

SUBJECT: MARINE INSTRUMENTATION

MOORINGS

Prepared By

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- **Mooring** can refer to any device used to hold, or secure, **any** object by means of **cables, anchors or lines**.
- **Mooring** can also refer to an **anchor** at the bottom of the waterway that holds a vessel in place.
- **Mooring** can also refer to the **place** where the vessel is moored, particularly if the place is convenient or if it is especially designed.
- **Moorage** can refer to the a place a vessel is moored or, the act of keeping a vessel moored in a **marina**, with a daily or monthly fee paid for occupying a berth of a given size, or the fee paid in such a case.

- A vessel is said to be **moored** when it is fastened to a fixed object such as a **pier, quay** or the seabed, or to a floating object such as an anchor buoy.
- Mooring is often accomplished using thick ropes called **mooring lines**. The lines are fixed to deck fittings on the vessel at one end, and fittings on the shore, such as bollards, rings, or cleats, on the other end.
- **Mooring by permanent anchor** can be accomplished by use of a permanent anchor at the bottom of a waterway with a rode (a line, cable, or chain) running to a float on the surface. This allows a person on the vessel to connect to the anchor.
- A **mooring buoy** is a white buoy with a blue band. While many mooring buoys are privately owned, some are available for public use. Always check before tying to any mooring buoy.



Mooring line materials



Regular mooring lines

Steel wire
Polypropylene
nylon

Polyethylene
Polyester
Chain

Permanent Anchor Mooring

- There are four basic types of permanent anchor moorings; dead weight, mushroom, screw in, and triple anchor.
- These moorings are used instead of temporary anchors because they have considerably more holding power, cause less damage to the marine environment, and are convenient.
- Example: On the **Great Barrier Reef** off the **Australian** coast, a vast number of public moorings are set out in popular areas where boats can moor. This is to avoid the massive damage that would be caused by many vessels **anchoring** in close proximity.

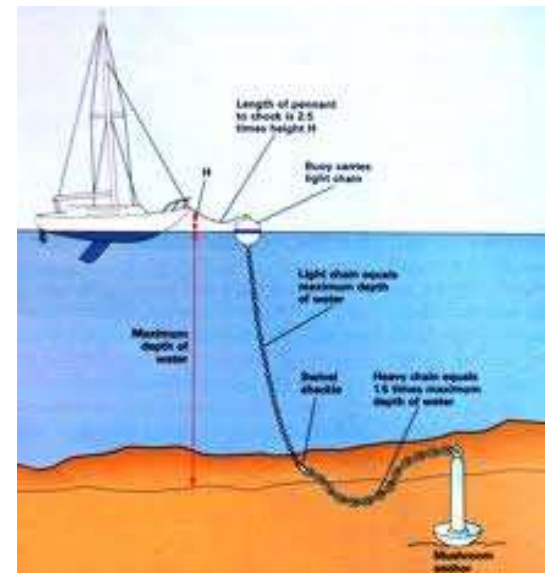
Dead weight moorings

- It is the simplest kind of mooring.
- They are generally made as a large concrete block with a line attached which resists movement with sheer weight; and, to a small degree, by settling into the substrate.
- The advantages are that such moorings are simple and cheap. A dead weight mooring that drags in a storm still holds well in its new position.
- Such moorings are better suited to rocky bottoms where other mooring systems do not hold well. The disadvantages are that they are heavy, bulky, and awkward.



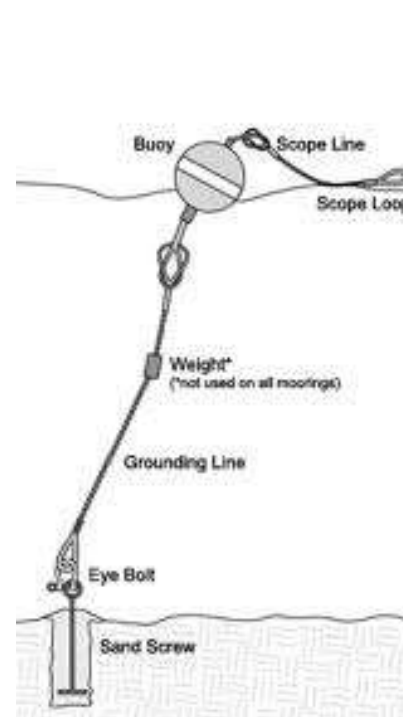
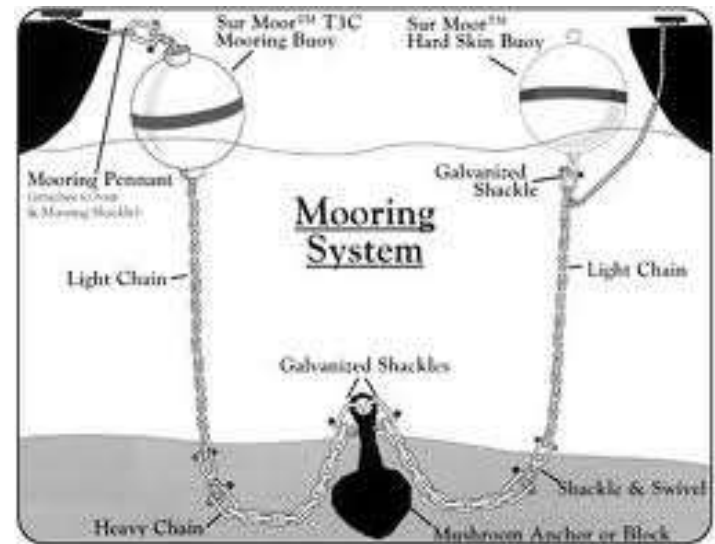
Mushroom moorings

- It is the most conventional moorings for mud and silt substrate.
- They are shaped like an upside down mushroom which can bury itself in these materials quite readily.
- The advantage is that it has up to ten times the holding power to weight ratio as compared to a dead weight mooring.
- The disadvantage is that they're more expensive than dead weight moorings, don't hold well on rocky or stony substrates, and they take time to settle in before reaching full holding capacity.



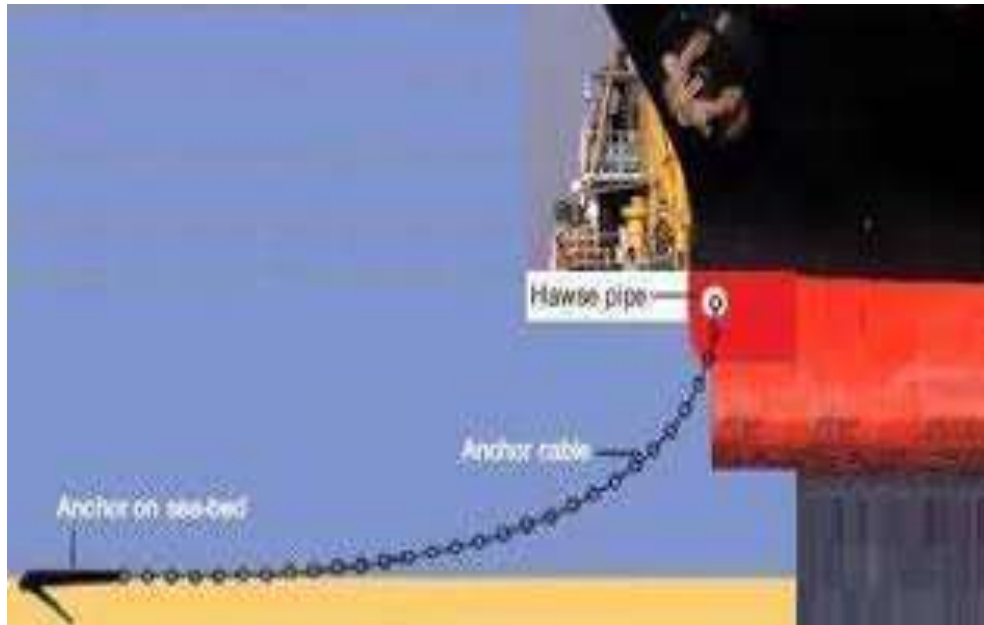
SCREW IN MOORINGS

- It is a modern method. The screw in mooring is a shaft with wide blades spiraling around it so that it can be screwed into the substrate.
- The advantages are a high holding power to weight ratio.
- Screw in moorings is so small that they are relatively cheap.
- The disadvantage is that a diver is usually needed to install, inspect, and maintain these moorings.

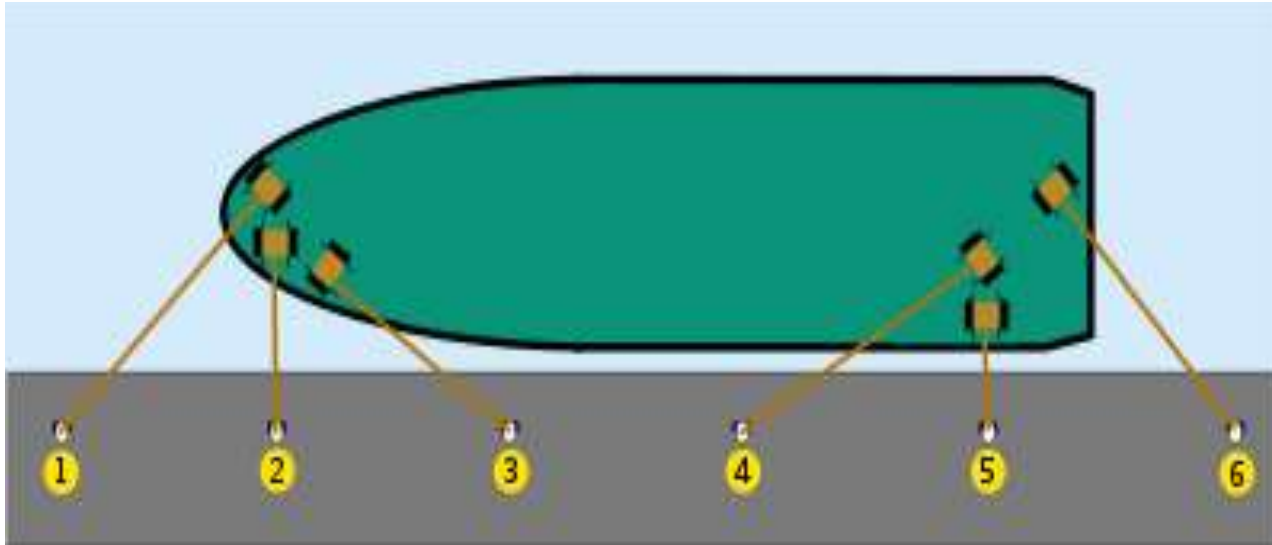


Multiple anchor mooring systems

- It use two or more (often three) light weight temporary style **anchors** set in an equilateral arrangement and all chained to a common center from which a conventional rode extends to a mooring buoy.
- The advantages are minimized mass, ease of deployment, high holding power to weight ratio, and ease of access to the required anchor components because temporary style anchors are commonly available.



A TYPICAL MOORING SCHEME



- | | | |
|--------------------------------------|---|-----------------------------------|
| 1 Bow line | - | Prevent backwards movement |
| 2 Forward Breast line | - | Keep close to pier (berth) |
| 2 After Bow Spring line | - | Prevent from advancing |
| 4 Forward Quarter Spring line | - | Prevent from moving back |
| 5 Quarter Breast line | - | Keep close to pier |
| 6 Stern line | - | Prevent forwards movement |

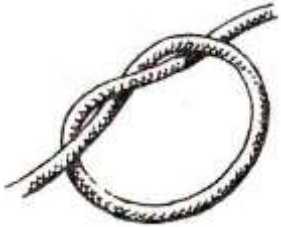
Mooring to a shore fixture

- Some ships use wire rope for one or more of their mooring lines. Wire rope is hard to handle and maintain. There is also a risk of using wire rope on a ship's stern in the vicinity of its propeller.
- Combination mooring lines made of both wire rope and synthetic line can also be used. This results in a hawser. This is more elastic and easier to handle than a wire rope, but not as elastic as a pure synthetic line. Special safety precautions must be followed when constructing a combination mooring line



Ropes and knots

Over hand knot:



It is a simple knot. It keeps the rope from unlaying. If jams it is impossible to untie.

Figure eight knot



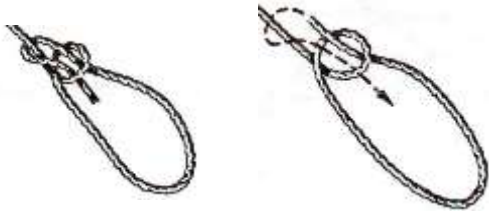
To stop untwisting of the ends of rope and also used to mark a point on a rope.

Reef or square knot



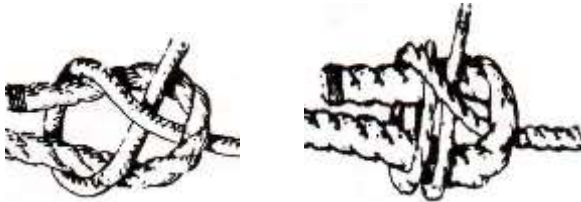
To join two cords of the same diameter

Bowline knot:



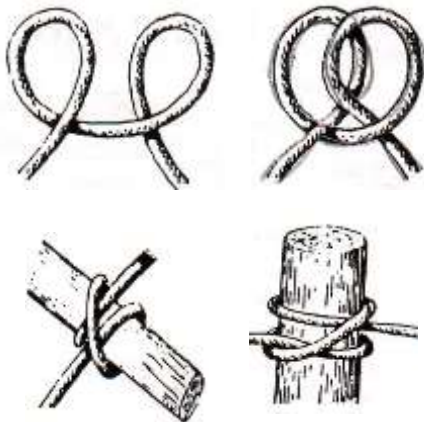
It is used to mark a loop at the end of the rope which will not slip.

Sheet bend



It is used to tie two ropes together. It will not slip even there is difference in thickness of ropes

Clove hitch:



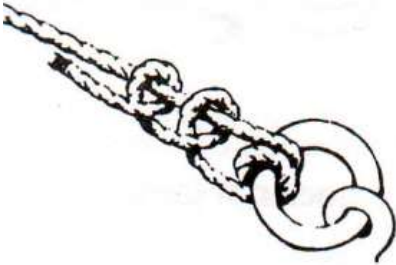
To moor a boat to a bollard or bar

Two half hitches:



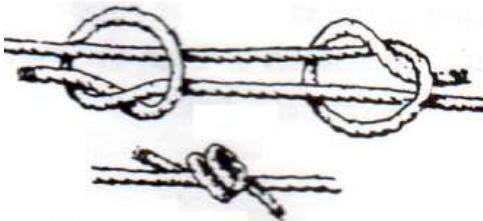
To attach a rope to a bollard or bar

Fisherman's bend:



This is also called as Anchor bend. It is handy for making fast to a ring of an anchor

Fisherman's knot



This is used to tie two ropes of same size together

Splicing:



It is used to join the ropes permanently. It helps to retain up to 95% of the original strength

Kinking



Unwanted twisting in the rope is called kinking. It weakens and destroys the rope easily

Chaffing and Abrasion



It happens because of rubbing on the surface of rope. This weakens the rope when the rope is dragged on the sharp surface

PIER

A pier is a raised structure, including **bridge** and building supports and **walkways**, over water, typically supported by widely spread piles or **pillar**. The lighter structure of a pier allows tides and currents to flow almost unhindered

Piers can range in size and complexity from a simple lightweight wooden structure to major structures extended over 1600 metres out to sea



BOLLARD

A bollard is a short vertical post used on a ship, principally for mooring.

Bollard is either a wooden or iron post found as a deck-fitting on a ship or boat, and used to secure ropes for towing, mooring and other purposes.



Bollard in jetty, harbour



Bollard in Boat

Moorings & Buoys

- **Ocean processes don't start and stop with the arrival and departure of an oceanographic research vessel. Currents are endlessly moving, plankton constantly bloom, the seafloor is continually being built—all of it happening over months, years, and decades.**
- **Most of us are familiar with common moorings, which use anchors and cables or ropes to secure boats, channel markers, and other floating objects in fixed places in our waterways.**
- **Fixed oceanographic moorings—work on the same principles, but the lines can be thousands of meters long and may or may not push above the surface of the water. Scientific instruments can be attached to the mooring line, mounted on a surface buoy, or made to climb up and down the underwater line.**

Moorings include:

an anchor — usually iron weights

cables — typically made of steel, nylon

bottom floats — often air-filled glass balls, which keep the mooring string upright, tight, and off the sea bottom

release mechanisms — mechanical devices which break the mooring chain and allow the instruments to float

subsurface floats and/or surface buoys — commonly made of foam or other buoyant, non-compressible materials; also used to keep the mooring upright and support instruments

THANK YOU