CHAPTER 5

Seamanship

The term seamanship is a broad one. Good seamanship includes everything from keeping the heads (toilets) clean and hygienic to handling the ship professionally and safely in adverse weather.

Housekeeping and staying shipshape

Housekeeping is an essential part of good seamanship — a place for everything and everything in its place. Consider the following when working as a crew member on a vessel:

- Keep the decks clear, especially access to emergency equipment.
- Hatches that are to be closed at sea should remain that way.
- Keep freeing ports clear at all times.
- Tidy all loose lines on deck.
- Fish/slime should be washed from the deck frequently.
- Always keep personal equipment stowed if it is not in use.

Types of ropes

Natural fibre

Natural fibre ropes are not as common as they used to be due to the superior strength offered by modern synthetic lines. However, they are still used for slings, cargo nets and lines that are run through block and tackles. Two types of natural fibres are:

- Manila — the strongest natural fibre, it is made from a type of banana tree found in the Philippines.
- Sisal — this fibre comes from a plant cultivated in Africa.

These ropes are relatively easy to knot and splice and are easy on the hands. Their lack of strength, when compared to synthetic lines, is due to the fibres that make up their construction not being continuous – plants only grow so tall.

Synthetic fibre

The fibres that make up the construction of synthetic rope are sometimes as long as the rope

itself, due to the plastic extrusion process. Plastics technology is complex and many different types of synthetic ropes exist today. The most common synthetic fibre ropes used onboard include:

- Nylon (polyamide) — it is immensely strong and may stretch up to 42% before breaking. For this reason it is ideal for situations where shock loads may be incurred, such as safety lines.
- Polyester — this is next in strength to nylon and stretches to about 35% before breaking.
- Silver rope (polyethylene) — very common onboard and often used for dinghy painters as, unlike polyester and nylon, it floats and rarely fouls propellers. It has good abrasion resistance and is relatively easy to knot and splice.

Steel wire rope

Used almost exclusively for lifting operations, steel wire rope comes in many different forms of construction and material. It is very important that the right type of wire is used for the right application. For example, wire rope that may be suitable for bracing a mast will be unsuitable for running through a block and tackle.

Chain

There are three standard grades of chain: 30(L), 40(P) and 80(T). Grade P is commonly used for anchoring and the much stronger Grade T is used for lifting purposes. Chain may be long link or the stronger short link. Stud link chain is even stronger as the studs strengthen the links and prevent distortion. The studs also prevent the chain from forming kinks or knots.

Chain should be joined using special lugged shackles, rather than conventional shackles. Using bolts to join chains should be avoided. If a conventional shackle is used, ensure its safe working load is equal to or greater than that of the chain. 'Proof tested chain' should be stamped on every link with the grade identifying letter.

Generally chains must be regularly inspected for wear, rusting and distortion and defective chains not used until they have been properly repaired.

Working load limits (WLL)

The working load limit is the maximum load which should be applied to an object under any condition. The WWL is based on a load being uniformly applied in a straight line pull. How the load is slung will affect the WLL.

Lifting gear

All lifting gear onboard is subject to extreme conditions and must be treated with care. This gear includes derricks, cranes, booms, rigging gear (blocks and tackles) and fish-lifting equipment. It also includes portable components such as eyes, shackles, hooks and pulley blocks.

Lifting gear should be regularly maintained and certified by an appropriate authority.

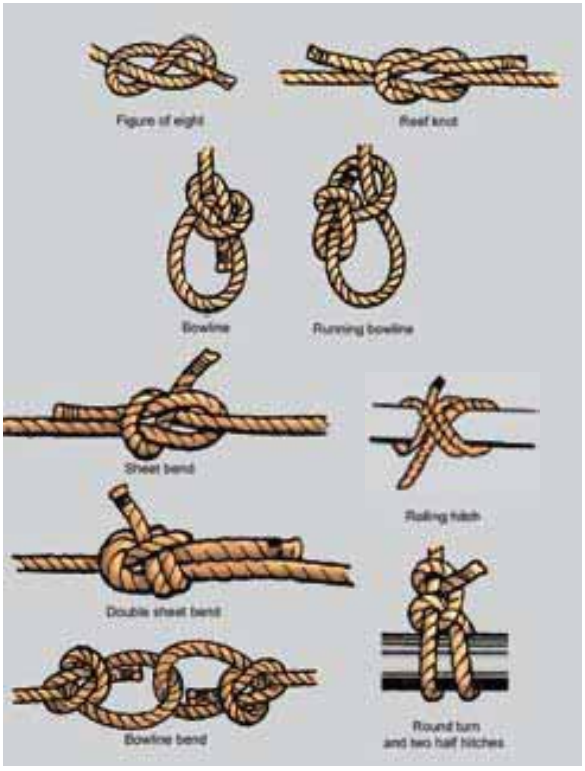
The following inspections should be carried out on lifting equipment:

- Check that the WLL is appropriate for the job.
- Check the eyes or chain links have not elongated.
- Check shackles are 'moused' (pins secured) and not worn.
- Sheaves of blocks are rotating and not worn.
- Check that steel wire rope is not rusted or kinked and has no broken strands.
- Keep moving parts well lubricated.
- Paint for protection where appropriate.
- Record all maintenance carried out.

When operating the equipment:

- Have a communication system — make sure all personnel involved know the correct signals.
- Make all movements slow and gradual.
- Be aware of the possible effect of the movement of the vessel in a seaway.
- Avoid sudden shocks and beware of 'side pulls'.
- Consider the effects that loads may have on the stability of the ship.
- When using derricks or cranes remember that the centre of gravity of a suspended load acts from the end of the boom.
- Don't stand in the bight of a line in case the line snaps under load.
- Never walk or stand under a suspended load.
- Always wear personal protective equipment and clothing.

Knots, hitches and bends



The ability to work a single line into a shape to perform a function (a knot), attach a line to an object (a hitch) or join two lines together effectively (a bend) are essential skills for crew members to learn. A good reference book will help crew to become proficient in rope work and there are many publications available on the subject.

Listed below are the basic knots, hitches and bends that crew members should be proficient in — like any skill it takes practice.

Reef knot

This knot is used to reef sails — tie them down to the boom to reduce the sail area in high winds. These reefing lines are single lines, so they are known as a knot rather than a bend. Lines of the same diameter must be used to tie a reef knot.

Figure-of-eight knot

This knot can be used in two ways:

- to stop a line from running through a block or fairlead
- as a hand hold to make it easier to grip the line.

Bowline (pronounced 'bowlin')

One of the most useful knots onboard a vessel, it forms a temporary eye in the end of a line and, even after a heavy load has been applied to it, will undo easily by 'breaking its back'. A bowline reduces the strength of the line by 50%.

Sheet bend

A sheet bend is identical to a bowline, but they are both used for different function. One line is passed through a loop of another line, rather than tied in itself, therefore, it is a bend rather than a knot. A sheet bend can be tied with two lines of different sizes but the strength of the lines in this bend will be reduced by 25%.

Clove hitch

A line can be very quickly tied to a rail using this hitch. However, it mustn't be used for suspending heavy weights as it is prone to slip on some surfaces, such as stainless steel rails.

Rolling hitch

The rolling hitch is used to take strain along spar or large rope, chain or wire. Instead of one initial turn about the spar, take two turns on the side the pull is to be exerted. The gripping power may be doubled by tying the hitch twice on the rail.

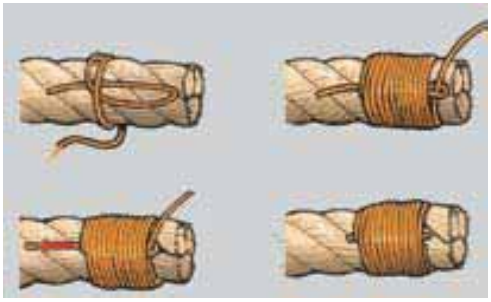
Round turn and two half hitches

Common for securing line to a bollard, spar or ring.

Whipping

Ends of a rope should be protected from unravelling by whipping. There are several methods, but one of the easiest to do is traditional whipping.

When whipping the end of a rope ensure that the turns of the whipping are passed against the lay as illustrated here. These turns need to be made as tightly as possible.



A common whipping.

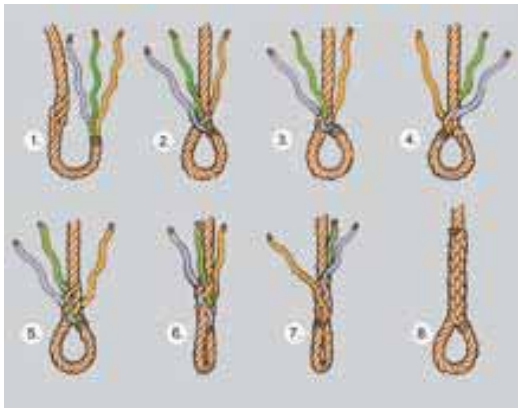
Special whipping twine that has a wax coating is available from ship chandlers. This helps the twine slip against itself and the rope to make sure that a tight bind is achieved. The width of the whipping should be equal to the diameter of the rope.

Melting a synthetic rope end

Commonly known as a butane backsplice, this is a common practice to prevent unravelling of a synthetic rope. Using an electric hot knife designed for the purpose is by far the most effective and safest way to do this, however, a whipping should still be applied.

Splicing three strand rope

Splicing is a preferred method of forming an eye in a rope (or joining two ropes together) as it does not weaken it as much as a knot does. A well-executed splice may retain 90% of the rope's strength, compared to approximately 50% for some knots and bends. Knots, are temporary arrangements, whereas a splice is permanent because it involves deconstructing the rope into its component strands.



Eye splice.

The eye splice is the most commonly used splice onboard. Note that before unlaying the strands, a small whipping is applied to each strand to prevent them from unravelling too far. The most common mistake that is made is tucking the strands with lay of the rope. Remember, all three strands must be tucked against the lay. Notice in the above illustration that the third strand needs to be turned back against its natural direction to ensure all three are then travelling in the same manner.

When splicing natural fibre ropes, each strand should be tucked at least three times into the standing part of the line. With synthetic rope, tuck each strand at least five times.

Many publications are available on the subject of rope work.

Coiling and stowage of rope

Most lines that are used onboard, including steel wire rope, are constructed with strands that spiral in a right-hand direction. That means that as you look at the line, it spirals clockwise no matter which way you view it. For this reason, lines should be coiled clockwise. Rarely, you may encounter a left-handed lay, so always check before coiling and stowing a new line.

If the rope is coiled against its natural lay, it will be prone to kinks and twists as it runs out which may cause the line to jam in blocks or fairleads and reduce its breaking strain.

Ropes should be stored clear on a pallet or hung in their coil in a dry, well-ventilated space out of the sun.

Securing a line

To a horn cleat or small bollard: pass the line around the base of the cleat with one round turn, then follow up with figure eights around the horns of the cleat. With materials such as stainless steel and synthetic fibres, it may be necessary to finish off with a half hitch to prevent the line slipping.

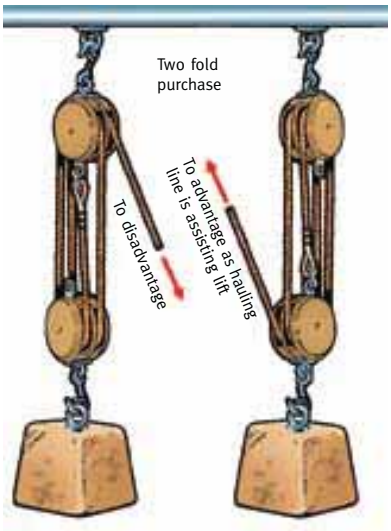
To a sampson post: pass the line three or four times around the post, then secure with a tugboat hitch (also known as a lighterman's hitch) as shown.

Anti-chafe

Some lines onboard may experience chafe and point loading over time. For example, a mooring line where it contacts the fairlead of the vessel or a towline at the point where it passes over the transom. 'Freshening the nip' is one method used to minimise this. The line is either bought in or veered out by small amounts at regular intervals. Commonly, anti-chafe material will be fixed to a line that is in continual contact with a surface.

Purchases and tackles

With the use of blocks, great mechanical advantages may be gained when heavy loads need to be controlled or moved. Most small ships will have a handy-billy in the bosun's locker — a portable block and tackle system that may be used about the ship when required. Purchases may also be a permanent part of the ship's rigging, such as the lifting mechanism for the boom of a derrick.



The tackle on the left is rove to 'disadvantage' with a mechanical advantage of 4 :1.

The tackle on the right is rove to 'advantage' with a mechanical advantage of 5 : 1.

The greater the number of sheaves in each block, the greater the mechanical advantage and the more weight that can be moved. By counting the number of lines (falls) supporting the moving block, the mechanical advantage can be determined.

Blocks must be well maintained and, if used for lifting, must have their safe working load stamped on the cheeks.

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Anchors and anchoring

Anchors are used primarily to hold vessels in one place, but are also able to reduce the rate of drift in heavy currents or seas and assist in berthing in close quarters.

Glossary of anchoring terms

Anchor aweigh — the anchor is aweigh immediately if it is broken out of the ground.

Bitter end — the very end of the anchor cable, where it is attached to the ship. When at the bitter end, there is no more cable to let out.

Catenary — the curve formed by a uniform chain hanging freely from two points not in one vertical line.

Dragging — when the anchor is not holding the bottom it is dragging.

Freshen the nip — at intervals, especially in foul weather, veer a little more cable so that the same section of cable will not receive the punishment (chafing) all the time. The same action would apply to anchor rope in a fairlead.

Fouled anchor — anchor has fouled on an obstruction.

Hawse pipe — these are cast steel pipes near the bow of a vessel, between upper deck or forecastle and the vessel's side through which a cable passes and into which the shank of an anchor may be drawn.

Kedging — moving a vessel by means of small anchors and hawsers.

Rode — the anchor line or cable between the attachment on the vessel and the anchor.

Scope — the ratio of the cable out to the depth of water when vessel rides at anchor.

Short or long stay — the cable is at short stay if it leads steeply downwards from the hawse pipe and at long stay if it leads well away and less steeply.

Surge — to let the cable run out without using power.

Veer — to use power in paying out the cable and not to let it run free.

Windlass — a mechanism for controlling an anchor rode as it is let out or hauled in.

Weigh anchor — to heave in cable until the anchor is broken out of the ground and clear of the water.

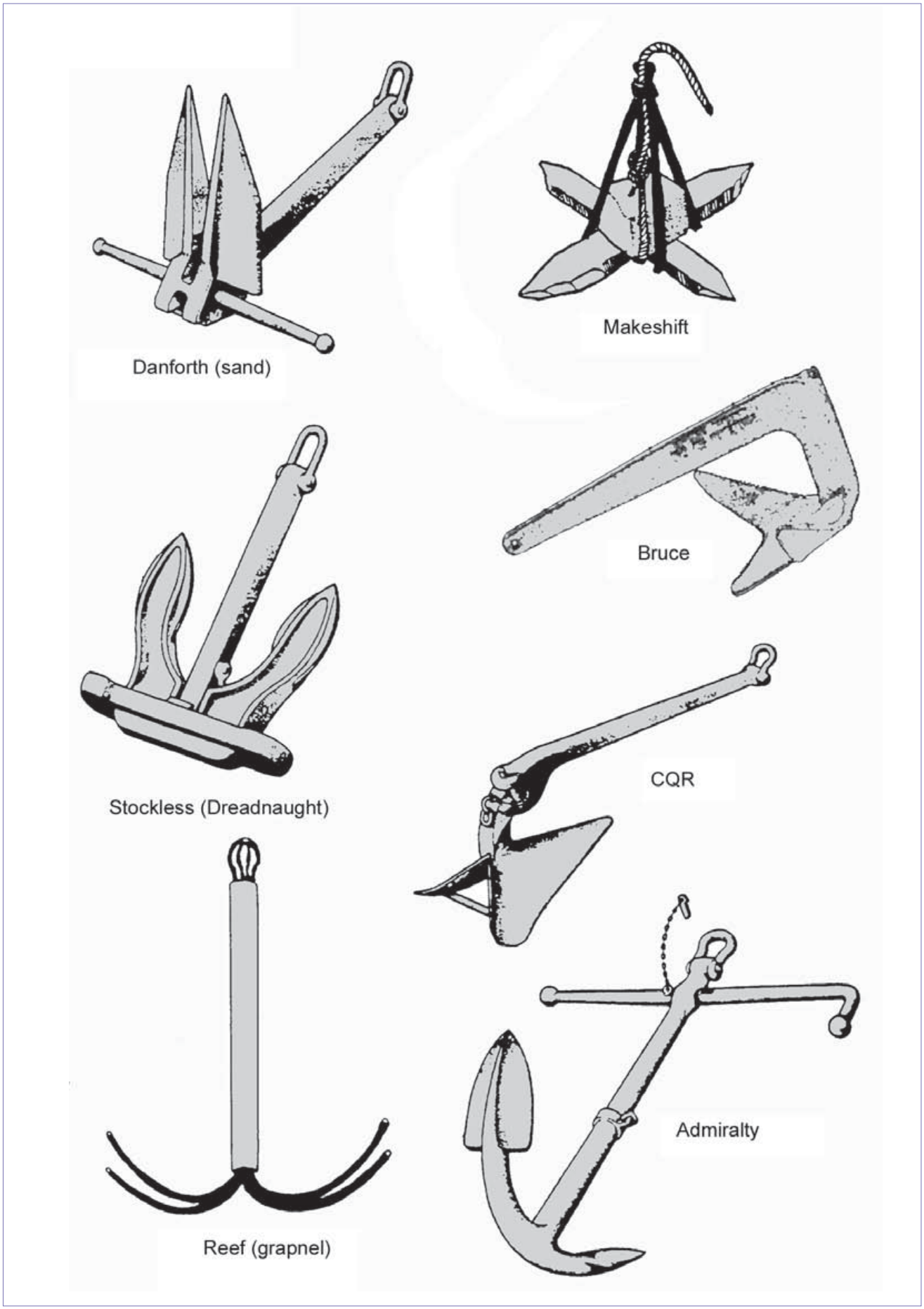
Types of anchors

The NSCV, Part C Section 7 deals with the number and weights of anchors required on various sizes and types of commercial vessels. However, anchors come in many shapes and sizes.

All of the anchors on the opposite page, with the exception of the reef grapnel, operate using the same principle. The flukes of the anchor will dig into the sea bed just like a plough. There are some advantages and disadvantages with each design, like stowage onboard and holding power in different bottom compositions.

For example, the danforth anchor design is commonly seen aboard small ships. It is relatively lightweight, may be stowed into a hawse pipe and holds well in muddy or sandy bottoms. However, the danforth also tends to need a higher scope ratio as it does not hold well at

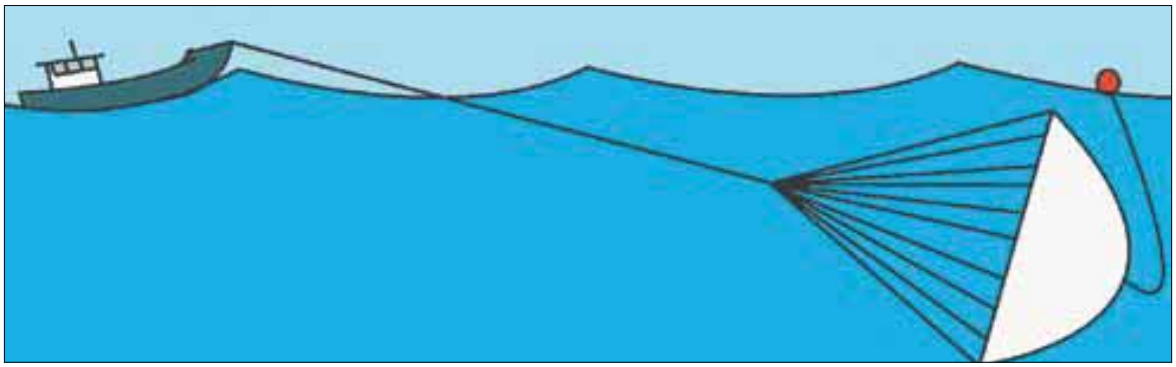
short stay, it tends to break out if strain is exerted from a sightly different direction and is also subject to fouling the rode if care is not taken.



Sea anchor

Also known as a drogue, this piece of equipment does not secure the vessel to the sea bed in any way. It is primarily used to slow the rate of drift of the ship at times when traditional anchoring is not possible, such as in very deep water.

In effect, the sea anchor is simply a hydraulic parachute. It can be deployed when a diver needs to disentangle a propeller far out at sea, to slow the rate of drift of the ship and also hold the bows toward the sea without using propulsion. On the other hand, it may be deployed during extreme conditions as a method of heaving to.

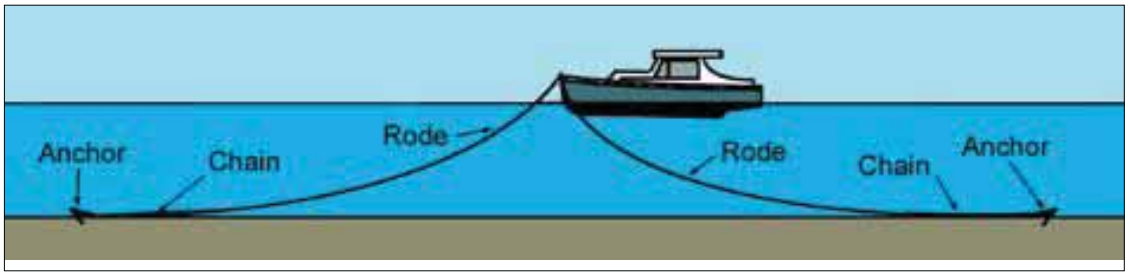


Sea anchor.

Dropping anchor

The master will take many things into account before the order is given to bring the ship to anchor. The master will consider:

- The state of the tide — under keel clearance must be adequate at all states of the tide, so when anchoring at the top of the tide, this is particularly important.
- The nature and contour of the bottom — does it drop away sharply? Does the chart indicate any smooth rock or coral heads?
- The current and forecast weather — the ship should never be exposed to a lee shore.
- The presence of hazards, nearby channels and other vessels with regard to the scope required and subsequent swinging room.



Anchoring system – scope is the ratio between the depth of water the length of the rode. For chain, a scope of 5:1 is adequate in normal conditions; increase to at least 7:1 if conditions worsen.

During the manoeuvre, crew members must be aware of their personal safety at all times by wearing appropriate PPE, particularly if the rode is surged rather than veered out.

- Make sure adequate communication is established with the master and that crew members have been briefed on any other crucial matters such as how much cable to pay out. Crew members must be familiar with the markings on the chain.

- Crew members must be familiar with the operation of the anchor windlass. Controls should be clearly marked. If they are not, the master will give a briefing beforehand.
- Ensure that the chain has flaked adequately in its locker or is arranged on deck so that no kinks or twists will prevent the rode from running free. Also ensure that the bitter end is secured to the vessel.
- As the anchor comes to rest on the bottom the ship should have slight sternway. If it does not, the rode is likely to foul the anchor. The rode should be laid out neatly behind the anchor so it does not catch on the flukes or stock.
- When the required scope is reached, apply the brake to the windlass and communicate this to the master. The master may then set the anchor using moderate reverse propulsion.
- Any raising or dipping of the rode at this stage may indicate that the anchor has not set but is dragging.
- Anchor windlasses are designed to raise and lower the ground tackle – not as a strong point to secure the vessel. The strain should be taken off the windlass and transferred to a sampson post on the foredeck, using a snubber line with a devils claw. This is known as a chain stopper.
- Observe the vessel's position with regard to other vessels, landmarks or transits and always remain vigilant for a dragging anchor.

Dropping anchor is a controlled exercise at all times and a well-executed manoeuvre as a result of good communication between crew members and the master. However, vigilance is required at all times, particularly if the weather deteriorates.

Weighing anchor

Often, it will be a crew member who calls the shots when weighing anchor. How the cable grows from the hawse pipe is not visible from the helm so good communication is essential. The master's actions with throttle and helm will often be dictated by the hand signals received from the crew members on the foredeck.

The windlass must not be used to bring the ship to short stay without the ship's main propulsion being used — remember the windlass is not a strongpoint. Substantial damage can occur if this piece of deck machinery is used to haul the entire ship through the water. Instead, the ship should be motored gently along the lay of the cable as the windlass brings it aboard.

Some points to remember when weighing anchor

- The cable may need flaking in the anchor locker below as it comes aboard. This prevents it mounting up under the spurling pipe as well as ensuring a clean run out the next time the vessel is anchored.
- Observe the chain links as they engage in the gypsy. A worn gypsy or elongated chain links will result in a jam and a dangerous override will result. If this occurs, veer some cable back out. If the cable is surged, it may jump off the gypsy completely and continue running out until the bitter end is reached.
- Some windlasses are fitted with a chain stripper which is a piece of metal mounted edge-on at the base of the gypsy to ensure any jammed links are prised out and don't cause an override.

- Have a well-understood set of signals to communicate with the helmsman. These should include the amount of chain that has come aboard, how the cable grows, when the cable is up and down, and when the anchor is hove in sight.
- Ensure that a chain stopper (such as a devils claw) is applied to the chain once the anchor is home. Do not rely on the windlass brake alone to hold the anchor in place.
- Changing the scope of the anchor rode (either more or less) does not reduce swinging, but only changes the 'period' of the swing. A smaller scope will result in a faster cycle, and increase the chance of anchor failure. The laying of two anchors set 45 degrees apart and centred on the wind will prevent swinging, but is not always a feasible option.

Motions of an anchored vessel

A vessel at anchor is constantly exhibiting many forms of motion. These are:

- Pitching — just as a vessel pitches underway, it will pitch at anchor if waves are present and of adequate size. The effect this has on the anchor cable is called heaving.
- Surging — as the wind gusts or the tidal stream varies in strength, the ship will surge on its anchor so that the cartenary of the cable will alternately decrease and increase.
- Sway and yaw — commonly referred to as swinging, this is the more obvious motion to be aware of. It occurs because the centre of wind and wave pressures act forward of the centre of lateral resistance of the ship. This tends to be more extreme on high-bowed vessels with their superstructure located forward of the beam. A vessel may sheer more than 60 degrees from the wind direction.

Watchkeeping at anchor

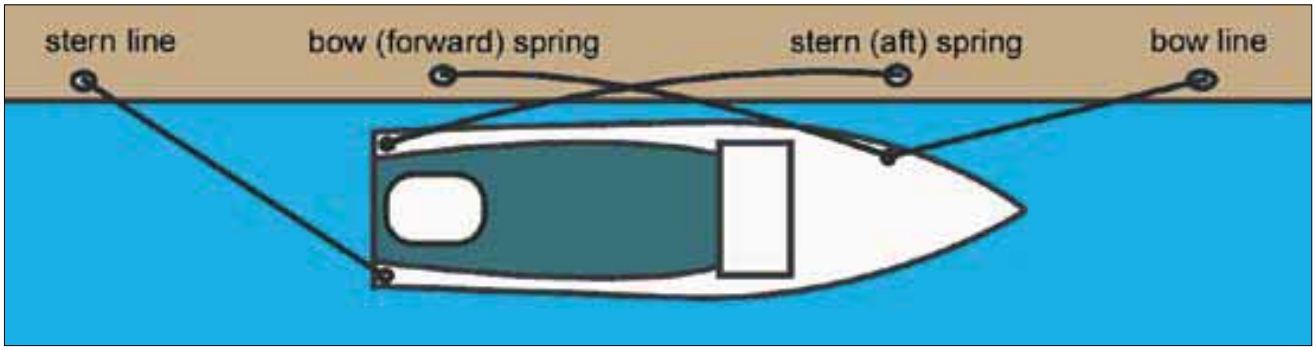
It is important for crew members to ensure that a proper lookout is maintained while the vessel is at anchor. The watchkeeper should:

- at suffienctly frequent intervals, check whether the vessel is remaining securely at anchor by taking bearings or observing transits of identifiable shore objects
- monitor weather, tide and sea-state conditions
- advise the master and take necessary measures if the anchor drags
- advise the master if visibility deteriorates
- ensure proper lights, shapes and sound signals are exhibited.

Coming alongside

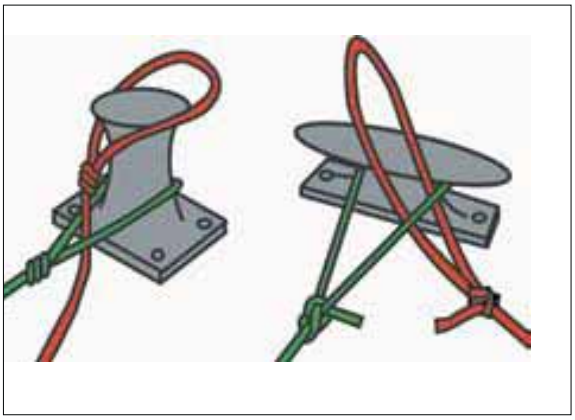
As with anchoring, good communication between crew and the master will ensure this manoeuvre is carried out safely and efficiently. It is important for crew members to know the correct terminology to maintain successful communication between the crew and master and avoid confusion.

How the berth is approached and the order in which berthing lines are to be passed ashore is entirely dependant on the master and may change with different circumstances and vessels. However some general rules for crew members will apply at all times.



Note: the forward spring line is made fast to the forward part of the ship. Spring lines are often mixed up by some deck hands. In addition to the above berthing lines, breast lines may also be used. These travel directly from the bow and stern of the vessel to the wharf at virtually right angles, but must be closely monitored in tidal situations and non-floating wharves.

- Fenders will always be required. Make sure that these, as well as all berthing lines, are ready before they are needed. A smooth berthing depends largely on preparation and any last minute running around just as the vessel is approaching the wharf will not help the master concentrate on the task at hand.
- Don't leave the ship — a professional crew should be able to berth their vessel without leaving the deck to complete the task on the wharf. Ideally, someone will be on the wharf to pass a line to or a competent deckhand can throw a line with sufficient accuracy that the bollard on the wharf can be lassoed. Make sure the working ends of all berthing lines remain onboard.
- If any mooring line drops into the water, retrieve it as soon as possible so that it does not foul the propeller.
- Do not stand in the bight of a line.
- Flake the line as part of your preparations — it will allow the line to run out more easily.
- Stand out of the way of the master's line of vision as the wharf is approached.
- The master will brief the crew prior to coming alongside.
- The master's directions must be obeyed, rather than those who may be on the wharf, unless the master advises otherwise.
- Be sure to dip the eye, as illustrated. This ensures that any line can be removed from the bollard or cleat in any order and is good etiquette with neighbouring vessels that may also be sharing that bollard.



Dipping the eye.

Heavy weather

Full responsibility for the safe navigation of the ship through rough weather lies completely with the master. However, the performance of the crew at this time is also of paramount importance.

They must be well rested, well fed and appropriately clothed for the forecasted conditions. The master's decisions will be made largely on the belief that the crew are trained and able to carry out the tasks that may be assigned to them. In preparation for, or when

encountering unexpectedly bad conditions, a good crew member can show initiative by:

- ensuring that objects that may move about are securely stowed
- bring stray lines under control and maintain a clear deck
- close and secure all hatches and monitor the state of watertight and weathertight integrity of the ship by closing portholes and deadlights and clearing scuppers, limber drainage holes and freeing ports
- secure the galley and shut off the gas supply at the bottles
- pump the bilges and ensure they are clear of debris
- be available — when off watch stay prepared by remaining clothed and having equipment readily available
- do not go out on deck without informing the master of your intensions, stay indoors and in communication with the master and fellow crew members
- prior to working on the deck put on a life jacket.

The master's options

In very heavy weather, the master may decide to run before the seas rather than continue on into a pounding head sea. During this turning manoeuvre, the vessel may roll violently as the seas come onto the beam and any gear that is not adequately secured will move from its correct location of stowage.

After the vessel is settled on its new course the wind and seas may appear to ease, as does the motion of the vessel, however great care still needs to be taken.

Broaching

In certain conditions, a vessel may be prone to broach when running before the seas. This occurs when the vessel starts to surf down the forward slope of a wave and the effect of the rudder diminishes as the stern rises and the bow drops deeper into the water. This brings the centre of lateral resistance of the underwater surface of the hull further forward, to the point where the vessel may trip over itself and yaw wildly out of control and lie broadside on the face of the wave. If the wave breaks at this point, it may capsize the vessel.

Broaching.

Pooping

When running before seas that are high and occasionally breaking, there is a possibility that a wave may actually break right over the stern of the ship and sweep the deck clear. (The term pooping comes from the days when older ships had a raised deck aft called the poop deck.)

If a vessel is pooping flooding may occur as water enters open hatches, the vessel may lose stability as water enters the deck and crew members may be injured or lost overboard from the force of the breaking wave.

In extreme conditions the master may decide that the ship's operations and current course become secondary to the need for comfort of the crew and safety of the ship, and so the ship may be hove to instead (note that 'heaving to' refers to the manoeuvre itself).

Several methods exist to make the ship as safe and comfortable as possible when it is in extreme conditions. Much depends on the design of the vessel, the experience of the master, the state of the wind and sea and how much sea room is actually available with respect to the rate of drift of the ship when hove to.

A sea anchor may be deployed from the stern or the bows of the ship with the engines stopped or at least out of gear. Some ships may lie more comfortably stern to. More commonly, a power vessel may be driven slow ahead at an angle of about 15 degrees to the oncoming waves at the minimum speed possible to maintain steerage way.

Pooping.