

TABLE 1.1 Types of Rope Available for Restraining Livestock

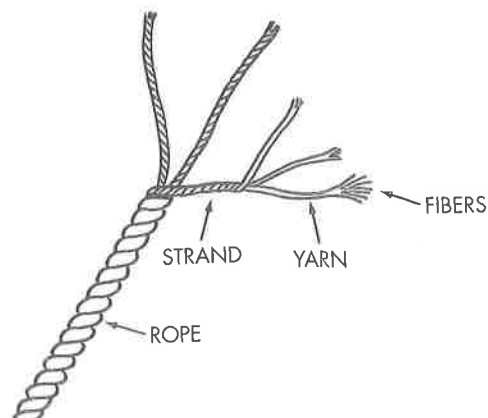
Type of Fiber	Breaking Strength (pounds)					Advantages	Disadvantages	Suggested Uses
	3/8"	1/2"	5/8"	3/4"	1"			
Cotton	890	1450	2150	3100	5100	Soft, flexible Least likely to cause rope burn Intermediate in cost	Least strong Low abrasion resistance Will rot and deteriorate	Tying of animal limbs Neck ropes Hobbles Lead ropes, if 3/8" or larger
Sisal	1080	2120	3250	4320	7200	Same as manila, except that sisal is 75-80% the strength of manila		
Manila	1350	2650	4400	5400	9000	Good strength for natural fiber rope Has good "grass" rope "feel"	Subject to rotting Harsh on hands Likely to cause rope burn	Some use as a lariate—not suggested for tying animal limbs (legs) Lead ropes, if 1/2" or larger Good for lead ropes
Polypropylene	2650	4200	5700	8200	14000	Very strong, second only to nylon and dacron Will not rot Resistant to barnyard acids and bases	Rope burn is likely Flame or heat will cause melting	Excellent for slinging and total restraint
Nylon	4000	7100	10500	14200	24600	Highest strength of any rope Will not rot from water or mildew	Will stretch Very likely to cause rope burn Flame or heat will cause melting	Strongest lead rope available Excellent for slinging and total restraint

braided rope for the majority of activities. The discussion and illustrations that follow are based upon the manager using three-strand twisted rope of either natural or man-made fibers.

Three-strand rope is constructed of plant or man-made fibers that are twisted together to form a type of yarn. The yarn is then twisted (in our case, three yarns) into a strand. Rope is formed by twisting three strands together. The tightness of the rope strands and the overall flexibility of the rope depend upon the amount of twist imparted to the fibers, yarns, and strands at each step of the operation. This twisting and reverse twisting is called "laying" the rope. A hard-lay rope is a stiff, hard-feeling rope that keeps a loop open quite well for throwing but is a poor choice for knot tying. On the other hand, a soft-lay rope does not hold a loop well but is convenient for knot tying because of its flexibility. A medium-lay rope, depending upon the manufacturer, is somewhere between hard and soft and is intermediate in its usefulness to you as a throwing and tying rope. Not all rope is of the three-strand, twisted variety that we use for lariats, hay ropes, most adjustable rope halters, and most lead ropes. Machines can also be used to braid fibers into a variety of shapes, sizes, and types of rope. Perhaps the most well known of

the braided ropes are clothesline and the towrope used by water-skiers. For the most part, only the three-strand rope is suitable for livestock restraint.

The type of rope chosen by the livestock manager will depend upon the use to which the rope will be put and the amount of strength required. If the livestock producer's primary need is to catch and hold calves for range management techniques, an entirely different type of rope should be selected than the one used to cast and tie a horse. Consult Table 1.1 before making these decisions.



Preparation of Rope

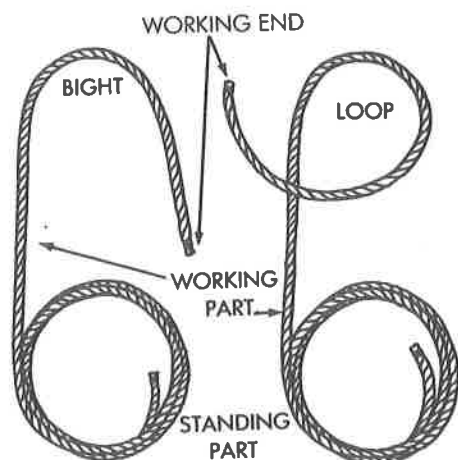
The following is a brief glossary of terms. These terms must be learned well, because they are basic to all rope work.

1. The *standing part* of the rope is the portion that is not being worked with, except perhaps to wrap the running end or working end of the rope around, as in forming a knot, hitch, or loop.

2. The *working end* (running end) or *working part* (running part) of the rope is the portion that is being worked with or being used to form a knot, hitch, or loop.

3. A *bight* or bend is a turn of the rope that does not cross itself.

4. A *loop* is a turn of the rope that does cross itself. If the working end of a bight is crossed over its standing part, a loop is formed.



When a rope is purchased, it is sized to the requested length and then cut from the parent coil. If this length of rope is then taken back to the livestock enterprise and used with no further preparation, it will cease to be of value in short order because both raw or cut ends will begin to unravel. To prevent this, the cut ends must be whipped, crowned, ferruled, dipped, or burned, depending upon the type of rope. An overhand or figure-eight knot can also be used to prevent unraveling.

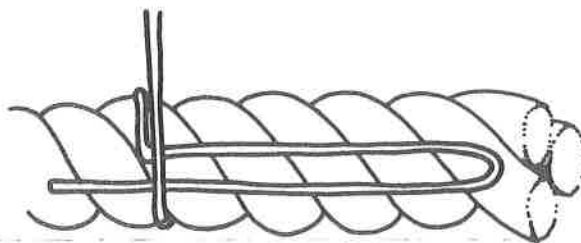
Whipping

Step-by-Step Procedure

1. Place the rope to be whipped in front of you, the standing part on your left, with the working end directed to your right.

2. Form a bight in the working end of the whipping cord (30- to 60-lb-test braided nylon bait-casting line works well for $\frac{3}{8}$ " to $\frac{1}{2}$ " rope), and place the bight lengthwise onto the first 2" of the rope. The bend of the bight should be directed toward the working end of the rope.

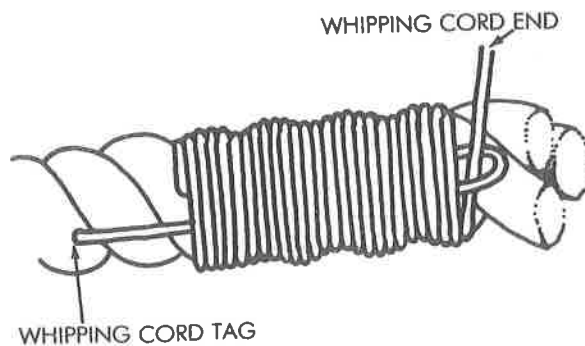
3. Begin wrapping the whipping cord around the rope in a clockwise rotation. Start at the open end of the bight and move outward toward the working end of the rope. As you begin to wrap the whipping cord around the rope (and around its own bight), be certain to leave a 1" or longer portion of the whipping cord protruding from below the wrapping.



4. Continue whipping up the rope, being certain to wrap the whipping cord about the rope tightly and place each successive wrap snugly against the preceding one.

5. Stop whipping when you are approximately $\frac{1}{2}$ inch from the end of the rope. At this point, the bight of the whipping cord should be located and opened to accept the working end of the whipping cord as it completes its last wrap of the rope.

6. Insert the working end of the whipping cord into the whipping cord bight and pull the working end until the last whipping wrap is as snug as the preceding ones.



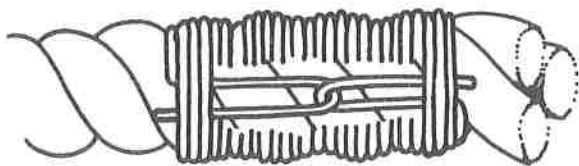
7. Hold the whipping cord end against the end of the rope with your right thumb and index finger. With your left thumb and index finger, grasp the tag of whipping cord that is protruding from the other end of the whipping on the rope and begin to pull it toward the standing end of your rope.

8. As you pull on the tag of the whipping cord, the bight at the other end of the whipping will begin to be drawn under the whipping wraps. As this occurs, the working end of the whipping cord will also be drawn down and under the wraps. Maintain

thumb and index finger pressure on the working end of the whipping cord so that when it is in position, it will still be tight.

9. Continue pulling on the end of the whipping cord until the interlocking bights are near the center of the whipped area. You can feel for the bulge to be certain.

10. Closely snip off the ends of whipping cord from both ends of the whipped area.



Crowning (Crown Knot and Backsplice)

The crown knot has one feature—it produces a bulge that is double the diameter of the parent rope—that is either an advantage or disadvantage, depending upon the purposes for which the rope will be used. It does provide a convenient handhold and an alert that the end of the rope has arrived, but it is a nuisance and perhaps unusable if the rope must be threaded through a tightly sized pulley.

Step-by-Step Procedure

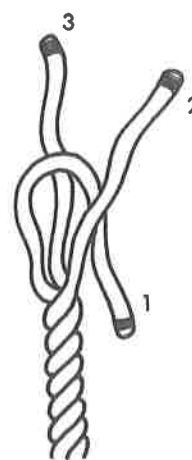
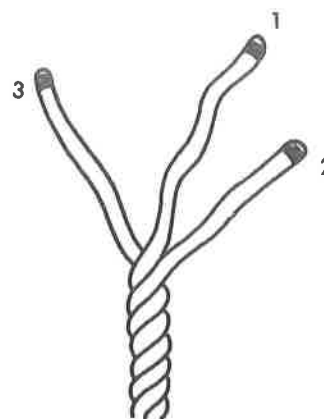
1. Place the working end of the rope to be crowned into your left hand and unwind about 4 inches of it. Before forming the knot and backsplicing, the end of each strand of the rope must be “finished” to prevent its unraveling during the splicing. With polypropylene, nylon, and dacron ropes, this is most easily done by using heat or flame to fuse the ends together. Cotton, manila, or sisal rope should be wrapped with masking tape.

2. Place your thumb on the front of the rope and your fingers on the rear. Your thumb and index finger should be pinching the rope strands and preventing further unraveling.

3. Arrange the strands so that two of them come across the top of the rope from a lower left to an upper right direction. The third strand appears to come from behind the front two, in a lower right to upper left direction. This arrangement is essential if the crown is to be properly constructed.

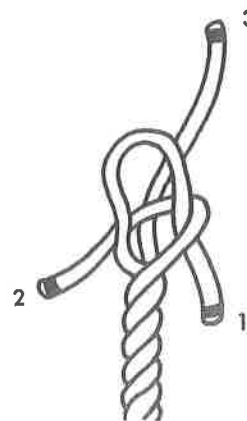
4. With your right hand, take the uppermost of the front strands (strand 1) and bend it over to the right forming a bight. Be certain that the bight goes behind strand 2, the second of the rope strands. Secure the end of strand 1 between the index and middle fingers of your left hand.

5. With your right hand, take strand 2, the remaining strand of the two that originally came



across the “top” of the rope, and bend it around the bight in strand 1 that you are holding in your left hand. The wrap must be taken around the working end of the bight.

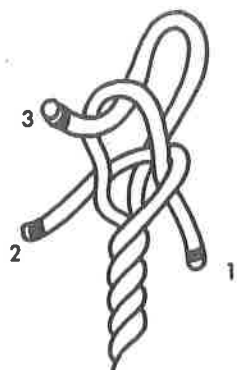
6. After making this wrap, place the end of strand 2 between the standing end of the bight in strand 1 and strand 3. Strand 3 is the only strand left untouched at this point.



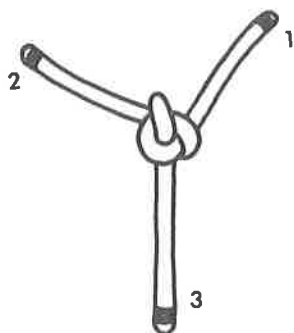
7. Secure the end of strand 2 between the index finger and thumb of your left hand and the rope.

8. With your right hand, take the end of strand 3 and place it under the bight in strand 1 and over all

parts of strand 2. Study this arrangement for a moment and you will notice that each strand locks and is in turn locked by another.



9. Release your grip on the strand ends. Start with any of the three strands and tug on it to begin tightening the crown knot. Do not attempt to pull one strand totally tight before beginning another. Take each up alternately, a little at a time, until the crown is tight.



At this point, the crown knot is complete and the backsplicing must be performed to finish the process of "crowning" to prevent unraveling of the rope.

10. Hold the end of the rope with the crown knot in your left hand. Select any of the strands sticking out from the crown and grasp it with your right hand. Notice that it passes under a strand of the crown and then lies on or passes over a strand of the end of the rope being crowned. Study the whole crown and each strand so that you are aware that this "under-over" arrangement is correct for each strand.

11. Select a strand, call it strand 1, sticking out from under the crown knot and begin the backsplicing at that point by placing your right thumb partially under it and at the same time upon the strand that it is passing over or lying upon. Grip the rest of the crown knot with the tips of your index and middle fingers.

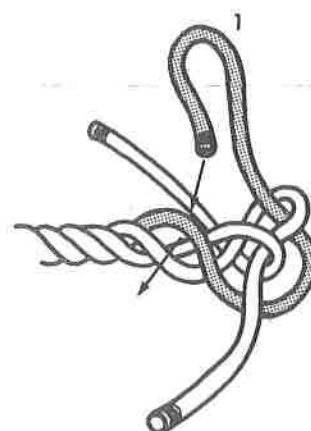
12. With your left index finger and thumb grasp the strand immediately below the one your right

thumb is holding. This is the strand directly below the one that the working part of strand 1 passes over.

13. With your right hand, twist the crown to the right (clockwise) while twisting the standing end of the rope to the left (counterclockwise) with your left hand. This will open the rope and enable you to isolate the second strand below the point where strand 1 exits from under the crown.

14. Keep this strand isolated, and with your right hand place the end of strand 1 under it and pull it through until it is pulling against the crown itself.

15. Retighten the crown by holding it in your left hand and pulling each crowned strand downward with a clockwise twist.



16. Move to the next strand to be spliced back into the parent rope by twisting the rope approximately one-third turn in either direction until the next strand coming out from under the crown knot is reached. This is strand 2.

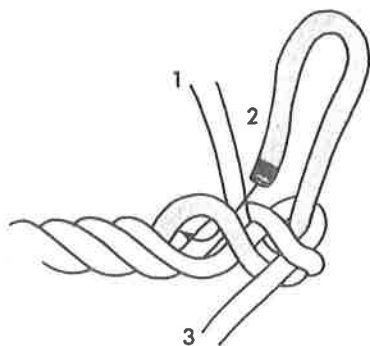
17. As with the first over and under, place your right thumb under strand 2 and upon the strand it is passing over. Grip the rest of the crown knot with the tips of your index and middle fingers.

18. Study the crowning at this point and keep in mind the over-and-under principle. The crowned strand you are now working with, strand 2, is lying upon the strand it will pass over. You must take the

strand of the parent rope next in line below this and isolate it between the thumb and index finger of your left hand. This is accomplished by twisting the crown to the right and the standing end of the rope to the left.

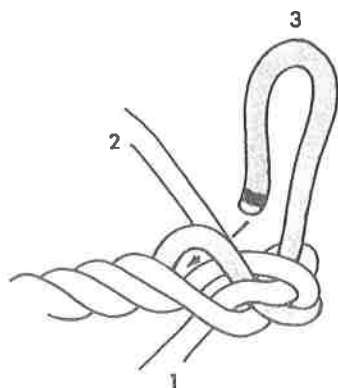
19. Keep this strand isolated, and with your right hand place the end of strand 2 under it and pull it through until it is pulling against the crown itself.

20. Retighten the crown as before by pulling each crowned strand downward with a clockwise twist.



21. There is only one strand, strand 3, remaining, and it too must go through the over-and-under process. As before, there should be no difficulty in identifying the strand to be passed over, because strand 3 is lying upon it.

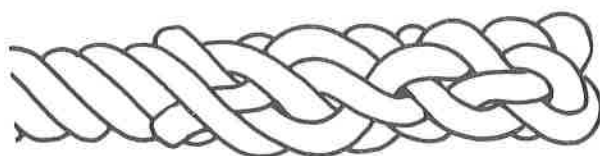
22. Grasp the knot in your right hand exactly as you did before for the first and second strands. Now, before you begin twisting, identify the strand of the standing end of the rope to pass the crowned strand under. Once again, it is the strand immediately below the strand being passed over. Since this is your last strand, the crowning is becoming "crowded" and it is easy to make a mistake. Keep in mind that *only one strand is passed over at a time, that only one strand can pass below another, and that only the strands of the standing end itself can be the ones passed over and gone under.* With this in mind, grasp the standing end of the rope in your left hand, twist the strands open as before, and insert the last crowned strand.



23. Retighten the crowning as before by pulling each strand downward with a clockwise twist.

24. To continue the crowning or backsplicing, repeat the preceding steps for as many rounds of splice as you desire. Except for your wishes, there is no need to repeat the process for more than three total rounds (over-under sequences).

25. Finish the crowning or backsplicing with a final retightening and a rolling of the entire crown between the palms of your hands. Cut off the ends of the crowned strands approximately $\frac{1}{4}$ " from the last strand they went under. Taper the ends when cutting so that the crown is less rough on your hands. The crown will not unravel and is now a permanent feature of the rope.



Ferrules to Prevent Unraveling

Sometimes called "whipping with a ferrule," this is the easiest and most rapid method available to prevent unraveling. It consists of placing an appropriately sized metal split ring or band over the working end of the rope and then hammering or pinching it tightly about the rope. The best types of bands are split at an angle across their width and are about $\frac{3}{8}$ " to $\frac{1}{2}$ " wide. Hog rings, applied with the pliers-like hog ring, will also serve as the whipping ferrule.

Care must be taken with any of the metal whippings to be certain that no sharp edges are present. Gloves, clothing, or flesh can easily be torn as this sharp edge is pulled through your hand.



Dipping

Dipping the ends of all types of rope, except polypropylene, works quite well to prevent unraveling. Usually only an inch or two is dipped, although no harm is done if an additional portion is treated. Some dipping agents weaken the rope, so take care not to soak a part of the rope that will be used to form a knot or otherwise carry the stress of a load.

The reason that dipping is unsuitable for polypropylene ropes is because the plasticlike fibers of polypropylene strands do not absorb common dipping agents, nor do they provide a porous surface to which the dips can fuse.

Common dipping agents for nylon, cotton, manila, and other fiber ropes are enamel, lacquer, varnish, shellac, liquid vinyl, cold vulcanizing compounds, and plastic pipe solvent. Each of these is flammable, highly volatile, and gives off potentially hazardous fumes until dry. Use them cautiously.

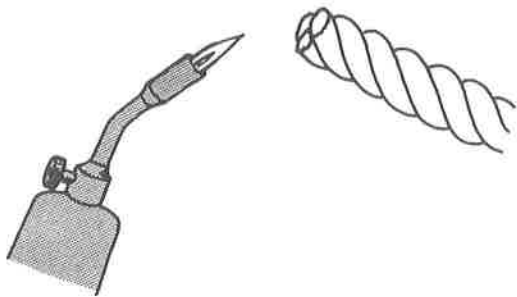
There are three disadvantages to this type of unraveling prevention: (1) when the dip has dried, it produces a very hard surface that some managers object to; (2) after dipping, the rope is unavailable for use for up to 24 hours; (3) the end of the rope is discolored (although this may be objectionable to some, others consider it a plus because it identifies ownership).

Heating

Heating the ends of nylon, dacron, and polypropylene rope can be a satisfactory way to prevent the unraveling of the strands. It is of no value when dealing with natural-fiber ropes such as cotton and manila.

There are two methods of fusing the ends of rope with heat or flame. One involves an open flame as the source of heat; the other utilizes a hot iron or blade.

Open-flame fusing (matches, lighter, propane torch) is satisfactory if the flame is held far enough below the rope end (start with an inch or two) so that the rope heats uniformly instead of only the outer fibers of each strand being heated. When this is done properly, the fibers melt and flow together until the flame is withdrawn, at which point they reharden in their new fused-together shape. The drawback to this is that the new shape may be a large glob or ragged, sharp-edged mass at the end. Do not attempt to shape this mass with your fingers as it is very hot, clings to your flesh, and imparts a severe burn!



Hot-iron fusing makes use of the same chemistry and physics of melting and reshaping man-made fibers but avoids the disadvantage of forming a glob at the rope's end. To fuse with a hot iron or blade, select a discarded knife blade, hot-iron docking tool, or a commercially made electric docking iron and heat it to a red-hot condition. Taking care to

avoid burning yourself, draw the rope across the hot edge. Cutting to size and fusing of the fibers occur simultaneously. If the cut edge is too sharp for your wishes, it can be rounded by rotating it while holding it at an angle against the hot iron.

Temporary Whipping

Masking, friction, adhesive, plastic electrician's (vinyl), and duct tape can all be used as temporary whipping, as can the overhand and figure-eight knots. On a seldom-used rope, they perform satisfactorily; however, if the rope will see heavy use, a permanent whip should be selected. If tape is selected, draw it down very tightly and wrap it around the rope three or four times. Tape does not work well on synthetic-fiber ropes.

Overhand Knot

1. Position the rope with the standing part to your left and the working end running to your right.
2. Position the working part of the rope, approximately 12" from its end, in your left hand. Grasp the running end of the rope and form a loop with it by placing it over the top of the standing part of the rope where it is being held in your left hand.
3. Wrap the running end of the rope around the standing part and bring it up through the loop.
4. Pull the running end with your left hand and the standing part with your right hand to form and firm up the knot.
5. Position the overhand knot as a fray stopper by "sliding" it, before you pull it tight, to wherever you need to have it on the parent rope.

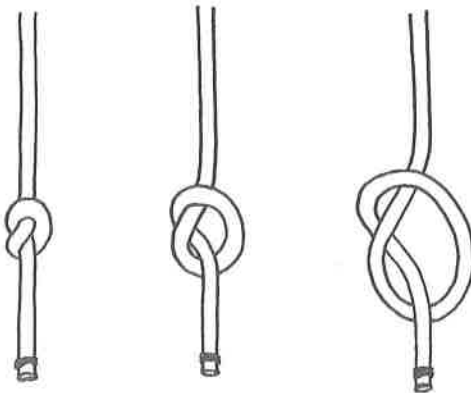
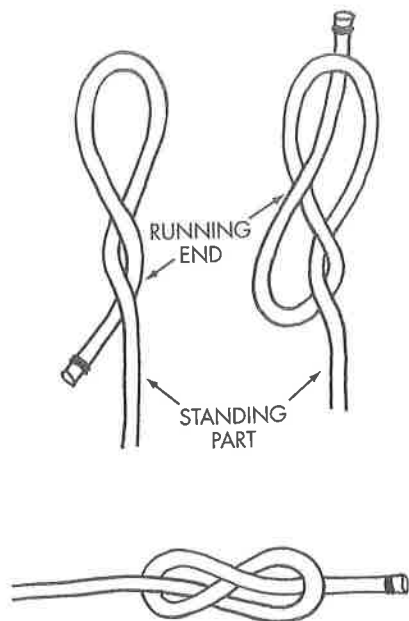


Figure-Eight Knot

1. Form a bight near the end of the rope. Allow the running end to hang to the left, with the standing end to the right.
2. Wrap the running end around the standing part, starting around the front first. Bring the



running end out from behind and insert it into the loop held in your left hand from front to rear.

3. Grasp the running end with your right hand and pull while pulling on the standing part with your left hand.

4. Slide, shape, and position the knot as necessary.

Storage and Care of Rope

All types of rope must be kept dry, free of chemicals and chemical vapors, and untangled between uses if they are to maintain their strength and be instantly available for your use.

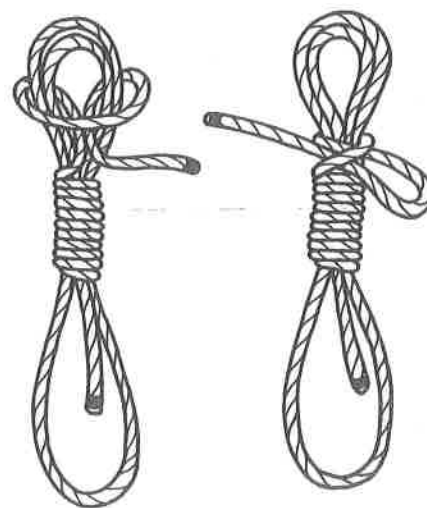
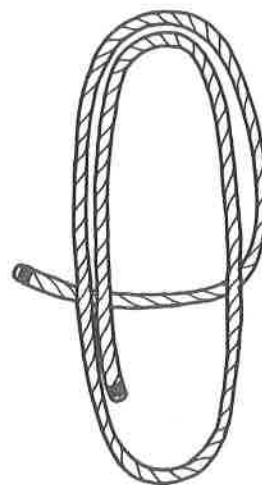
Freedom from moisture and chemical agents will assure you of continued strength if you have not nicked the fibers with a sharp instrument or otherwise damaged the strands. Freedom from moisture implies proper drying after use, before coiling and storage, and shelter from moisture during storage.

Rope, contrary to what appears certain at times, does not tangle itself up during storage. If you cannot peel it apart freely after storage, you did not coil or "hank" it properly prior to storage. Rope should always be coiled in the direction of its lay; i.e., if the strands are right-handed (running from lower left to upper right) the coils must be built in a right-handed or clockwise rotation. The reverse is true for the rare left-handed rope. Lariats and any other hard-twist rope are always coiled, never hanked. The size of the coil depends on the diameter of the rope. If you wish, the coils can be held together by wrapping the coiled rope at two or three places with a strand of twine or piece of tape.

Large-diameter ropes, especially the medium-to-soft-lay, $\frac{3}{8}$ "-and-larger-diameter, natural-fiber ropes are hanked for storage. To hank a rope, coil it as you

would any other rope, forming a coil that is approximately 24" from top to bottom. When you are finished coiling, take the working end of the rope and wrap it entirely around the coils at least six or seven times, starting near the center and working upward. Secure this working end of the wrap by bringing it beneath a previous wrap or by using a modification of a half hitch. Do not hang the rope over a nail. Instead, use a 2" x 4" stob or other broad support to prevent a sharp kink or crease in the rope.

The total care and protection of rope involves more than coiling it in some manner and then hanging it over a stob.



A rope to be used in animal restraint is of value to you only if it does not break in the midst of the procedure. The following are guidelines for the care and preservation of rope.

1. When a rope is new and kinky (has a strong coil memory), it should be dragged for several minutes over level, nonrocky ground before use. This

will help remove the kinkiness and improve the overall performance of the rope.

2. When a rope is coiled after use, it should always be coiled in the direction of its lay; i.e., a right-handed rope should be coiled to the right, or clockwise, and vice versa for the left-handed rope.

3. All rope should be protected from oils, paints, and other man-made chemicals. Urine and manure should be rinsed from the rope with clear water. Do not use soaps or detergents.

4. Do not coil and store any rope before it is thoroughly dried. The mildew fungus seriously weakens rope. Dry the rope by suspending it above the ground.

5. Look for worn or frayed spots on the outside of the rope strands and periodically inspect the insides of the rope by untwisting it (twist it against its lay) and exposing the inner strands. They must be new-looking, bright, and unspotted for the rope strength to be normal.

6. As you use the rope, prevent kinks, which can cause permanent damage (weakening) by overtaking the fibers at the point of the bend. A kink is much like a poorly constructed knot—it can reduce rope strength by as much as 55%.

Knots, Hitches, and Splices

Knots are used to join ropes together, to attach ropes to a post or rail, or to attach ropes to an animal. *Hitches* are used to attach a rope to a post or rail. They are not truly knots, in that the only thing securing the rope to the post is the pressure of one rope coil wrapping upon the others. *Splices* are used to permanently join ropes to one another. They differ from knots in that, in a splice, the individual strands from each rope are interwoven with the individual strands from the other.

All knots, hitches, and splices weaken the ropes with which they are formed. This is because they form a bend in the fibers that distributes the stress on the fibers unequally. The sharper the bend on the fibers, the weaker the knot, hitch, or splice formed by it.

Table 1.2 illustrates the efficiency of several of the common knots used in animal restraint.

Several of these knots, hitches, and splices will be detailed and illustrated. At first, they may seem complicated and their construction clumsy. Just as with any other skill, practice is necessary and will make the formation of the knots second nature. It is important that you practice the knots enough to arrive at this "second-nature" status. When you are in the midst of tying a full-size, frightened farm animal, you cannot stop to think about knot formation.

TABLE 1.2 Strengths of Knots, Hitches, and Splices

Type of Knot, Hitch, or Splice	% Efficiency*
Fresh, dry, undamaged, unknotted rope	100
Short splice	80
Double bowline knot	70
Half hitch, timber hitch	65
Bowline knot, slipknot, clove hitch, quick-release knot	60
Square knot, sheet bend knot	50
Overhand knot	45

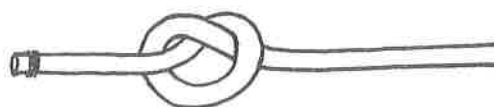
*This is the percentage of remaining strength, compared to new unknotted ropes, after the knot, hitch, or splice has been formed.

Overhand Knot

The overhand knot is the simplest of all knots to tie, but is the least useful of the common knots when used by itself. It is the first step in the formation of more complex and more useful knots. It serves very nicely as a temporary "whipping" to prevent unraveling of a rope end. It also provides a convenient handhold at rope's end (or at intervals for climbing).

Step-by-Step Procedure

1. Position the rope with the standing part to your left and the working end running to your right.
2. Position the working part of the rope, approximately 12" from its end, in your left hand. Grasp the running end of the rope and form a loop with it by placing it over the top of the standing part of the rope where it is being held in your left hand.
3. Wrap the running end of the rope around the standing part and bring it up through the loop.
4. Pull the running end with your left hand and the standing part with your right to form the knot.



5. As your knot-tying skill and confidence increase, you will realize that this knot can be tied from either the right or left side and from either the front or back.

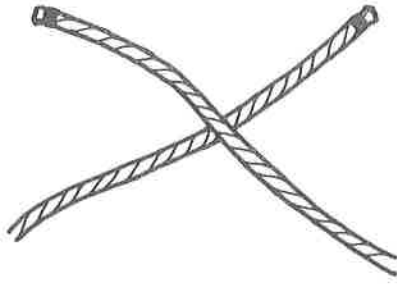
Square Knot

In essence, the square knot is but two overhand knots—one tied on top of the other. Tied correctly, it is an excellent knot for joining two pieces of equal or nearly equal size rope or for tying the ends of a single rope together to form a loop. A variation of the square knot—the surgeon's knot—is the basic knot of surgery. In animal restraint, the major use of square knots or surgeon's knots is to tie or secure the gates of cages.

Step-by-Step Procedure

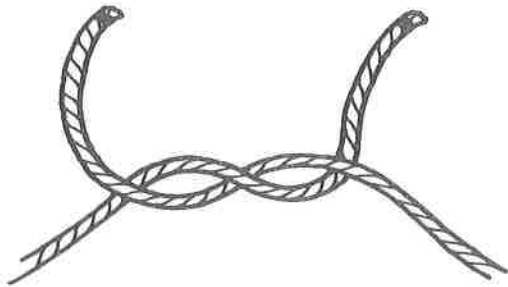
1. Grasp the two ends of rope to be fastened together, one in each hand, about 4" from their running ends.

2. Lay the end of the right-hand rope across the end of the left-hand rope near the point where you are holding them.



3. At the point where the two ropes cross, hold them in position between the thumb and index finger of your right hand.

4. Using the fingers of your left hand, wrap the end of the original right-hand rope over, around, and under the left-hand rope.



5. Now take the new left-hand end and cross it over, around, and under the new right-hand end.



6. Grasp an end in each hand and pull to tighten and secure. The end result should look and act like two interlocking bights. If the knot does not look or act correctly, it is very likely that you have tied a granny knot. The cause of this is a mix-up on which strand was used to start the second overhand knot.



7. A true square knot can be built every time if you remember the sequence, "right over left—left over right" or the exact reverse, "left over right—right over left." If the left-right switch is not made, the granny knot will result.

8. The granny knot is undesirable because it will slip under tension. The square knot or its variations, such as the surgeon's knot and reefer's knot, will not slip regardless of the tension.

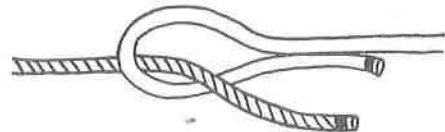
Thief Knot

There is an interesting knot, with a most intriguing bit of legend attached to it, that closely resembles the reef knot in name, appearance, and utility. Its name is the *thief knot*. Legend has it that sailors, leaving their quarters for a watch tour, used to tie their seabags shut with a thief knot. A burglar, often in a hurry and always distracted with the task at hand, would, following a quick glance, open what appeared to be a reef knot securing the about-to-be-purloined contents of the seabag. When the dishonest soul would retie the bag with the reef knot, the sailors could immediately tell that their bags had been pilfered by a thief . . . hence the name of the knot. While similar in all other aspects, the thief knot ties entirely differently from the reef knot.

Step-by-Step Procedure

1. Form a bight near the working end of one rope. Secure this bight, near its lower end, in one of your hands.

2. Take note of on which side of the bight the running end of the rope is positioned. Insert the running end of the second rope into the loop of the first bight . . . from the bottom to the top.



3. Wrap this running end around the lower end of the first bight. Be certain to start the wrap toward the side of the bight formed by the running end of the first rope. Continue around the bottom of the first bight, back out to the top, and insert the running end back into the first bight from top to bottom.



4. Pull on both ropes to firm up the knot.



5. Note that the thief knot and the reef knot are identical in appearance, except for the fact that in the reef knot the tag ends of the bights are on the same side of the knot, while in the thief knot the tag ends are on opposite sides.

6. For the purposes of illustration, we have used two ropes to form the knot. The thief knot, like the reef knot, can also be used to secure the ends of a single rope . . . as around a seabag!



REEF KNOT



THIEF KNOT

Surgeon's Knot

The surgeon's knot is a variation of the square knot, and as such it shares the ease of tying and nonslip characteristics of the parent knot. It has the added advantage of having the first part of the knot hold while the second is being tied. Imagine this advantage while trying to tie shut a gate or door in a windstorm, securing an overstuffed box, or for its intended purpose of suturing.

Step-by-Step Procedure

1. Grasp the two ends of rope to be fastened together, one in each hand, about 6" from their running ends.

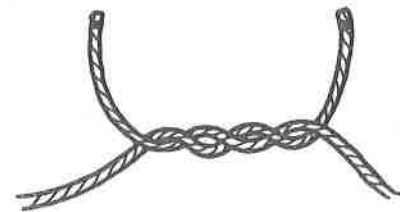
2. Lay the end of the right-hand rope across the end of the left-hand rope near the point where you are holding them.

3. At the point where the two ropes cross, hold them in position between the thumb and index finger of your right hand.

4. Using the fingers of your left hand, form the first of the overhand knots as you did for the square knot, going original right over original left.



5. Now, simply make one more wrap with the original right end. The end result of this step is to form a twice-wrapped overhand knot instead of a singly wrapped knot.



6. Now take the new left-hand end and wrap it over, around, and under the new right-hand end.



7. Grasp an end in each hand and pull to tighten and secure.



8. Like the square knot, the sequence can be reversed. The surgeon's knot can be tied correctly by double-wrapping right over left, left over right, or double-wrapping left over right, right over left.

Reefer's Knot

The reefer's knot is also known as the *bowknot* or *quick-release square knot*. Like the square knot, it is a

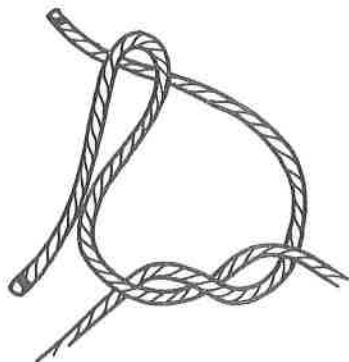
good nonslip knot with which to tie ends of rope together. It has the added advantage that it can be untied under tension—a most important feature for any knot used to restrain livestock.

Step-by-Step Procedure

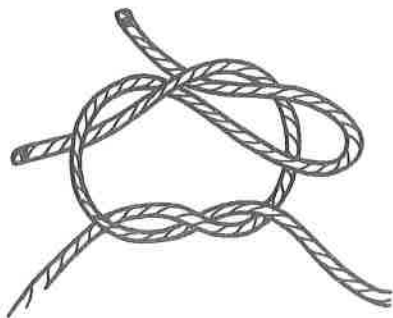
1. The first four steps are identical to those used in tying the square and surgeon's knots: a simple overhand knot, coming from right over left, is formed.



2. Now, begin to tie the second overhand knot, coming from left to right, by laying the new left-hand strand over the new right-hand strand.



3. Instead of inserting the running end of the new left-hand strand into the loop formed by the crossing strands, form a bight in the new left-hand strand and insert it into the loop.



4. Grasp the bight with the thumb and index finger of your right hand and pull it partway through the loop.

5. Grasp the left-hand strand and left working end in your left hand and the right-hand strand in your right hand. Pull to shape and secure the knot.

Be certain that the end of the bight is "trapped" in the center of the knot.



6. In an emergency, the free end of the bight can be pulled sharply, immediately releasing the knot.

7. The sequence is reversible; i.e., instead of initially right over left, then left over right, it can be tied left over right, right over left.

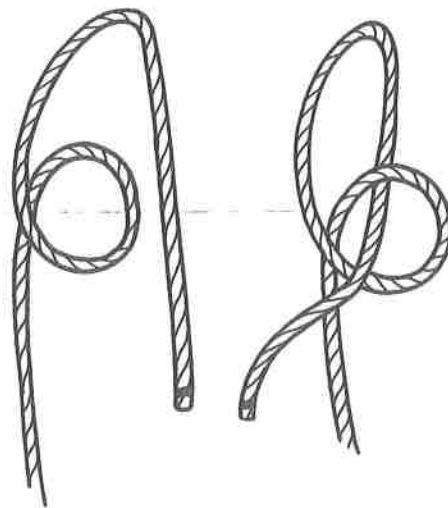
Bowline Knot

Knot users, from stockmen to seafarers, consider this the most useful of all knots. It is a nonslip knot, and as such can be used to form a loop or slip that will not tighten or draw down when placed around an animal's body or a post. Tied small, the loop formed makes a usable honda for a lariat. It is relatively easy to untie.

Step-by-Step Procedure

1. Position the rope so that the standing part is to your left, the working end to your right.

2. Form a right-hand loop by passing the working end of the rope over the standing part.

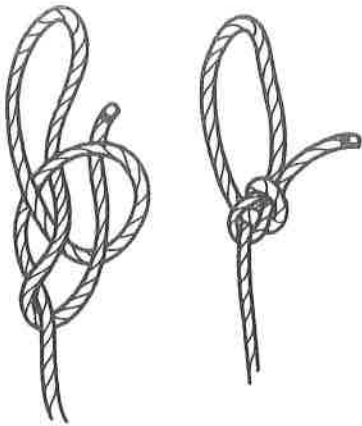


3. Secure the loop by positioning the strands where they cross between the thumb and index finger of your left hand.

4. Insert the working end of the rope into the loop from the back.

5. Cross the working end over the top of the standing part and wrap it around the rear of the standing part.

6. Reinsert the working end into the loop from the front.



7. Grasp the working end of the rope and the right-hand strand of the loop in your right hand, the standing part of the rope in your left hand.

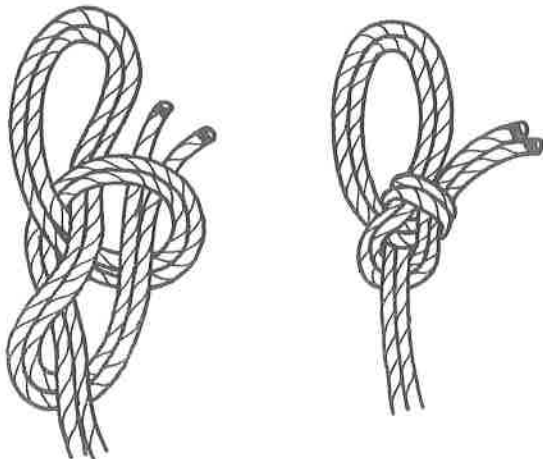
8. Pull to shape and secure the knot.

9. The size of the loop formed is dependent upon the amount of working end originally allowed for use.

10. It makes no difference whether this knot is tied in the hand or about an animal's body—the steps are the same.

Doubled Bowline Knot (Three-Loop Bowline)

The doubled bowline knot is just what is says—it is a bowline knot tied into a doubled rope. It is sometimes described as being a bowline-on-a-bight because it is formed by a bight of rope, not a single strand. It differs from the true bowline-on-a-bight only slightly. Many tyers do not appreciate the fine distinction, and so the doubled bowline (three-loop bowline) will likely always be misnamed the bowline-on-a-bight. Whatever its proper name, the



knot is particularly useful whenever you must form a loop in the center of a long rope. It is a comfortable loop for the animal because it is two strands wide and therefore only one-half as irritating to the hide.

The steps followed in tying the doubled bowline knot are exactly the same as those for the single bowline, with the exception of the initial doubling of the rope and consequent formation of the bight in what becomes the working end of the rope.

Slipknot

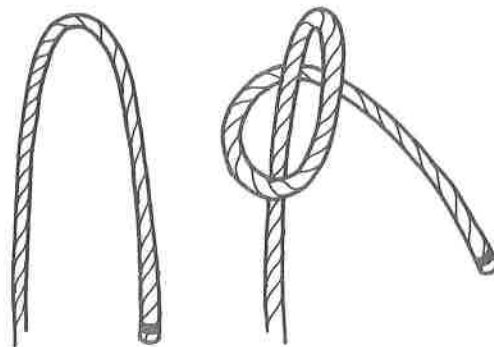
The slipknot is not a particularly useful knot in animal restraint for the following reasons: it slips under tension, draws down upon the body of the animal restrained, and does not release itself when the tension ceases; it is next to impossible to untie this knot while it is under tension, or for that matter after it has been under tension; and last, it is one of the least efficient of knots (weakest). Its primary value appears to be that of providing a starting point for tying the quick-release knot. Be certain that the slipknot is never placed about the neck or body of an animal.

Step-by-Step Procedure

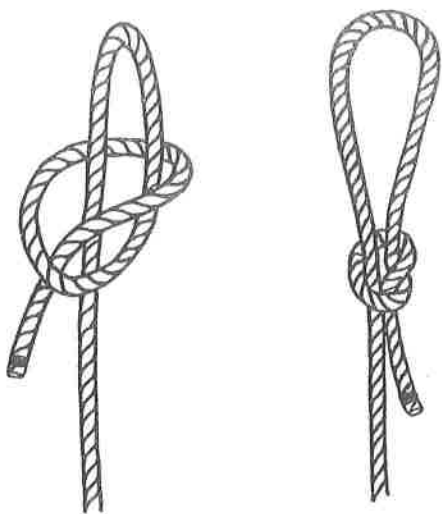
1. Start with the rope before you. Place the standing part to your left, the working end to your right.

2. Grasp the standing part in your left hand, about 24" from the working end.

3. Form a bight in the working end of the rope by placing the working part between the left thumb and index finger next to the standing part of the rope. Leave 6" to 8" of the working end below your left hand.



4. With your right hand, wrap the working end over the top and around the back of the original bight. Complete this wrap by inserting the running end of the working part of the rope into the loop just formed—from top to bottom.



5. Grasp the standing part of the rope and the running end of the rope in your left hand and the loop in your right. Pull to shape and secure the knot.

6. Mention has been made of the many weaknesses and faults of this knot. One of those faults, the fact that the knot slips under tension, even to the point of becoming completely undone, can be remedied by securing an overhand knot near the end of the working end of the rope. The slipknot will still slip, but only to the point where the overhand knot is jammed against the primary knot.



7. There are better ways to do whatever you had planned to accomplish with the slipknot.

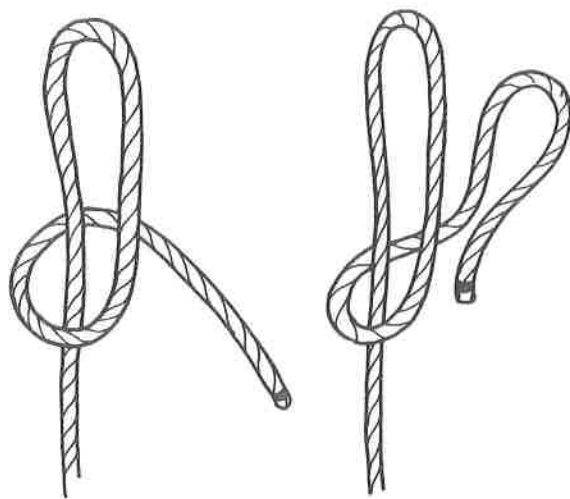
Quick-Release Knot

This knot is known as the *mooring knot* among yachtsmen and as the *halter knot* in animal circles. Whatever the circumstances and the name of the moment, this handy knot is the standard way to tie an animal or bouncing, bobbing boat to a post or bollard and be able to release it very quickly even while it is under tension. It is a simple variation of the slipknot.

Step-by-Step Procedure

1. As with the slipknot, start out by forming a bight near the end of the rope end securing it between the thumb and index finger of your left hand. Leave 10" to 12" of the working end below your left hand.

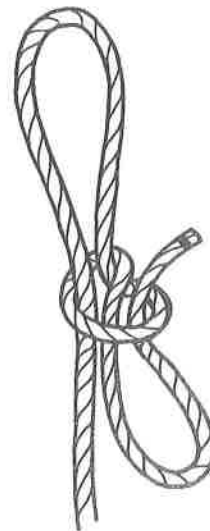
2. With your right hand, wrap the working end over the top and around the back of the original bight, forming a loop.



3. Now, instead of completing this wrap by inserting the running end of the rope into the loop just formed (and thereby making a slipknot), form a bight in the running or working part and insert it into the loop.

4. Grasp the standing part of the rope and the bend of the bight in your left hand and the loop in your right. Pull to shape and secure the knot.

5. Horses have the notorious habit of biting on the knots restraining them and ultimately freeing themselves. To prevent this, insert the running end of the rope into the bight.



6. This knot can be tied in the hand or around a post or tree. It should never be placed upon the neck or body of an animal.

Sheet Bend Knot

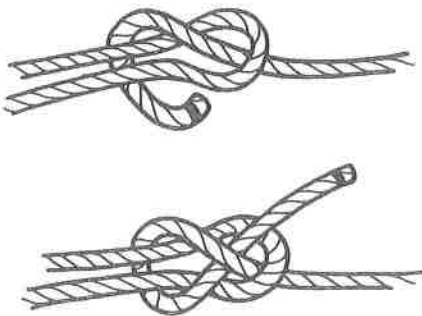
The sheet bend is a friction knot used primarily to join together two ropes of unequal size. If the ropes are of similar size, the easier-to-tie square knot should be used. Ropes of unequal size do not bind together well and keep the true square knot orientation, so the sheet bend is the knot of choice for this purpose.

Step-by-Step Procedure

1. Form a bight in the working end of the heavier of the ropes and hold it in position with the thumb and fingers of your left hand.
2. Run the working end of the lighter rope into the bight of the heavier rope from below.



3. Run the working end of the lighter rope over, under, and around the bight in the heavier rope and finish by bringing it over the bight and inserting it between its own standing part and the strands of the bight.

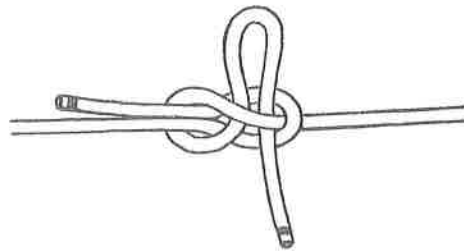


4. Shape and secure the knot by pulling on the heavy rope bight with your left hand and on the standing part of the light rope with your right.

Learning one more step in the process of tying sheet bend knots can save a lot of frustration. Recall that the sheet bend is a friction knot, i.e., it holds securely only when under tension. This same tension that makes it a worthy knot makes it most difficult to untie. This can be remedied by an additional step that converts the sheet bend to a "slipped" sheet bend.

5. Take the working end of the lighter rope that you have just brought over, under, and around the

heavier rope bight, and insert it, as in step 3, between its own standing part and the bight of the heavy rope. But this time, before you tighten the bend, form a bight in the running end of the light rope and insert the tag end of it under the standing part of the light rope. Now secure the bend by pulling on the bight in the heavy rope and on the standing part of the light rope.



6. When it is time to release this knot, under tension or not, a quick jerk on the tag end of the bight in the light rope is all that is necessary.

Double Sheet Bend Knot

Because the sheet bend knot holds well only when under tension, an improved form called the *double sheet bend* has been developed to hold securely even without tension on the knot. This knot is formed in the same way as the sheet bend, except that an additional wrap is taken with the working end around the strands of the bight.

Step-by-Step Procedure

1. Form a bight in the heavy rope and run the working end of the lightweight rope into the bight from below as with the sheet bend knot.
2. Run the working end of the lighter rope over, under, up around, and then over, under, and up around once again before inserting it under its own standing part where it has entered the bight.



3. Shape and secure the knot by pulling on the heavy rope bight with your left hand and on the standing part of the light rope with your right.

Earlier, the figure-eight knot was illustrated. Its usefulness is primarily as a stopper knot in the end of a single rope, although it is an attractive and enjoyable knot to work with. When there are two ropes to be joined, the figure-eight principle can be expanded into the figure-eight bend. The

figure-eight bend is also known as the *Flemish knot*. It is one of the strongest bends, simple to tie, and holds $\frac{1}{4}$ " cord as well as 1" rope.

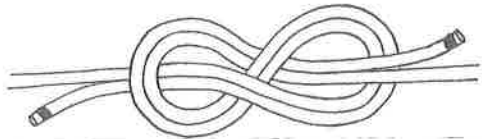
Figure-Eight Bend

1. Form a bight near the end of one of the ropes to be joined. Allow the running end to hang to the left, with the standing end to the right. Hold the bend of the bight in your left hand.
2. Wrap the running end of the bight around the standing part, coming over the front and around to the back. Bring the running end out from behind and insert it into the loop held in your left hand.

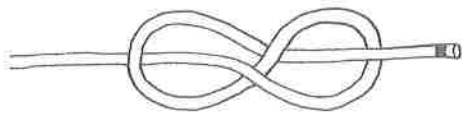


3. Stop at this point, before you pull the ends of the rope and firm up the knot. Arrange the figure-eight knot so that each of the loops are open and well formed.

4. Now, take the running end of a second rope to be joined to the original one (with the figure-eight in the end of it), insert it into the original figure-eight knot by sliding it along the tag end of the first rope which is sticking out of the figure-eight knot. Continue to place the second rope into the figure-eight knot. The coils of the two ropes should lie against one another through each turn of the figure eight.



5. As you complete this bend, the standing end of rope 1 and the tag end of rope 2 will be exiting the figure-eight bend to the right (or left) and the standing end of rope 2 and the tag end of rope 1 will be exiting to the opposite direction.
6. At this point, position and firm up the knot.



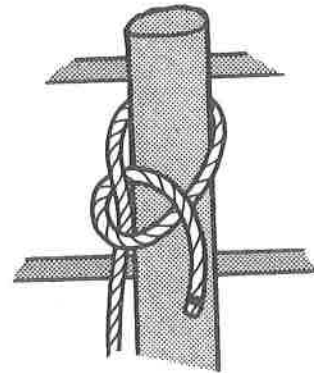
Half Hitch

The half hitch is a very quick knot or hitch to form and use. It is a useful method of temporarily holding a rope in position around a post or tree in an

emergency situation (such as an animal escaping). Any hitch is a tension knot, i.e., it must be held under constant pressure for it to remain tight. The half hitch is particularly vulnerable in this regard in that the working end must be held by the handler for the knot to remain secure. It is particularly useful as a leverage hitch to keep any ground gained while trying to move an animal closer to a post, trailer, or chute.

Step-by-Step Procedure

1. Position the standing part of the rope to your left and grasp the working end of the rope in your right hand.
2. Pass the running end of the rope over or around the post.
3. Bring the running end over the standing part of the rope, under it, and then insert it into the loop (the one around the post) from the bottom.



4. The knot is held by handler tension on the running end and animal tension on the standing end.

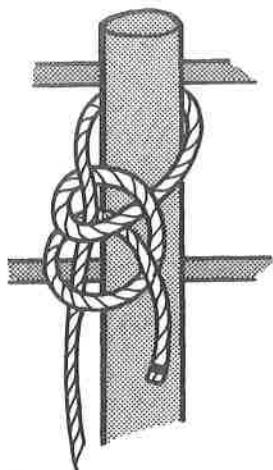
Double Half Hitch (Two Half Hitches)

The double half hitch is an extremely useful knot for the handler of livestock. It is quick, easy to tie, acts like a slipknot, and provides a convenient way to tie up the end of a rope when no other knot seems appropriate.

Step-by-Step Procedure

1. Position the standing part of the rope to your left and grasp the working end of the rope in your right hand.
2. Pass the running end of the rope over or around the post.
3. Bring the running end over the standing part of the rope, under it, and then insert it into the loop (the one around the post) from the bottom.
4. Repeat step 3 to form the second half hitch; i.e., take the running end of the rope and pass it over the standing part, under it once again, and

then insert it into the loop just formed below the first half hitch.



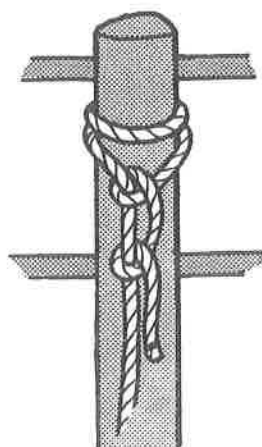
5. Shape and secure the knot by pulling on the running end of the rope. Animal tension will provide the pull on the standing end of the rope.

Round Turn and Double Half Hitch

This knot is a fine substitute for the clove hitch and an extremely practical knot. The practicality involves using the wrap around the post, which was probably used to winch the animal into position, as the start of the knot, and then finishing it off with the easy-to-remember, easy-to-tie-under-tension double half hitch.

Step-by-Step Procedure

1. Start the knot by wrapping the working end of the rope around a post in a clockwise direction. As it comes back to the front, pass it either above or below the standing part of the rope and continue around the post once more. Stop as the running end of the rope is ready to pass over the top of the standing part.



2. At this point, a double half hitch is formed exactly as before (steps 1, 2, 3, 4, and 5).

Clove Hitch/Miller's Knot

The clove hitch is a knot that can be tied around a post or leg, or it can be preformed and dropped over the top of a post. It is not a secure knot and it is not particularly easy to tie around a leg or post. Better choices are the ring knot for dropping over a post and the round turn with double half hitch for tying around a post.

Drop-Over Clove Hitch

Step-by-Step Procedure

1. Form a loop in a section of rope by laying the working part of the rope over the standing part—refer to this as the loop to the front.



2. Keeping this front loop formed, make a second loop, this time a loop to the rear, by again placing the working part of the rope over the standing part.



3. Hold the front loop in your right hand and the rear loop in your left. Position the two loops atop one another by sliding the front loop in your right hand behind the rear loop in your left hand.



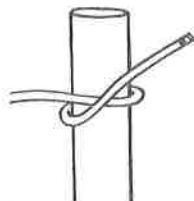
4. Insert fingers from both hands into the double loops and pull to size the knot *before* attaching it to the animal. After dropping the double loop over a post or placing it over a leg, pull on the ends to shape and tighten the knot.

Wraparound Clove Hitch

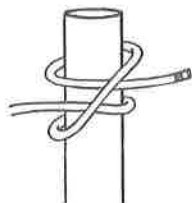
Step-by-Step Procedure

1. Grasp the working end of the rope in your right hand and wrap it around the post or leg to be secured, starting from the right side of the post or leg.

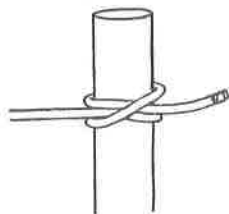
2. Cross the working end under the standing end of the rope in front of the post or leg. Pinch this point of crossing between your thumb and index finger.



3. Wrap the working end about the post or leg a second time, this time above the first loop, and as the working end comes around to the front, bring it between the pole or leg and itself.



4. Slide the loops together. Shape and secure the knot by pulling on the working end and standing part of the rope.



Ring Knot

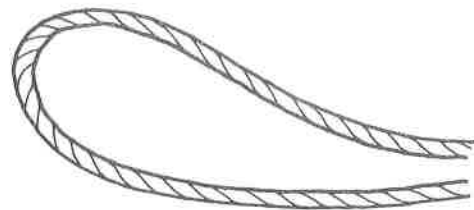
The ring knot is also known as a *girth knot* or *girth hitch*. It is a superior substitute for the clove hitch in that it does not slip and is more easily tied. Just as with the clove hitch, it can be preformed to drop over a post or tied about the post or leg.

Drop-Over Ring Knot

Step-by-Step Procedure

1. Form a bight at the desired position in the rope by grasping the two strands in your right hand.

2. Insert your left hand into the bight and grasp the strands just in front of where your right hand is



securing them. Remove your right hand from the strands.

3. With your right hand, grasp the bend of the bight and pull it over your left hand and down onto the standing parts of the rope.



4. The double loops now formed are the ring knot. Shape and size them in your hands to fit your needs as dictated by post or leg.

Wraparound Ring Knot

Step-by-Step Procedure

(If the knot is to be tied to a ring, this is the only method of forming it.)

1. Form a tight bight at the desired position in the rope by grasping it with your left hand.

2. Wrap the bight around the post or leg or insert it into the ring. As it comes around from behind the leg, grasp it in your right hand.

3. Take the doubled strands of the standing part of the rope and place them into this bight. Switch hands, so that the left hand is now controlling the bight while the right hand pulls the standing end of the rope into and through the bight.



4. After the entire lengths of the standing ends have been drawn through the bight, release the bight and tighten the knot by pulling with the right hand.

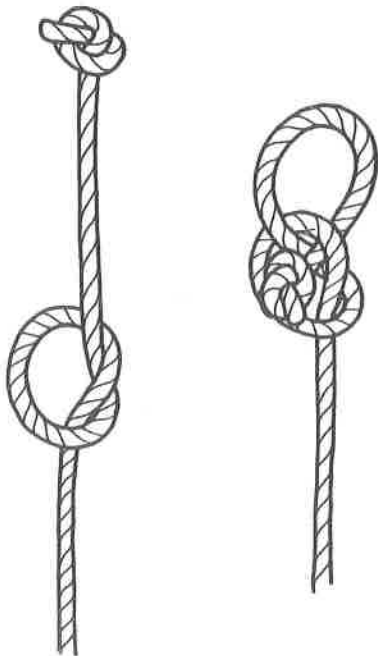


Honda Knot

A honda is a small loop secured into the working end of a rope through which the standing part of the rope passes as it forms a much larger loop. Most lariats come with the honda knot pretied into an end. A few are manufactured with a quick-release honda tied into the end. Bulk rope or broken lariats must have honda knots retied into their ends.

Step-by-Step Procedure

1. Tie an overhand knot tightly into the end of the rope.
2. Approximately 8" below this, tie another overhand knot, only this time leave it in the loosened state.
3. Grasp the loose overhand knot in your hands and study it until you have determined how to orient it so that the working end of the rope comes out from the loop and toward you. From there it runs upward to the end knot.



4. Grasp the running end of the rope and bend it so that it lies over the bend of the overhand knot loop.

5. Insert it into the overhand knot loop *between* the bend of the loop and its own standing part. Study the diagram carefully because it is easy to place the running end improperly.

6. Shape and secure the knot by pulling on the loop and standing part of the rope.

Sheepshank Knot

There will be times, as you work around a farming operation, when you must secure something with a rope or otherwise perform work with a rope that you wish were several feet shorter. Cutting is not the answer because there are tasks where the greater length of rope is valuable. The sheepshank knot allows you to temporarily "shorten" a rope. Since it holds only when there is a strain on it, it is unsuitable for livestock handling.

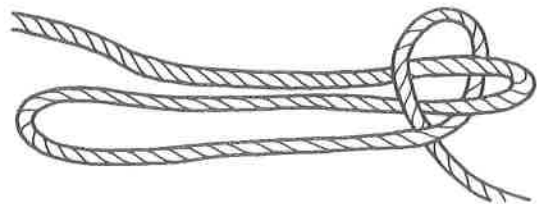
Step-by-Step Procedure

1. Position the rope in a Z configuration with the top and bottom bars of the Z about 12" in length and lying nearly on top of one another (the diagonal leg of the Z only about 2" tall).



2. Slide your left hand to right side of the Z, forming a bight in the rope and holding it upon the bottom leg of the Z.

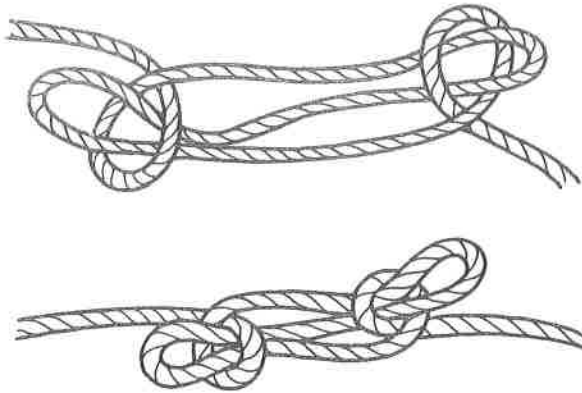
3. Form a loop to the rear in the lower leg of the Z, twist it in a counterclockwise motion and place it over the bight being held in your left hand. Snug it around the bight, being certain that about 2" of the bight protrudes from the loop.



4. Slide your right hand to the other side of the Z, forming a bight in the rope and holding it up against the top leg of the Z.

5. This time, form a loop to the front in the upper leg of the Z, twist it counterclockwise, and place it over the bight held in your right hand. Snug and position it as before.

6. Tension on the two ends of the rope will keep the sheepshank secure.



Splices

Splicing becomes necessary when two ropes are to be joined or when an eye (honda) must be permanently installed in the end of a rope. Splicing the ends of rope together is necessary to repair a break or to create a longer rope from two shorter lengths. While the break or short ropes could be joined together with knots, splices are preferred because they are stronger than knots, less bulky, and permanent.

Short Splice

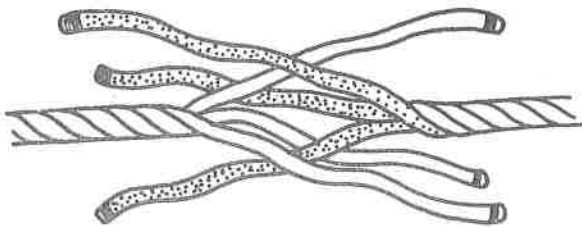
Step-by-Step Procedure

1. Unlay about 6" of the ends of the two ropes to be joined. With $\frac{1}{2}$ " to $\frac{3}{8}$ " rope, this will allow for three complete over-under sequences. Experience has shown that three sequences provides maximum strength.

2. Whip, tape, or melt (nylon and dacron) the unlaid end of each strand of both ropes. This is absolutely necessary if you wish to avoid a hopeless frayed-fiber mess after only the first over-under sequence.

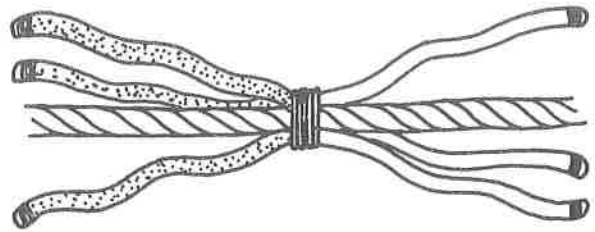
3. Position the two ropes to be joined so that one lies to your left, the other to your right. Grasp the working end of the left rope in your left hand, the working end of the right in your right hand.

4. Bring the two ends together, alternating the strands; i.e., arrange it so that no two unlaid strands from the same rope lie next to one another without a strand from the other rope between them.



5. Push the ropes together snugly, twisting them slightly back and forth. Tie or tape the strands of

one rope onto the standing end of the other rope. This is to prevent further unraveling of the rope during the splicing sequence.



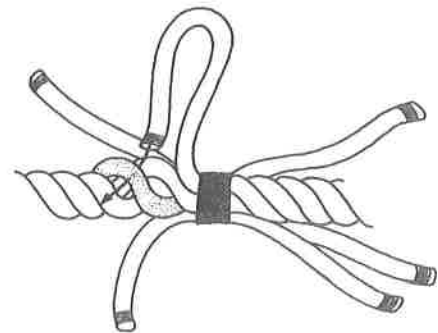
6. Study the junction of the ropes and the unlaid ends. You will notice that each of the unlaid strands lies directly over (upon) a strand of the intact rope. This arrangement is assured if step 4 was carefully followed.

7. Each of the unlaid strands must go *over* the rope strand that it is lying upon and *under* the one immediately to its left if you are splicing in a right-to-left direction.

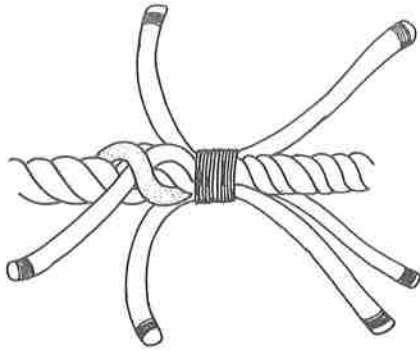
8. Select any of the strands and begin your splice at that point by placing your right thumb partially under it and at the same time upon the strand that it is passing over or lying upon. Grip the junction area of the ropes to be spliced with the rest of your right hand.

9. With the index finger and thumb of your left hand, grasp the strand to be gone under—this is the one immediately adjacent to the one that the unraveled strand is passing over.

10. With your right hand, twist the junction to the right (clockwise) while twisting the rope being spliced to the left (counterclockwise) with your left hand. This will open the rope and enable you to isolate the strand under which to pass the end of the unlaid strand.



11. Keep this strand isolated, and with your right hand place the end of the unlaid strand under it and pull it through until it is pulling on the body of its parent rope.



12. Rotate the rope in a clockwise direction, and repeat steps 8 through 11 for the second and third strands.

13. After you have completed the first series of over-and-under tucking, the work should be tightened. Grasp each individual unlaidd strand, one at a time, and while pulling it into the rope being spliced, give it a strong twist in a clockwise direction.

14. Repeat steps 8 through 13 for the second and third sequences of over-and-under tucking. From this point onward, the over-and-under splicing is the same as for the backsplice.

15. Remove the tape or string that previously held the other set of unlaidd strands and repeat the entire sequence (steps 6 through 14) for these strands and the part of the rope to be spliced into.

16. After the strands have been tucked over and under for three sequences, the entire splice should be stretched and faired (rolled on the floor under your foot). Clip off the excess unlaidd strands approximately $\frac{1}{4}$ " from the last strand they went under.

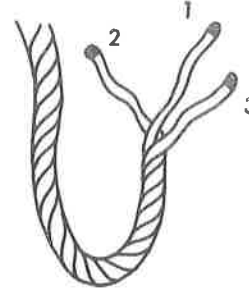
Eye Splice

Step-by-Step Procedure

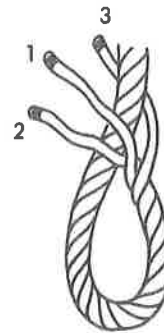
1. Unlay about 6" to 8" of the end of the rope to receive the eye. With $\frac{1}{2}$ " to $\frac{3}{8}$ " rope, this will allow for three over-under sequences. Just as with the short splice, three courses have proven to be the most efficient number to use.

2. Whip, tape, or melt the unlaidd end of each strand of the rope. This is absolutely necessary if you wish to avoid a hopeless frayed-fiber mess after only the first over-under sequence.

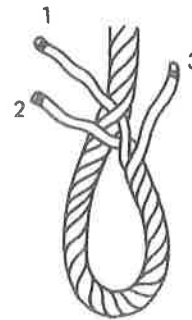
3. Hold the standing end of the rope in your left hand and the unraveled strands in your right. Arrange the strands so that two of them come across the top of the rope from a lower left to an upper right direction. The remaining strand appears to come from behind the front two, in a lower right to upper left direction.



4. Form a loop the size appropriate to your needs by placing the unlaidd strands against the standing part of the rope in the following manner. The strand coming from behind in a lower right to upper left direction, and the topmost of the strands lying in the lower left to upper right direction go on top of the standing part, while the remaining lower-left- to upper-right-lying strand goes beneath this standing part of the rope. Push these into position snugly and hold them with your left hand.



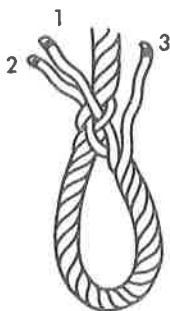
5. Using both of your hands, while maintaining the loop (or eye) positioning, twist open the standing part of the rope where the unlaidd strands pass over it. Take the center one of the three unlaidd strands, identify it as strand 1, and insert it under any strand of the twisted-open rope. Take care not to lose the original orientation of the unlaidd strands.



6. Now study the eye and rope. Note that unlaidd strand 1 has just gone under a rope strand. Unlaidd strand 2 is lying upon the rope strand that unlaidd strand 1 went under.

7. Unlaid strand 2, the other strand on top, is now inserted over the rope strand that 1 is under and under the rope strand immediately adjacent to it.

8. If you look closely, you will note that strands 1 and 2 are touching and that strand 2 enters where strand 1 came out.



9. For the remaining unlaid strand, look to the back side of the eye and study the eye and rope. You will note that there is only one rope strand that does not have an unlaid strand under it. This is the strand under which strand 3 must go.

10. Strand 3 must be placed *over the top* of this remaining rope strand and come back under it in a left-to-right direction. At this point, strand 3 goes under where strand 2 comes out, and 3 comes out where 1 goes under.



11. Tighten and shape the eye by pulling and twisting in a clockwise direction on the unlaid strands. If you have performed the eye formation properly, the unraveled strands will come out at the same height and at equal spacing from one another.

12. From this point on, the unlaid strands are tucked twice more in the familiar over-and-under sequence detailed in the discussions of crowning and short splicing.

13. The strands are also finished as detailed in the discussions of those splice types.

Adjustable Rope Halter

A supply of low-cost, easy-to-make, adjustable rope halters is a necessity on farms or ranches where beef and dairy cattle are kept. Larger breeds of sheep

and goats are also more easily handled in a rope halter than by the traditional methods.

Adjustable rope halters are used to teach cattle, sheep, and goats to lead, to routinely handle them in day-to-day activities, and to restrain them as necessary. The halters' low cost allows the producer to make extras and place them about the farmstead so that they will be handy when needed.

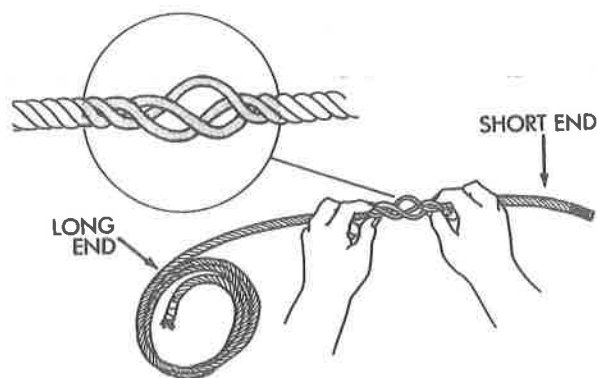
Step-by-Step Procedure

1. Select a 12' to 15' length of $\frac{1}{2}$ " three-strand rope. Any of the rope types from cotton through nylon will work. The choice will depend upon the strength needed, durability required, and cost. Rope of $\frac{1}{4}$ " to $\frac{3}{8}$ " diameter is suitable for sheep and goats.

2. Finish one end of the rope by whipping it, clamping it with a ferrule, dipping, or heat-treating. (The method selected will depend upon your wishes and the type of rope selected.) If you do not finish the rope ends, they will unlay and fray. Temporarily finish the other end of the rope with tape or string. A crown knot will be formed into this end after the halter is constructed.

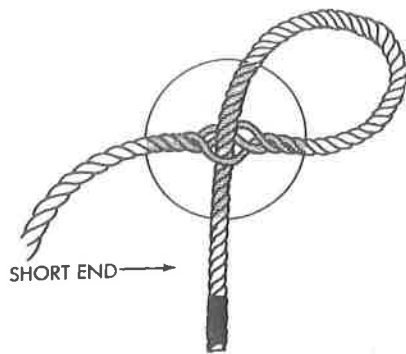
3. Mark a point with your hand about 12" to 15" from the whipped end of the rope. Refer to this 12" to 15" length as the *short end* of the rope—the remaining length is the *long end*.

4. Place the short end to your right, the long end to your left. Grasp the rope at the 12" to 15" mark between the thumb and first two fingers of both hands. Separate your right and left hands by about 2". Rotate the rope clockwise with your right hand and counterclockwise with your left. This will open the strands of the rope between your hands.

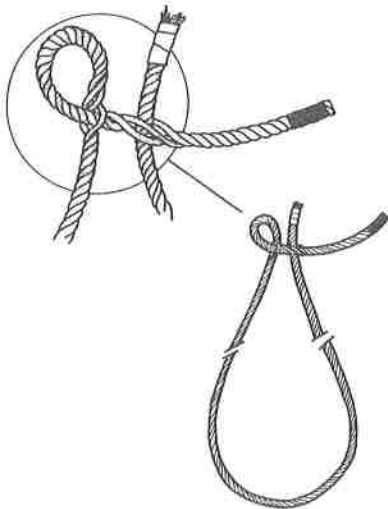


5. Isolate any one of the opened strands with the thumb and index fingers of your left hand. Use your right hand to insert the whipped end of the short end of the rope under this strand opening until the loop formed has an eye opening of about double the rope diameter.

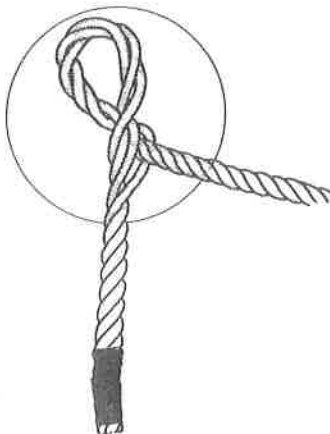
6. Now position the rope so that the eye loop is in your left hand with the short end pointing toward three o'clock and the long end exiting



toward six o'clock. Grasp the eye loop and the single strand running across the short end of the rope between your left thumb and index finger. With your right thumb and index finger, grasp the short end of the rope at a point near the eye loop. Twist the eye loop and short end of the rope with your hands until you have isolated two strands between your right thumb and index finger.



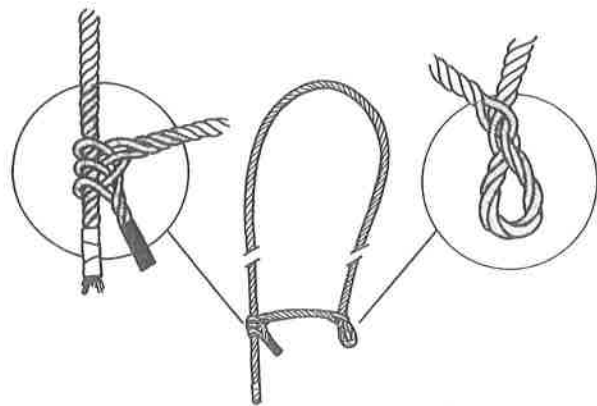
7. Use your left hand to insert the long end of the rope from bottom to top under and through these two strands. Pull it completely through until



all the slack is gone. If done properly, one side of the loop will show three strands lying smoothly side by side. This is important because they will be positioned against the animal's face.

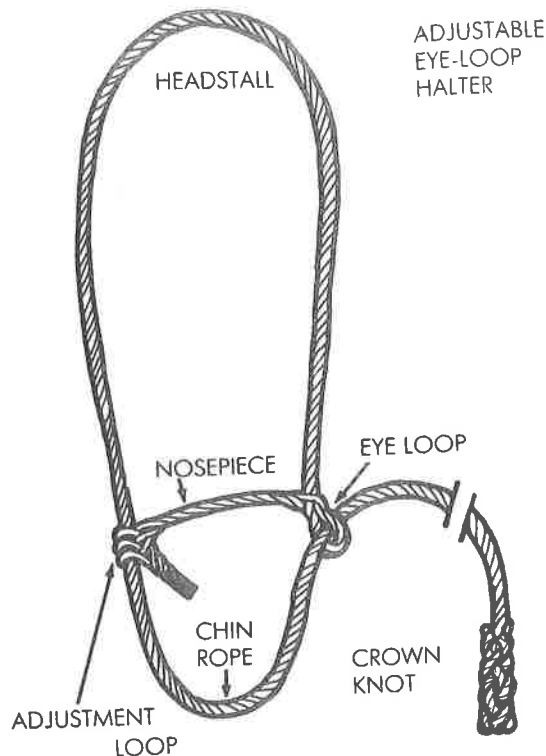
8. With the eye loop to your right, grasp the short end of the rope between your left thumb and index finger about 2" from the whipped end. Two inches farther from the whipped end, grasp it in the same manner in your right hand. Open the strands by twisting clockwise with your right and counter-clockwise with your left hand. When the strands are opened wide, push your hands together. This will cause the strands to buckle and fold over, forming three loops.

9. Line these three loops up in order and work into them a sharpened stick of diameter equal to that of the rope. Use your right hand to feed the long end of the rope into the loops, starting at the one closest to the eye loop. Remove the stick from one loop at a time as you run the long end of the halter through them.



10. Run the long end of the rope into and through the eye of the loop. This completes the halter.

11. Permanently finish the long end of the rope in the chosen manner. Consider crowning the end because a crown knot and backsplice creates a convenient handle. Do not use a hog ring to finish the end because it could catch and tear the skin of your hand.



12. Always place the halter on the animal so that the eye loop is on the left side. Lead from the left.

1.4 CATTLE RESTRAINT

To be able to safely and correctly perform the day-to-day management techniques necessary for efficient cattle production, a thorough working knowledge of cattle-restraint methods is necessary. Efficient cattle restraint is more than "whoopin' and hollerin'" and "ropin' and tyin'." In fact, the more whooping, hollering, roping, and tying involved, the more inefficient the whole process becomes.

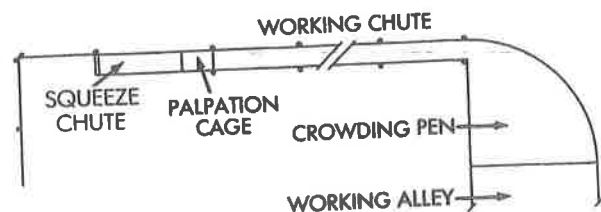
Cattle are large and strong, and while they are not particularly quick by animal standards, they can move rapidly enough to evade man's brute-force efforts. If you are going to be successful in restraining cattle, you must (1) have the mechanics of the restraint method well practiced so that you do not have to stop and think about what step is next, (2) study and try to understand their behavior so that you can outsmart them instead of trying to outmuscle them, and (3) have strong, appropriately sized, well-cared-for equipment that you thoroughly understand how to use. Some of the restraint methods discussed in this section may not be required on dairy operations, since dairy cattle are generally not as difficult to restrain as beef cattle. Common stanchion facilities, halters, and pen systems are all that are usually required for dairy cattle. In con-

trast, beef cattle often require working chutes and/or squeeze chutes to partially immobilize the animals.

Working Chute

Working chutes can be used effectively as the only restraint method for many of the management techniques discussed in Chapters 2 and 3. Some of the techniques, such as vaccinations, spraying, and applying pour-on insecticides, can be done while the animals are crowded head-to-tail in the chute. For more rigid confinement, and for other techniques, a squeeze chute and headgate, a scale, or a loading chute can be placed at the end of the working chute.

Many commercial and homemade designs are available, but the best of them share the following characteristics: (1) they have V-shaped sides or an adjustable side (18 to 30 inches) so that large or small cattle can be handled; (2) the "V" measures 14 to 17 inches wide at the bottom and remains so for the first 2 feet from the bottom, at which point it flares to approximately 30 inches at hip and horn height. Straight-sided permanent chutes measure 26 to 28 inches in width; (3) the sides should be solid so that the cattle cannot see through and become distracted; (4) the crowding pen and working chute should be bent or curved so that the cattle do not sense and resist the tunnel effect; and (5) the working-chute exit gate-squeeze-chute entry gate is usually made of bars (not solid) to give the illusion to the cattle of being able to escape, thereby causing them to enter.



When constructing the working chute, build an access gate into it, adjacent to the squeeze chute end, so that you can enter the working chute to perform palpations and castrations.

Step-by-Step Procedure

1. Move the cattle to the working alley and crowding pen that funnels into the working chute.
2. Start the cattle into the working chute. It will be more efficient to get one singled-out animal started down the chute instead of trying to drive all of them at once. If the cattle will simply not cooper-

ate, it may be necessary to enter the crowding pen and force the cattle with the sparing use of broom whip, cane, or tail twist.

CAUTION: With several large animals in a relatively small area, you risk being squeezed, stepped on, or kicked. Avoid using the electric prod or "hot shot." It will make the cattle nervous and less cooperative, increasing the risk of injury not only while you work cattle this time but also when they are reworked later.

3. Keep the cattle moving down the working chute by walking along the outside of it and talking to them, slapping them on the rump with your hand and tail-twisting as necessary.

4. Place a bar completely across the working chute behind the last animal and also behind the first animal in the chute. This should be placed just above the hock and will prevent the animal from backing up.

5. Open the gate to the squeeze chute and allow the first animal in the working chute to enter.

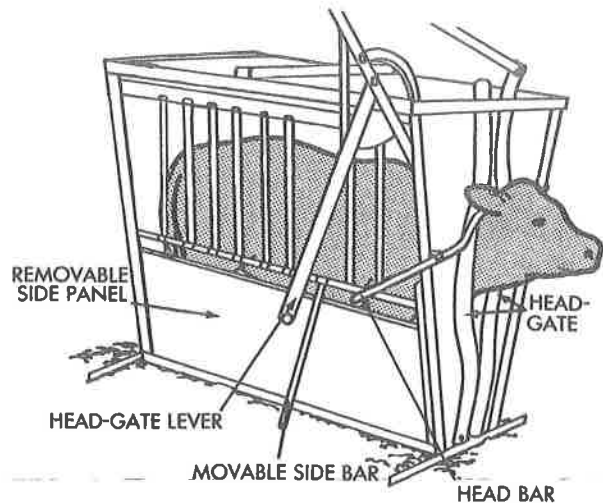
Squeeze Chute and Headgate

The combination of squeeze chute and headgate can be used to advantage on any type of farm or ranch for such management techniques as dehorning, castrating, branding, implanting, ear tagging, stomach tubing, artificial insemination, and blood testing. It is made even more valuable when it is positioned at the terminal end of a working chute.

There are many commercial and homemade designs available. A workable combination should consist of the following: a squeeze mechanism, a headgate with head and nose bars, a tailgate, removable solid side panels measuring approximately 24 inches from the ground, and removable side bars for easy access to the animal's side.

There are three basic headgate designs used in beef production: straight-bar headgate, positive-type headgate, and curved-bar headgate. The *straight-bar headgate* generally is designed to automatically catch an animal as it walks through the chute and fits well into purebred and commercial cow-calf operations. The greatest advantage of the straight-bar headgate is its protection against choking the animal. The main disadvantage is that the animal can move its head up and down easily, which can create some problems in certain techniques that require head immobilization.

The *positive-type headgate* operates something like a guillotine. The main advantage of this headgate is



almost complete head control, both sideways and up and down. The headgate almost completely immobilizes the head without the necessity of a head and nose bar. This type of headgate is popular among feedlot operators.

CAUTION: It is absolutely necessary that the headgate be adjusted to the correct height of the animal being worked to prevent choking. In addition, it is mandatory that the animal's head be released from the headgate before the gate is opened for the animal to exit. If this is not done, the animal can lunge forward and break its neck or choke to death.

Regardless of the headgate design used, it is important that the headgate be adjusted for the size of animals being worked to prevent choking or escape.

The *curved-bar headgate* combines most of the safety of the straight-bar headgate and some of the up-and-down head restraint of the positive-type headgate. This headgate is an excellent compromise for the cow-calf feedlot operator.

Step-by-Step Procedure

1. Position the squeeze chute at the end of the working chute. Be sure they fit squarely and snugly together. In permanent squeeze-chute installments, the squeeze chute should be anchored to a concrete pad to prevent forward movement. When portable facilities are used, the squeeze chute should always be chained near the ground to a post on both sides of the working chute to prevent forward movement.

2. Adjust the squeeze chute to the size of cattle being worked. The bottom of the chute is most important. The inside width at the floor for 400- to