the rig the pendent is disconnected by the Boat.
11.16 RUNNING ANCHOR:
Preparations as required for the lifting of the Anchor are required for the running of the anchor as well

The rig will call you to pick up a pennant from the crane, this pennant is 200 ft. (approx) and will be attached to the anchor crown or crown chain when we approach the rig and the other of the pendent wire is connected to the work wire of the boat.

This pennant is hauled on the stern of the vessel and put on the work wire of the drum. Now heave on the work wire while the rig is paying the anchor out and take the weight on the work wire. Move in the direction as directed by the rig mover and position the boat where the anchor is to be dropped with enough length of the wire off the rig. When we have reached the desired position inform the rig mover.

Having arrived at the marker buoy or given bearing and distance, confirm with the rig that you are in the right position and then lower the anchor to the bottom keeping engine at about half speed to stop the catenar of the anchor chain pulling you back towards the rig.

Check your pennant length against depth of water, this should be done before anchors have been run but it is most embarrassing to find the water is deeper than pennant length. Lower the anchor to the bottom, put the pelican hook on to last pennant length, and when wire is lying safely in hook two men should disconnect the work wire while other two pull buoy down deck ready to shackle in to pennant wire with a 25 ton SWL nut and bolt shackle.

Casing wedge are very useful in holding the buoy in position on deck while it is being shackled to pennant wire. When this has been completed everyone stand clear and knock off pelican hook. The buoy may go shooting over the side or may need the ship to steam away from it to pull it over the stern depending on water depth/length of pennant and weather conditions. Care should be taken to see that the buoy does not take the casting wedge with it when it goes over.
11.17 PROBLEMS LIKELY TO BE ENCOUNTERED

Kenter shackles will not fit over thimbles of pennant wires, this is quite common and sides of thimbles should be ground down or burnt off to make links fit if this is impossible permission should be asked to install 50 ton bow shackles.

You may experience difficulty reaching your objective in cross winds. While dragging out cable you will find that bow thrust and rudders are not much use to you in making the direction you wish to go. Engines should be used, ie more revs on the down wind engine, to make up to the position in a sideways direction.

You may not be able to reach your objective due to the drag of the chain on the seabed. If you do come to a halt before arriving at the required distance, check with rig how much cable they have out, they may have stopped early, if there is no apparent reason for stopping come right back to the rig leaving the cable in a large bight behind you and then steam out on full power all the way, you will probably gain two or three hundred feet this way. If that does not work get the rig to pull you back to 1000 feet cable out and attempt to run again. If this is still unsuccessful the rig may ask another ship to connect to your bow to assist in pulling out the cable.
11.18 ANCHORING OPERATIONS:

11.18.1 Prior Anchoring:

A detailed passage plan must be made for approaching anchorage areas.
In addition to the factors usually taken into account in passage planning, the following factors must be taken into account for planning arrival and departure from anchorages:

**An assessment must be made prior to approaching the anchorage for the following:**

- Testing the M/E in the astern direction well in advance of the approaches to the anchorage area;

- Reduction of speed appropriate for making the approach towards the anchorage area. If the approach speed is too fast, it is difficult to control the vessel, especially if the anchorage is too crowded.

- The maneuverability of the vessel, especially of larger vessels at slow speeds, which may restrict the vessel from making large or sudden alterations.

- It is imperative that prior anchoring, the vessel has come to a complete stop i.e. the speed over ground is near zero. The ship's speed should not exceed 0.3 over the ground when the anchor cable is being paid out.

- Identify a suitable anchoring space of appropriate depth, at a safe distance from other anchored vessels and hazards to navigation;

- Consider the combined effect of tide, current and the wind direction and strength, to plan the approach towards the anchoring position. If other ships are at anchor, the general direction of heading of the vessels provides a fair indication of the way own vessel will head after anchoring.

- Traffic conditions, especially with respect to other vessels approaching or leaving the anchorage area, thereby restricting them in their ability to manoeuvre fully, due to their slow speeds.

- Other vessels, approaching or leaving the anchorage area may also be unable to maneuver fully, due to their slow speeds.

- The ship’s speed should be reduced or the vessel stopped, if required, to carry out further assessment when approaching a crowded anchorage.

Basis the assessment on the above mentioned criteria, in case the conditions are found to be unfavourable for safe anchorage, the Master should avoid anchoring.
11.18.2 Critical Wind velocity:

Critical wind velocity is the wind speed at which the wind pressure exerted on the ship’s windage area is greater than the holding capacity of the anchor. The following table gives an estimation of critical wind velocity for different types of vessels in reasonably good holding ground:

<table>
<thead>
<tr>
<th>Vessel Type</th>
<th>Critical wind velocity</th>
<th>Beaufort Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>metres/sec</td>
<td>knots</td>
</tr>
<tr>
<td>PCC/ Container ships</td>
<td>Ave 10 m/s</td>
<td>20</td>
</tr>
<tr>
<td>VLCC, Cape Size Bulker (Ballast)</td>
<td>Ave 15 m/s</td>
<td>30</td>
</tr>
<tr>
<td>VLCC, Cape Size Bulker (Fully Loaded)</td>
<td>Ave 20 m/s</td>
<td>40</td>
</tr>
<tr>
<td>Others</td>
<td>Ave 15 m/s</td>
<td>30</td>
</tr>
</tbody>
</table>

It should be noted that critical wind velocity does not take into account the effect of swells and tidal stream.

11.18.3 The vessel’s anchoring equipment is essentially intended for the temporary mooring in a sheltered or protected area or within a harbour when the vessel is awaiting berth, tide, etc.

The vessel’s anchoring equipment is designed to hold the vessel in good holding ground in conditions such as to avoid dragging of the anchor, and in poor holding ground the holding power of the anchor will be significantly reduced.

The vessel’s anchoring equipment is not designed to hold a vessel in an exposed location in rough weather or to stop a vessel which is moving or drifting.

The vessel’s anchor and anchor cable are designed based on an assumed current speed of 2.5 m/sec (5 knots), wind speed of 25 m/sec (50 knots) and scope of chain (ratio between chain paid out and water depth) between 6 and 10.

The anchor windlass is typically designed to be capable of weighing the anchor and 3 shackles of chain hanging free in water.

11.18.4 Deep Water Anchoring: The Company requires all vessels to walk back the anchor under power to the desired scope in depths over 50 metres, except in emergency. Vessels must not anchor in depths greater than 100 metres, except in emergency. If the vessel requires to anchor in depths greater than 100 meters during routine operations, then office permission should be sought. To avoid damaging the windlass, the anchor cable should be kept up/down and paid out continuously under power till the entire scope is paid out. Engines and anchor brakes should be used as required to avoid over-speed and/ or overload of the windlass motor.
Anchor lashings must be removed while transiting in restricted and congested waters where depths allow anchoring (e.g. Dover, Singapore Straits). In certain cases, such as Single Buoy Moorings and on approach to some berths, local regulations require the anchors to be secured.

**Anchoring Procedure**

When anchoring any vessel in depths less than 50 metres, other than in an emergency, there are two options:

- The anchor should be lowered under power consistent with manufacturer's instructions; to 4-6 metres above sea-bed. It should then be taken out of gear and the operation completed by “letting go” maintaining full control by careful application of the brake.
- The windlass should be kept in gear with the brake and cable stopper off, and the anchor lowered under power until the required amount of cable has been paid out. The brake and the cable stopper should then be applied and the windlass taken out of gear. This will ensure no damage to gear teeth in the event of sudden surge on the cable.

A pre anchoring meeting between officer in-charge of forward operations and Master should preferably be carried out prior anchoring. During the meeting the planned anchoring procedure and depth available at anchorage area should be discussed.

Close communication should be maintained between the Bridge and the forward station throughout the anchoring operation. Both parties should keep each other updated regarding the depth of water, ship’s speed over ground, visual check forward, engine motion, direction and strength of wind/current and direction and tension of the cable.

After it has been confirmed that the vessel is brought up, the ground stopper should be lowered and secured with the locking pin. The chain should be eased so that the weight of the cable is taken by the ground stopper.

**11.18.5 Anchoring of Large Vessels**

Very large vessels (Capesize Bulk Carriers and VLCCs) must in general, use method 2 when anchoring, except in cases of an emergency or running moor.

In shallow waters (depth less than twice the draft) option 1 can be exercised, however, when doing so extreme care must be taken.

It should be noted here that when lowering anchor under power, excessive load on the anchor cable could cause damage or wear of the windlass engine and gearing. Every effort should be made to maintain the brake system in fully operable condition.

We remind Masters, particularly of our larger vessels, that pilots are not always well experienced in this aspect. Pilot’s intentions should be established well in advance of anchoring, preferably during the Master-pilot information exchange.

On completion of anchoring, the cable stopper is to be locked in position across the cable. The cable adjusted to rest up against the stopper and then the brake engaged and windlass gear disengaged.
11.18.6 Upon Anchoring / Anchor Watch

Immediately upon anchoring, a fix on the anchor drop position should be made and the ship’s swinging circle ascertained, based upon the length of cable in use.

At sufficiently frequent intervals, check this position by taking bearings of fixed navigational marks and/or marks monitored by automatic radar plotting aids or readily identifiable shore objects.

Other than visual means, positions should also be checked using all other available means on board, including Radars, GPS and ECDIS, at regular intervals. In built “anchor watch” features should be utilised (where available) and alarm limits set as per the swing circle. The swing circle radius should be calculated by adding the length of the chain paid out and the ship’s length.

Ensure that the vessel exhibits the appropriate lights and shapes and that in restricted visibility the appropriate sound signals are sounded.

Ensure that an efficient lookout is maintained. In case of restricted visibility, it is recommended to have a look out in addition to the OOW.

Ensure that the state of readiness of the main engines and other machinery is in accordance with the Master’s instructions.

Unless the anchorage is considered very safe and the vessel is going to be anchored for a long period of time, vessel must keep her engines at immediate notice or short notice.

Observe weather, tidal, sea, current and ice conditions and obtain weather forecasts every 6 hours. In case the weather is expected to deteriorate, engines must be kept ready at all times. Generally in wind condition above Beaufort force 6 and swell height over 2 metres, engines must be kept ready. In case of wind force greater than force 6/7 or swell over 2 metres, an assessment must be made well in time whether the vessel must remain at anchor or drift out at sea.

Notify the Master if the vessel drags its anchor and undertake all necessary remedial measures.

Notify the master if any other vessel is dragging anchor.

Notify the Master if the visibility deteriorates.

Notify the Master if any vessel anchors too close to own vessel.

Ensure periodic rounds on deck, where required, maintain anti piracy precautions.

Maintain a listening watch on the VHF on the channels prescribed for the port, in addition to channel 16 / 70.

Ensure the security of the vessel by keeping a vigilant look out for approaching boats.

Call out additional stand by crew if the situation demands.
Monitor the safety of cargo deck operations from the wheel house, if applicable, and assist the Chief Officer with information as necessary.

11.18.7 Records shall be maintained in the Deck Log Book showing the bearings and distances being checked, the ships heading, and bearings and distances of vessels anchored around own vessel. These checks shall be recorded at intervals decided by the Master, but should be no greater than at hourly intervals.

11.18.8 Action to take in case of anchor dragging:

1. Pay out extra length of anchor chain. It should be noted that by paying out additional three shackles of anchor chain, the critical wind velocity increases only by 1m/s.

2. Keep the ship’s head into the wind and ease the tension on the cable by using the main engine, rudder and bow thruster (if applicable).

3. Consider shifting anchorage or drifting offshore.

At anchorages which are exposed to heavy wind and swell conditions, all usual heavy weather precautions must be taken. Weather forecast reports must be taken such that decisions, if required, to heave up anchor and proceed to sea can be made well in advance and not wait till the situation becomes out of control. Long range weather forecast (4/5 days) must be taken daily and carefully reviewed by Master. Efforts should be made in receiving such long term weather reports through local VHF, Radio and television sources (as applicable).

In case the port allocates an anchorage position and the Master has justifiable reason to consider it unsafe, he should seek advice from the port authorities, explaining his concerns. Once at anchor, if other vessel(s) come and anchor very close and which the Master deems unsafe considering the prevailing circumstances and conditions, this should be communicated to the vessel(s) concerned as well as to the port authority, with a request to the other vessel(s) to shift anchorage.

If however no action is taken by the other vessel(s) then the Master should use his judgment and discretion to shift the anchorage, bearing in mind that the final responsibility for the safety of the vessel remains with him.

Caution is required when picking up anchor in bad weather to avoid damage to windlass machinery. While heaving up the anchor, the cable should be kept as close as practicable to up and down. The vessels should consider use of main engines to maneuver vessel or bow thruster, if available, to relieve tension in the anchor chain before having up. Anchor station crew should closely monitor and report “lead” of cable. When required brakes can be tightened to avoid the load to continue on the motor and vessel can resume heaving once the weight is eased off.

11.18.9 Securing of Anchors at Sea

It is extremely important that the anchors are stowed tightly against the shipside while at sea. It is not enough that the ground stopper is engaged whilst at sea. The anchor must make a ‘three point contact’ with the hull. Both flukes and the crown of the anchor should be in contact with the hull.
If the chain is slack, the anchors will bang against the shipside, in heavy weather. This can easily cause a hole in the shipside.

While the vessel is at sea, the Windlass brakes and Lashing wires are the primary and secondary means respectively for anchor securing. Hence it must be ensured that both these arrangements are fully intact and reliable.

The Windlass brakes are to be tightened as per the recommendation of makers. Please note extra tightening and insufficient tightening are both incorrect. It is to be ensured that brake linings are in satisfactory condition at all times and timely renewed if necessary. A complete set of spare brake lining and screws to be always maintained on board.

In general anchor lashing arrangement should consist of at least 2 independent lashing wires of minimum 24 mm diameter, and the Turnbuckles used should be of 50 T BL, and their Test certificates safely maintained on board. The above lashing wires should be renewed every two years.

The Lashing wire eyes should have a thimble with pressed fitting at both ends. On no account should bulldog grips be used.

On smaller vessels where usage of a 24mm diameter lashing wire is impracticable, a smaller diameter wire in, consultation with the Superintendent, can be used. It is recommended that wires, shackles and turnbuckles should have a breaking load of at least twice the weight of the anchor.

Spurling pipes must be covered by steel plates, canvas and cement to avoid any ingress of water into the chain lockers.

Chain locker doors / Man holes must be secured tightly to ensure that even if chain locker gets filled with water, it does not enter the Fore Peak Stores.

11.18.10 Emergency Preparedness:

1. Heaving the anchor using the opposite side windlass or anchor winch:
   Should the windlass motor fail, vessels shall have ready a contingency plan for heaving the anchor with mooring wires/ropes by turning the gypsy using the opposite side windlass or another winch.

2. Opening the joining shackle or the bitter end:
   All suitable gear i.e. shackle punch, spike, sledge hammer, hooks, marking buoy etc. shall be marked and kept separately in the fore peak store for immediate use.

3. On ships with hydraulic winches, be aware of the change over procedure in case one power unit is inoperational.

4. Compatibility of motors:
   Check the possibility of replacing the windlass motors/pumps with other winches.