

NSWC INDIAN HEAD DIVISION
DETACHMENT EARLE
PHST CENTER
TECHNICAL MEMORANDUM

TECH MEMO NO: PHST-36-00

DATE: 31 JULY 2000

SUBJECT: PROCEDURE FOR MAKING A STANDARD EYE SPLICE IN
DOUBLE-BRAIDED LINE

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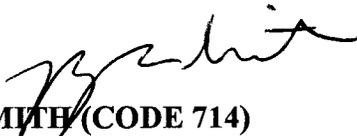
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1. PURPOSE

1-1. This technical memorandum is issued to provide detailed procedures for completing the standard eye splice in double-braided line. The Packaging, Handling, Storage and Transportation (PHST) Center required a detailed procedural document that would be available to all prospective contractors. This procedure eliminates commercial variations of the standard eye splice and provides the contractor with the Navy approved method.

2. BACKGROUND

2-1. In the past, commercial splicing manuals listed slight variations of the standard eye splice in double-braided line. The Navy's approved procedure for the splice was contained in the Boatswain's Mate Manual. The problem with the Boatswain's Mate Manual was that it was restricted to U.S. Government agencies only. In addition to containing sling splice information, the manual contained information on ship system operation, which was developed for enlisted personnel seeking Navy rate advancement. This information was of no use to commercial sling contractors. In an effort to eliminate administrative lead time and expedite the contracting process, we have extracted the step-by-step procedure, making it available to all contractors as part of our sling drawing lists.

3. STANDARD EYE SPLICE PROCEDURE

NOTE

The standard eye splice shall be performed on new line only. The eye splice retains 90 percent of the average new line strength.

3-1. Special tools are required for construction of a standard eye splice in new double-braided line.

- a. For lines 3 inches or smaller in circumference, a tubular fid and pusher are used.
- b. For lines larger than 3 inches in circumference, only a wire fid is used.

3-2. Only fids of the correct size shall be used. Table I provides a line to fid size comparison. Refer to Table I when verifying fid size or when manufacturing fids of the correct size. Stamped on each fid is a number indicating the size of line for which the fid was made. Fids are also used as "rulers" when splicing and will be explained later.

3-3. The wire fid lengths shown in Figure 2 are 1/2 and 1/3 scale. When measuring 13 inches in circumference and smaller with a wire fid, you must double the measurements. For 14 inches and larger, you must triple the measurements. Friction or masking tape and a soft lead pencil, crayon, or preferably, a wax marking pencil are needed. Sharp-pointed

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shears are also handy. The splice described here, and the line on which it is used, was developed by the Samson Cordage Works of Boston, Massachusetts.

3-4 Until you have become familiar with splicing this material, each step should be followed in detail. Figure 1 shows the fids and pushers used for splicing; steps 1 through 3 explain how to secure the wire fid to the line to be spliced. Figure 2 shows how to mark the line and extract the core.

3-4.1: Tape the end to be spliced with one thin layer of tape. Then measure one tubular fid length (two wire fid lengths, because wire fid is 1/2 size) from the end of the line and mark. (This is point R [reference], step 1 of Figure 2.) From R, form a loop the size of the eye desired and mark. (This is point X, where you will pull the core out of the cover.)

3-4.2: Tie a tight slipknot approximately five fid lengths from X. This must be done to keep the core and cover from becoming uneven. Bend the line sharply at X. With the pusher or any sharp tool, such as an ice pick, awl, or marlinespike, spread the cover strands to expose the core (step 2). Do NOT pull the cover strands away from the line or split the paired strands when you are spreading the cover, as this will distort the line unnecessarily. First pry, then pull the core completely out of the cover from X to the taped end of the line. Put one layer only of tape on the end of the core. To assure correct positioning of mark 1, do the following: Holding the exposed core, slide the cover as far back toward the tightly tied slipknot as you can. Then firmly smooth the cover back from the slipknot toward the taped end. Smooth again until all the cover slack is removed. Then mark the core where it comes out of the cover. (This is mark 1.)

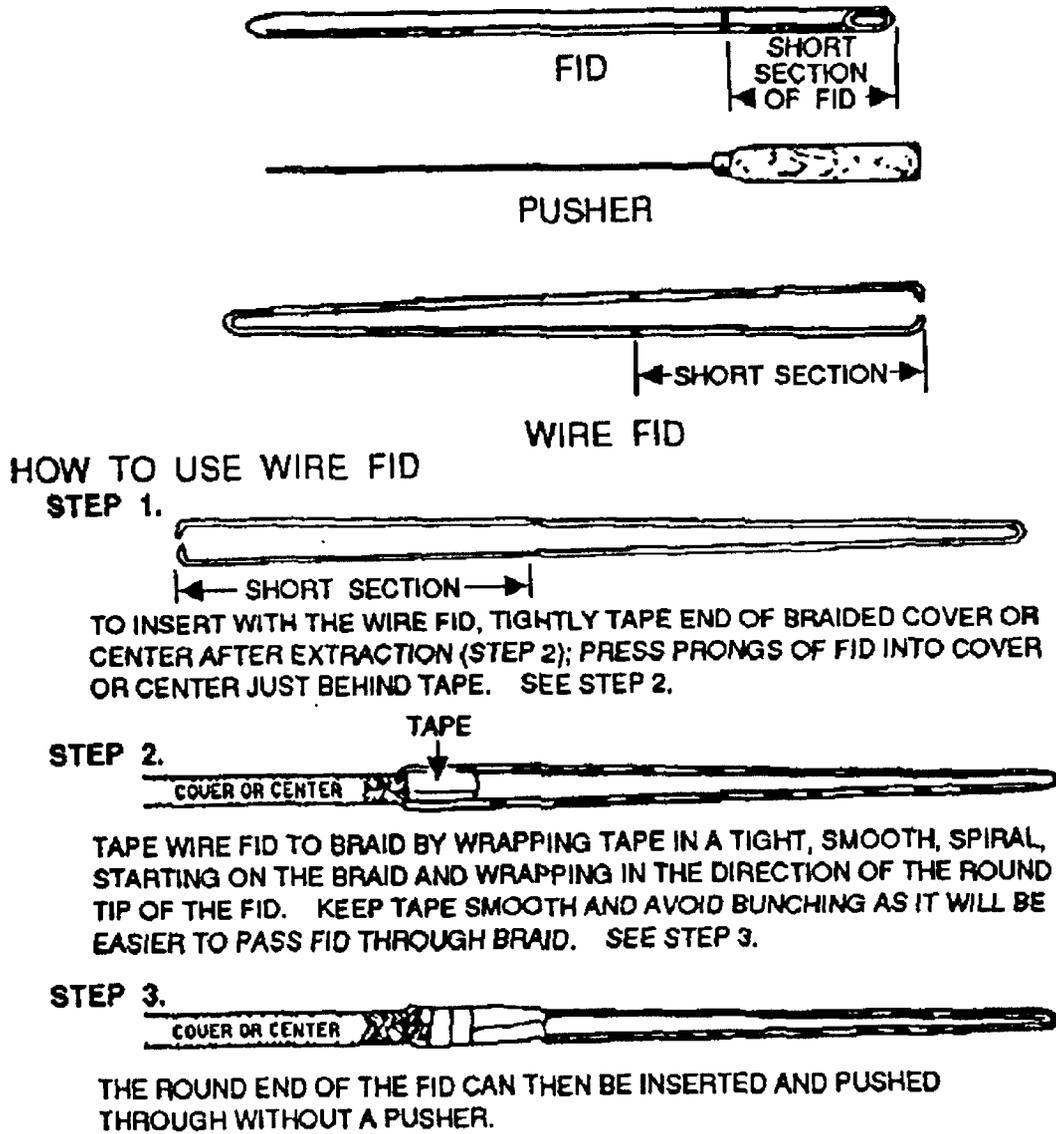
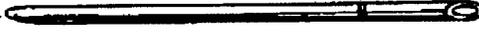


Figure 1. Fids Used for Splicing Double-Braided Line.

SPECIFICATIONS FOR LINE SIZES 3" AND UNDER.

SHORT SECTION
OF FID

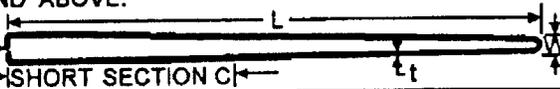
TUBULAR FID



FID SIZE AND ROPE CIRCUMFERENCE	2-IN-1 BRAID ROPE DIAMETER	FID SHORT SECTION LENGTH	TOTAL FID LENGTH
3/4"	1/4"	2 - 1/16"	5 - 1/2"
1"	5/16"	2 - 1/2"	6 - 3/4"
1 - 1/8"	3/8"	2 - 7/8"	7 - 3/4"
1 - 1/4"	7/16"	3 - 9/16"	9 - 1/2"
1 - 1/2"	1/2"	4 - 1/8"	11"
1 - 3/4"	9/16"	3 - 5/8"	12 - 1/4"
2"	5/8"	4 - 1/8"	14"
2 - 1/4"	3/4"	4 - 3/4"	16"
2 - 3/4"	7/8"	4 - 3/4"	19"
3"	1"	5 - 1/4"	21"

SPECIFICATIONS FOR LINE SIZES 3" AND ABOVE.

WIRE FID

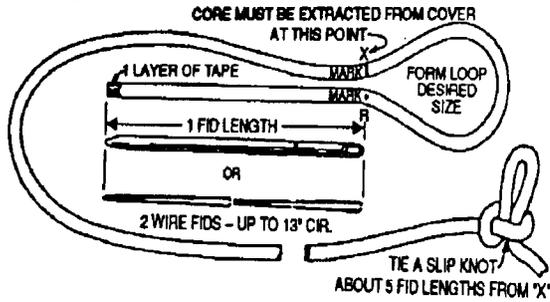


ROPE DIAMETER	ROPE CIRCUMFERENCE	WIRE DIAMETER t	TOTAL WIDTH W	FID LENGTH L	SHORT SECTION C	FID SCALE
1"	3"	3/16"	3/4"	10 - 1/2"	2 - 5/8"	1/2
1 - 1/8"	3 - 1/2"	3/16"	3/4"	12 - 1/4"	3"	1/2
1 - 1/4"	3 - 3/4"	3/16"	3/4"	13 - 1/4"	3 - 1/4"	1/2
1 - 5/16"	4"	3/16"	3/4"	14"	3 - 1/2"	1/2
1 - 1/2"	4 - 1/2"	3/16"	3/4"	16"	4"	1/2
1 - 5/8"	5"	3/16"	3/4"	17 - 1/2"	4 - 1/2"	1/2
1 - 3/4"	5 - 1/2"	1/4"	3/4"	19"	4 - 3/4"	1/2
2"	6"	1/4"	1 - 1/4"	21"	5 - 1/4"	1/2
2 - 1/8"	6 - 1/2"	1/4"	1 - 1/4"	23"	5 - 3/4"	1/2
2 - 1/4"	7"	1/4"	1 - 1/4"	25"	6"	1/2
2 - 1/2"	7 - 1/2"	1/4"	1 - 1/4"	26"	6 - 1/2"	1/2
2 - 5/8"	8"	1/4"	1 - 1/4"	28"	7"	1/2
2 - 7/8"	8 - 1/2"	1/4"	1 - 1/4"	30"	7 - 1/2"	1/2
3"	9"	5/16"	1 - 7/8"	32"	8"	1/2
3 - 1/4"	10"	5/16"	1 - 7/8"	35"	8 - 3/4"	1/2
3 - 1/2"	11"	5/16"	1 - 7/8"	39"	9 - 1/2"	1/2
4"	12"	5/16"	1 - 7/8"	42"	10 - 1/2"	1/2
4 - 1/4"	13"	5/16"	1 - 7/8"	46"	11 - 1/2"	1/2
4 - 5/8"	14"	3/8"	4 - 1/2"	33"	8 - 1/4"	1/3
5"	15"	3/8"	4 - 1/2"	35"	8 - 3/4"	1/3
5 - 1/4"	16"	3/8"	4 - 1/2"	37"	9 - 1/2"	1/3
5 - 1/2"	17"	3/8"	4 - 1/2"	40"	10"	1/3
6"	18"	3/8"	4 - 1/2"	42"	10 - 1/2"	1/3
6 - 1/4"	19"	3/8"	4 - 1/2"	44"	11"	1/3
6 - 1/2"	20"	3/8"	4 - 1/2"	47"	11 - 1/2"	1/3
7"	21"	3/8"	4 - 1/2"	49"	12 - 1/4"	1/3

NOTE: WIRE FID SIZES 3" CIRC. TO 13" CIRC. ARE 1/2 SCALE - OVER 13" CIRC. ARE 1/3 SCALE. THIS IS NECESSARY IN ORDER TO KEEP WIRE FIDS TO A PRACTICAL LENGTH.

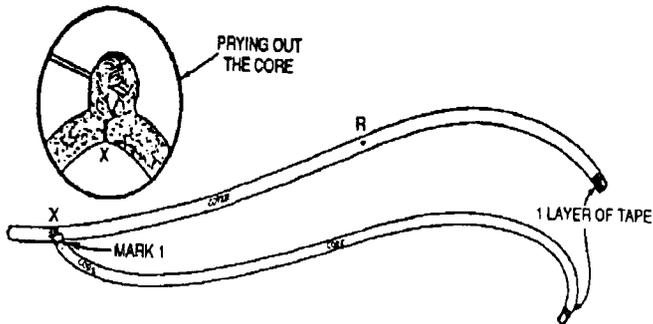
Table I. Braided Line Fid Specifications

STEP 1.

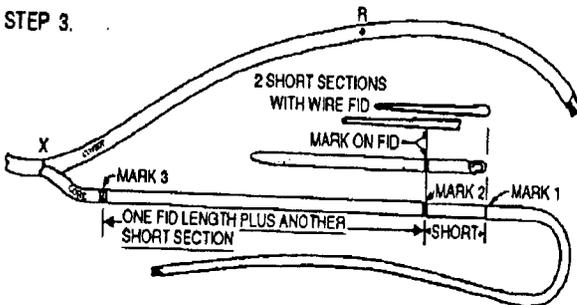


ON ROPE OVER 1" DIAMETER, IT IS OFTEN EASIER TO PASS A SPIKE OR SIMILAR OBJECT THROUGH THE ROPE INSTEAD OF TYING A SLIPKNOT.

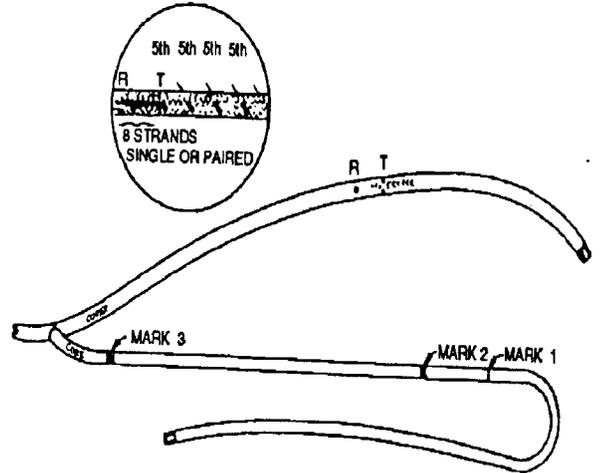
STEP 2.



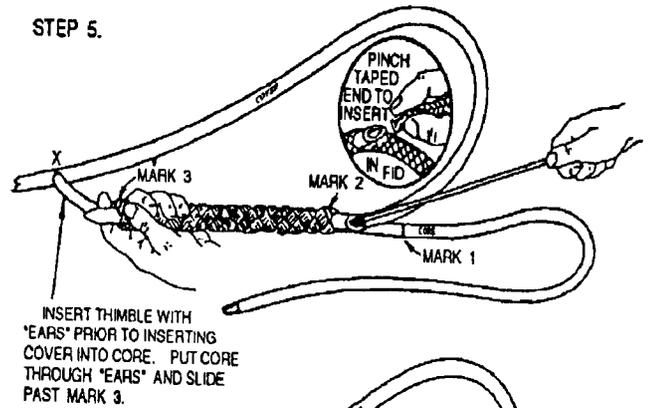
STEP 3.



STEP 4.



STEP 5.



STEP 6.

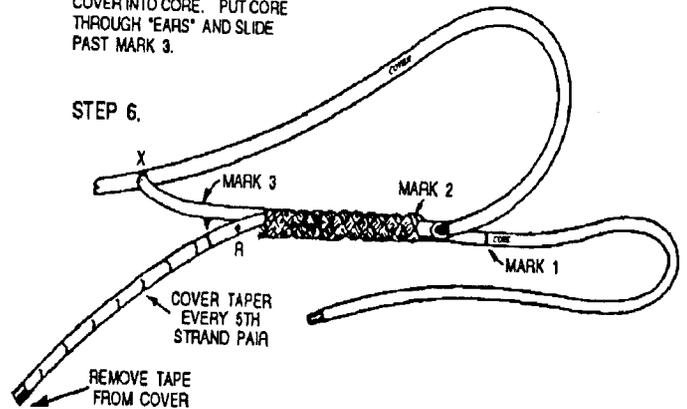


Figure 2. Completing the Double-Braided Eye Splice
Sheet 1 of 2

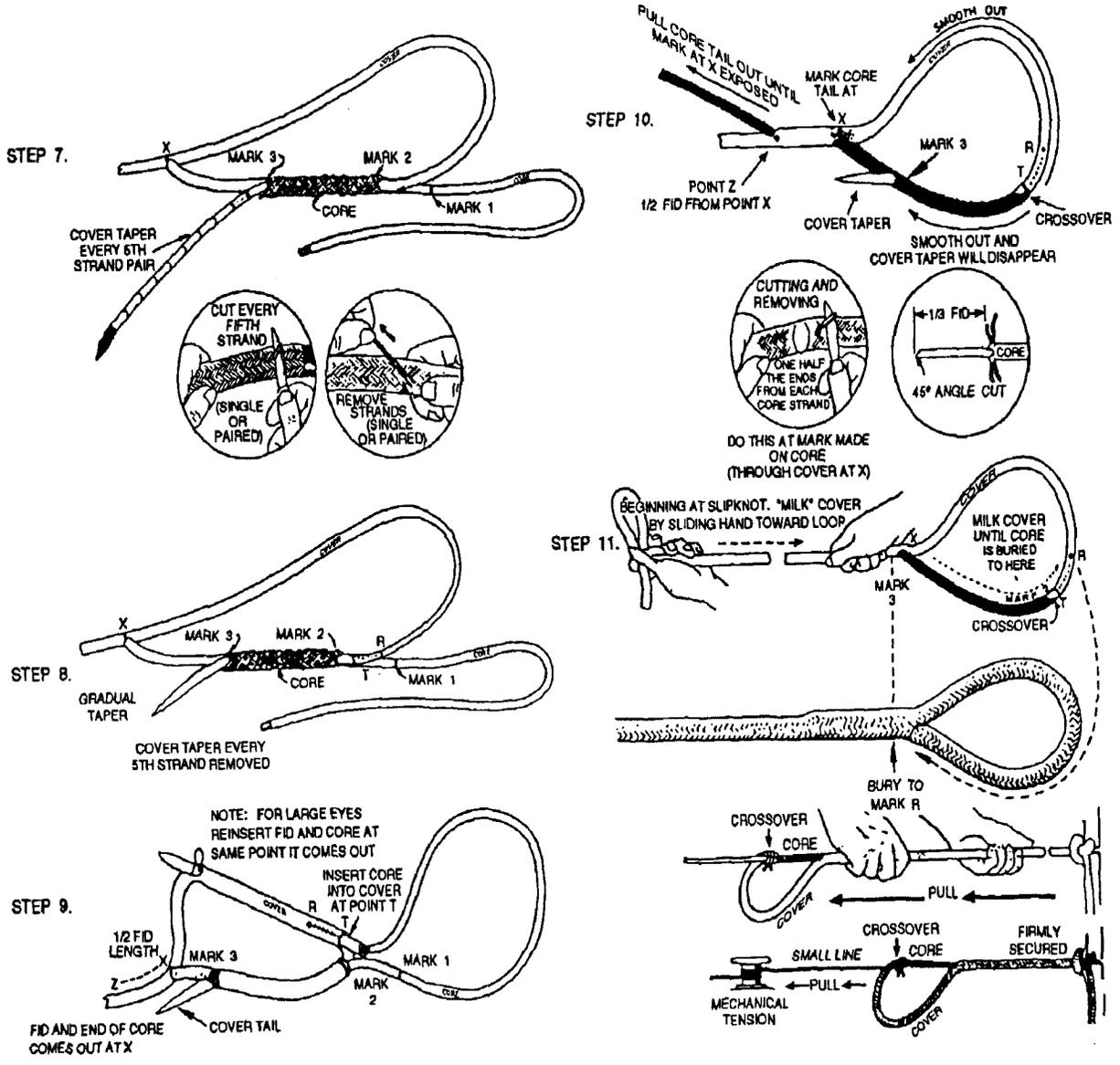


Figure 2. Completing the Double-Braided Eye Splice
Sheet 2 of 2

3-4.3: Again slide the cover toward the slipknot to expose more core. From mark 1, measure along the core toward X, a distance equal to the short section of tubular fid (two short sections with wire fid) and make two heavy marks. (This is mark 2.) From mark 2, measure in the same direction one fid length plus another short section of the fid (with wire fid, double measurements) and make three heavy marks. (This is mark 3, step 3.)

3-4.4: The nature of the cover braid—it is made up of strands, either one or two (pair). Notice that half of the pairs revolve to the right around the rope and half revolve to the left. Beginning at R and working toward the taped end of the cover, count eight consecutive strands (single or pairs) that revolve to the right (or left). Mark the eighth strand. (This is mark T, step 4.) Make mark T go completely around the cover. Starting at T and working around the taped cover end, count and mark every fifth right and left strand (single or paired) until you have progressed down to the end of the taped cover.

NOTE

When inserting the fid in at mark 2 and out at mark 3,
ensure no strands in the core are split.

3-4.5: Insert the fid into the core at mark 2. Slide it through and out at mark 3. See Figure 2, step 5. Add extra tape to the tapered cover end, then jam it tightly into the hollow end of the fid (see insert). Hold the core lightly at mark 3; place the pusher point into the taped end; push the fid and cover through from mark 2 and out at mark 3. With the wire fid, first press prongs into the cover, then tape over. Then after the fid is on, milk the braid over the fid while pulling the fid through from mark 2 to mark 3. Take the fid off the cover. Continue pulling the cover tail through the core until mark R on the cover emerges from mark 3 (see step 6). Then remove the fid and the tape from the end of the taped cover.

3-4.6: Make sure the tape is removed from the cover end. Now taper the cover by starting with the last marked pair of cover strands toward the end; cut and pull them out completely (see step 7). Cut and remove the next marked strands and continue with each right and left marked strand until you reach point T; do NOT cut beyond this point. The result should be a gradual taper ending in a point. Very carefully pull the cover back through the core until point T emerges from mark 2 of the core (see step 8). From point X on the cover, measure approximately one-half of fid length toward the slipknot on the line and mark this point Z (see step 9).

3-4.7: You are now ready to put the core back into the cover from T to Z. Insert your fid at T (step 9); jam the taped core end tightly into the end of the fid. With the pusher, push the fid and core through the cover “tunnel” past point X, to and through the cover at point Z. When using the wire fid, attach the fid to the taped core. After the fid is on, milk the braid over the fid while pulling it through from T to Z. When pushing the fid past X to Z, make sure the fid does not catch any internal core strands.

NOTE

Depending on eye size, the fid may not be long enough to reach from T to Z in one pass. If not, bring the fid out through the cover, pull the core through, and reinsert the fid into the same hole it came out of. Do this as many times as needed to reach point Z.

3-4.8: Alternately pull on the core tail at Z, then pull on the tapered cover at mark 3. The crossover should be tightened until the crossover is equal to the diameter of the line. Remove all the slack from the eye area by smoothing the cover from point T toward X. Mark the core tail through the cover at point X (see step 10). Then pull the core tail out until the mark just made on the core is exposed at Z. The diameter of the core must now be reduced by cutting and removing one strand of each group around the complete circumference. Measure one-third of fid length from the first reduction cut toward the end and make a mark. Cut off the remaining tail at this point. Make the cut on a 45 degree angle to prevent a blunt end (see the inset of step 10). With one hand, hold the crossover part (mark T). Smooth the cover section of the eye out firmly and completely from the crossover toward mark X. The reduced-volume core tail should disappear into the cover at Z. Smooth out the core section from the crossover toward mark 3, and the cover taper will disappear into the core. Hold the rope at the slipknot and with your other hand, milk the cover toward the splice, gently at first, then more firmly (see step 11). The cover will slide over mark 3, mark 2, the crossover, T, and R. (It may be necessary to occasionally smooth out the eye during milking to prevent the reduced-volume tail from catching in the throat of the splice.)

If bunching occurs at the crossover, preventing full burying, smooth the cover from T to X. Grasp the crossover at T with one hand and then firmly smooth the cover slack (female side of eye) with the other hand towards the throat (X). Repeat as necessary until bunching disappears. Continue milking until all of the cover slack between the knot and the throat of the eye has been removed.

NOTE

Before burying the cover under the crossover, do the following:

- Anchor the loop of the slipknot to a stationary object before starting to bury the cover. You can then use both hands and the weight of your body to more easily bury the cover over the core and crossover.
- Holding the crossover tightly, milk all excess cover from R to X.

Flex and loosen the line at the crossover point during the final burying process. Hammering the cover at point X with a rubber or rawhide mallet will help loosen the strands.

With larger ropes, it is helpful to anchor the slipknot securely, attach a small line to the braided core at the crossover, use a rolling hitch and mechanically apply tension with either a block and tackle, capstan, come-a-long, or power winch. Tension will reduce the diameter of the core and crossover for easier burying.

CAUTION

Do not apply more tension than the safe working load of the line.

3-4.9: Refer to the appropriate sling assembly drawing for views and details outlining the proper application of seizing.

4. REFERENCES

Boatswain's Mate Manual SN0502-LP-213-4700 (August 1996 Edition, Naval Education and Training Manual, NAVEDRA 12100)

Samson Ocean Systems Inc. Splicing Manual, 1983 Edition (Red Book).