How To Anchor Securely

What They Do

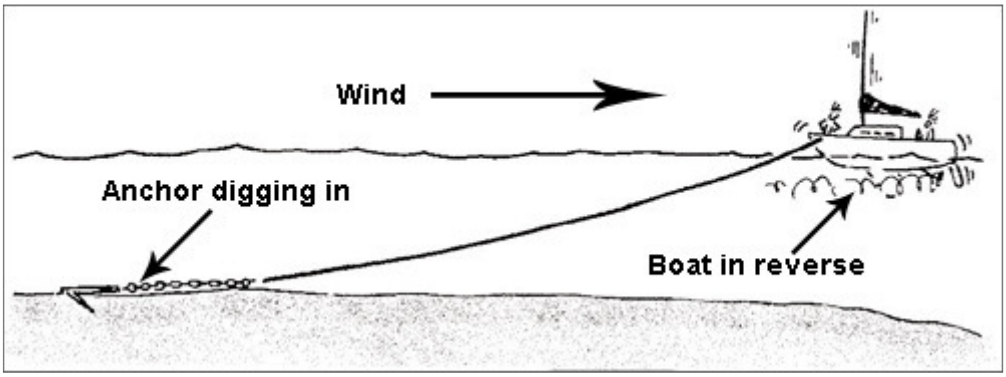
Anchors dig into the seabed to hold a boat in position. They serve a safety role by keeping boats out of the surf or off the rocks. They also allow boaters to secure the boat temporarily while fishing, having lunch or spending the night.

How They Work

When an anchor penetrates the surface of the seabed, suction generates resistance, created by the bottom material plus the weight of the material above the anchor. As the boat pulls on the anchor rode, the anchor digs in deeper, creating additional resistance. In rocky or coral bottoms, anchors can't dig in, but rather snag on protrusions and hold precariously.

Setting

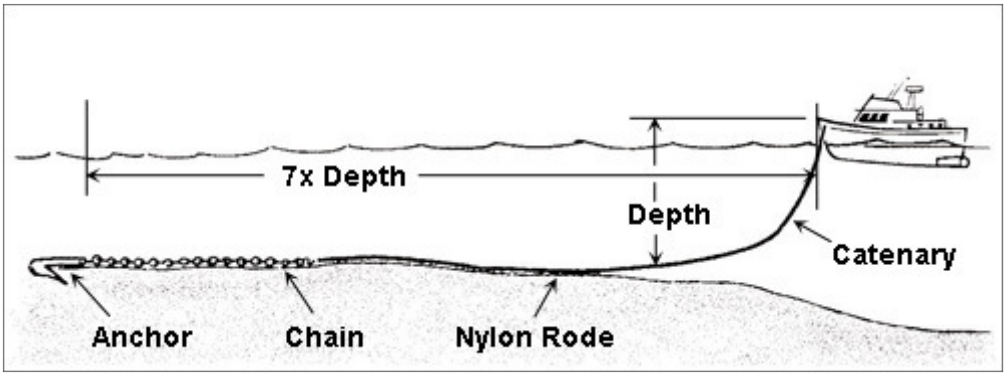
To ensure that an anchor "sets" well, apply tension to the rode so the anchor penetrates the bottom. Do this by making fast the line and applying power in reverse. If your boat moves, reset the anchor and try again.



Many boaters make only a half-hearted attempt to set the anchor by putting the boat in reverse for just a few seconds. To be sure the anchor is set you must put a reasonable strain on the rode for a reasonable length of time. Your boat should surge forward when you back off the power, indicating that you have put some strain on the rode to test the anchor set. We know of no way to ensure that your anchor will hold other than by pulling on it hard.

Scope

Scope is defined as the ratio of water depth (plus freeboard) to anchor line paid out. Most anchoring texts and anchor manufacturers agree that a scope of 7:1 achieves the anchor's designed holding power, and more scope is better than less. In theory, 7:1 scope is great, but at a crowded anchorage most cruisers scoff at the idea of paying out more than 3:1 or 4:1-there just isn't that much space for boats to swing. When an anchor is securely set you can consider shortening scope in a crowded anchorage.



Once an anchor has been set, it will almost always hold the same amount of tension that was used to set it, even if the scope is reduced. This means that you can pay out long scope, pull hard on the anchor rode using the engine, and then shorten scope to reduce swinging room. However, if your boat swings and the anchor has to reset itself, it will have to do so at a reduced scope. This is known as Anchoring Russian Roulette.

Resetting

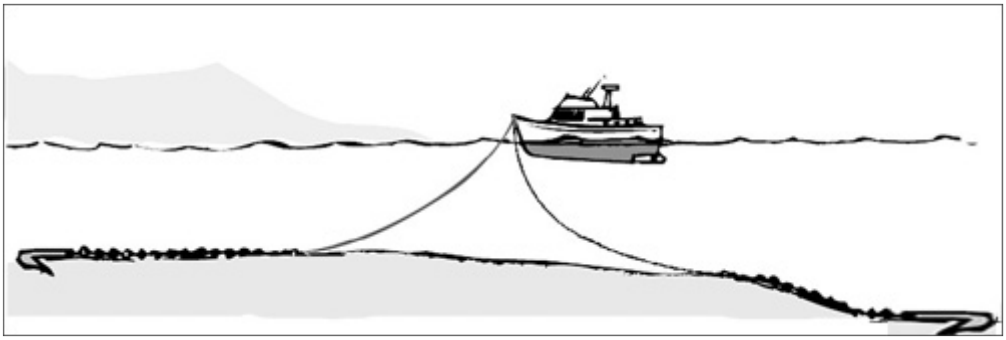
It's fairly easy to set an anchor when wind and current come consistently from one direction, but if they veer, some perform better than others under varying angles of pull. Any anchor can become dislodged from the seabed if the boat swings far enough. Four techniques can alert you when your boat swings:

- If you have an anchor alarm on your GPS, set it so it alerts you if the boat swings too far from the position where it was when you set the anchor.
- If you have an electronic compass or autopilot, set the course alarm so it alerts you if the boat's heading changes radically.
- If you have alarms on your depth sounder set maximum and minimum alarms to alert you if the water depth changes significantly, indicating that you are drifting either away from or towards the shore.
- Stand an anchor watch. It is a good practice to take bearings on prominent landmarks when you anchor so you can detect any subsequent change in position.

Anchoring Techniques with Two Anchors

Anchoring Bow and Stern
In tight anchorages, you may have to limit your boat's tendency to swing at anchor. By dropping an anchor close to the beach and a second anchor offshore, you can locate the boat precisely in the anchorage. You can also use the tension on one rode to help set both anchors.

Two Anchors off the Bow
Bob Ogg, co-inventor of the Danforth anchor, recommends setting one anchor into the wind or current, and a second anchor 180° away. Then take both lines to the bow of the boat. This allows the boat to swing around in a relatively small arc, yet will allow the boat to pull against an anchor without causing it to reset when wind or current change.



Assessing Bottom Conditions

Anchors need to develop enough resistance in the seabed to withstand the environmental forces on the boat-the wind and the waves. An anchor's ability to develop resistance is entirely dependent on its ability to engage and penetrate the seabed. We have participated in several anchor tests, and despite varying results, there always seems to be one undeniable conclusion: the selection of a suitable bottom for anchoring is a much more critical factor than the design of the anchor. So how do you choose the right anchor design? You must take expected bottom conditions into account. Here is an analysis of potential options, based on the seabed.

Sand:
Fine-grained sand is relatively easy for anchors to penetrate and offers consistently high holding power and repeatable results. Most anchors will hold the greatest tension in hard sand. Best in sand are the West Marine and Fortress anchors.

Mud:
Mud has low sheer strength, and requires anchor designs with a broader shank-fluke angle and greater fluke area. This allows the anchor to penetrate deeply to where the mud has greater sheer strength, and also presents more surface area in the direction of pull. Mud is frequently only a thin layer over some other material, so anchors that can penetrate through the mud to the underlying material will hold better. Fortress anchors have superior holding power in mud, because they can be converted to a broad fluke angle.

Rock and coral:
Holding power is more dependent on where you happen to drop the hook, than on the type of anchor you have. Plow-shaped or grapnel-type anchors, with high structural strength to sustain the high point loads generally work the best. These include the Bruce, CQR, or Delta.

Shale, clay and grassy bottoms:
Tough bottoms for all anchor designs. The weight of the anchor, more than its design, may be the most important factor in penetration and holding power. CQR and Delta anchors are thought to be good due to their ability to penetrate the vegetation. However, these conditions have a high probability of false setting, due to the anchor catching on roots and protrusions, rather than something solid.

Anchoring Tips

Despite claims to the contrary, no single anchor design is best in all conditions. Boaters voyaging to areas where there is a specific type of bottom must carry an anchor(s) suitable for that bottom. For all but very small boats, we recommend that all boats carry at least two anchors for the following reasons:

- You'll have another if one anchor is lost
- Different anchor types work best for different conditions
- Two anchors allow you to anchor bow and stern in tight anchorages

Inspect your entire anchor system frequently for chafe, loose shackles, and bent flukes. The system is only as reliable as its weakest component.

Store at least one anchor so that it can always be used immediately. Even the strongest anchor won't do you any good if you can't deploy it. Quickly deploying even a small anchor can keep you from going further aground.

Selecting Anchor Rodes

Not surprisingly, no one rode does the job for all boats. Each anchor rode is a combination of characteristics that must be chosen for a given type of boating. Ideally, an anchor rode would have the following attributes:

- Strength, so it can resist tremendous strain
- Stretch, so it can absorb the jerking motion caused by wind and waves
- Weight, so the pull on the anchor is horizontal

- Abrasion resistance, so it does not get worn by rocks or coral
- Compatibility with windlasses, so you can utilize them to weigh anchor
- Lightweight construction, so the trim of your boat is not affected
- Rot-resistance, so you don't have to replace it frequently
- Affordability, so you can afford to go boating!

Unfortunately, no one material combines all of these attributes (especially being simultaneously light and heavy), so we generally end up using multiple materials in partnership or we select the one material that offers the best compromise.

Rode Types

All-Nylon Rodes:
Small boats often use anchor rodes made entirely of three-strand nylon because they are lightweight, inexpensive and, for boats without a windlass or anchor well, easier to stow than rodes with chain. Although all-nylon anchor rodes can be quite strong, they lack the chafe resistance of rodes with chain and are therefore not appropriate for extended use or for use in rough weather. As the rode for a lunch hook or spare anchor, however, an all-nylon rode functions quite well.

Combination Rodes:
A good compromise between all-nylon or all-chain rode is to use a short length of chain (6'-30') connected to the anchor, with a long length of three-strand nylon line connected to the chain. This combination satisfies nearly all requirements of a good anchor rode, except that it is not abrasion resistant over its entire length, and the weight of the chain is pretty ineffective in keeping the pull on the anchor horizontal; even a 15-knot wind will lift short lengths of chain off the bottom. The primary function of chain for combination rode is to handle the chafe from rough bottoms that would otherwise abrade the soft nylon line. Long scope (7:1) must be used to compensate for the lack of weight to keep the pull horizontal. Nylon is preferred for its elasticity. Its stretch reduces peak loads on the anchor and on your boat.

Rope-to-Chain Spliced Rodes:
One drawback of the normal combination rode with nylon and galvanized chain is the interface between them consisting of a shackle and a galvanized thimble. While long lasting, this connection is bulky and adds a shackle to the system that could possibly fail or lose its pin. Therefore, many boaters splice their nylon line directly to the last link of chain, a technique originally developed for self-tailing windlasses (see The West Advisor on Windlasses for more information). This produces a very sleek rode which stows easily, passes through a chain pipe more easily than a splice/thimble, and which retains about 90% of the breaking strength of the line compared to new line.

All-Chain Rodes:
Larger boats with windlasses generally use an all-chain rode. This reduces the need for long scope (except in shallow water) because the chain is heavy and lies on the bottom until severe conditions are encountered, when more scope may be required. Since chain has very little elasticity, care should be taken to prevent the chain from becoming "bar tight" in high winds by using a snubber made of nylon line. The drawbacks to all-chain rode are weight, expense, and the need for a windlass. A windlass and all-chain rode may add 300-600lb. in the bow and can adversely affect the performance of your boat. Owners of modern, lightweight cruising boats are probably unwilling to suffer the reduced speed and increased pitching caused by this extra weight.

A logical compromise:
Because we feel strongly that a decent length of chain is critical for effective anchoring, and because we also like boats that perform well, we suggest using 60-100' of high-test chain spliced to 250' of three-strand nylon line. This combination provides sufficient chain to ward off bottom abrasion, and in shallow anchorages, you may not even need to pay out nylon. It is reasonably light (as little as

65lb.) and tremendously strong.

Rode Sizes and Lengths

When selecting anchor rodes for our customers in our stores, we generally use the following rules:

- Anchor line should be 1/8" diameter for every 9' of boat length.
- Proof coil and BBB chain should be half the line diameter (1/2" nylon line would be matched to 1/4" galvanized chain).
- Use shackles one size larger than the chain (1/4"chain would use 5/16" shackles).

As a general guide, for winds up to 30 knots, we recommend the following anchor line and chain diameters, using three-strand, high quality line. This table assumes an 8:1 working load ratio.

Boat LOA	2 Strand Nylon	Chain
to 25'	3/8"	3/16" PC
27'-31'	7/16"	1/4" PC
32'-36'	7/16"	1/4" PC
35'-40'	9/16"	5/16" PC/BBB or 1/4" HT
38'-45'	5/8a"	5/16" PC/BBB/HT
42'-54'	3/4"	3/8" PC/BBB or 5/16" HT
50'-63'	7/8"	1/2" PC or 3/8" HT
58'-72'	1"	5/8" PC or 1/2" HT
