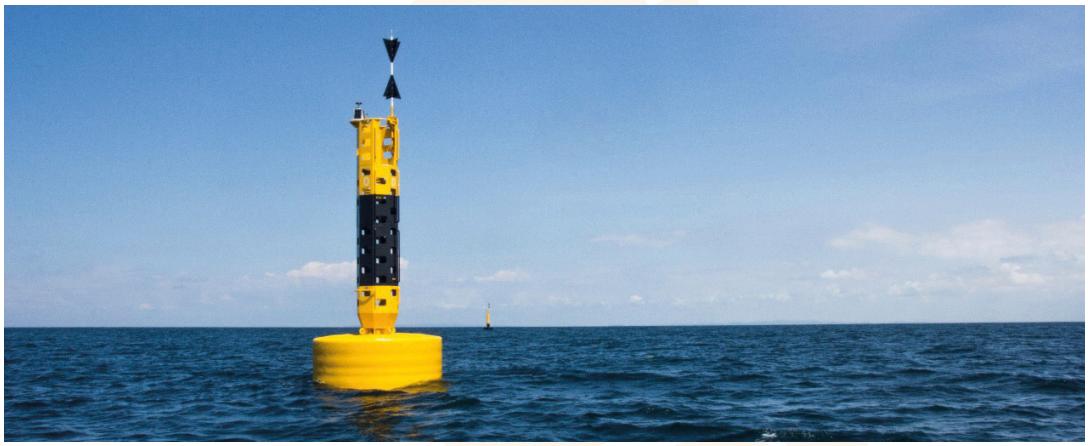
IALA

HYBRID MOORINGS

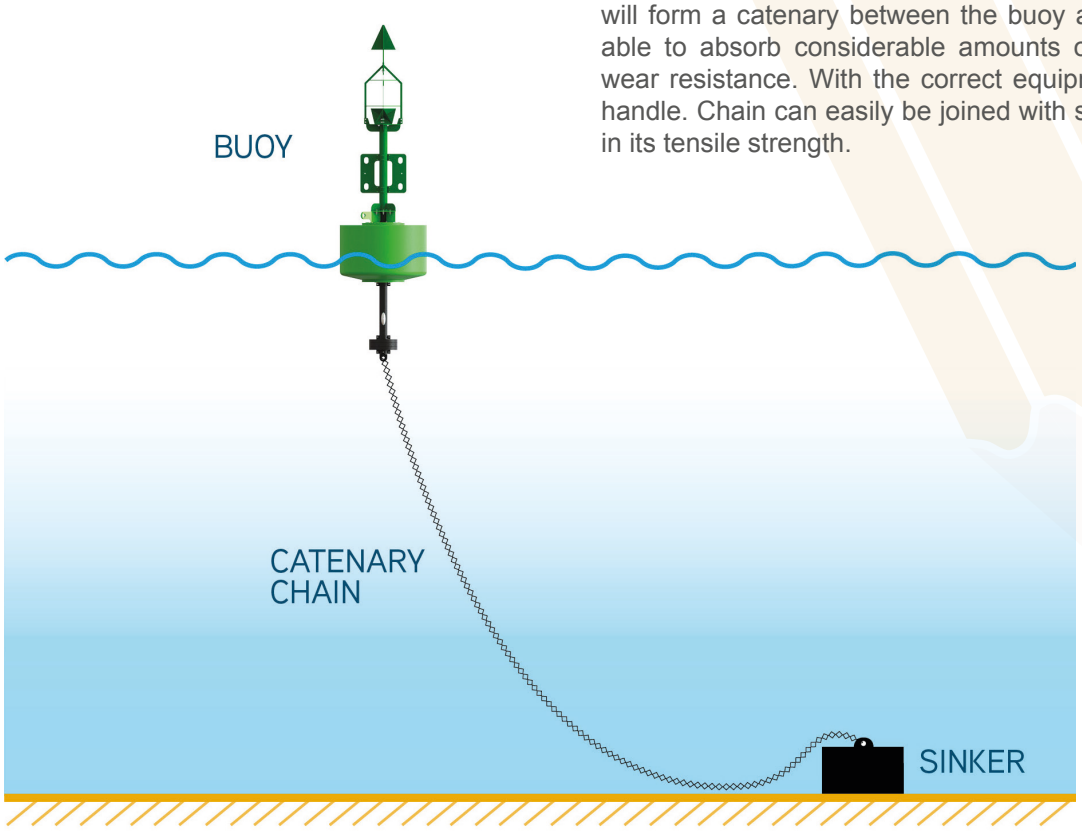
To ensure the safety of the mariner, lighthouse authorities maintain buoys and similar floating AtoNs as aids to navigation (AtoN). These floating AtoN are maintained in position by their moorings.

The mooring system must maintain the floating aid in a sufficiently accurate position for it to perform its function as an AtoN.



The mooring consists of a flexible cable connecting the floating AtoN to an anchoring device.

The most common form of mooring cable is steel chain. The chain will form a catenary between the buoy and the seabed and will be able to absorb considerable amounts of energy. Chain has good wear resistance. With the correct equipment it is easy and safe to handle. Chain can easily be joined with shackles with little reduction in its tensile strength.



MSM

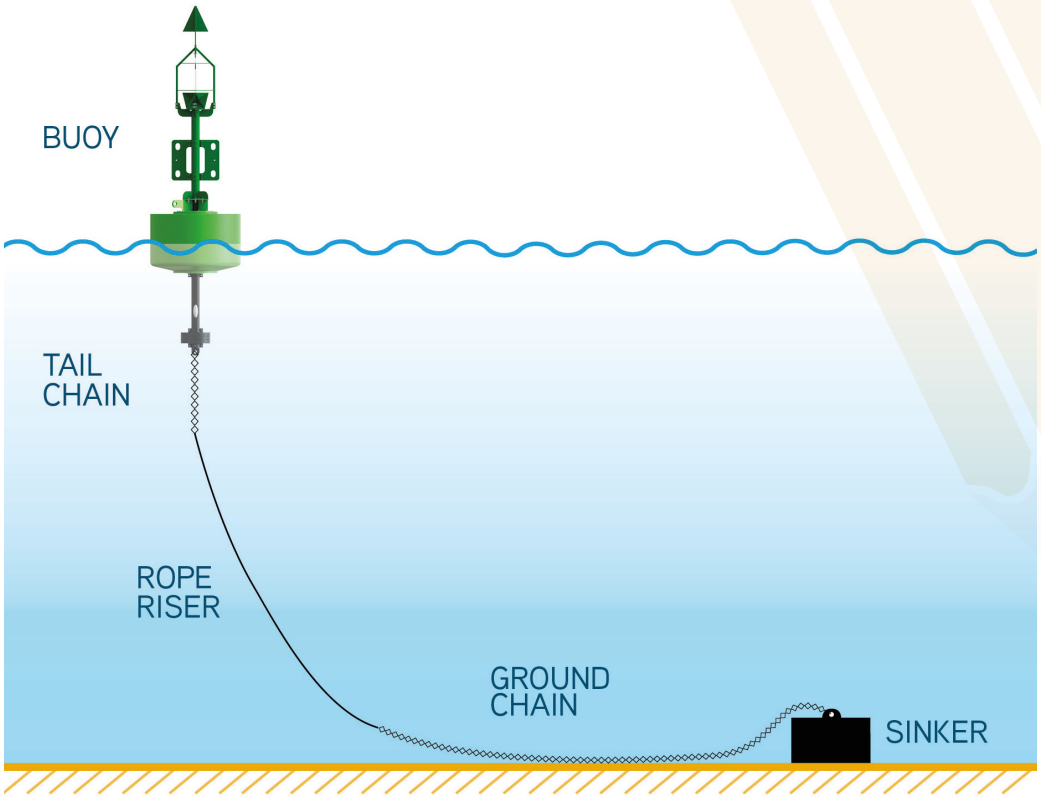
Rope moorings are also common, mainly on cheap and temporal markings in shallow beaches, but when designed only with rope they have big limitations, due to the wear resistance and the risk of failure when the rope is damaged.

Hybrid moorings, on the other hand, are formed by combinations of steel chain and rope, and their advantages are their light weight and elasticity, when compared to chain moorings, and if the design is precise, they can be as much durable as a much heavier chain mooring.

HYBRID MOORING DESIGN

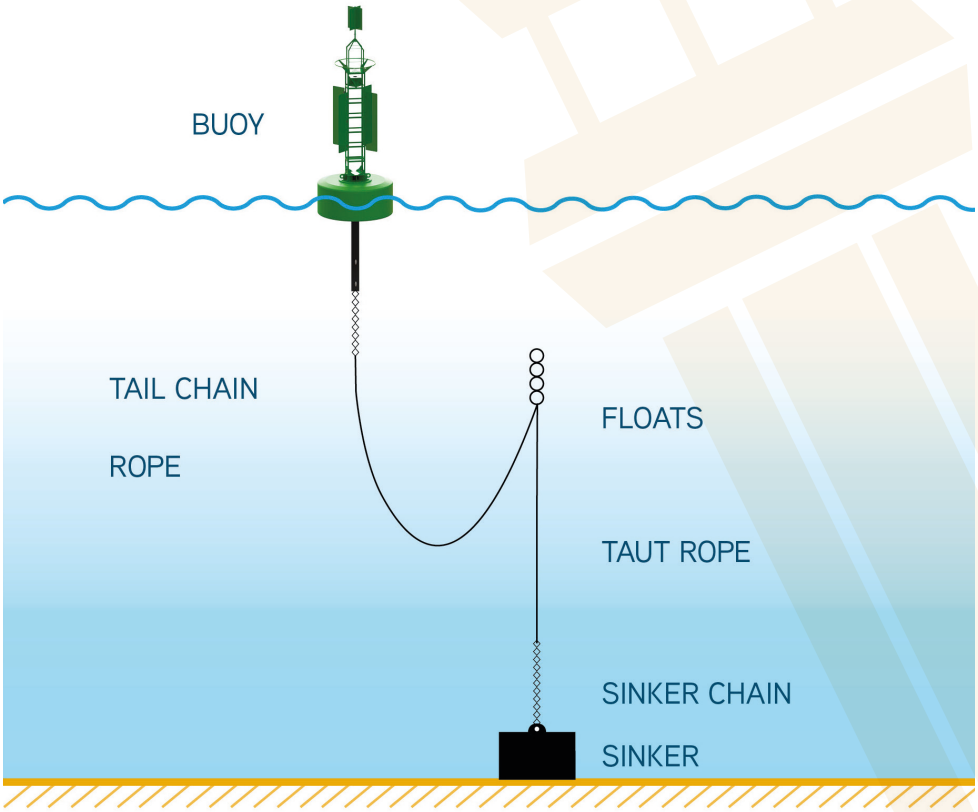
The conventional chain mooring utilises energy absorption of the chain catenary to absorb much of the wind and wave energy acting on the buoy and prevent this being transferred to the sinker or anchor. The elasticity of the rope performs a similar function and choosing a suitable combination of fibre type and rope construction can optimize this energy absorption.

Chafe and cutting are the greatest dangers to a rope mooring. Any sharp edges presented by rocks, seashells or the servicing ship's can cause permanent damage to the surface of the rope. Slipping the rope in a rough surface can result in localized heating such that the surface fibers of the rope may melt, resulting in significant weakening. Rope may suffer abrasive damage from sand particles in suspension in the water and ropes may attract considerable weed and shell fouling.



The mooring must be designed so that the rope is never in contact with the buoy body or tail tube and is never in contact with the sea bed (although this may not be a problem in areas with soft, muddy bottoms).

These criteria can be achieved in a normal buoy mooring by utilizing a ground chain that absorbs the wear on the seabed to which a rope 'riser' is attached. The rope 'riser' component of the mooring is of such a length that even at the lowest tides the rope is never chaffing on the seabed. A short length of chain (or bridle in the case of two mooring eyes) may be used in the first section of the mooring line to absorb any chafe. Additionally, cutting by trawl wires may also be a hazard in some areas where commercial fishing takes place. This is another reason to utilize chain in the first part of the mooring, helping to prevent abrasion from trawl wires.



When hybrid moorings are used in very high depths, a section of rope riser may not be enough to provide the necessary weight reduction to the mooring set. In this cases, **intermediate floats may be incorporated to keep the rope off the seabed.** Floats may also be used in this way in environmentally sensitive areas. In this type of mooring, the floats will maintain the lower section of the mooring taut, so that a virtual mooring point is created, the buoy will be moored to this point as usual, and mooring set resistance, retention and elasticity must be calculated precisely.