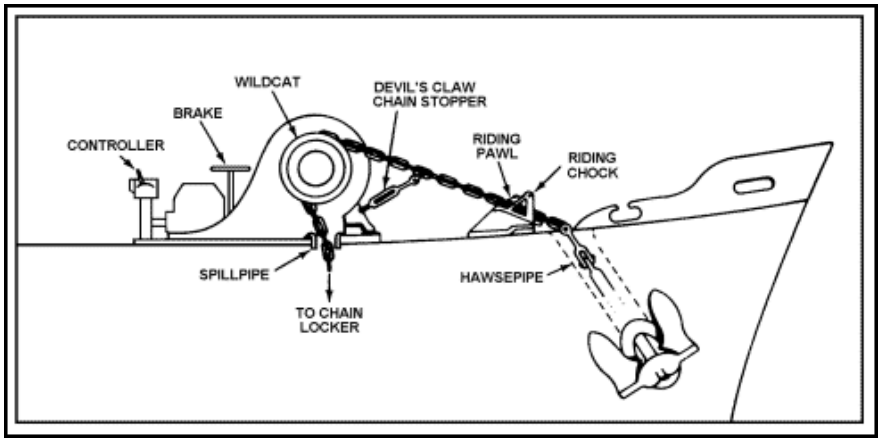
Unit 22

ANCHORING

1. Anchor Gear

The anchor gear (or ground tackle) is located on the forecastle and consists of all the equipment used in anchoring. This includes the anchors, the anchor windlass, anchor cables or chain, chain stoppers and the connecting devices (shackles, swivels), etc. When the ship is underway, the anchor is stowed in the hawse-pipe. It is attached to the anchor chain or cable by means of an anchor shackle (type D) and a swivel shackle. The chain then goes through the hawse-pipe onto the windlass (anchor winch) fitted on the forecastle deck. A ship is normally fitted with ten shackles (shots in US) of cable, each shackle about 25 metres in length, and connected to another shackle (length of chain) by an accessory fitting called kenter joining- shackle. The cable is lifted and lowered by the cable lifter (‘gipsy’ or ‘wildcat’) from where it falls down through the spurling gate and spurling pipe into the chain locker. The cable is secured on the forecastledeck by stoppers, devil-claws and anchor lashings. The chain is held by the windlass brake. The windlass also consists of one or two drums on the sides of it for warping and heaving on the mooring lines.



An anchor windlass is a machine that restrains and manipulates the anchor chain, allowing the anchor to be raised and lowered. The cable lifter (a notched wheel) engages the links of the chain. A brake is provided for control and the windlass is usually powered by an electric or hydraulic motor operating via a gear train.

Combination Anchor Windlass / Capstan

Technically speaking, the term "windlass" refers only to horizontal winches. Vertical designs are correctly called capstans. Horizontal windlasses make use of an integral gearbox and motor assembly, all typically located above-deck, with a horizontal shaft through the unit and wheels for chain and/or rope on either side. Vertical capstans use a vertical shaft, with the motor and gearbox situated below the winch unit (usually below decks).

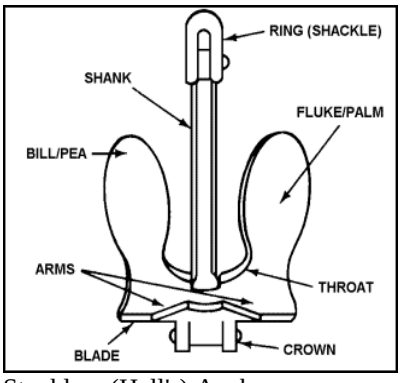
Wildcats (*gipsies*, technically referred to as *cable lifters*) are used in windlasses to haul in and pay out anchor chain on board ships. An associated chain stopper is used to secure the chain while the ship is anchored, or the anchor is housed. The wheels on either a vertical or horizontal windlass provide for either chain or rope to be engaged. The wheel for rope is termed a warping head, while the chain handling wheel is variously referred to as the gypsy (in the UK) or wildcat (in US), though due to the influence of the offshore oil industry the latter usage is now more common. For clarity in communication the generic term chain wheel is often used.

Nowadays, especially on large tankers and cruise ships, the windlass may be split into independent Port & Starboard units. In these cases they are frequently coupled with Warping Drums (as distinct from Warping Heads). In some of these the warping drums are of the self tensioning or constant tension type.

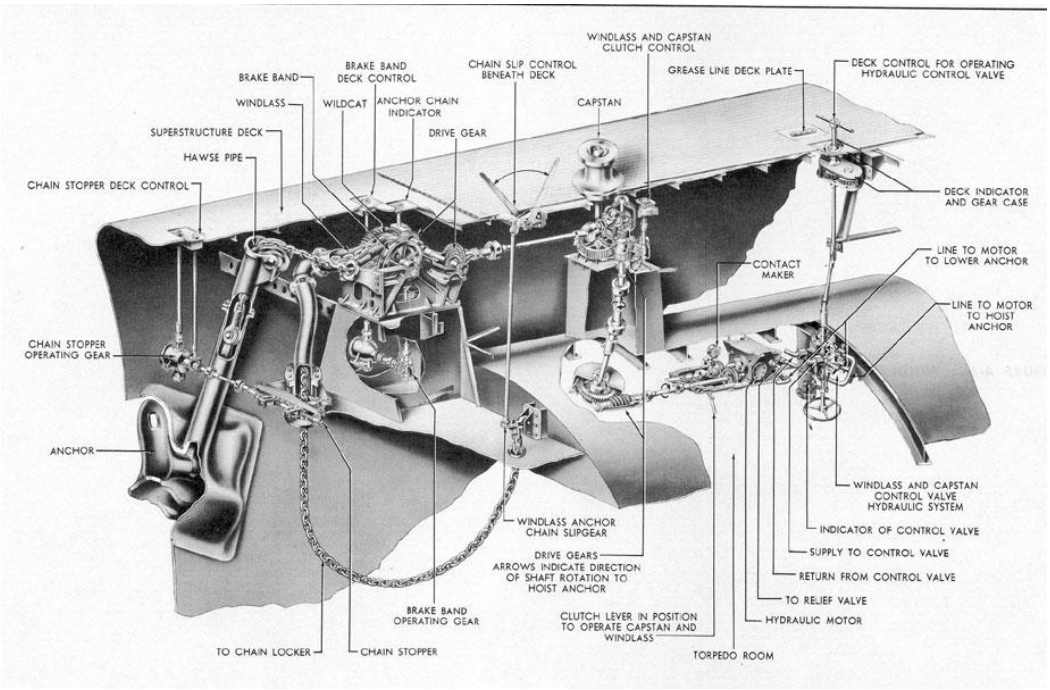
Power

Powered solutions include steam (antiquated), hydraulics, and electrics. Electrics are convenient and relatively cheap, but hydraulics prove more efficient and powerful on all but small boats. In general, windlasses and their power system should be capable of lifting the anchor and all its rode (chain and rope) if deployed so that it hangs suspended in deep water. This task should be within the windlass' rated working pull, not its maximum pull.

A super high **holding power anchor** is an anchor with a holding power of at least four times that of an ordinary stockless anchor of the same mass. A super high holding power anchor is suitable for restricted service vessels' use and does not require prior adjustment or special placement on the sea bed.



Stockless (Hall's) Anchor

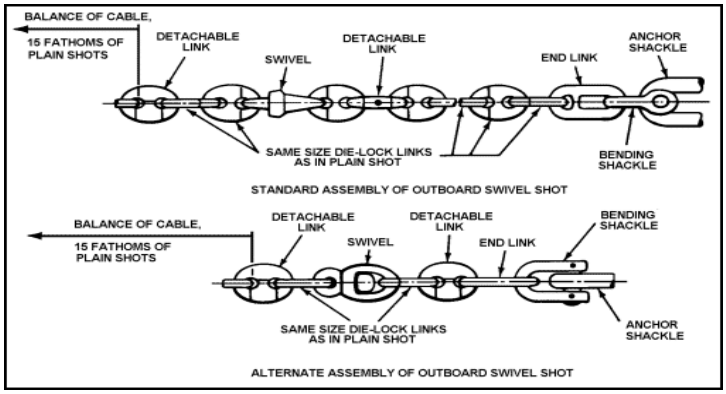


Layout (cross-section) of the anchor gear

2. Anchor chains and accessories

There are basically two types of ship anchors: the stockless anchor and stock anchors. Chains consist of chain links which can be either stud-links or studless links. The chain accessories include shackles (anchor shackle, joining shackle, kenter joining shackle, swivel shackle, Ramfor connector, pear shackle, mooring shackle, swivel-forerunner, etc.)

An anchor cable is an assembly of a number of individual units properly secured together. These units are connected to the anchor by means of a swivel piece made up of shackles, swivels, and special link. Each shot or shackle (=25 m) of chain is joined together with a detachable link.



Connecting Anchor to Anchor Cable; see: **www.globalsecurity.org/.../fm/55-501/chap21.htm**

TYPES OF ANCHORS, CABLES & CONNECTING ACCESSORIES

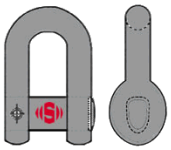
The Hall anchor (**stockless anchor**, patent anchor) is the most commonly used conventional shackles ship anchor.
The anchor can be supplied with certificates from the major class society.


Admirality anchor The Admirality type stock-anchors are designed to fold the stock along the shank when not used. The stock-anchors were used by sailing-ships, but later more modern studless anchors have made it obsolete.

Studlink anchor-chain is used for permanent and emergency anchoring of ships and other floating installation. The studs secure that every link comes into the gypsy (cable lifter), in correct position.

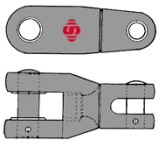
Studless anchor chain
Studless anchor chain are made to be used in permanent moorings when the chain will not go over a gypsy. The advantages are: less weight, fit bigger shackles without end-links and avoid problems with loose studs.
Studless anchor-chains are available in the same steel qualities as studlink anchor-chains. Studless anchor-chains in every size are supplied both for fish-farm mooring and offshore installations.

Anchor Shackles - Type D are used to connect the anchor to the anchor-chain. The shackle requires a studless endlink at the chain-side, and fits the anchors crown-shackle. Anchor-shackles Type D ready in stock in most sizes from dia 12,5 mm up to dia 137 mm..



Kenter Joining Shackles A kenter joining-shackle is made to join two lengths of chain and to fit in the gypsy (chain-wheel). Kenter Joining-shackles ready in stock in most sizes from dia 12,5 mm up to dia 137 mm. Kenter Joining-shackles ready in stock in most sizes from dia 12,5 mm up to dia 137 mm.

The swivel-shackle The swivel-shackle (often called super-swivel) was made to minimize the space between the anchor and the chain. It can connect both to a crown-shackle and also direct in the anchor-shank. The other end fit a studless endlink or a common link with stud. These shackles are a more expensive solution then the traditional swivel-forerunner, but often used to avoid the swivel in the chain-stopper.



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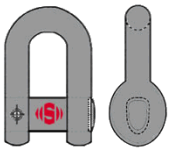
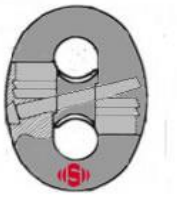


Pear Shackles - Type Baldt
Pear shaped End shackle can be used to connect the anchor-chain to the anchor. In the USA it often replace the D-type anchor-shackled used in the rest of the world. It can also connect a smaller chain to a bigger chain.
Pear shaped End shackle in every size from No 2 to No 9 to cover anchor-chain dia 19 – 95mm always ready in stock.

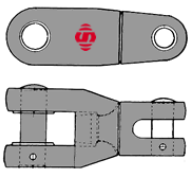
Connectors type RAMFOR
Connectors type RAMFOR has the same outside shape as a traditional Kenter joining shackle, but with improved fatigue properties. The difference is the design of the interior. The RAMFOR and RAMFOR Slim designs have a locking head of a different design than that of the Kenter joining shackles. This locking head has been designed to provide a larger load-carrying area, which in turn gives a better stress distribution.
RAMFOR and RAMFOR Slim type connectors have the same outside shape as the Kenter joining shackle and the RAMFOR Slim has a reduced thickness equal to the Baldt type connector. The slim shape will enable the RAMFOR Slim connector to be used on every mooring system on semi-submersibles, offshore loading systems etc. and will fit any wildcat (cable lifter, gipsy).



A Swivel-forerunner is the most common swivel-connection used on ships. It is economical and safe. The end with a studless endlink fit the anchor-shackle, and the end with a common link for the kenter-shackle. Swivel-forerunner ready in stock in most sizes from dia 12,5 mm up to dia 137 mm.

Baldt joining shackles for studlink anchor chain.

Swivel-shackle type A



Safety Bow Shackles
Standard shackles type G-2130 are used worldwide for both mooring and lifting. They have hot clip galvanized surface. They are certified with a safety factor of 6. Working load limit x 6 = Breakload


The mooring shackles are similar to the G-2130 shackles, but are made with a bigger gap to easier fit the anchors and other mooring accessories.
We have a stock of mooring shackles from 28 tonnes up to 90 tonnes. The mooring shackles are similar to the G-2130 shackles, but are made with a bigger gap to easier fit the anchors and other mooring accessories.


Thimbles
The wire rope thimbles are available in sizes from 19 mm up to 64 mm.

MARKING THE ANCHOR CHAIN

- 15 fathoms (1 shot). The detachable link is painted red, and one link on each side is painted white.
- 30 fathoms (2 shots). The detachable link is painted white, and two links on each side are painted white.
- 45 fathoms (3 shots). The detachable link is painted blue, and three links on each side are painted white.
- 60 fathoms (4 shots). The detachable link is painted red, and four links on each side are painted white.
- 75 fathoms (5 shots). The detachable link is painted white, and five links on each side are painted white

3. Anchoring - general

All vessels approaching anchorages must be aware of the potential incidents and take all appropriate precautions. All Masters should take the opportunity to manoeuvre their vessels whenever possible - approaching anchorages is a good opportunity to practice their ship handling skills and familiarise themselves with the characteristics of their vessels.

Masters are reminded to exercise caution when navigating in channels with strong currents either across or with the intended track. The control of the vessel and their ability to maintain their intended track can be affected. The safety of the crew and vessel comes first - proceed at a safe speed - slow down to a minimum steering speed before you enter the channel - check the response of engine movements if you are at unusual draft or trim - if you experience difficulties steering, use the engine with large rudder movements for short periods, if in doubt or if the situation is getting worse, stop the vessel and be prepared to anchor.

Be prepared - know as much about the anchorage as you can before arrival - do not underestimate tide and current. Anchoring large vessels has many dangers. It is strongly recommended that large vessels only walk out the anchor. All vessels should walk out the anchor when anchoring in deep water.

When at anchor, the notice you require for main engine to be ready must be appropriate to the circumstances - where the risk is greater - a crowded anchorage, poor holding ground, bad weather / strong wind (at the time or forecast for later) or strong tides and current - the main engine must be available for use at short notice. You will not need to be reminded of the usual practice of good seamanship and know that it is always advisable to cross astern of other anchored vessels - not cross ahead.

4. An anchoring operation involves the following stages:

Selecting the Anchorage

- Criteria:
  - Sheltered
  - Bottom Conditions (no rocks or reefs)
  - Water Depth (not too shallow or too deep)
  - Hazard Free for Anchor (buoys, traps)
  - Hazard free for Navigation (shoals, sand bars)
  - Fixes Available (Day & Night)
  - Boat Launch (close proximity to landing)

Plotting the Anchorage

- Letting-go Circle: radius = distance from hawsepipe to pelorus
- Letting-go Bearing
- "Drop" Bearing: 90^0R or 270^0R preferred
- Range Circles: 100 yd arcs to 1,000 yds
  1,200 & 1,500 & 2,000 yd arcs
- Length of Chain: 5 to 7 times the depth:
- Drag Circle: r = chain + dist. (hawsepipe to pelorus)
- Anchor holding?
- Swing Circle: r = chain + ship
- Collision threats?

Executing the Anchorage

- Get the ship as close to the approach track as possible
- Take all headway off when the hawsepipe is directly over the center of the anchorage.
- The navigator will take constant fixes and make course and speed recommendations throughout the evolution.

Post-Anchoring Procedures 1. Check the following:

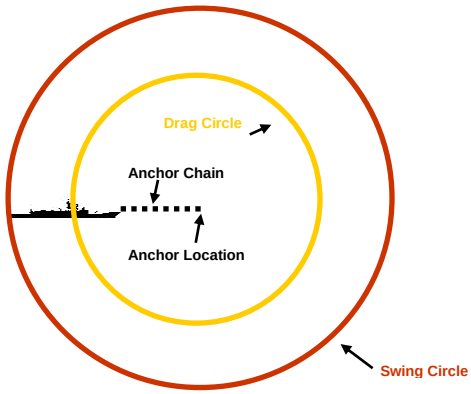
- Engines are backed
- Anchor flukes dig into the bottom
- Anchor is "set"
- Chain is *let out* or "veered"
- *Length* or "scope" of chain is five to seven times the water depth
- At this point, the chain is secured and ship should be all stop
- SOG = 0kts

Post-Anchoring Procedures 2:

- Once anchor is set:
  - Another round of bearings
  - Record ship's head
  - Note direction the chain is tending.
  - Plot another fix
  - Recompute the position of the anchor
  - Plot (chain + h to p) in the direction the chain is tending.

Post-Anchoring Procedures 3:

- Drag Circle
  - r = chain + dist. (hawsepipe to pelorus)
  - All subsequent fixes should fall within the drag circle; if they do not, the anchor should be considered to be dragging.
- Swing Circle
  - r = chain + ship
  - Verify there are no obstructions (above, below or on the water) within the ship's Swing circle.



Executing the anchorage

When executing the anchorage, the navigator's objectives are to keep the ship as close to the approach track as possible, and to have all of the headway off the ship when the hawsepipe is directly over the center of the anchorage. The navigator will take constant fixes and make course and speed recommendations throughout the evolution.

- Step One: With 1,000 yards to go, most ships are usually slowed to a speed of five to seven kts.
- Step Two: Depending upon wind and current, the engines should be stopped when 300 yards from the letting-go circle, and the anchor detail should be instructed to "stand by". As the vessel draws near the drop circle, engines are normally reversed so as to have all remaining headway off the ship as it passes over the letting-go circle.
- Step Three: When the pelorus is at the letting-go bearing, the word "Let go the anchor" is passed to the anchor detail, and the anchor is dropped.
- Step Four: As the anchor is let go, the navigator calls for an immediate round of bearings and marks the ship's head. After the resulting fix is plotted, a line is extended from it in the direction of the ship's head, and the hawsepipe to pelorus distance is laid off along the line, thus plotting the position of the anchor at the moment it was let go. If all goes well, the anchor will be placed within 50 yards of the center of the anchorage.

5. Anchor & Cable Work

After being instructed from the bridge by the officer, the ship's Boatswain releases the brake on the windlass and, with a clanging roar, the port anchor drops and the cable chain runs out through the hawse pipe. Six shackles of cable, attaching the anchor to the ship, have been run out. The vessel, drifting astern with the tide, pulls on the cable. The Chief Officer is leaning over the bows, directing a torch on the part of the cable that he can see. Slowly, it is lifting ahead, becomes taut, and is slackening again. The vessel is being brought up. When the Master orders "Dead slow ahead", the vessel is inching towards the lying ground of her port anchor. Then the Chief Officer on the forecastlehead says "Slack away starboard cable, heave in port cable easy". Three shackles of the starboard cable are being paid out and three of the port cable hove in, and the vessel, her engines stopped, comes to rest mid-way between her two anchors.

This manoeuvre is known as making a standing moor. It means that the ship is put in a position between two anchors. To be moored indicates that a ship has been put in position by two or more anchors and cables. To be moored also implies that a vessel is attached to a buoy or two buoys. A vessel is also moored when she is made fast alongside (i.e. port or starboard side to) or bow/stem on. A ship may be moored to a single buoy (SBM) or to a number of buoys (Multiple-Buoy Mooring).

When the ship is under way, the anchors are stowed in the hawse pipes, on either side of the ship's bow (bower anchors). The cable runs through the hawse pipe and is stored in the cable locker below the forecastlehead. An anchor is also carried on the afterdeck and is called the spare anchor. The anchor is carried out by boat some distance from the ship and the vessel is then pulled up to it by means of the windlass or a winch. Buoys and beacons are fixed into place by means of mooring anchors.

Cable is supplied in lengths of ninety feet, fifteen fathoms, and these lengths are called shackles of cable. Our ship has ten shackles of cable attached to each bower anchor. In order to distinguish one shackle from another, the lugless shackle is painted white. (Each length of

cable is joined to the next by a link which can be dismantled, and is called a lugless shackle.) Neighbouring links are also painted white. The windlass is used to heave in or veer out the cable. It has two drums called gypsies. It is driven by electricity and equipped with powerful brakes. From the gypsies the cable drops vertically through openings called the spiralling gates into the chain lockers. Various stoppers are used so that the pull of the anchor will not come on to the winch alone and that the anchor can be firmly secured when not in use. They are devices fixed on to the inboard end of the hawse pipes and are known as compressors.

"Anchor clear of the hawse pipe" means that the anchor has been eased out of the hawse pipe and is hinging by its ring. The cable "grows" in the direction it leads outside the hawse pipe. "Wind-rode" means that a ship, when she is at anchor, is with her head to the wind; "tide-rode" means that her head is to the tide; "riding weather tide" is when a ship is at anchor and the wind is against the tide; "riding lee tide" means that the wind and tide are in the same direction.

When a cable is at short stay, it is taut and leads down to the anchor vertically and when it is at long stay it reaches out and makes an acute angle with the level of the water. To veer cable is to let it run out under control; To surge cable is to let it run out under its own weight; To snub or check cable is to stop it running out by putting on the brake.

When the anchor is weighed-broken from the ground and hove up clear of the water the officer in charge will report whether it is clear or foul. Clear means that it is free from obstructions such as a chain picked up from the bottom, and foul means that the cable has its own cable twisted around it. If a ship is moored in a good holding ground and the weather is fair, there is little to worry about. There are, however, a number of rules to bear in mind about anchor work generally, and managing/handling vessels at anchor in bad weather in particular. An anchor is dragging when through stress of wind or tide it does not hold well, and is drawn along the bottom.

IMO SMCP 2001: phrases used in anchoring

A.1/6.3.2 Anchoring (VTS)

A.1/6.3.2 *.1* *You must anchor*
~ *at ... UTC.*
~ *until the pilot arrives.*
~ *in a different position.*
~ *clear of fairway.*

.2 *Do not anchor in position ... .*

.3 *Anchoring is prohibited.*

.6 *You must heave up anchor.*

.7 *You are at anchor in a wrong position.*

.8 *Have your crew on stand by for heaving up anchor when the pilot embarks.*

.9 *You have permission to anchor (at ... UTC)*
~ *in position ... .*
~ *until the pilot arrives.*
~ *until the tugs arrive.*
~ *until sufficient water.*

.10 *You are obstructing the fairway / other traffic.*

.11 *Are you dragging / dredging anchor?*

.11.1 *Yes, I am dragging / dredging anchor.*

.11.2 *No, I am not dragging / dredging anchor.*

.12 *Do not dredge anchor.*

A2/3.5 Anchoring (On-Board Communications)

A2/3.5.1 ***Going to anchor***

.1 *Stand by port / starboard / both anchor(s) for letting go.*

.2 *Walk out the anchor(s).*

.3 *We are going to anchorage.*

.4 *We will let go port / starboard / both anchor(s).*

.5 *Put ... shackles in the water / in the pipe / on deck.*

.6 *Walk back port / starboard / both anchor(s) one / one and a half shackle(s).*

.7 *We will let go port / starboard / both anchor(s) ... shackle(s) and dredge it / them.*

.8 *Let go port / starboard / both anchor(s).*

.9 *Slack out the cable(s).*

.9.1 *Check the cable(s).*

.9.2 *Hold on the port / the starboard / both cable(s).*

.10 *How is the cable leading?*

.10.1 *The cable is leading*
~ *ahead / astern.*
~ *to port / to starboard.*
~ *round the bow.*

~ up and down.

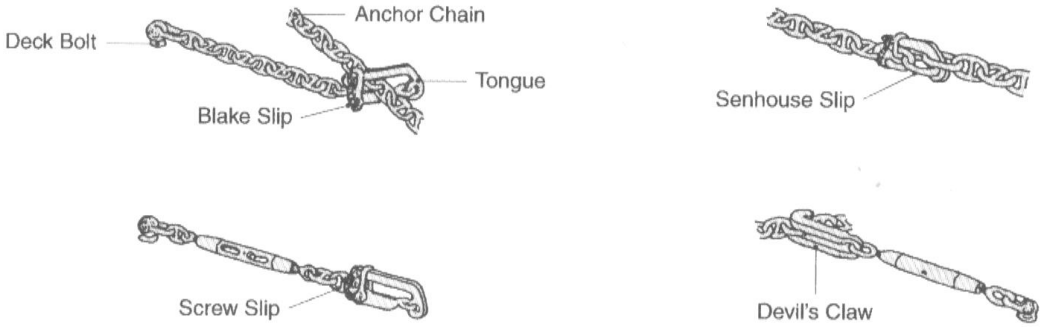
.11 How is the cable growing?
.11.1 The cable is slack / tight / coming tight.
.12 Is / are the anchor(s) holding.
.12.1 Yes, the anchor(s) is / are holding.
.12.2 No, the anchor(s) is / are not holding.
.13 Is she brought up?
.13.1 Yes, she is brought up in position … .
.13.2 No, she is not brought up (yet).
.14 Switch on the anchor light(s).
.15 Hoist the anchor ball.
.16 Check the anchor position by bearings / by … .
.16.1 The anchor position is bearing … degrees, distance … kilometres / nautical miles to … .
.16.2 Check the anchor position every … minutes.

A2/3.5 Anchoring (On-Board Communications)

A2/3.5.2 Leaving the anchorage

.1 How much cable is out?
.1.1 … shackle(s) is / are out.
.2 Stand by for heaving up.
.3 Put the windlass in gear.
.3.1 The windlass is in gear.
.4 How is the cable leading?
.4.1 The cable is leading
~ ahead / astern.
~ to port / to starboard.
~ round the bow.
~ up and down.
.5 Heave up port / starboard / both cable(s).
.6 How much weight is on the cable?
.6.1 Much / too much weight is on the cable.
.6.2 No weight is on the cable.
.7 Stop heaving.
.8 How many shackles are left (to come in)?
.8.1 ... shackles are left (to come in).
.9 Attention! Turn in cable(s).
.10 The anchor(s) is / are aweigh.
.10.1 The cables are clear.
.11 The anchor(s) is / are clear of the water / home / foul / secured.

Cable stoppers



Further reading & Supplements

1. PORT OF GENOA

Single Buoy Mooring

The new mooring facility is located at 1,740 m. from the airport breakwater in a water depth of about 65 m., at distance of 2,250 m. from the platform and just in from of Italsider steel factory; it is linked with shore plants by a submarine pipe-line. The new buoy can accommodate tankers up to 270,000 d.w.t., 350 m. length, 53 m. beam, 20 m. draft. This size was chosen on account of the fad that 80% of vessels coming up to the platform are under 270,000 d.w.t., whereas it can accommodate voxels up to 500,000 d.w.t. The terminal operations are expected to take the following time:

- Mooring: *(from tanker arrival to pump beginning) 2 - 3 hours.*
- Discharge: *(tankers up to 270,000 d.w.t. and discharge rate 9,000 cu.m./p.h.) 20 hours.* Unmooring: *30 minutes.*

Single Mooring Platform

A steel lower, set up about 2,800 m. off the Genoa Mulledo Oil Dock in water 50 m. in depth is provided for the discharge of crude oil from supertankers up to 500,000 d.w.t. Unloading capacity 14,000 cu.m./h.

A 48 in. (120 cm.) submarine pipe-line connects the tower with the terminals of all the oil companies operating at the Multedo Oil Dock.

Technical Characteristics. *The tower consists of a steel structure having the form of a truncated pyramid set into the sea-bed at a depth of 50 m. and supporting the following parts above the level of the sea.*

A lower platform having quarters for the accommodation of personnel or the housing of the various services, the deck being at a height of 6.335 m. a.s.l. This platform is protected by a steel structure mounted on elastic supports, with wooden fenders topped with rubber buffers. The toroidal structure, externally to the rubber buffers, is 34.20 m. in diameter. Under the impact of a vessel, the ring will shift axially for a distance of 2 m. as a result of the system of shock absorbers which support the lower platform.

An upper platform 10.335 m. a.s.l. which carries the rotating arm for berthing tankers and the connection of the floating discharge hoses. The rotating arm reaches a height of 13.882 m. a.s.l. and is fitted with:

a. a bollard capable of withstanding a horizontal pull of 360 tons,'

b. 2 pipes 24 in. in diameter running to a double universal joint at sea level for connecting the riser of the submarine line to the floating hoses linking tower and tanker, on the rotating part of the tower, the two 24 in. pipes are fitted with cut-off valves and may be connected one to the other by means of a by-pass with a gate valve:

c. a 5 ton service crane; d. a lighted beacon and radar reflector at a height of 23 m.

Floating Hoses for Crude Oil Discharge. *The 2 x 24 in. pipes with winch the riser connects on the tower are coupled by universal joints to 2 floating hoses of 24 in. diameter, with 16 in. terminals, each hose being about 310 m. in length and consisting of 29 sections of 10.67 m., of which the last 3 are of 16 in. diameter for connecting to the ship's manifold. They are fitted with a blank flange, a Camlock rapid-closing joint and a Keystone rapid cut-off valve that will ensure perfect tightness and rapid disconnection in an emergency.*

The hose connections are exactly 90° left of the bollard with respect to the mooring vessel.

Signal Lights and Fog Horn. *The tower is equipped with a regulation flashing white light 23 m. a.s.l. and a fog horn.*

The 2 floating hoses are marked at night by 5 red lights visible at a distance of 2 miles.

Request for Berth. *Mooring at the tower is generally reserved for tankers which, owing to their size*

and draft, are unable to use the Multedo Oil Dock and have applied for permission to the Port of Genoa Authority Oil Dock Management.

Order of Berthing. *Arriving tankers that are to work cargo at the tower and are awaiting authorisation to berth thereat must anchor in the roads.*

The order of berthing is that of anchorage in the roads and, for vessels authorised to berth, according to the moment when arrival in the roads is signalled to the Port Authority's lockout station at the foot of the main lighthouse in Genoa Harbour.

Should it be impossible to communicate with the lockout station, the time when communication is established with the Genoa-Multedo Oil Dock Operations Office over VHF radio, on the frequency that will be notified as soon as possible (normally Channel 6 - 156.3 MHz), indicating the point of anchorage or the ship's position, will serve for establishing the order of berthing.

Berthing at the tower will be authorised by the Oil Dock Management upon receipt of the Master's written or radioed assurance that the ship is fully efficient and ready to proceed to berth and commence discharge. The Oil Companies that are receivers of cargoes or in anyway interested as users of the Oil Dock should begin discharge within 4 hours of completion of mooring and continue without interruption, day and night. Saving cases of proven force majeure, *vessels moored at the tower must restrict berth occupancy to the time strictly needed for discharge operations and for ballasting.*

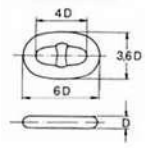
Berthing at Tower. *Berthing at the tower will be authorised only weather permitting and must be carried out with the assistance of a Pilot. The Master may ask for the help of tugs, in the number needed to ensure the manoeuvre being executed safely.*

Ships should moor using two 15 in. nylon hawsers 65 m. in length, supplied by the tower, each able to withstand a 300 ton pull. The end of each hawser is fitted with a 4.5 m. length of chain of which the last link, devoid of stud, will be made fast to the ship's bow structures for securing mooring ropes.

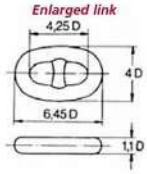
2. Chain Accessories

APPROXIMATE DIMENSIONS FOR CHAIN & ACCESSORIES

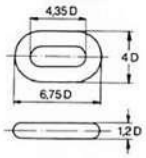
Common link



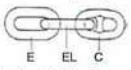
Enlarged link



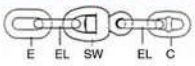
End link



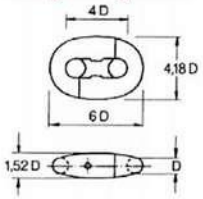
Normal adaptor piece



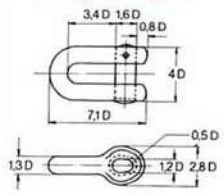
Swivel w/4 links (forerunner)



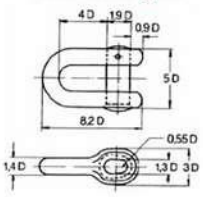
Joining shackle type Kenter



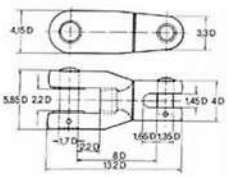
Joining shackle type D



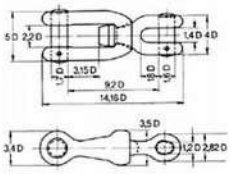
Anchor shackle type D



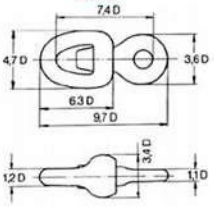
Swivel shackle type A



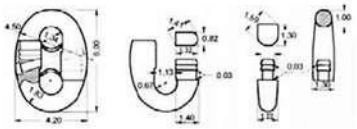
Swivel shackle type B



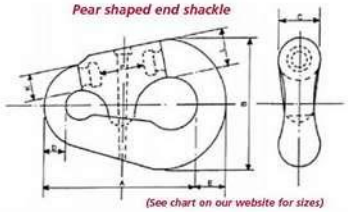
Swivel



Ramfor™ Slim connectors



Pear shaped end shackle



(See chart on our website for sizes)

3. Anchoring: MARS Reports

3.1 Anchoring - The Bitter End

The Bitter EndReport No. 200249 (www.nautinst.org)

Recently on board of one of our vessels the bitter end of the starboard anchor has been damaged as a result of using too much cable. The vessel was lying to starboard anchor, in deep water, therefore 9 shackles were used.
After a while, the weather deteriorated and the vessel began dragging her anchor. The engine could not be used as the engineers were in the process of transferring a large piece of machinery in the engine-room. A decision to pay out another shackle of cable was taken to try and stop the vessel dragging her anchor. This was done by lowering the cable using the winch brake. When the 10th-shackle mark was sighted coming up on deck, the Chief Officer received orders to pay out another 10 metres of cable. The Chief Officer commenced lowering the anchor cable but had to stop as there was no more loose cable remaining in the locker. If he had not stopped the winch the ancor cable would have slipped into the sea.
The cable bitter end was inspected and it was found that the securing pin housing and bulkhead had been damaged. This could not be repaired by the ship's staff and therefore has been postponed until dry-dock.
Lessons Learned:

Ship's staff in charge of anchoring must be familiar with the equipment they are in charge of. The officer in charge of anchoring must know the number of shackles available on each anchor.

To assist with the above we require that the amount of shackles available on each of the anchors be stencilled in a conspicuous place on each windlass.

3.2 Anchor Ran Out Too Fast

Achor Ran out too fastMARS Report 200349 (www.nautinst.org)

A gas vessel was engaged in anchoring at a port where very strong tides of up to 5 knots are experienced. The vessel was anchoring at 0120, the 3rd. Officer and Bosun were at stations forward with the Master and 2nd. Officer on the bridge. The anchors were cleared and the starboard anchor made ready for letting go. The vessel was on hand steering and at 0130 reached her anchoring position. The vessel was turned to port to stem the tide and the engines were put astern. At this point there was an estimated 2.5 knots of ebb tide running. The depth of water was 20 metres, the weather was fine with a light breeze.
The propeller wash was not seen but the log showed about 0.5kts stern way. At this point the starboard anchor was let go on the order from the bridge. The chain started to run out very quickly and the Third Officer was ordered to put on the brake. The Third Officer reported that the brake was not holding, however no report was made regarding the lay and scope of the cable. Finally the brake did take hold and the stopper was put in place.
By this time, 10 shackles had run out (there being 11 shackles on this anchor). The winch was put in gear and the chain hove back to 6 shackles in the water. Once the vessel had steadied up the anchors were screwed up and made secure. The next morning the windlass was inspected for damage and it was seen that the brake lining had almost completely burnt away. The brake lining had to be renewed as soon as possible as the brake may not have held. If it had been necessary to use that anchor, it would have had to be "walked out".
The immediate cause for the incident was the large stern way which was estimated at 3 knots over the ground, also a contributing factor was the lack of communication from forward to the bridge with regard to the lay and scope of the chain. The anchoring plan had been discussed with the 3rd. Officer prior to him going forward. Firstly, if the Officer had reported the lay and strain on the cable in good time then the engine could have been used to relieve the strain on the chain. Secondly, the ground speed was not properly ascertained on the bridge when the anchor was let go. The speed through the water was known, as the log display is prominent on the console and the radar. Had the GPS been checked the ground speed would have been ascertained. It was assumed, wrongly as it turned out, that in shallow water the Doppler Log goes automatically into ground tracking mode and gives speed over the ground. However this is not the case with this particular model of log.
Communications between the Bridge and the people on stations fore or aft must be good, the bridge must be kept advised of all relevant information. During manoeuvring the Officers on the bridge must be aware of the limitations of the equipment they are using and what mode they are operating in.

3. Anchoring: Definitions and Abbreviations

Definitions	
Working wire	Wire in working winch including termination, for

	example socket
Work winch	Winch for hoisting and setting anchors. Power, length, width and diameter determine the area of application of the working winch.
Bollard pull	The towing vessel's pull normally specified as maximum continuous pull.
Bridle towing arrangement	Two wires/chains of equal length arranged as a triangle that connects the installation to the towing vessel.
Catenary curves	Specification of towline and anchor line curvature (bow height) for various loads.
Deck crane on vessel	Crane for lifting and assembling equipment on deck.
Shark jaw	Device for connecting/disconnecting chains/wires.
Stern roller	Large stern roller for guiding chains and wires primarily, but also anchors.
Installation	Submersible platforms, jack-ups, barges, etc.
J-chaser	Hook used by anchor handling vessels to "fish" the installation's anchor lines.
Gypsy	Wheel with machined pockets for hoisting chains fitted on a winch.
Kenter link	Device for linking two chain lengths.
Chain tail	A short piece of chain consisting of two or more links.
Fairlead for chain	Device that guides chains towards gypsy and chain lockers.
Pear link	Device for linking two different chain dimensions.
Pennant wire	Buoy wire; wire from the seabed up to a buoy on the surface.
Pendant	Wire hanging permanently attached to the installation used for chasing out anchors. PCP (Permanent Chain Pendant)
Permanent chaser	Ring fitted over the anchor line connected to the pendant wire. Used by anchor handling vessel when hoisting or setting the installation's anchors.
Pigtail	Short chain/wire with open end links.
Piggyback anchor	Anchor connected to primary anchor with wire/chain in case of insufficient holding power.
Towing winch	Winch of the same design as a working winch, but often with different gears. On newer vessels, the towing winch has a smaller drum than the working winch.
Towline	Wire on towing winch used for towing.
Spooling gear	Arrangement to guide wire onto drum.
Socket	Cast anchoring termination on wire.
Swivel	Connecting link/device used to prevent wire rotation.
Towing pins/guide pins	Device for guiding towline/pennant wire, e.g. towards stern roller.

Tow eye/towline guide	Arrangement for keeping towline in centre line/midship area.
Tension control	A type of constant tension control; may be set to pull in or pay out at a specified tension.
Tugger winch	Used for pulling equipment on deck during anchor handling, delivered with remote control on newer vessels, may also be controlled from the bridge on some vessels.
Tugger wire	Steel or fibre wire used for tugger winch.
Weather criteria	Specification of maximum allowed weather (wind, waves, etc.) when performing the operation.
Weather window	Specification of maximum allowed weather (wind, waves, etc.) when performing the operation for a specific time period.
Weak link	Weak link in a rigging arrangement.

Abbreviations	
AHTS:	Anchor Handling Tug Supply vessel
AHV:	Anchor handling vessel
DP:	Dynamic Positioning
IMDG:	International Maritime Dangerous Goods Code
ISM:	International Safety Management Code
MBL:	Minimum Breaking Load
ORQ:	Oil Rig Quality, chain quality designation
PCP	Permanent Chaser Pendant
ROV	Remotely Operated Vehicle
REH	Reporting after incident
RUH:	Reporting of undesired incident
SOW:	Scope of Work
STCW:	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
SWL:	Safe Working Load

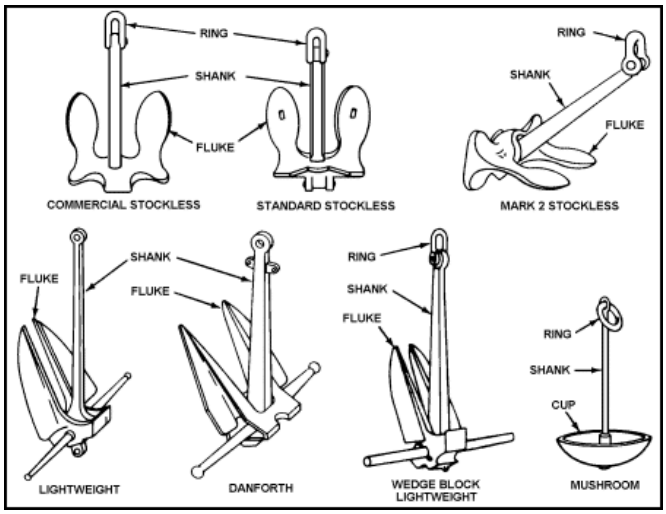


Figure 21-2. Types of Anchors

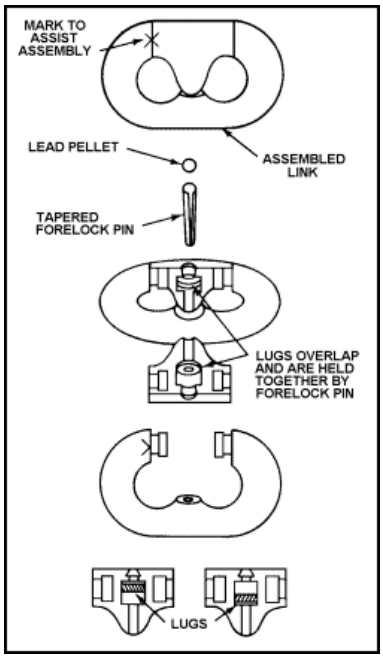


Figure 21-3. Detachable Link

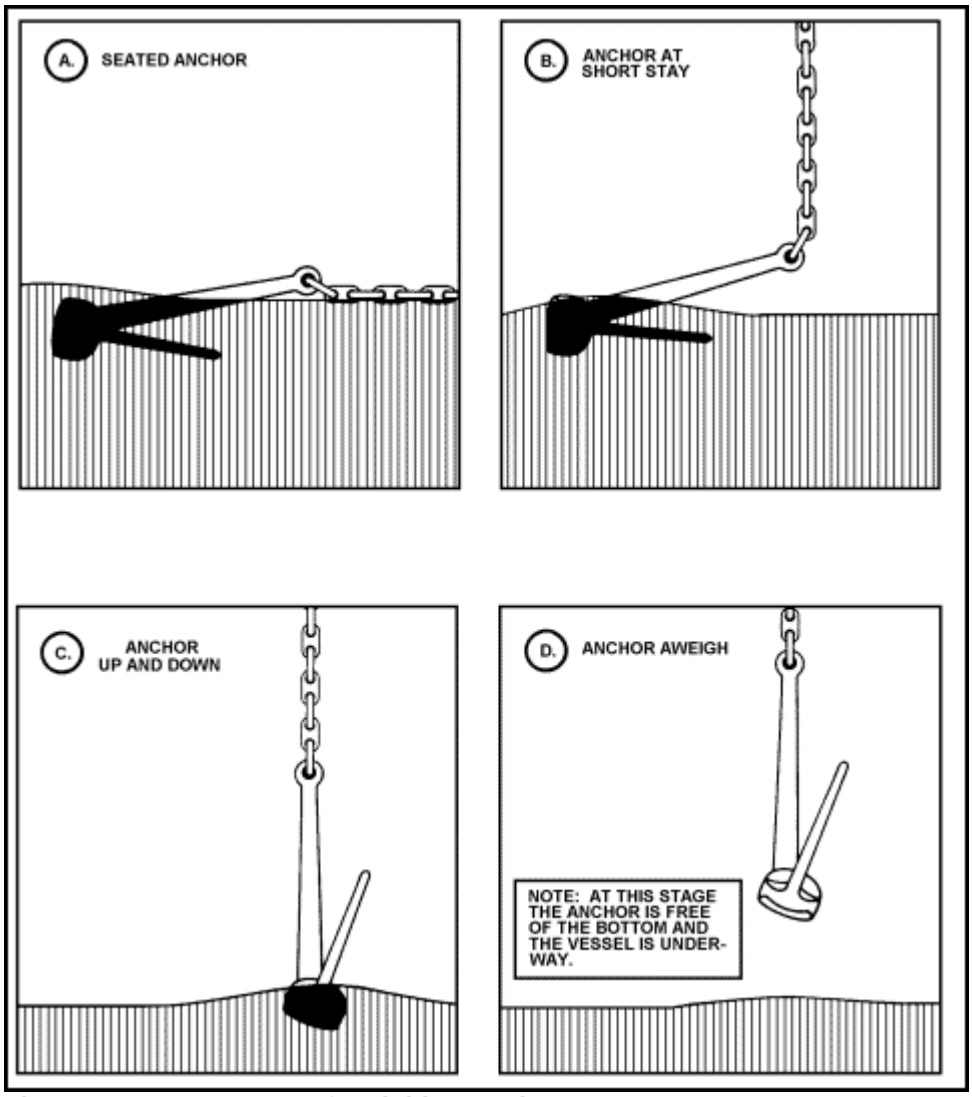


Figure 21-26. Sequence of Weighing Anchor

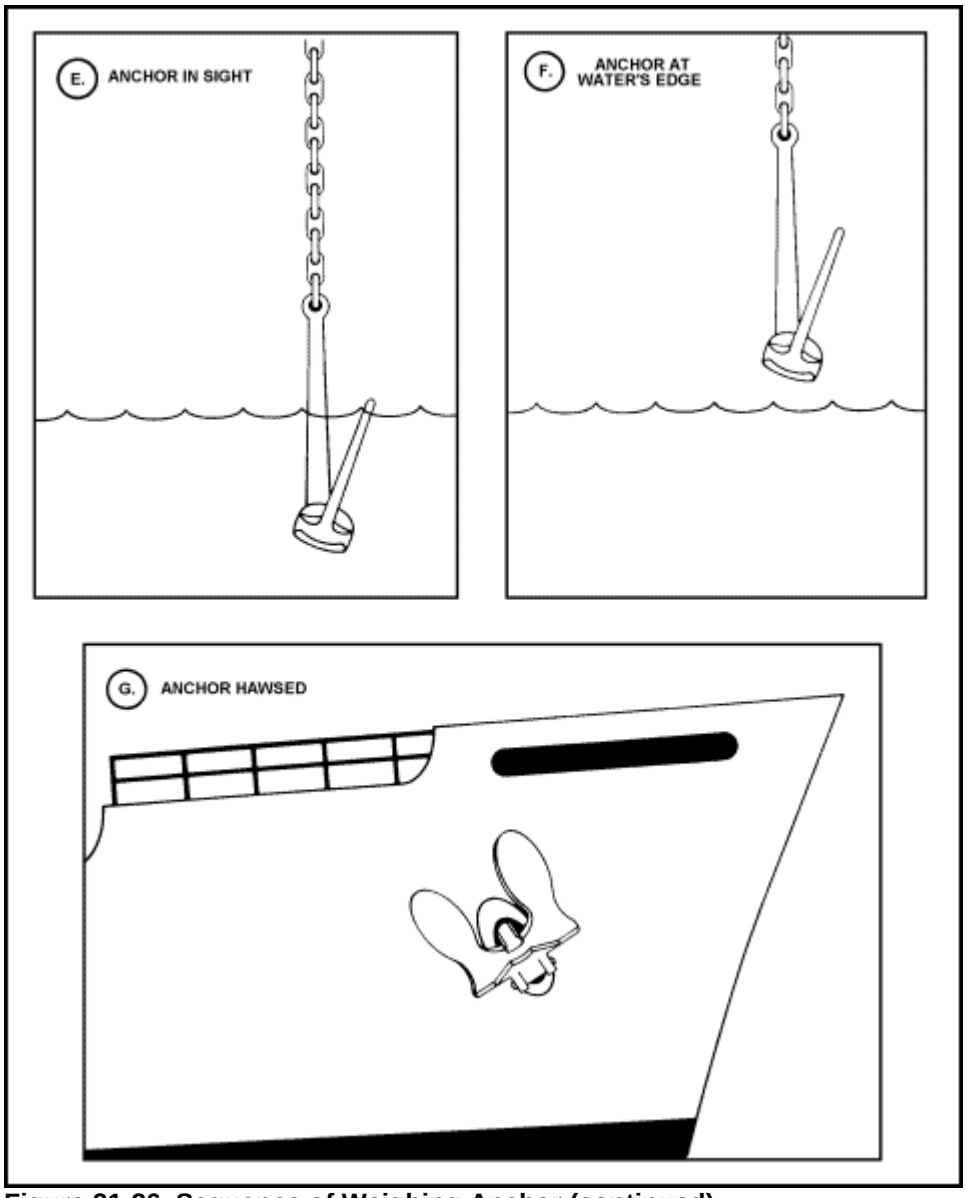


Figure 21-26. Sequence of Weighing Anchor (continued)

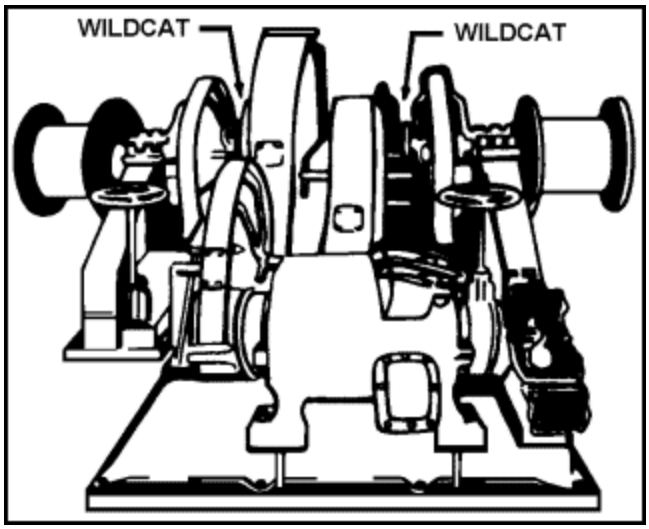


Figure 21-6. Horizontal Shaft Windlass

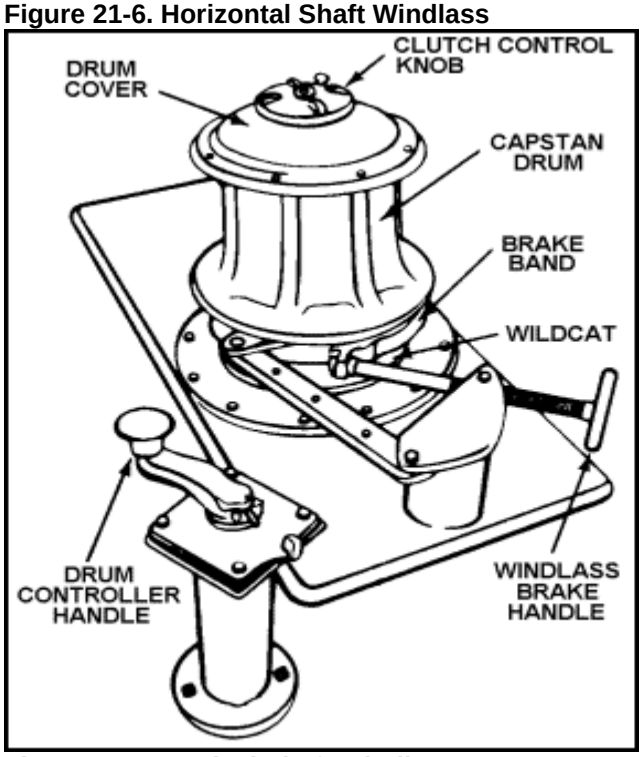


Figure 21-7. Vertical Shaft Windlass