Lecture

Discussion of class and expectations

Why I'm teaching the class:

30 years ago, I spent five years in the US Merchant Marine, and learned to splice three-strand as a common skill. About ten years ago, I learned how to splice double-braid eyes. I think that they are part of the traditional sailor's skill set, just like navigation and trimming sails. When Sam asked about a splicing class, I immediately volunteered.

These skills are easy and extremely useful. They save you money and time since you can do the work yourself. More importantly, they lend personal satisfaction.

Expectations:

At class's end, you should be able to perform these knots and splices, using the tools, instructional materials, and techniques used in class.

You should be able to modify the techniques that you learn today to suit any other knot/splicing technique you wish.

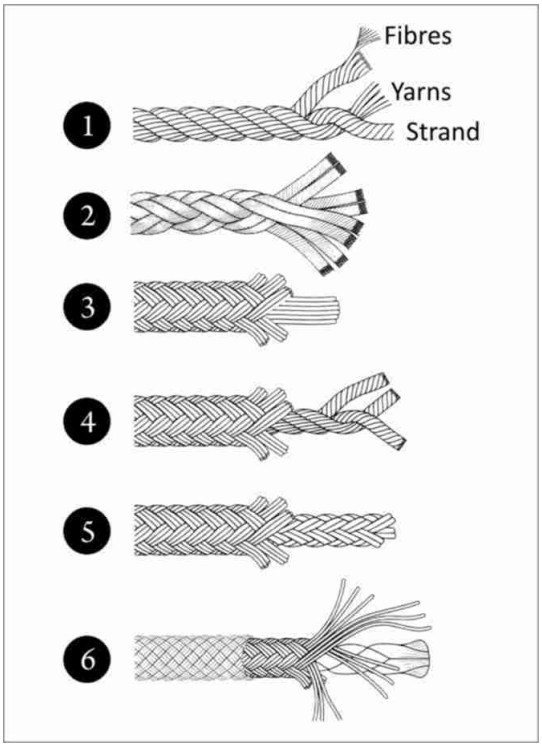
Class Organization:

LOOSE! Ask questions, talk freely, move around, etc.

We'll start with some rope technology, then hit some useful knots, then to double-braid eye splices, then 3-strand.

We'll complete the day with some useful maritime splices.

Rope strength is dependent on two characteristics:
Rope construction
Rope materials



Marine rope construction:

- Laid or twisted rope
    - Fibers spun into yarns, yarns twisted into strands, strands twisted into rope.
    - Each level is twisted opposite to the next.
- 3-strand
    - otherwise known as plain or hawser laid rope
    - causes rope to untwist when used, leading to stretching, kinking, and hockling.
    - All fibers exposed to damage along length of rope

- Braided Rope
    - Single braid with hollow inside
        - Flexible, supple, absorbs twists and resists kinking: Balanced.
    - Double-braid or “braid on braid”
        - Braided cover surrounds a braided core, producing a rope designed for strength, durability, shape, and easy handling.
    - Used in running rigging and dock lines
    - Inner core may be of same or different material
    - Often inner braid chosen for strength and outer for abrasion/UV resistance.

Materials
Nylon: Outstanding strength, elasticity and abrasion resistance. Ideal for applications where stretch and energy absorption are critical, such as in dock and anchor lines. Nylon suffers minimal strength loss when exposed to sunlight. Very stretchy (10% stretch at 30% breaking stength), Strength reduced by 10-20% if wet, resists rot and UV. Melts before burning. Does not float.

Polyester/Dacron: “ordinary rope”, resistant to UV and rot, does not float. 3.5-5% elongation at 30% breaking strength. Not weakened by water. Melts before burning. Very UV resistant. High strength and low stretch characteristics make it ideal for running rigging where durability and feel are important.

Polyethylene: More commonly now, high molecular weight polyethylene (HMWPE), high modulus polyethylene (HMPE), high performance polyethylene (HMPE) Spectra, Dyneema. Extremely long and cross-branched molecules. Excellent abrasion resistance, very slippery, low melting point, resistant to water, most chemicals, and UV. 40% stronger than Aramid fibers. Floats.

> Dyneema®, ideal for lightweight running rigging, is characterized by its very high strength, low stretch characteristics as well as its ability to repel water. Unfortunately, Dyneema® has a low melting point which makes it susceptible to friction and is also inclined to elongate or creep under sustained loads. AmSteel!

Polypropylene: stretchier than polyester. Floats. Degrades with UV. Usually 3-strand.low melting point. Absorbs no water, cheap. Does not “butane backsplice”.

Aramids: “Aromatic polyamide”. Heat-resistant and strong synthetic fibers. Body armor, asbestos substitute,. Highly oriented along fiber axis. Nomex, Kevlar, Technora. Unaffected by water.

> Technora, the highest strength aramid fiber, is ideal for low stretch running rigging such as halyards. It does not creep under normal loads, but is subject to fatigue if cycled over a small radius. The black version of Technora has superior resistance to UV degradation.

Liquid Crystal Aromatic Polyester (LCAP) such as Vectran. Low stretch: 0.77% at 30% of breaking! Extremely strong and light weight, but very expensive.

Modulus is NOT the same as strength! Modulus (M) is force required to stretch rope fibers. High modulus means little elasticity!

Fiber type	Strength	Stretch	Resistance to UV	Cost
Nylon	high	high	good	moderate
Polyester	high	low	good	moderate
HMPE	very high	very low	fair	very high
Aramids	very high	very low	fair	very high
LCP	very high	very low	fair	very high
Polypropylene	low	high	poor	very low

Generally: Nylon best for dock and anchor lines because of stretchiness.
Polyester best for running rigging because of low stretch, durability, and high strength.

New England Ropes is a major producer of marine rope:

Sta Set: The #1 double braid in America. A strong, flexible, and long wearing line. Great for a wide range of boats for sheets and control lines.

Sta Set X: Parallel core design results in an all polyester rope with 30% less stretch and 20% greater strength than other polyester ropes (size for size). Best for halyards.

Recommended sheave size is 8:1 for most ropes.

Double constrictor knot
Clove hitch
Highwayman's hitch

Discussions of available resources

Discussion of Rope Parts and Terms

line, standing part, working or bitter end. Bight vs loop.

Strand - A strand in a braided rope is a group of one or more yarns which follow the identical path through the rope.
Pik - A pik is the exposed area of a strand traveling in a straight line along the axis of the rope. In a cover braid there are normally 16, 20, 24, or 32 strands.

Useful Knots:

Double Constrictor Knot
Whipping
Clove Hitch
Highway's Hitch

For knots, rope tied to itself
For hitches, rope tied to something else
Bend joins two ropes together
Splice disrupts the construction of the rope