ANCHORING, RAFT UPS & JETTY MOORING

Presented by Commodore Norm Roberts

A sixth generation West Australian Norm has grown up on boats sailing, fishing, and diving. Norm holds commercial marine qualifications including a Master 5 and Marine Engineer. He has worked on and off commercial vessels since the early '80's. He has worked on cray boats, prawn trawlers and charter boats from the tip of Cape York to Augusta. He has also boated through Southeast Asia; Papua New Guinea; The Great Barrier Reef; The Whitsundays; Fiji; Hawaii; the Cayman Islands; and the Bahamas.

Get the best out of your boating - learn about anchoring, jetty mooring & raft ups.

Anchoring can open many places to visit and stay overnight without a mooring.

Anchoring - Do you want to:

- Know the best way to anchor your boat safely?
- How to set an anchor?
- Be confident in anchoring

Learn about scope, letting go and walking back and anchor retrieval.

Raft Ups & Jetty Mooring – things to consider for and how to:

- Rafting up and mooring
- Multiple boat rafts ups
- Fender placements
- Creating "X" with the lines between boats

Contents

ANCHORING

1 Using the Right Anchor Gear for Anchoring Out Overnight

How to choose an anchor for your boat and your anchorage conditions for a secure and safe night out on the water

Taking your boat out for a cruise can take boaters on wonderful adventures, with virtually thousands of magnificent destinations to choose from. Most areas also offer boaters several anchorages where you can secure your boat and anchor out for the night to fully enjoy the beautiful scenery surrounding you on the water.

Anchoring your boat at an anchorage will not only exclude you from additional expenditures of staying at a marina but will reward you the beauty of experiencing a calm and peaceful night on the water. You can anchor out for a few days, a week or even a month depending on the amount of food, beverages, fuel, and other provisions you have on-board.

Some boaters, however, do not agree with this idea. They are afraid of staying on the boat overnight or may be nervous about securing their boat for natural factors like water current and wind velocity. Other boaters simply do not know how to anchor their boat correctly.

Anchoring in general is quite easy. All you need is the right equipment and some bits of important knowledge. If you want to anchor overnight, it is crucial to know your anchors and bottom conditions. But with the right anchor gear and technique, a night on the water can be a great boating experience.

As a standard precaution, boaters should bring at least one heavy anchor suitable for each bottom condition you expect to anchor on plus an extra (bow and stern) in tight anchorages.

After setting the anchor, you need to double check the line and confirm if it has affixed itself to something solid. Boaters should always consider the probability that the anchor might have experienced a "false set". Securing and checking the line is vital to hold your boat in place.

Once secure, relax and enjoy your anchoring out on the water!

1.1 Anchor alarm apps (both paid and free apps)

Apps are a useful addition to increase the safety at anchor when you are short-handed and cannot man a full anchor watch. Essentially, they raise an audio alarm when the vessel leaves a certain perimeter and thus raise your attention that the anchor may be slipping, and your vessel is dragging.

I prefer the ones that overlay with a chart so you can see your swing, and the ones that have a history so you can see what has happened with a wind swing etc but are usually paid apps. (net.fs)

Some anchor alarm apps include Anchor Watch (ideaboysug); Anchor Alarm (w+h GmgH); Anchor Pro (ideaboysug); Anchor Alert (SlimJiM Software) – please do your own research. Other very useful apps include Navionics ; Windy.Com ; WillyWeather ; and, How to Tie Knots

Of course, using such an anchor alarm does not mean you can neglect any of the other essential tasks and drills when anchoring, such as finding an appropriate anchorage to begin with, fit for any predicted changes in weather, making sure the anchor is properly set, and paying out enough chain and/or rode so as to reduce the anchor load to the minimal value and thus minimise the risk of dragging or worse from the start.

The alarm location is supposed to be set as dropping the anchor – however you are usually busy with other things such as operating the boat, the anchor winch and reversing.

You need to set the alarm when the vessel is already at anchor, and all has settled down. If the app can only set an alarm as a circle around the vessel's current position, this is obviously no good then. It is usually done by dragging with one's fingers, which is not very precise at all. Preference is to either do mark the position at drop, or in a tender or kayak reset the location (and radius / tolerance) when over the anchor.

You can get false alarms if you set once at anchor. **You must not purely rely on the anchor alarm app – it is just another tool.** These anchor apps also have other issues.

Anchor alarm apps have to share the phone resources with many other apps on the phone, and this can mean that they may stop functioning correctly without one becoming aware of it, they may temporarily lose GPS signal, or may even be terminated for good, because the operating system on the mobile decides it needs the resources for some other app. Some are not functioning when sent to the background and another app is in the foreground. This is a fundamental problem and cannot be resolved in full. But at least, the anchor alarm should warn you when the battery level is low, the sound level is low, the GPS signal is weak or even non-existent.

There are also apps that can help you in working out the **minimally required anchor chain and/or rope length** and the associated **anchor load**.

1.2 Planning.

Make sure you consider not only the conditions at the time of arrival, but what they might become. Will the wind forecast increase significantly? Is it likely that the anchorage will get significantly busier while you are there? How many tidal currents can pass when the tide changes? Tide depths? Swing whilst on anchor with any wind or tide changes?

It seems extraordinary that for all the articles on anchoring and discussions on scope there is so little consideration of how to allow for wind strength.

Wind & tide formula for shallow anchorages (4 to 8m) Chain needed (m) = wind speed (knots) + boat length (m)

Anchor chains are usually marked in 10m stages, so a practical approach is to round the calculations to the nearest 10m of chain. With 10m boat length added, this gives an easy-to-use table (below).

Maximum wind Beaufort Scale	Wind Speed knots	Shallow Anchorage (4 – 8 metres)	Deep Anchorage (10 – 15 metres)
F1 – 3 Light Winds	10 knots or less	20m	30m
F4	11-16 knots	30m	40m
F5	17-21 knots	30m	40m
F6	22-27 knots	40m	50m
F7	28-33 knot	40m	60m
F8	34-40 knots	50m	70m
F9	41-47 knots	60m	80m
F10 – 12+	48 knots and up		

For shallow anchoring (5-8 m), the anchor chain slope / curvature is close to one: the contact system length (m) = wind speed (knots). At deeper anchorages (of 15 m depth), the slope rises to 1.5 and further to 2 at a depth of 20 m.

The square root factor with a depth clearly shows that the volume concept is mistaken. For example, to anchor in a depth of 4 m with present or expected wind strength of 5, you will need a chain length of 32 m, with a ratio of almost 8:1.

The length of the anchor chain you use in calm conditions should be different from that one you need in strong wind. You should forget the commonly advertised 3:1 ratio and choose at least 5:1, and if there is a pitch, then choose even more.

1.3 Anchor tributes – Which anchor

There are mainly four factors to keep in mind when selecting an anchor.

1. **Ease of Use** – Is the anchor easy to set and retrieve?
2. **Hold Strength** – Will the anchor stand its ground in a variety of bottom conditions and withstand heavy current/load?
3. **Storage and Maintenance** – Is it easy to store and clean?
4. **Construction Quality** – Is the anchor made of quality materials, resist wear and tear and fully galvanized?

1.4 Selecting the right anchor

When choosing an anchor, it is paramount to consider both the length of boat, weight and weather conditions in your area. The anchor style is dependent on bottom type and personal preference.

RULE OF THUMB IS: As a starting point 1 kilo per meter (rounding up to the nearest size)

Remember to use at least 1 meter of chain of every meter of boat length as a minimum – and consider the correct gauge of chain recommended for boat size.

Most table or charts for anchor selection according to boat size / type assume winds less than F5; and an anchor scope of 5:1. At a minimum, select an anchor in the highest weight/length category for your boat. You also need to allow for the weight of the boat and windage on the boat.

However, in W.A. our regular overnight sea breeze or easterly winds will regularly exceed 25 – 30knots (F7 – Near Gale). I normally choose an anchor size two (2) up from the recommendation. This will give you peace of mind when the conditions turn nasty and for an overnight.

1.4.1 Fixed Head Plough Anchors

(Lloyds rating HHP - High Holding Power) have a shank profile and ballasted tip facilitate self-launching with immediate set. They are suitable and recommended for sand, rock, weed, mud and coral.

Their designs have increased holding power and are designed to continue to hold the boat even when the wind or tidal current changes direction.

Delta® Anchor

Selection guide

	ANCHOR WEIGHT		BOAT LENGTH OVERALL								
	kg	lb	6 m 20 ft	9.2 m 30 ft	12.2 m 35 ft 40 ft	15.2 m 50 ft	18.3 m 60 ft	21.3 m 70 ft	24.4 m 80 ft	27.4 m 90 ft
Delta®	4	9								
Delta®	6	14								
Delta®	10	22								
Delta®	16	35								
Delta®	20	44								
Delta®	25	55								
Delta®	32	70								
Delta®	40	88								
Delta®	50	110								
Delta®	63	140								

Lighter shading represents the upper limit of model. If in doubt, move up a model.

1.4.2 Spade with roll bar anchors

(Lloyds rating SHHP - Super High Holding Power) designed to be the highest holding, fastest setting fixed shank anchor in the world. The anchor be used effectively across all seabed types. Their designs have increased holding power and are designed to continue to hold the boat even when the wind or tidal current changes direction.

This category includes Bügel, Manson Supreme, Rocna, Sarca and Spade. They are patented and as such come with a high price tag.

SIZING FOR YOUR BOAT

		ROCNA OR VULCAN MODEL												
		4	6	9 Vulcan only	10 Rocna only	12 Vulcan only	15	20	25	33	40	55	70 Rocna only	110 Rocna only
Vessel length	4 m 13 ft	≤ 2 t												
	5 m 16 ft	≤ 1 t	≤ 5 t											
	6 m 20 ft	≤ ½ t	≤ 3.5 t	≤ 7 t										
	7 m 23 ft	≤ ½ t	≤ 2 t	≤ 6 t	≤ 7 t	≤ 9 t								
	8 m 26 ft		≤ 1 t	≤ 5 t	≤ 6 t	≤ 8 t	≤ 12 t							
	9 m 30 ft		≤ ½ t	≤ 4 t	≤ 5 t	≤ 7 t	≤ 10 t	≤ 16 t						
	10 m 33 ft			≤ 3 t	≤ 4 t	≤ 6 t	≤ 8.5 t	≤ 14 t	≤ 22 t					
	11 m 36 ft			≤ 2 t	≤ 3 t	≤ 5 t	≤ 7 t	≤ 12 t	≤ 20 t					
	12 m 39 ft					≤ 4 t	≤ 6 t	≤ 10 t	≤ 18 t	≤ 30 t				
	14 m 46 ft						≤ 4 t	≤ 6 t	≤ 13 t	≤ 23 t	≤ 40 t			
	16 m 52 ft							≤ 3 t	≤ 9 t	≤ 18 t	≤ 32 t	≤ 60 t		
	18 m 59 ft								≤ 5 t	≤ 14 t	≤ 25 t	≤ 50 t	≤ 85 t	
	20 m 66 ft									≤ 10 t	≤ 18 t	≤ 40 t	≤ 75 t	≤ 165 t
	22 m 72 ft									≤ 6 t	≤ 12 t	≤ 33 t	≤ 65 t	≤ 150 t
	24 m 79 ft										≤ 7 t	≤ 25 t	≤ 55 t	≤ 135 t
	26 m 85 ft											≤ 18 t	≤ 45 t	≤ 120 t
	28 m 92 ft												≤ 35 t	≤ 105 t
	30 m 98 ft													Use EN*
	35 m 115 ft													Use EN*
Anchor weight		4 kg 9 lb	6 kg 13 lb	9 kg 20 lb	10 kg 22 lb	12 kg 27 lb	15 kg 33 lb	20 kg 44 lb	25 kg 55 lb	33 kg 73 lb	40 kg 88 lb	55 kg 121 lb	70 kg 154 lb	110 kg 243 lb
Rocna fluke area		460 cm²	590 cm²	-	795 cm²	-	1030 cm²	1140 cm²	1415 cm²	1695 cm²	1945 cm²	2300 cm²	2690 cm²	3330 cm²
Vulcan fluke area		420 cm²	560 cm²	730 cm²	-	880 cm²	1020 cm²	1240 cm²	1440 cm²	1730 cm²	1970 cm²	2430 cm²	-	-
Recommended G40 chain		6 mm 1/4"	6 mm 1/4"	7 mm 1/4"	7 mm 1/4"	8 mm 5/16"	8 mm 5/16"	9 mm 5/16"	10 mm 3/8"	10 mm 3/8"	11 mm 7/16"	12 mm 7/16"	14 mm 1/2"	16 mm 5/8"

Vessel displacement units: 1 t (metric tonne) = 2,205 lb

1.4.3 Articulated shank plough anchors

Have a shank profile and ballasted tip but have a propensity to fall on their side and drag. They can drag and till the seabed like a plough. These will pull under extreme heavy loads, ploughing the seabed in soft sand or silt. But in general, if set properly these are anchors with a high holding capacity.

They have been superseded by the fixed head plough. They are suitable for sand, weed and mud.

- 10lb - Boats up to 5 mtrs
- 15lb - Boats up to 7 mtrs
- 20lb - Boats up to 8 mtrs
- 27lb - Boats up to 9 mtrs
- 35lb - Boats up to 11 mtrs

1.4.4 Danforth anchors

Are ideal for sandy bottoms or anchoring on a beach due to their triangular shaped flukes which bury into the sand. Danforth, have a large surface area for their weight and hold well on soft to medium ground. On hard bottoms, such as compacted sand and pebbles, they can slip and generally do not "switch" when tide or wind changes direction of thrust.

If you drop them in reef they will generally snag and be lost.

Description GALV or SS	Recommended Boat Length (ft)
Manson Supreme 5lb	0' - 15'
Manson Supreme 10lb	15' - 22'
Manson Supreme 15lb	18' - 30'
Manson Supreme 25lb	25' - 35'
Manson Supreme 35lb	35' - 40'
Manson Supreme 45lb	40' - 45'
Manson Supreme 60lb	45' - 55'
Manson Supreme 80lb	50' - 60'
Manson Supreme 100lb	55' - 70'
Manson Supreme 125lb	65' - 75'
Manson Supreme 150lb	70' - 80'
Manson Supreme 175lb	75' - 90'
Manson Supreme 225lb	80' - 100'

1.4.5 Claw or Bruce anchors

Are easy set in most bottoms especially mud and sand. They are self-aligning and will usually roll upright. They perform relatively well with low rode scopes. The original Bruce has been out of production for many years and many copies have been produced, often from poor quality, fragile, weak materials and not weighted correctly to roll upright. The original anchor is said to hold well on soft to medium soils and cling to rock, but not grass.

CLAW ANCHOR SELECTION GUIDE

Anchor Weight		Chain Size		Boat Length Overall							
kg	lb	mm	in	6m 20ft	9.2m 30ft	12.2m 40ft	15.2m 50ft	18.3m 60ft	21.3m 70ft	24.4m 80ft	27.4m 90ft
1	2.2	5	3/16								
2	4.4	5	3/16								
5	11	5	3/16								
7.5	16.5	6	1/4								
10	22	8	5/16								
15	33	8	5/16								
20	44	10	3/8								
30	66	10	3/8								
50	110	12	1/2								
80	176	12	1/2								

Lighter shading represents the upper limit of model. If in doubt, move up a model.
This information is for guidance only, please consult the relevant Classification Society for specific certification requirements.

These anchor size suggestions are based on winds of less than 25knots with a rode of at least 7 to 10. In W.A. we regularly have sea breezes and overnight easterlies up to 35 knots plus.

1.5 Holding Fast - A (Somewhat) Scientific Approach to Sizing Ground Tackle

I am often concerned by how lightweight the anchors and ground tackle are on many boats. It doesn't matter how good your anchoring routine; if your ground tackle is inadequate for the boat or the conditions, sooner or later it will let you down. Here are some tips to improve the state of your ground tackle game.

1.5.1 Calculating the Load

The most basic requirement is to match the strength of the ground tackle and the size of the anchor to the boat and the likely loads that you will find in your cruising grounds. To do this, you need to know the loads, which are a function of the following:

- Windage of the boat
- The extent to which the boat shears (weaves) around at anchor (the more it swings out of line with the wind, the greater the windage and the higher the shock loads at the limit of the swing)
- The impact of current
- The boat's weight
- The sea state in which the ground tackle is deployed
- The extent to which the ground tackle cushions shock loads (the two key factors here being scope—the relationship of rode length to water depth—and the material from which the rode is made (for example, chain or nylon line).

The number of variables involved makes load calculations complicated. On most trawler / passage maker / flybridge boats with substantial superstructures, the most significant factor is windage. The load increases with the square of the wind speed, which is to say that if the wind speed doubles, the wind-induced load goes up four times.

By making certain assumptions that relate windage to boat length and beam, the wind load at differing speeds can be calculated for generic boat lengths and beams. These numbers can then be adjusted on the assumption that a boat at anchor may shear away from the wind, from one side to another, by as much as 30 degrees. Real-world testing that I have conducted with a load cell on my anchor rode has shown that, at the limits of shearing, the loads can be as much as four times the steady-state loads.

Some assumptions can also be made relating boat size and beam to immersed volume and the maximum likely impact of tidal streams and currents on the anchoring load (as you can see, this is getting fuzzy).

Next, we introduce waves. As a boat pitches up and down, the shock loads from that motion can be well more than those generated by the wind and current. However, if the boat is anchored with plenty of scope, and if the rode has some elasticity (using a nylon rode or a snubber on a chain rode) there will rarely, if ever, be a true shock load. For reference, a nearly instantaneous application of shock load is when a roped climber falls off a cliff and is suddenly brought up short by the rope. The one exception to this might be a fouled anchor, when the rode is hauled in until it is vertical, and then wave action is used unsuccessfully to break out the anchor. Short of this, any wave action will increase the loading to a point somewhere on a curve that runs from the wind load without waves to the maximum load that could be imposed by an instantaneous shock.

At different times, a variety of people and organizations have attempted to quantify all these factors and derive some numbers for the likely loads on ground tackle and its associated hardware from the effects of wind, current, and wave action. These loads have been calculated for four wind speeds, including 15, 30, 42, and 60 - published by the American Boat and Yacht Council (ABYC) which shows the design loads in knots. See below table. NB – boat and load is imperial, not metric.

Boat Length	Boat Beam (Bmax) ft		Load On Tackle & Hardware - lbs			
(LOA) ft	Sail	Power	15 knots	30 knots	42 knots	60 knots
10	4	5	40	160	320	640
15	5	6	60	250	500	1000
20	7	8	90	360	720	1440
25	8	9	125	490	980	1660
30	9	11	175	700	1400	2800
35	10	13	225	900	1800	3600
40	11	14	300	1200	2400	4800
50	13	16	400	1600	3200	6400
60	15	18	500	2000	4000	8000

The table is entered with a boat's length or beam, using whichever gives the highest numbers, and then moving across horizontally to find the potential loads at different wind speeds.

A weekend sailor who never goes to sea in strong winds is going to need very different ground tackle from that of an around-the-world cruiser who may be faced with violent winds and seas at anchor. Although the ground tackle and associated fittings must

match its use and area of operation, **no boat should have its ground tackle sized according to the 15-knot column.**

However, a day sailor who never strays far from home might use the 30-knot column. A cruising sailor, whether coastal or offshore, should use the 42-knot column. In the case of a long-distance cruising boat, the 42-knot column should serve as a minimum starting point; a more conservative approach would be to take the potential loads at 60 knots, especially if you intended to voyage into high latitudes.

It should be noted that this is a conservative table, with substantial built-in safety margins, which is to say that in most circumstances it overstates the loads that will be experienced by the ground tackle and deck hardware. If windage alone were used to calculate loads, the numbers would be approximately 25% of those in this table. Consequently, if this table is used to size ground tackle, it will provide a significant margin for dealing with dynamic (surge) loads and other complicating factors.

1.5.2 Matching the Components

Having determined the kinds of loads we might see, we need to size anchor rodes and shackles to meet these loads, making sure that all the components in the ground-tackle system are matched to one another. At this point, we step into a minefield. We can start to negotiate a path through it with another table developed by the ABYC (NB: Imperial numbers, not metric).

Nominal chain /rope size/ diameter - inches	Working Load Limit (WLL) - pounds				
	Nylon		Galvanized Chain		Anchor shackles
	3-strand	Double Braid	Proof Coil (BBB)	High Test	
¼	186	208	1300	2600	1000
5/16	287	326	1900	3900	1500
3/8	405	463	2650	5400	2000
7/16	550		3500	7200	3000
½	709	816	4500	9200	4000
5/8	1114	1275	6900	11500	6500
¾	1598	1813	9750	16200	9500
7/8	2160	2063	11375	-	12000
1	2795	3153	13950	-	15000

On the surface of things, if we have a rope/chain rode, we simply make sure the working load limits of the various pieces are matched and are at least as high as the number we extracted from our first table. It's not quite this simple.

The above table gives Working Load Limits (WLL), not breaking strengths. The WLL is defined as a percentage of breaking strength. Different WLLs are used for the different components in the ground-tackle system, reflecting the various properties of these components (e.g. nylon rope as opposed to chain) and also reflecting other considerations not necessarily related to functionality in an anchoring system (e.g. legal considerations, use in other applications, and so on).

For example: Nylon rope may be given a WLL of 5% to 25% of its breaking strength, depending on the application. The numbers used in the ABYC table come from the Cordage Institute (an industry-wide organization) which is using an extremely conservative WLL of around 10% of minimum tensile strength of generic nylon rope. Minimum tensile strength is generally between 80% to 90% of the average breaking strength of a rope.

In other words, 10% of the minimum tensile strength is just 8% to 9% of average breaking strength. What is more, the generic nylon rope used to calculate these numbers has a breaking strength below that of most nylon rope sold for anchoring applications, further lowering the WLL number.

- Proof Coil and BBB chain have a WLL that is 25% of their breaking strength.
- High Test chain has a WLL that is 33% of its breaking strength.
- Shackles are commonly given a WLL of 20% of their breaking strength (reflecting the fact that they may also be used in lifting applications with wire rope, which in turn has a WLL of 20% of its breaking strength).

In practice it is reasonable to assume a WLL of 25% of minimum tensile strength for nylon rode (i.e. 20% to 22-½% of average breaking strength), or 20% of average breaking strength (if average breaking strength is the only number available), and a common WLL of 25% of breaking strength for Proof Coil chain, High Test chain, and anchor shackles

Nominal Size (chain)/ Diameter (rope)-inches	MODIFIED Working Load Limit - pounds				Shackles (weldless; drop forged)
	Nylon		Galvanized Chain		
	3-strand	Double Braid	Proof Coil (BBB)	High Test	
¼	-	-	1300 (.43)	1950 (.4)	1250 (5/16)
5/16	-	-	1900 (.50)	2925 (.48)	1875 (3/8)
3/8	880	980	2650 (.62)	4050 (.57)	2500 (7/16)
7/16	1180	1320	3500 (.75)	5400 (.65)	3750 (1/2)
½	1500	1700	4500 (.81)	6900 (.74)	5000 (5/8)
9/16	1880	-	5500 (.84)	-	-
5/8	2440	2700	6900 (1.01)	8625 (.82)	8125 (3/4)
¾	3340	3880	10600 (1.10)	12150 (1.02)	11875 (7/8)
7/8	4700	-	-	-	15000 (1)
1	5880	6800	-	-	18750 (1 1/8)

You may be tempted to use a stainless-steel shackle, because these have a much higher WLL for the same size as a galvanized anchor shackle, but this would be a mistake. Typically, stainless steel shackles are rated at up to 50% of breaking strength, so the extra strength may be illusory and in fact the shackle may be weaker.

In addition, the stainless steel may cause galvanic corrosion with the chain. The way to use a larger shackle is to have the chain manufacturer weld in an oversize link at the end(s) of the chain before it is purchased (a common practice). If you already have the chain without this link, and if using high test chain, you should use the largest galvanized shackle that will fit and recognize that this may be the weak link in the system.

Whatever is done, any shackle used in a ground tackle system should be specifically manufactured for this purpose and stamped with its WLL. All other shackles are suspect. The pin on any shackle must always be seized / moused (tied off) to prevent it from working loose. I have used a plastic zip tie for this (they last a long time and are easily replaced).

Finally, it should be noted that if any nylon line under load breaks, it can spring back (snapback) with enough force to break limbs and tear eyes out of their sockets.

Extreme caution should always be exercised when in the vicinity of a highly loaded anchor (or tow) line.

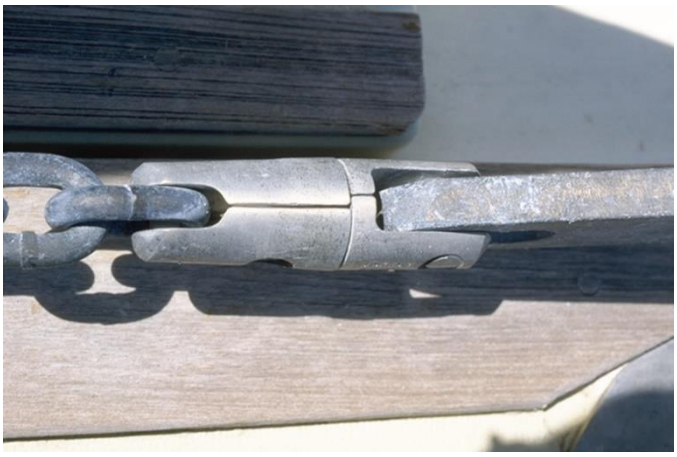
1.6 Chain Rodes

In tropical waters there is a great deal of coral. Although we go to some trouble not to anchor in coral, chafe is still one of the principal hazards. Your primary rode in the tropics should be entirely chain.

Chain has other advantages. It is, given a windlass and a properly designed anchor locker, the easiest rode to handle; its weight causes it to hang down in a catenary, which acts as something of a shock absorber; its weight also holds down the shank of an anchor and, in so doing, helps the anchor to set and increases its holding power; and, most of the time, much of the chain lies on the bottom where its friction increases holding power.

Chain has its drawbacks, though, the two most significant being cost and weight (not just the cost of the chain, but also the cost of the windlass needed to handle it). Chain is approximately four times the cost of an equivalent amount of nylon rode. However, this high cost may be mitigated over a longer life span, assuming the galvanising does not need redoing too often.

So far as weight is concerned, this ends up in the bow of the boat where it can significantly impair performance. The impact can be minimized by using high-test chain (also known as grade 40) in place of the more common proof coil or BBB (which are known as grade 30; they use the same wire size, but the BBB has a shorter link length and is stronger). In general, given any proof coil or BBB size, the next size of high-test down will have about the same breaking strength, and cost about the same but will weigh one-third less. It also takes up significantly less room, so more of it will self-stow before it piles up and jams the chain pipe.



Many people like to use a swivel fitting to connect a chain rode to an anchor, believing that this will keep the rode from twisting. Often these swivels become the weak link, and in our experience, swivels are not needed.

We have never used one and have anchored thousands of times without issue. If a swivel is used, on no account should it be connected directly to the anchor: If the boat swings, it will put an unfair sideways load on the swivel for which it is not designed. To provide full articulation, there should always be a shackle between the swivel and the anchor.

Once the wind kicks up, or wave action builds, the snubbing action of a boat will regularly take the catenary out of a chain rode, transmitting shock loads to the chain's attachment point on the boat. If this is the windlass, damage is likely.

A chain rode needs a snubber, a length of nylon rode, to absorb shock loads. After the anchor is set, one end of this is tied to the chain with a rolling hitch or attached with some variant of a chain hook, with the other end cleated off on deck. Two or three extra feet of chain are then fed out and left to hang loose so that the entire load on the rode is transmitted to the boat via the snubber.

Nylon is always used for a snubber. It should be sized in much the same way as a regular rode for a 30- or 42-knot wind (depending on the conditions in which it is likely to be used). There is no point in oversizing a snubber–this will simply negate much of its shock-absorbing capabilities. The length need be no more than 20- to 30-feet.

On some boats with an anchor platform — and on all boats with a bowsprit — there will be a bobstay running down to the bow of the boat. Very often, the anchor rollers are set well back from the tip of the bobstay. As the boat moves around at anchor, the snubbing line may chafe on the bobstay. This can be partially mitigated by slitting a length of PVC pipe and slipping this over the bobstay. Better yet is to bring the snubbing line on board through a fairlead set just back from the bow. This will cause

the boat to lay just off the wind, helping to stop it shearing around and therefore keeping the rode away from the bobstay.

If a snubbing line parts, the windlass will be subjected to a sudden shock load, which may break the shaft or simply cause the chain to jump up on the wildcat and start running out. Once a chain starts to do this, it sometimes will not reset itself. It is essential to have at least one more line of defence against losing all the chain.

A very strong attachment point for the bitter end of the chain is obviously called for, but it would be better to have an additional chain stopper on deck, or to place a loop of chain around a samson post or cleat. If all the chain runs out and the boat comes up short on the chain's bitter-end attachment, there will be an enormous shock load, which may rip the attachment out of the boat, resulting in the loss of the anchor, the chain, and possibly the boat.

Very often the bitter end of the chain is shackled to a U-bolt in the chain locker. It should not be. What is needed is to attach the chain to the U-bolt with a length of nylon rode long enough to allow all the chain to come up on deck. This way, if it is ever necessary to cut the anchor loose in a hurry, it can be done in seconds with a sharp knife or even an axe.

1.7 Rope Rode

Nylon is the only choice for rope rodes because of its tremendous strength, its ability to stretch and absorb loads, its resistance to environmental insults, and the fact that it sinks in water and so is less likely to foul the boat or propeller than, for example, polypropylene. The choice is between three-strand and double-braided nylon. The former is cheaper, has the most stretch, and is easier to splice, but the latter is a little stronger, is softer on the hands, is easier to coil, and will not hockle (kink). Take your pick.

All nylons look pretty much the same, but there are significant variations in quality from one manufacturer to another. Nylon is hygroscopic (absorbs moisture) which reduces its strength by up to 11% and lowers its abrasion resistance. Better-quality nylon lines are given a water repellent treatment (MOF) that limits strength loss when wet to

around 5%, while at the same time improving abrasion resistance and handling characteristics. It pays to buy good line.

Chafe is the enemy of all nylon snubbers and rodes. To minimise the chances of chafe in the water, any anchor should be given a substantial chain lead so that the nylon does not drag across the bottom every time the boat swings at anchor (a chain lead will, in any case, be needed to hold the anchor's shank down and help it to set). Ideally, the chain lead will be at least as long as the boat.

A modest load on the line will then keep the entire rode clear of the bottom. In reality, a chain lead between 8 and 20 feet is more common, but this still works head, but not much can be done to protect against this. On deck, chafe is mitigated by providing chafe guards at all points of contact between a nylon rode or snubber and the boat (other than the cleat to which either is fastened).

Traditionally, chafe protection has been provided by wrapping a piece of cloth around the rode and tying it on. In all but an extreme blow, a more effective approach is to use a length of hose. In the case of a snubber, this can be permanently fastened in place. In the case of a rode, it will need to be slit down one side so that it can be slipped over the rode once the desired amount has been let out. It will then need to be securely tied in place; it helps to have holes through which a lashing can be run at both ends of the hose. In a prolonged blow, the chafe protection will need regular inspection.

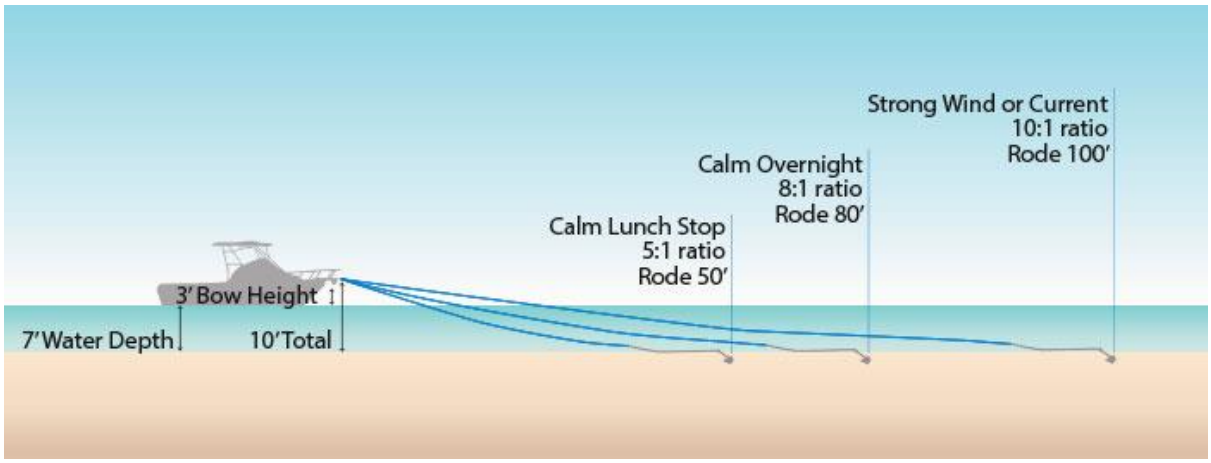
Finally, it is worth noting that by far the best kind of cleat for minimizing chafe is the type that incorporates a couple of horns into the inboard side of a hawse hole through a bulwark. Given that there is no distance between the cleat and the exit point from the boat, there is no way for a line to develop more than minimal movement between its attachment point and this exit point. This will minimize friction and heat.

1.8 The Scoop on Scope

Scope is often defined as the ratio of the length of deployed anchor rode to the depth of the water. Wrong! Scope calculations must be based on the vertical distance not from the sea bottom to the surface of the water, but from the sea bottom to the bow chock or roller where the anchor rode comes aboard.

For example, if you let out 30 feet of anchor rode in six feet of water, you may think you have a 5:1 scope, but if your bow roller is four feet above the waterline, your scope is actually 3:1.

Scope is required to keep the pull on the anchor horizontal. The more upward pull on the anchor, the more likely it is to break free. **Minimum scope for secure anchoring is 5:1**. 7:1 is better where you have the room. In windier or heavier conditions it may be 10:1 or more. A length of chain between the line and the anchor (at least 20 feet) also helps to keep the pull horizontal.

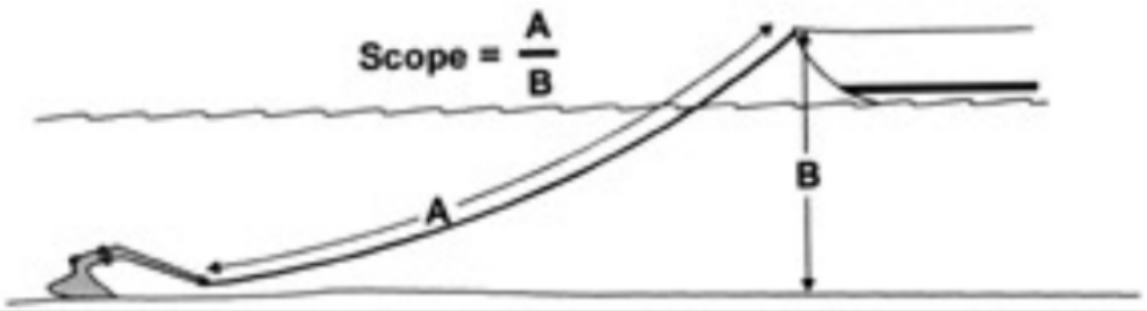


1.8.1 Pay Out Proper Scope

Your anchor holds best when the load on it is horizontal, not vertical. So let out enough scope to accomplish that. First, add the depth of the water to the height of the bow from the water, then multiply that by 5 and pay out that amount of rode for a "lunch hook" when you'll be aboard, awake, and watching in calm conditions. If the tide is coming in, adjust for it so you rest at 5-to-1 scope once it's fully in. If it's windy or you might go ashore for a bit, pay out at least a 7-to-1 scope. If you're spending the night on the hook, pay out an 8-to-1 scope. NOTE: When you calculate scope, don't include the chain at the anchor end of the rode unless there's more than 6 feet or so; the chain's job is simply to weigh down the anchor.

So, for example, if you're anchoring in water that's 10 feet deep and your bow is 5 feet above the waterline, water depth (10) + bow height (5) = 15 feet, which means that for a lunch hook you should put out 75 feet of rode (15 feet x 5).

So, for example, if you're anchoring in water that's 10 feet deep and your bow is 5 feet above the waterline, water depth (10) + bow height (5) = 15 feet, which means that for a lunch hook you should put out 75 feet of rode (15 feet x 5).



Scope	Holding Power
10:1	100%
7:1	91%
6:1	85%
5:1	77%
4:1	67%
3:1	53%
2:1	35%

1.9 Set The Hook – gently reverse onto the anchor to 'set'

Once you've let out ample scope, let the boat settle back on the anchor to straighten out the rode. A gentle breeze or a mild current may be sufficient for this step. If not, use the engine with just a touch of reverse. Pause and take a good look around, especially abeam (opposite the boat's middle), and note your position relative to other fixed objects.

Now, put the engine in SLOW reverse. You can expect to move slightly astern as the anchor and rode set themselves and stretch out. Soon, though, the boat should settle in a fixed position.

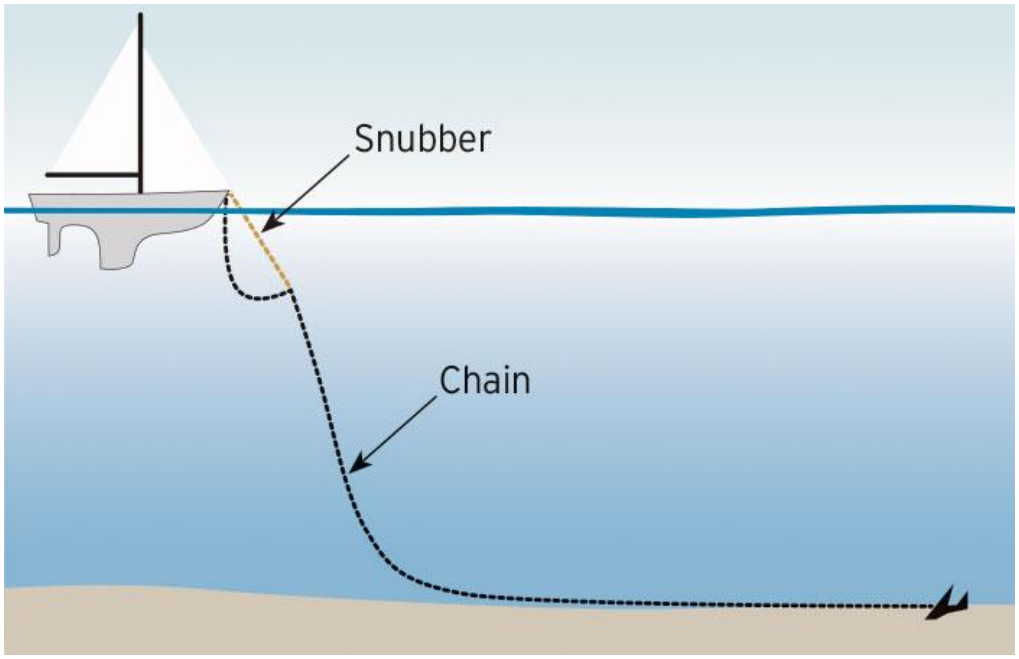
If at this stage the boat is still moving astern, your anchor may be dragging; pick it up and dragging; pick it up and drop it again, perhaps in a different spot. If the boat's

position is fixed, you should see prop wash alongside aft, and your anchor rode should be straight and taut.

To thoroughly set the anchor, with the engine still in reverse, increase the rpm. If the boat stays put, you can rest (relatively) easy, knowing you're hooked. Check your swinging room again if the wind or current might come from any direction.

1.10 How To Rig a Snubber

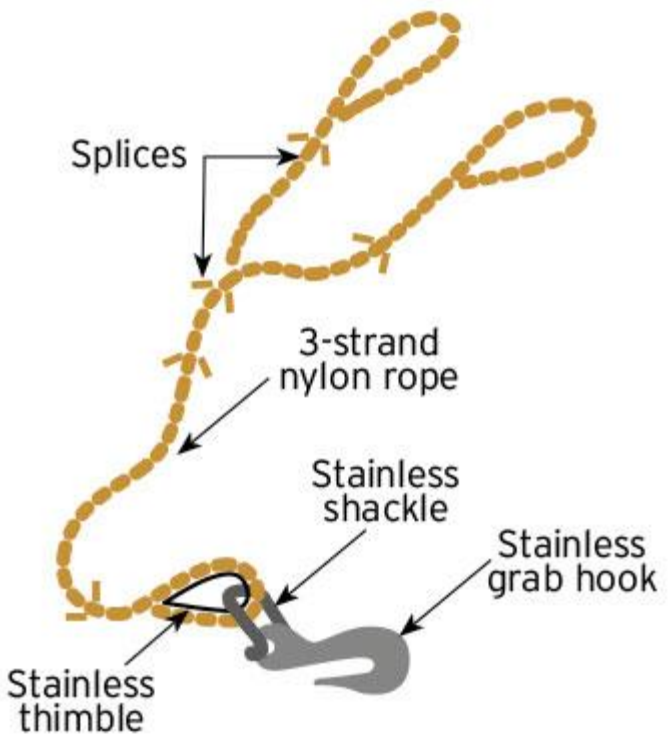
An anchor snubber, or snubbing line, performs two important functions for boats using all-chain rode: absorbing shock loads to an anchor rode and preventing the anchor windlass from taking all the strain as the boat swings at anchor and rises and falls with waves.



The simplest way to rig a snubber is, after setting the hook, attach a 20-foot length of nylon line (ideal because it stretches) to the chain or rode using a rolling hitch, before you deploy the final length of chain. (Lengths may vary depending on your circumstances.) Attach the other end of the subbing line to a strong bow cleat, then

feed out more anchor chain/rode until it hangs loosely between the rolling hitch and the windlass or other point where it attaches to the boat.

When rigged correctly, all the weight is taken by the snubbing line, not the windlass. Also, letting your chain loop down between the rolling hitch and cleat will add additional weight, thus producing more catenary effect which may improve the holding power of the anchor and give additional shock absorption to the rode.



To make rigging a snubber even quicker, many boaters with all-chain rode invest in a snubbing hook or chain hook. Both come in different sizes to suit the size of your chain and can be permanently spliced into the end of a suitable snubbing line. Once you're successfully anchored, slip the specially shaped hook over a chain link, attach the other end of the snubber to the boat, then let out a bit more chain until the snubber is taut.

1.11 You've successfully anchored. Now here's how to free your hook so you can head to your next port.

When it comes time to move on, you'll need to apply a vertical load to your anchor rode to break the anchor free. Move forward slowly and gently using the engine (never use only the windlass). If you don't have a windlass, gather aboard as much rode as you can by hand. Make sure to keep the rode out of the propeller and rudder.

A person at the bow should communicate with the person on the helm by continually pointing at the position of the rode and anchor, so the helmsman can steer toward the anchor location. Once the rode is directly below the bow of the boat, take a turn on a cleat. Then signal the helmsperson to put the engine in SLOW forward.

The anchor should break free. If it doesn't, apply a little more throttle. Once the anchor is free, go back to neutral, bring the anchor and rode aboard, rinse off any mud, and coil and stow the rode.

1.12 We're Stuck!

Once in a while, the anchor won't break free. First, try to use the vessel's own buoyancy and whatever wave action there is to help. Position the boat so the rode is vertical, then snub it up as tight as you can with each successive dip of the bow in the waves, letting the pumping action of the vessel work the anchor free. If this doesn't work, let out a little scope (2:1) and slowly motor forward to back the hook out. Circling the anchor while keeping the rode tight may work as well, but always keep your prop, rudder, and keel free of the rode.

If Davy Jones just won't let go and the water's clear and the weather is nice (and it's safe to do this), grab your snorkel or diving gear and check things out. You might see that your rode is around a rock or other obstruction. Alternatively, use a "look-down" bucket (a 5-gallon bucket with a clear Plexiglas bottom).

If neither is an option, check the chart to figure out what you could be hung on. If you think a cable or old anchor chain is the culprit, utilizing an anchor rider or chaser may work. Shackle a short length of chain together to form a loop around the anchor rode, then lower it down to the anchor shank using a messenger line of double-braided nylon (3/8-inch minimum). Double-braided line has less stretch than three-strand and won't snap back if it breaks or when the anchor comes free. Once you've worked the chaser over the anchor's shank (keeping the rode somewhat tight and vertical will make this easier) and down to the main body of the anchor, use the messenger to pull the anchor backward and hopefully free from the obstruction.

In extreme cases, buoy the rode, cast it off, then try backing out the anchor with the messenger by pulling 180 degrees from where you were originally anchored. If an old anchor chain or cable is the culprit, try to fish for it with a grapnel to lift it up and free your anchor. Be sure to attach a trip line to the grapnel's crown to aid in retrieval in case it gets stuck, too!

MOORING & DOCKING

2 Mooring and Docking

There is a saying: "Never approach the dock faster than a speed at which you are willing to hit it," and if most skippers can remember that their boat (and the boats of others) will usually remain undamaged.

Most of the issues around the docks can be summed up by one or two things. Either the skipper is #1 – applying too much throttle too fast or #2 – simply not applying enough throttle to steer clear of danger. Add current and/or wind to this equation and it could turn into a small disaster quickly.

Think about how you will secure the boat even before you pull up to a dock or into a slip.

Look at the direction of the wind and any current (look for flags if you are unsure about wind direction and look for how water is moving around pilings as an indication of current), and if you are in tidal waters look at water marks on pilings, which will tell you if you are near high or low tide.

Tying up your boat to a dock is a basic skill that will become easy with a little practice and experience. When a boat is properly tied up at a dock, it will not only be secure—it can't float away—but will also be protected from damage and not able to damage other boats.

Before you approach the dock or slip have your dock lines ready, your fenders (soft vinyl "bumpers") deployed and give your crew instructions on how to help.

2.1 The Plan of Attack

Remember: Docking is a manoeuvre, and all good manoeuvres require a plan.

Your Crew

Tell them what you expect of them prior to getting to the dock. Docking in a strong current may require fast action by your hands. Waiting until you get to the dock to give your crew direction simply distracts you from what you should be doing in that critical moment – driving the boat.

Have them place the fenders out for the side you will be approaching. Train your crew in advance. A smooth command of "Fenders out starboard side please" should be all that is needed.

Have the crew call out your blind spots and how far you are from docks or piers. "5 metres to the jetty, 3 metres, 2, aaaand 1." This is much better than having someone tell you "Keep going, keep going, (CRUNCH) that's good."

When lines are made fast, teach your crew to tell you which lines were made fast. If you have an order that you like – as in bow first, then stern – tell them in that in your pre-talk as well.

2.2 A Quick Review of Docking Techniques

Plan your docking manoeuvre in advance and rehearse it on a calm day with minimal current and wind. This will prepare you to handle more challenging docking manoeuvres later. Your technique will vary based on your engine configuration.

2.2.1 Single Screw

- Normally use short bursts of power
    - Enough to maintain directional control and steerage
- When a little is not enough
    - Sometimes, when it is windy or there is current, you have to add and sustain power to overcome outside forces. In this instance, don't be passive; you must control the boat.
- If it's blowing hard
    - Feel free to reduce your profile and windage. Take things down that can be taken down like soft biminis.
- Prop Wash and Prop Torque
    - Most single screws have a right-hand turning prop. What do you care? Because with a little practice you can "walk" your stern over to port and slip right into a dock space. There are plenty of YouTube videos that will teach you more about this technique.

2.2.2 Twin Screws

- Use shifters and throttles
- Remember to not use steering at low speeds

2.3 Winds and Tides

Now that we have done a quick review of docking techniques, we'll go over docking in current and high wind. The simple truth is that most skippers don't practice this stuff, but we should. A windy day with no traffic around your marina is the perfect day to practice.

Use Tide and Wind to Your Advantage

Good skippers have long ago learned that they can simply use wind and tide as part of their docking plan.

Three simple rules to follow are:

- Always dock into the wind and into the tide where possible.
- Know what the wind and the tide are doing.
- Know at every given moment which force is affecting your boat more.

A word of caution: There is a lot going on when you add in either or both of these variables. If you haven't near perfected docking in good weather, you have no business doing it in foul weather.

2.4 Practice, Practice, Practice

Now, when you are ready, take your boat somewhere that has either wind, current or both. This should be a safe place away from other boats and boaters.

Come alongside, close to a dock but not too close, and practice holding your hover (like a helicopter). Apply what you must to hold yourself in position. You will have to orientate your boat accordingly. This may result in either a bow or a stern toward the dock attitude and that is ok. This is one of the hardest parts. Do it until you are good at it.

Next, try the same technique from the opposite direction. What happens? Which force has a stronger effect? Now, make another approach. Crab in if necessary. Get close to the dock and then back away. Do this a few times and let your confidence build.

Let's look at two wind variables that you often see at the docks. The key here is to know what to do before it's too late. Set yourself up with the proper position before getting too close to the dock:

- Wind blowing away from the dock
    - Requires you to come in at steeper angle than normal and with more power.
- Wind blowing toward the dock
    - Requires you to keep a hover. Stabilize away from the dock then slowly slip in as you reduce power.

Finally, just like aircraft coming in for a landing, don't be afraid to abort – the dock or jetty isn't going anywhere. The best lesson here is to think of your docking "attempt" as just that – an attempt. Be ready to abort and "go around". Too many skippers try to fix a poor manoeuvre at the last minute. This usually leads to something going CRUNCH. It's way easier to abort and try again than to absolutely commit to the first try.

2.5 Take-Aways

Docking manoeuvres aren't easy and adding in wind and/or current just makes them that much harder. The key is to learn how to manoeuvre your boat and to perfect your handling skills in calm conditions. Then move on the training with current and wind. Understand the physics of the forces that are acting on your vessel and know what you must do to counteract them.

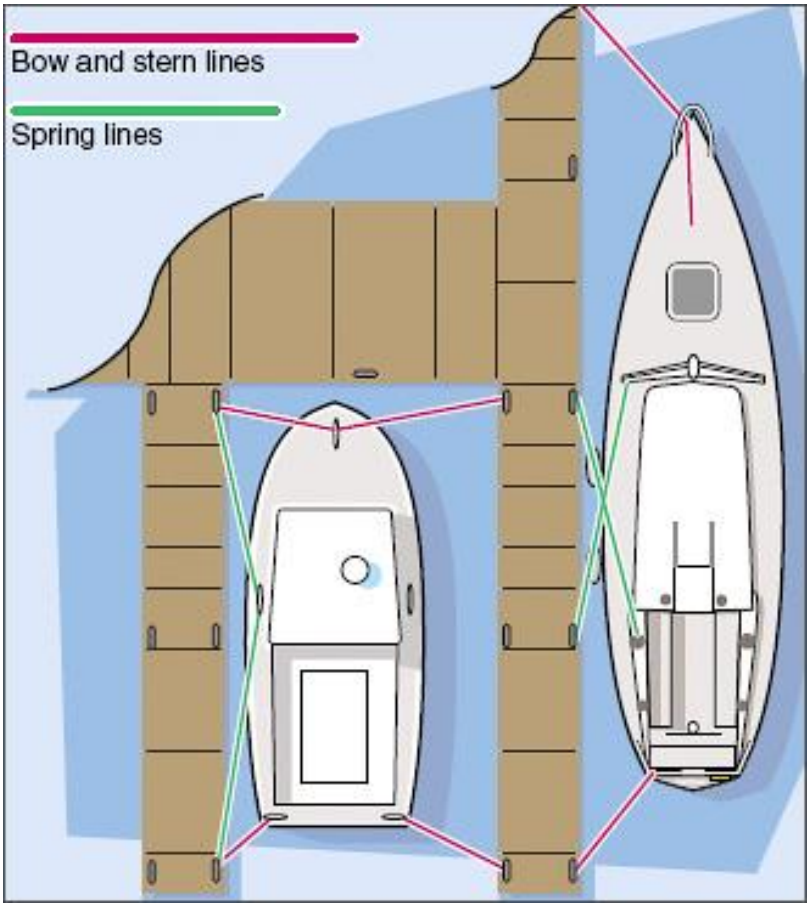
Finally, and most importantly, always give yourself the permission to abort a docking attempt rather than force the issue if you aren't set up correctly. Your boat and your neighbours' boats will thank you.

When tying one side of the boat to a dock, such as a fuel dock, you can secure the boat for any situation with three lines.

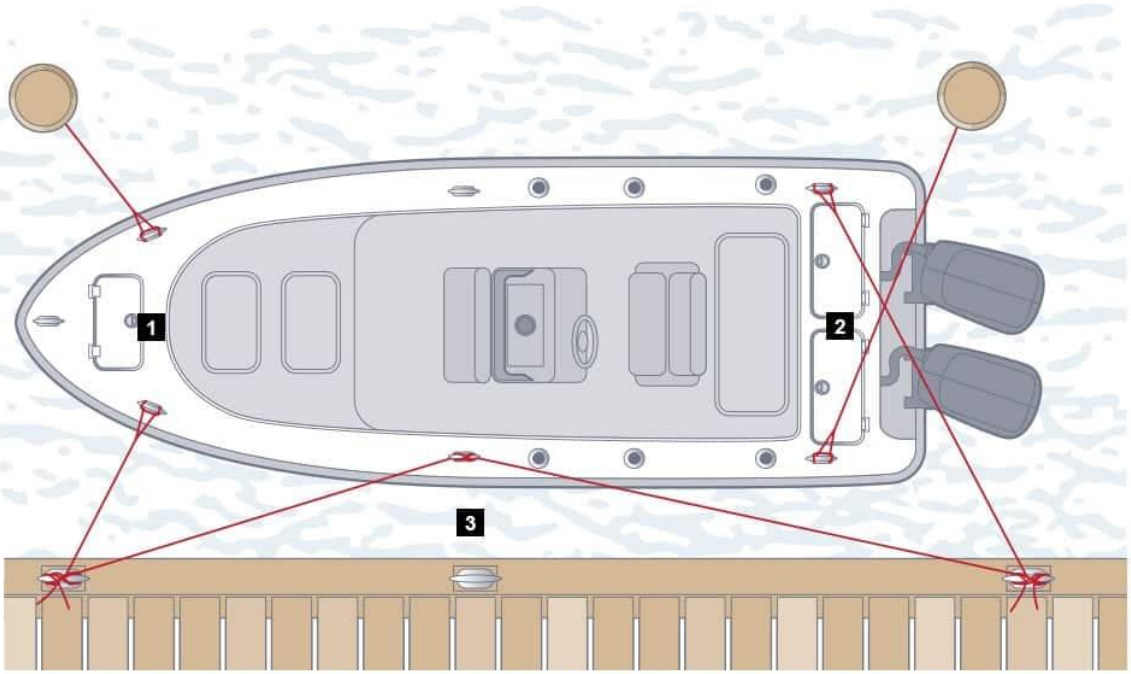
- Always start by tossing a spring line (attached to the cleat in the middle of the boat) to someone on the dock, who can hold the boat in place.
- Secure a line from the bow cleat to a dock cleat forward of the boat.
- Then secure the spring line to a dock cleat angled aft, toward the back of the boat. These two lines will keep the boat from moving fore and aft.
- Attach a line from the stern cleat on the side of the boat away from the dock to a dock cleat behind the boat.
- Tying each line at an angle, rather than straight to the dock (called a breast line) will allow the boat to move up and down in reaction to waves, wakes or changing tide if the dock is not floating.

2.6 How to Tie Up a Boat to a Dock

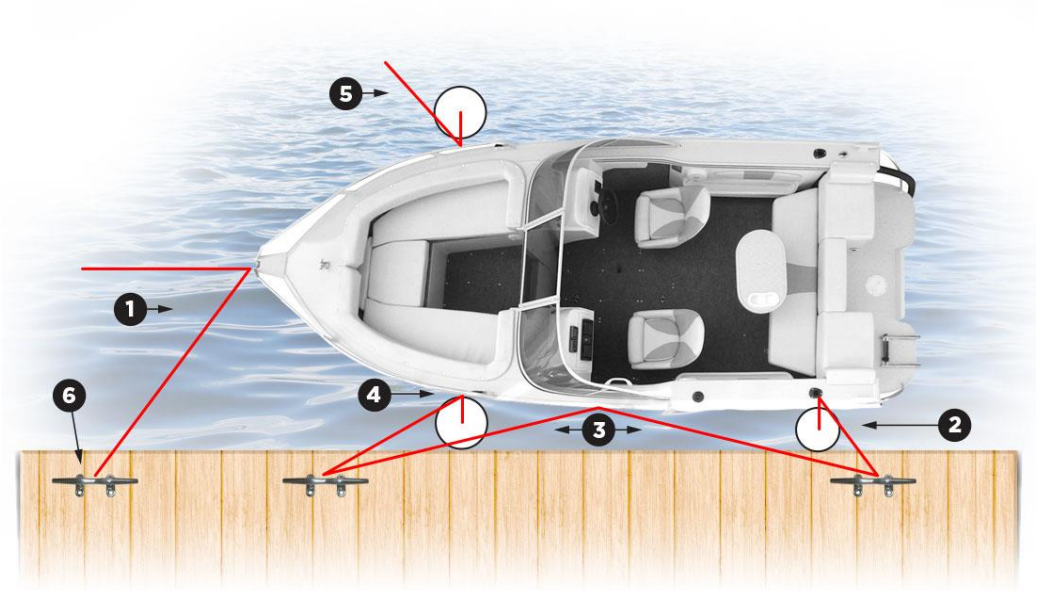
1. Plan your approach — consider wind direction and currents.
2. Always start by tossing a spring line to someone (if available) on the dock.
3. Secure a line from the bow cleat to a dock cleat forward of the boat.
4. Secure the spring line to a dock cleat angled aft.
5. Attach a line from the stern cleat on the side of the boat away from the dock to a dock cleat behind the boat.



Typical Dock Line Arrangement. The powerboat is using double bow and stern lines to keep the boat away from the dock. The sailboat is using spring lines to prevent fore and aft surging, while the bow and stern lines "locate" the boats.



1. **Bow Lines**: Whenever possible, secure one line to a cleat and another to a piling, both preferably slightly ahead of the boat to keep it from sliding backward.
2. **Stern Lines**: Cross both lines before tying them to the stern port and starboard cleats. Adjust the length to ensure they rest over the motors to prevent snags during tide fluctuations.
3. **Spring Line**: When two bow and two stern lines are used, one spring line is enough to limit forward or backward movement and pull the boat close to the dock for boarding.



1	Use a Single or Double Bow Line depending on the type of dock to secure your bow.
2	Use a Stern Line to secure the stern.
3	Use at least one Spring Line to reduce fore-and-aft movement.
4	Use Fender Ties to tie your fenders to your boat cleats.
5	Use Dock Lines when tying up along side a dock or pier.
6	Dock Cleats are used to secure your lines from your boat to the dock.

2.7 Line Handling

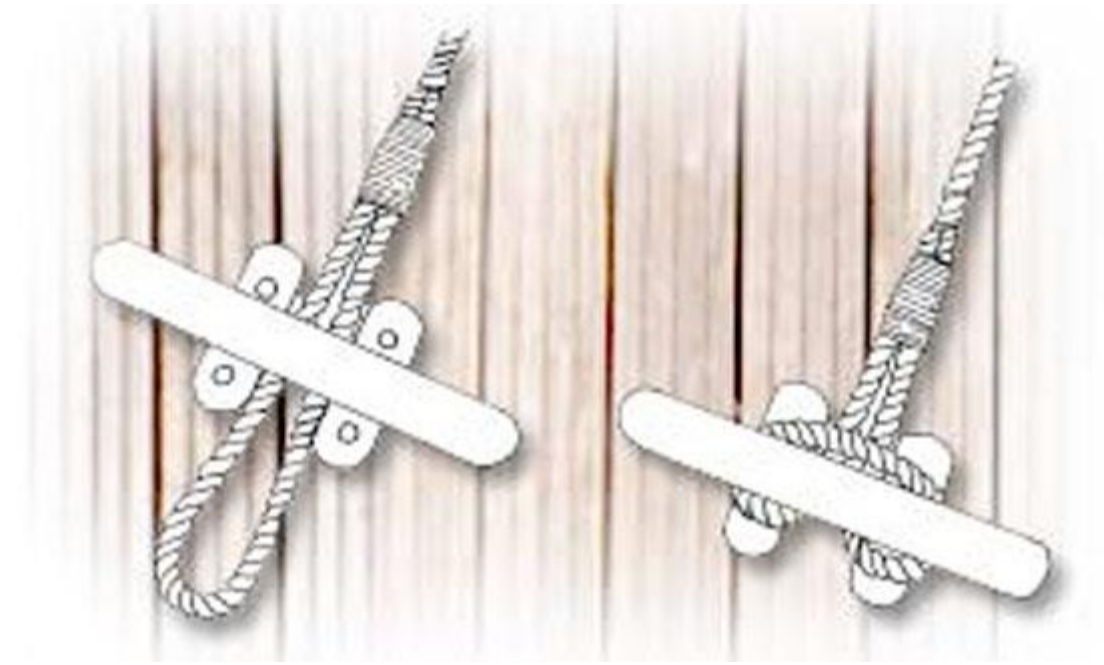
When aboard a boat ropes are no longer called ropes, they are called lines. At least three and preferably four lines should be carried aboard for docking. The diagram above shows four lines used. Although the stern line will keep the boat from moving forward too much, to be safe a fourth spring line running from the dock cleat forward could be used.

2.8 Cleats & Hitches

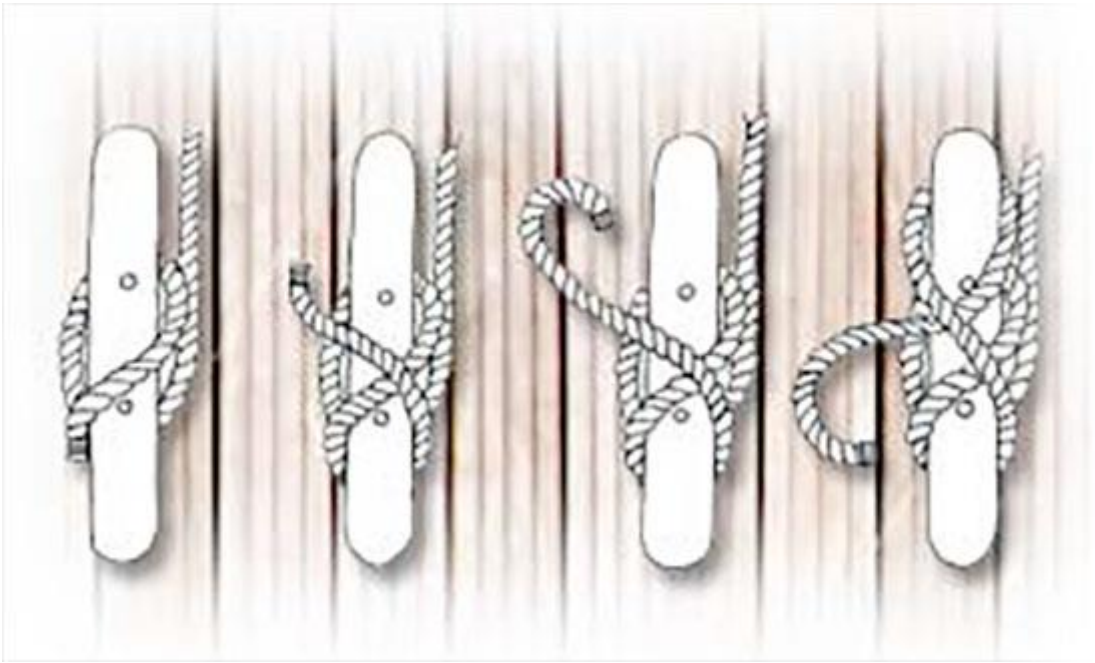
A cleat is the piece of horn-shaped hardware attached to both your boat and usually to the dock to which you'll secure the dock lines. Never try to secure a dock line to another part of your boat, like a railing, the windshield frame or a passenger grab handle. Only the cleats are secured through the deck with hardware stout enough to hold the boat.

Most popular boats will have two stern cleats, two cleats in the middle of the boat (sometimes called spring cleats) and two cleats towards the bow. There may also be a cleat at the bow peak. Larger boats may have two cleats between the bow and the stern cleats.

A dock line usually has a loop on one end. This is the end you'll attach to the boat, by passing the loop through the center of the cleat and then back over the horns of the cleat, working towards the boat. The other end of the line is secured to the cleats on the dock using a cleat hitch. To tie a cleat hitch, pass the line twice around the cleat's base, then make two turns in a figure 8 motion around the horns before making a third turn with the line turned under itself in a half-hitch. This secures the line.



Cleat Know Hitch



RAFT UPS

3 How to Raft Up Boats for Summer Fun

A how-to guide to safe and secure boat raft ups – raft planning, anchor position, fender and line use, overnight rafting, and boat configurations

Have you ever dropped your hook in an anchorage and noticed 2 or more boats anchored and tied together? That is rafting… or a "boat raft up".

Maybe you have had a rendezvous with friends and family on a number of boats. You'd like to all socialize but the best you know how to do is to dinghy or swim over to your friend's boat. That could be hard on the hors d'oeuvres platter or the dessert tray you are carrying. Rafting two or more boats together is the solution!

Below I will tell you how to do it safely and securely. I will also offer opinions on when NOT to raft up. With just a little practice and care, you can confidently put together secure rafts and then let the party begin!

3.1 Choosing a Boat Raft up Location

Rafting involves anchoring. Selecting an appropriate location to raft boats requires the same judgment one might use to select a place to anchor one boat. However, there will be additional concerns given that there will be more than one boat, probably multiple anchors, and potentially boats of different type and size.

The bottom line is that you will want to make sure you have room for a raft-up of the size you are planning. Since a raft-up is usually assembled for socializing, consider other boats in the vicinity. They may have selected the anchorage for its solace and quiet. Beyond the issue of how boats swing at anchor, consider how sound travels over the water and leave you neighbours an adequate buffer from your party.

Breezy weather and shifting winds can be problematic. Finding a well-sheltered location would be desirable under those conditions. It is worth reiterating here that you should always avoid rafting near a lee shore. A high stand of trees on the windward side of a creek or cove can often provide an excellent wind break. In the summer, the early shade would also provide a welcome respite from the sun.

You will not want to be in an area with a lot of boat traffic. The swells from the wakes of other boats could put undo strain on dock lines and anchor lines.

3.2 Planning Phase

Regardless of the number of boats in the raft, it is important to identify one person who will act as **Raft Control**. This person is generally, but not necessarily, on the boat that anchors first. It is his or her responsibility to:

1. Verify the selected anchorage is appropriate and safe for the planned raft.
2. Keep in constant contact with all skippers.
3. Direct each boat to join the raft in a specified position.
4. Confirm that all skippers are secure and comfortable with the situation with their respective vessels.
5. Establish anchor watches.
6. Oversee the safe dismantling of the raft.
7. Before getting underway, all the skippers should meet and select a primary location and one or more secondary anchorages in which to build the raft. This would also be the time to lay out a preliminary raft plan…that is, who will anchor first, which boats will lay where, and which boats will set anchors in which direction. Other issues to consider are whether the raft will persist overnight or if it is only for an afternoon.
8. It is worth noting that a good number of skippers do NOT like leaving rafts assembled overnight and some do not like the concept of rafting at all. That is their right. The primary concern should always be safety of the vessels and the people aboard them. Everyone must agree to the plan as discussed. If a change is made after getting underway and regardless of the reason, Raft Control is responsible for communicating that with everyone.
9. Building the Boat Raft Up

3.3 First Boat

Raft Control should approach the selected location first. In general, the largest boat with the biggest and best anchor will be the first boat to set a hook. This boat becomes the core of the raft. It is therefore essential that a good set on the anchor is made. Be mindful that the raft will move differently than a single boat on an anchor. It should

be expected that more than one boat will set an anchor. (I will get into those details shortly.)

Given the extra load of multiple boats, it is wise to err on the side of more scope when setting anchors. The core boat should set its anchor and then take several minutes to see how the boat lies to the anchor. (See Figure 1.)

Figure 1

Ideally the wind and/or current will be from directly ahead and is not veering significantly or erratically. If a shift in winds is forecast for overnight, it may be wise to orient the raft in the direction of the forecasted weather. Obviously there should be

no dragging. As with anchoring a single boat, note cross bearings using clearly visible landmarks. This will allow you to monitor the position of the raft over time.

Once the boat is anchored, Raft Control should use a working channel (not VHF 16) on the VHF to direct each boat into the raft one at a time. Whatever was determined in the pre-trip meeting regarding the order of assembly and who was setting anchors, should be reiterated in the radio calls to the approaching vessels. If a change in that plan is necessary, make it clear that it is a change from the plan.

As the raft comes together, skippers are to follow the instruction of Raft Control without hesitation. If Raft Control issues a call to break off or to disengage the engine, those commands should not be questioned. Additionally, only one boat should approach and connect to the raft at a time. This makes it utterly clear to whom Raft Control is speaking when issuing commands.

Regarding the position of anchors, some people like to use floats tied to the shank of the anchor and some people prefer keeping a light strain on the anchor lines to make it more obvious where they lie. Either will help while building the raft but having floats will make it more obvious to boats moving nearby that are not part of your group.

3.4 Additional Boats

To keep the raft balanced, it is best adding each additional boat on alternate sides of the raft. If the wind or current is slightly off to one side, I like to add the first boat on that side. While there may be some additional windage, the additional mass should act as a damper and moderate any motions caused by the wind.

For groups of 4 or more boats, try to avoid having adjacent boats set their anchors. That would reduce the risk of fouling anchor lines. However, if you only have 2 or 3 boats in your raft, then it is more advisable for everyone to set an anchor. Otherwise, designating every other boat to set an anchor is fine. There are other raft configurations that I will touch on later.

For those boats that set an anchor, they should position themselves outboard of where their final position will be in the raft. That is, if a boat will come along the starboard side of a rafted boat, it should set its anchor off the right somewhat so that when the boat joins the raft, its anchor line will tend off the bow to the right. (See Figure 2)

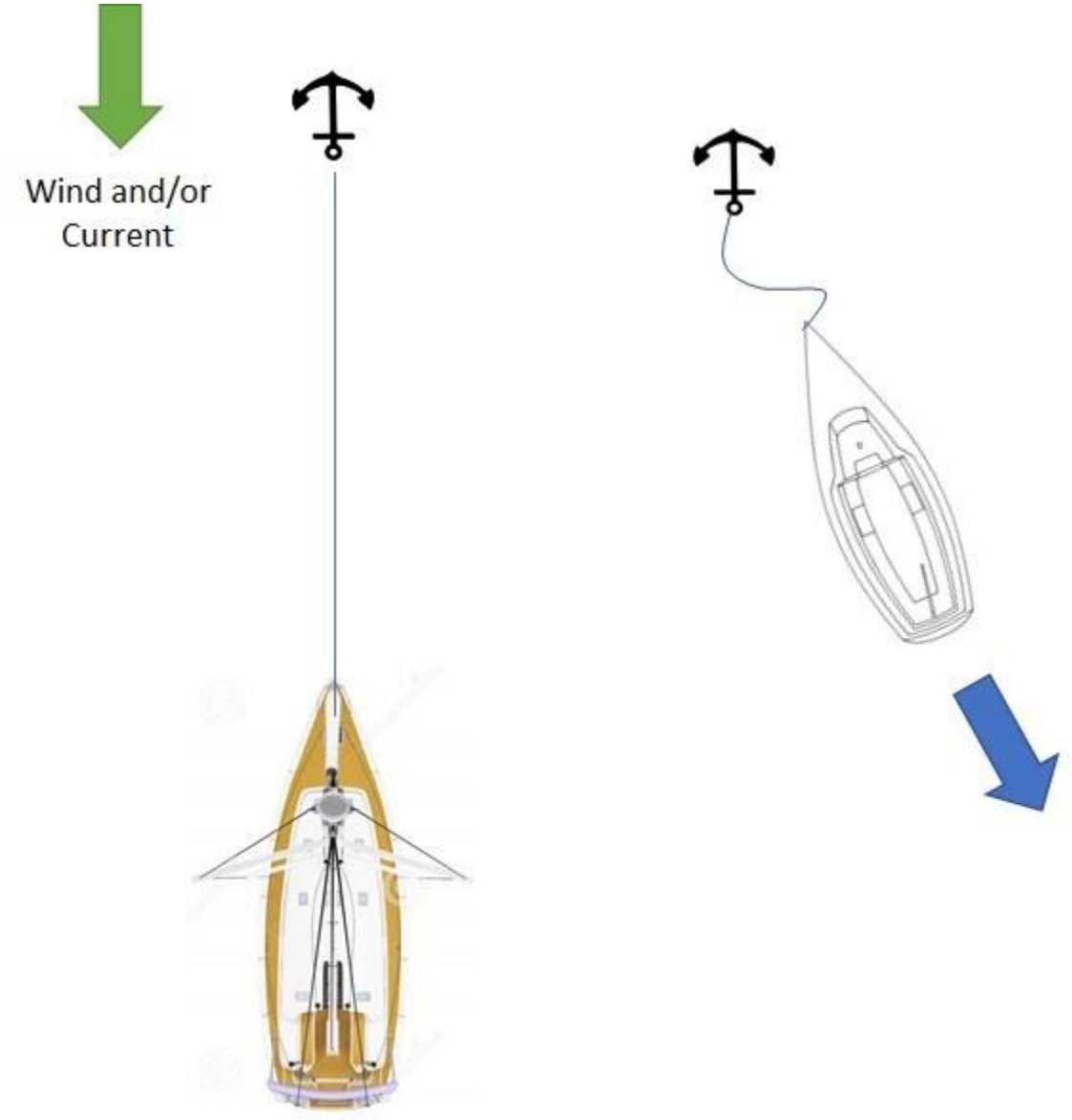


Figure 2

The angle formed by anchor line and the centreline of the boat should not be much more than 10 or 15 degrees. If approaching from the left side, then the anchor line would tend off to the left. In either case, they should set their anchor as if anchoring solo including verifying the set. Then they should drop back while paying out anchor line to keep it slack. (See Figure 3)

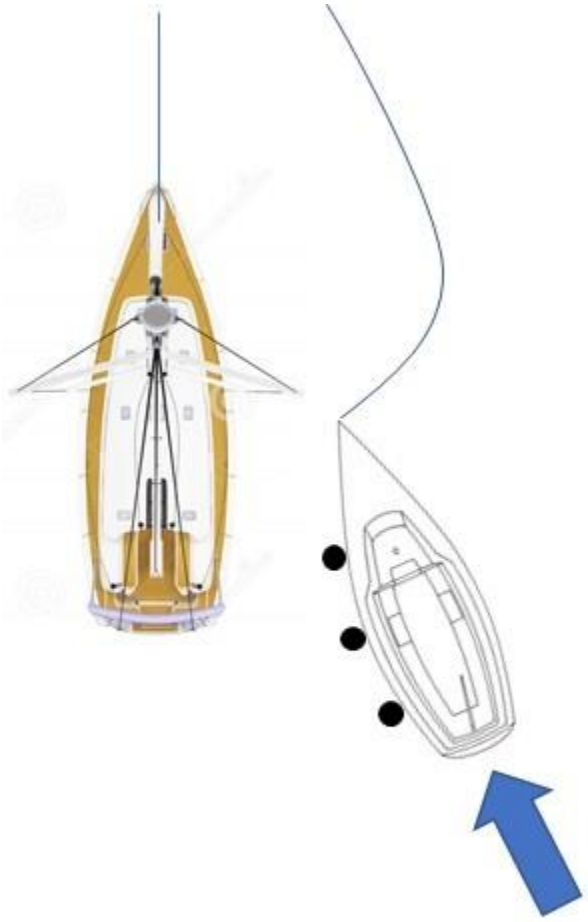


Figure 3

The idea now is to make the shallow angle approach to the raft by coming up from behind and laying alongside the adjacent boat. Once secured to the raft, all slack in the anchor line should be eliminated. (See Figure 4)

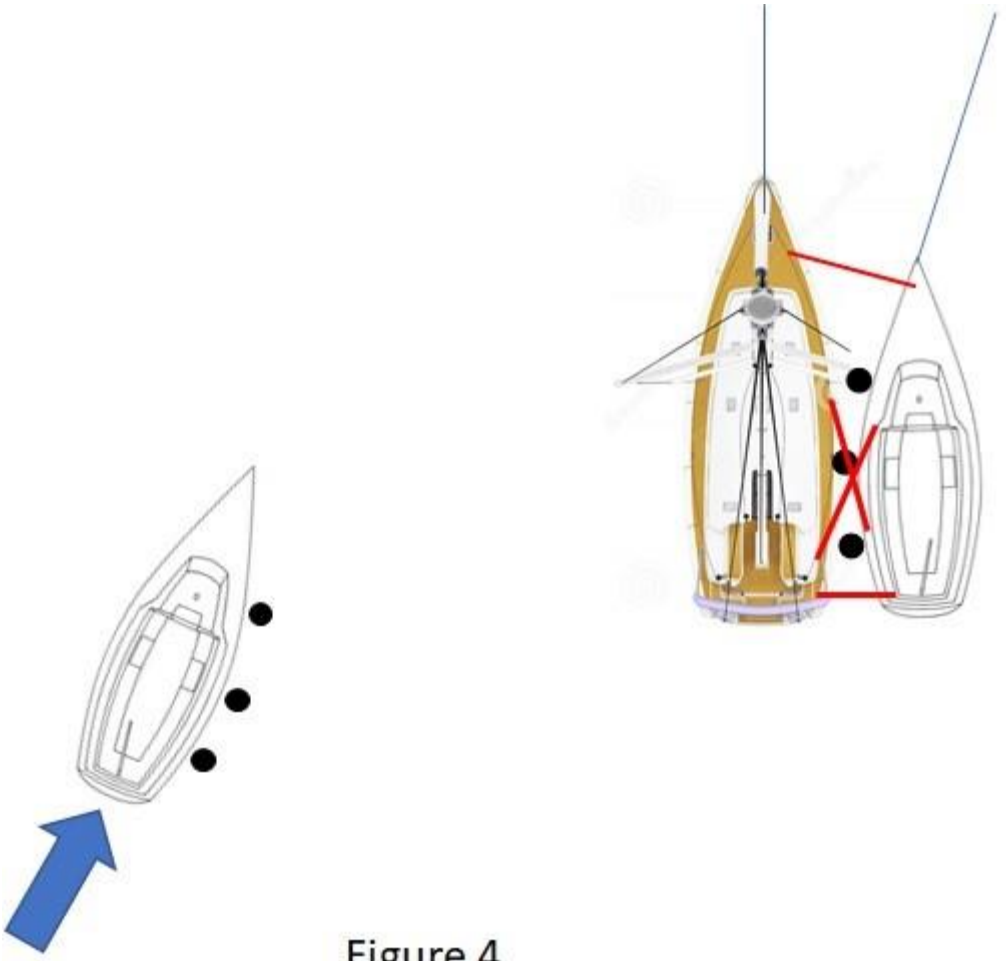


Figure 4

Boats which are not setting an anchor would simply make a shallow angle approach from astern. It is well to remember that the raft is not a fixed dock and can move freely. This is particularly important if, for some reason, the raft moves toward your boat as you are approaching leading the distance closing faster than you might have anticipated.

Each boat approaching the raft is to deploy its own fenders and its own dock lines. Only the core boat need not set fenders. The exception to this would if the shape and height of adjacent boats is different enough that more fenders should be used to protect the hulls. Send bow and stern lines first to control the lateral position of the boats. Then use spring lines to adjust the relative fore and aft positions of the two boats.

For sailboats, be mindful of the relative position of spreaders and masts. If the boat should roll in a swell or a wake, you do not want the rigs to collide. Boats tend to roll in

opposite direction on a raft so at some point, they will roll TOWARDS each other. Keeping the masts and spreaders offset avoids collision and damage.

For sailboats, you can use winches to position adjacent boats fore and aft and then tighten the spring lines. This allows easy and fine adjustments without much struggle. If you can't find a convenient deck cleat to use, you can run spring lines to shroud chain plates or even to the mast. In any event, the dock lines between all boats in the raft should be tight and without slack, even when the boats move.

It may be somewhat more difficult to get spring lines on power boats as tight without a winch as on a sailboat, but it is no less important. The notion of offsetting masts and such is also less of an issue. However, the goal in all cases is for the raft to move in concert as one vessel.

3.5 Rafting Up Preparation

Whether it's rafting up on a mooring, stern lined to a bank or swinging on anchor(s), the principles of good rafting technique remain the same. Consideration of the following key points will ensure no boat (or friendship) gets damaged from a raft up, no matter what conditions may develop:

- The weather forecast and conditions.
- How many boats will be in the raft up.
- Boat positions within the raft up. Ideally the largest boat should serve as the building block for other boats to tie up along either side. It should be well anchored with plenty of anchor rope or chain out or well secured to a mooring.
- The combined weight of all the boats on a mooring or anchor(s).
- Is the raft to last through the night or just a few hours?
- Is stern lining to be undertaken or considered?
- Any individual boat's needs (e.g., need to depart early).

Before joining a raft up there are two main preparations required.

1. Fenders should be positioned on the side of your boat and ideally also on the receiving boat. At this early stage, place two good fenders amidships,

approximately 1 - 2 metres apart with an additional fender further forward and one aft. Ensure they are positioned at a height where they extend above and below the rub strip of your boat.

2. Mooring lines of appropriate size and condition should be attached to cleats on the boat. One on the bow and one on the stern, and two additional lines kept midships to be used as spring lines when completing the raft.

   The ropes should have good shock absorption and allow some stretch. The use of non-stretch sheets or halyards should be avoided as it can lead to a very uncomfortable and 'jerky' motion as the boats move around due to waves or wind. In extreme cases they can also lead to damage to cleats and rope attachment points.

3.6 The Rafting Up Process

The actual process to raft boats up is reasonably straight forward: -

1. Slow down when approaching or joining a raft up to avoid any potential collision.

2. Make sure all passengers keep their hands and feet in the boat while rafting up, so they don't get pinched.

3. Come abeam of the host boat and heave the bow and stern lines to the host crew. If you can't do this because of current or wind conditions then approach the bow of the host at a 45-degree angle and toss the bowline, and once it is made fast allow your boat to settle gently back and beside the host by using a combination of the wind, current and engine. Always secure ropes onto cleats or strong points - not handrails or other accessories.

4. Run the two spring lines from the bow of one boat to the stern of the other (or utilise a midship cleat), to minimize fore and aft motion creating an "X" shape. These spring lines will keep the boats in the correct fore and aft position and should be well tensioned to minimise motion between the boats.

5. The bow and stern lines can be adjusted and kept a little looser to allow the spring lines to do much of the work and avoid a jarring motion when the bow or stern lines suddenly tighten.

6. Reposition any fenders that need moving up, down or aft or forward to create a continuous fender barrier.

When leaving a raft up, either reverse the above procedures, or ideally just release the spring lines, followed by the bow and stern lines, and allow the boat to slowly drift backwards whilst a crew member makes sure the boats remain apart. Once clear aft, move away and tidy up.

Unfortunately, not all boat operators are considerate or experienced skippers, and some can put large wakes through anchorages and populated bays. So, ensure the raft up is solid, well fendered and lines are tight, so the raft moves as one.

3.7 Completing the Boat Raft Up

After all the boats have been properly anchored and/or secured to the raft, Raft Control should convene a brief meeting of all the skippers. Do this before any food or drinks are set out or before any partying begins. Poll each skipper to make sure they are comfortable with their position in and connection to the raft. Also ascertain that everyone is comfortable with the position and set of the raft in general. Then begin anchor watches in rotating shifts. Each person on watch should know where the next person is sleeping so they can wake them when necessary.

If the raft lies askew of the anchor line from the core boat, it is worth considering whether an adjustment can or should be made or even if the raft should be disassembled and reassembled being more mindful of the set of the core anchor.

Also remember that all boats in the raft are to display anchor lights after sunset and anchor balls during daylight.

3.8 Leaving the Raft

Under normal conditions and when it is time to leave the raft, skippers should let their engines warm up and Raft Control will determine the order in which boats depart. Once departure clearance is granted, the skipper of the given boat will issue the appropriate commands to take in lines, retrieve the anchor if necessary, and move safely away from the raft.

Generally, the spring lines are let go first. Since the boats arriving on the raft use their own gear, as they leave it is easy to remember that the raft side gear belongs to the departing boat. Whether a boat backs away or pulls forward to leave will depend on weather conditions, where the anchor lines lay, and how the boat handles under power.

3.9 Oh Oh…!!! When Rafting Problems Happen

There may come a time where conditions…emergency, weather, or otherwise…dictate that the raft be broken up. And of course, this will always be under far less than ideal situations like a moonless night, high winds, driving rain, or a disabled boat. Then more than ever, order, procedure, and obeying Raft Control is imperative.

Some of the situations that might lead to an emergency raft break-up have already been listed but other reasons include the raft is dragging or lines have slacked or broken.

Follow the commands of Raft Control. She or he will know who is where and the best route away from the abandoned raft. In bad weather or windy conditions, have your VHF on and turned up so you can hear.

In emergencies, there is likely to be lots of shouting and other noises. In practically every one of these situations, the best immediate solution in the dark is to break up the raft and have everyone anchor individually. Once boats have safely cleared the raft the individual skippers will have the responsibility for safe operation of their vessels.

3.10 Other Boat Raft Up Configurations

There are more advanced configurations you can use in different conditions. For instance, if you have a raft that you don't want to swing or move for one reason or another, you arrange the boats such that each one alternates which direction it points. With boats in both directions setting anchors, the raft should not swing or move. This would also address the situation where the winds shift 180 degrees.

If a linear raft would be too wide for the anchorage, you could assemble two rows of a equal number of boats with the sterns together. Boats in both directions would set anchors which yields the same benefits mentioned above.

This article generally addresses the situation where all the boats in a given raft are of the same type: power or sail. However, it is not completely unrealistic that you may participate in a raft of a mix of sail and power boats. My advice is that if one type predominates and the sizes among all boat are all similar, the more common type should be in the middle (core) of the raft and the minority boats should be positioned at the outer edges unless the sizes of the boats vary enough that they need boat size determines raft order more than boat type.

In all cases, skippers must be mindful of the differences in deck heights, hull curvature, and any potential conflicts with above deck hardware or rigs like light towers, fishing outriggers, and other things.

If you have never participated in a raft, start with small simple linear rafts. Practice all the basics from planning through execution. You may not want to stay rafted overnight the first few times. With more experience, it will be a comfortable and familiar manoeuvre. And soon you will be able to spontaneously respond and adapt to various rafting situations.

3.11 Summary & Gear for a raft up

Rafting is a great way to enjoy your friends on other boats. Sharing amongst boats becomes much easier. It is somewhat like going from room to room in a house party…except you must climb over a rail to get to each room! Try it! You might like it.

If you're not sure you have the right gear on your boat, here are some of my recommendations for future raft ups:

Boat Fender Set – Recommended to have at least four boat fenders appropriate size for your boat on board. Polyform US® make excellent, long-lasting fenders. https://polyformus.com/ available in Australia.

Dock Lines – extra dock lines will always come in handy… make sure you have a good mix of line lengths. You will need at least two springs and up to four lines for bow and stern.

Anchors – can your anchor hold a raft up?

Anchor Rode Kit – ensure your windlass is in ship shape – it may be time to upgrade your anchor rode.