FM 5-125
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Change 1

Headquarters
Department of the Army
Washington, DC, 23 February 2001

Rigging Techniques, Procedures, and Applications

1. Change FM 5-125, 3 October 1995, as follows:

Remove Old Pages	Insert New Pages
i through iv	i through iv
vii and viii	vii and viii
1-15 through 1-20	1-15 through 1-21
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2. A bar (▌) marks new or changed material.

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Washington, DC, 3 October 1995

Rigging Techniques, Procedures, and Applications

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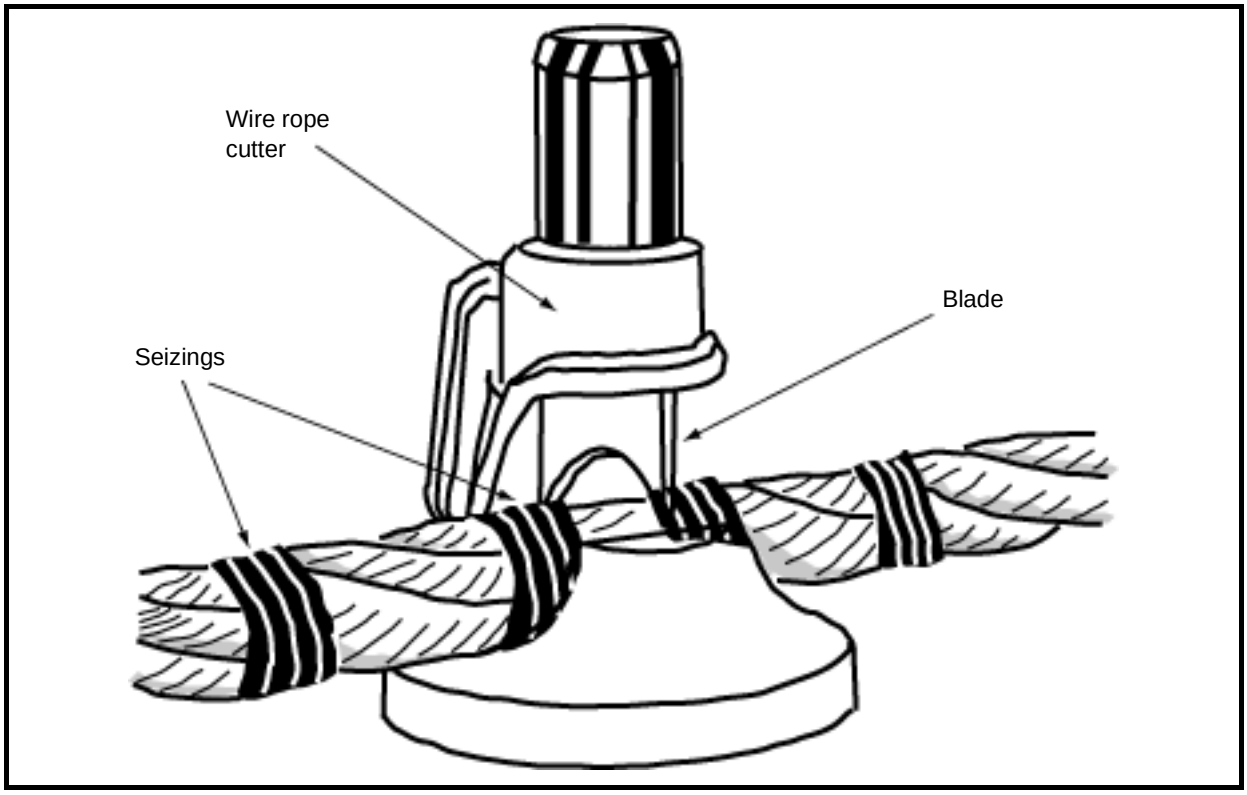

Figure 1-11. Wire-rope cutter

the two central seizings. Push the blade down against the wire rope and strike the top of the blade sharply with a sledge hammer several times. Use the bolt clippers on wire rope of fairly small diameter; however, use an oxyacetylene torch on wire rope of any diameter. The hacksaw and cold chisel are slower methods of cutting.

DRUMS AND SHEAVES

The size and location of the sheaves and drums about which wire rope operates and the speed with which the rope passes over the sheaves have a definite effect on the rope's strength and service life.

Size

Each time wire rope is bent, the individual strands must move with respect to each other in addition to bending. Keep this bending and moving of wires to a minimum to reduce wear. If the sheave or drum diameter is sufficiently large, the loss of strength due to bending wire rope around it will be about 5 or 6 percent. In all cases, keep the speed of the rope over the sheaves or drum as slow as is consistent with efficient work to decrease wear on the rope. It is impossible to give an absolute minimum size for each sheave or drum, since a number of factors enter into this decision. However, *Table 1-4, page 1-16*, shows the minimum recommended sheave and drum diameters for several wire-rope sizes. The sheave diameter always should be as large as possible and, except for very flexible rope, never less than 20 times the wire-rope diameter. This figure has been adopted widely.

Table 1-4. Minimum tread diameter of drums and sheaves

Rope Diameter (inches)	Minimum Tread Diameter for Given Rope Construction* (inches)			
	6 x 7	6 x 19	6 x 37	8 x 19
1/4	10 1/2	8 1/2		6 1/2
3/8	15 3/4	12 3/4	6 3/4	9 3/4
1/2	21	17	9	13
5/8	26 1/4	21 1/4	11 1/4	16 1/4
3/4	31 1/2	25 1/2	13 1/2	19 1/2
7/8	36 3/4	29 3/4	15 3/4	22 3/4
1	42	34	18	26
1 1/8	47 1/4	38 1/4	20 1/4	29 1/4
1 1/4	52 1/2	42 1/2	22 1/2	32 1/2
1 1/2	63	51	27	39

*Rope construction is strands and wires per strand.

Location

You should reeve the drums, sheaves, and blocks used with wire rope and place them in a manner to avoid reverse bends whenever possible (see *Figure 1-12*). A reverse bend occurs when rope bends in one direction around one block, drum, or sheave and bends in the opposite direction around the next. This causes the individual wires and strands to do an unnecessary amount of shifting, which increases wear. Where you must use a reverse bend, the block, sheave, or drum causing the reversal should be of larger diameter than ordinarily used. Space the bend as far apart as possible so there will be more time allowed between the bending motions.

Winding

Do not overlap wire-rope turns when winding them on the drum of a winch; wrap them in smooth layers. Overlapping results in binding, causing snatches on the line when the rope is unwound. To produce smooth layers, start the rope against one flange of the drum and keep tension on the line while winding. Start the rope against the right or left flange as necessary to match the direction of winding, so that when it is rewound on the drum, the rope will curve in the same manner as when it left the reel (see *Figure 1-13).* A convenient method for determining the proper flange of the drum for starting the rope is known as the hand rule (see *Figure 1-14, page 1-18*). The extended index finger in this figure points at the on-winding rope. The turns of the rope are wound on the drum close together to prevent the possibility of crushing and abrasion of the rope while it is winding and to prevent binding or snatching when it is unwound. If necessary, use a wood stick to force the

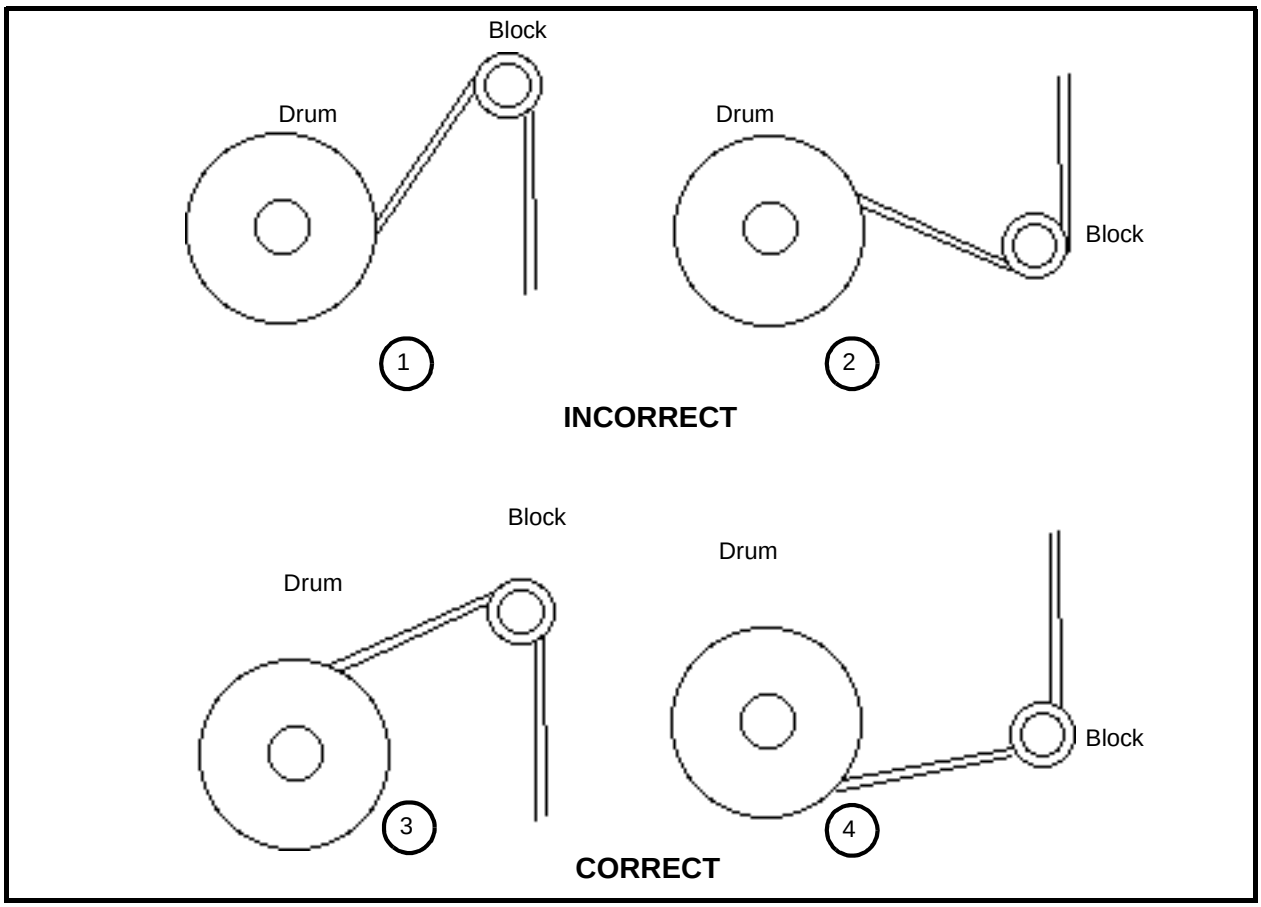

Figure 1-12. Avoiding reverse bends in wire rope

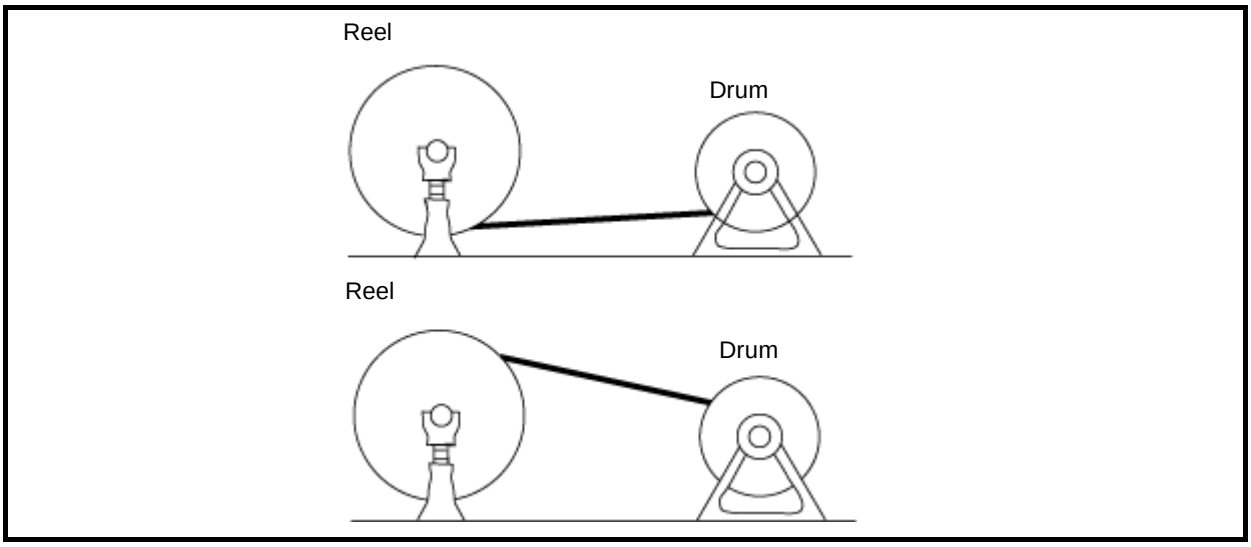

Figure 1-13. Spooling wire rope from reel to drum

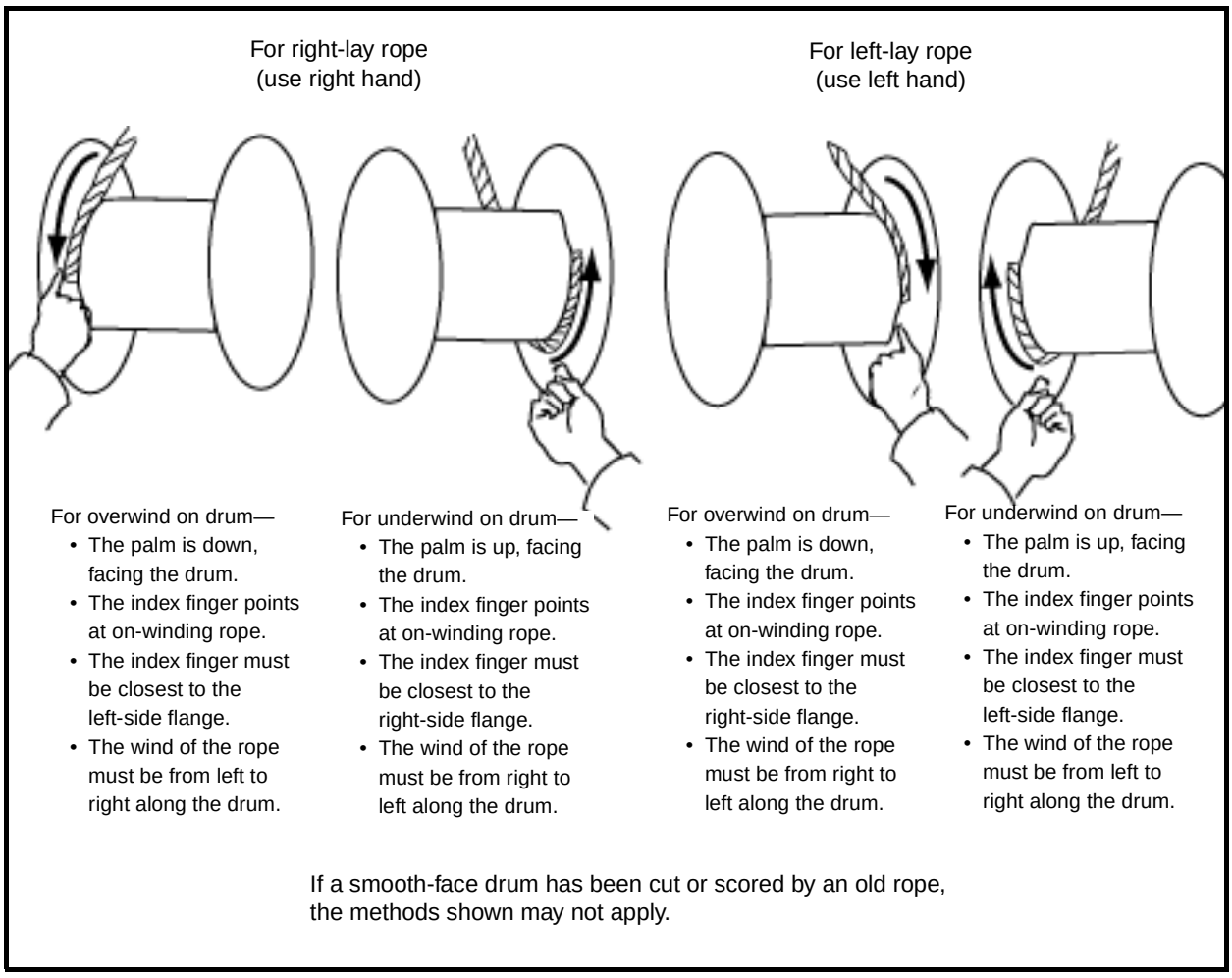

Figure 1-14. Determining starting flange of wire rope

turns closer together. Striking the wire with a hammer or other metal object damages the individual wires in the rope. If possible,wind only a single layer of wire rope on the drum. Where it is necessary to wind additional layers, wind them so as to eliminate the binding. Wind the second layer of turns over the first layer by placing the wire in the grooves formed by the first layer; however, cross each turn of the rope in the second layer over two turns of the first layer (see *Figure 1-15*). Wind the third layer in the grooves of the second layer; however, each turn of the rope will cross over two turns of the second layer.

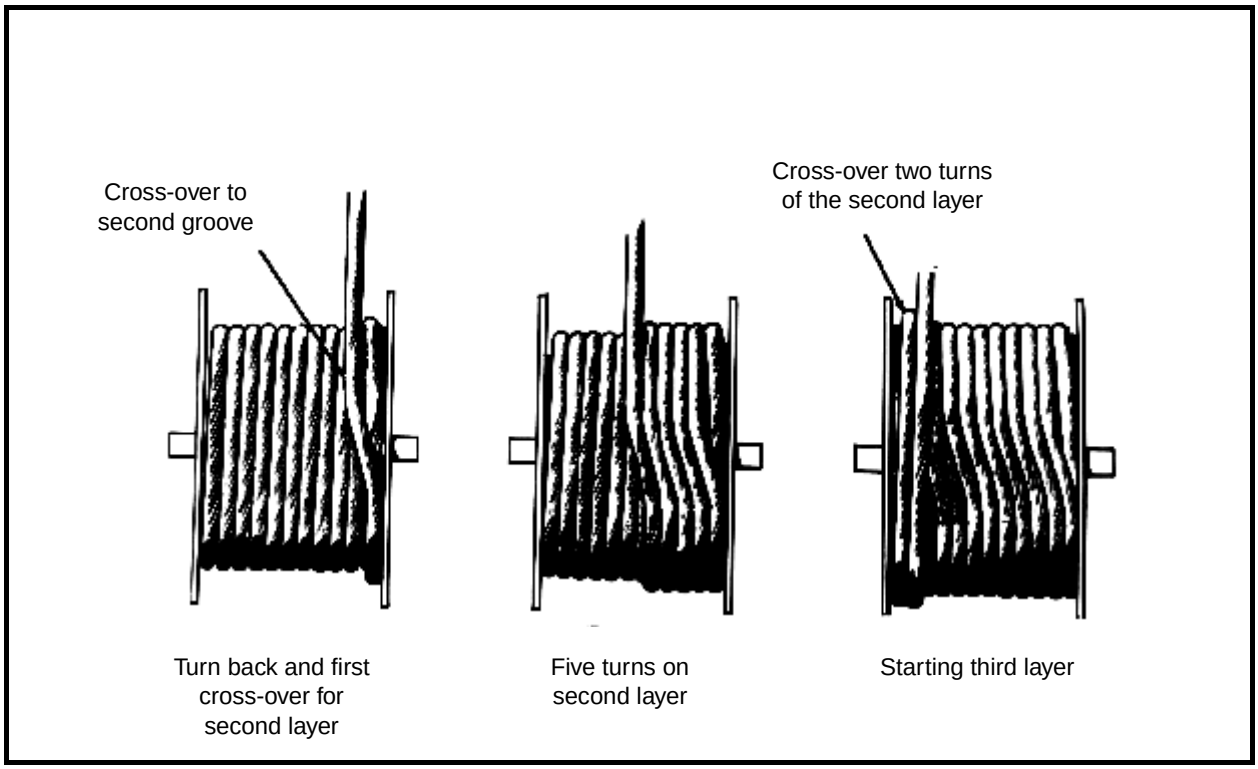

Figure 1-15. Winding wire-rope layers on a drum

INSPECTION OF WIRE ROPE

Inspect wire rope frequently. Replace frayed, kinked, worn, or corroded rope. The frequency of inspection is determined by the amount of use. A rope that is used 1 or 2 hours a week requires less frequent inspection than one that is used 24 hours a day.

PROCEDURES

Carefully inspect the weak points in rope and the points where the greatest stress occurs. Worn spots will show up as shiny flattened spots on the wires.

Inspect broken wires to determine whether it is a single broken wire or several wires. Rope is unsafe if—

- Individual wires are broken next to one another, causing unequal load distribution at this point.
- Replace the wire rope when 2.5 percent of the total rope wires are broken in the length of one lay, which is the length along the rope that a strand makes one complete spiral around the rope core. See Figure 1-16.

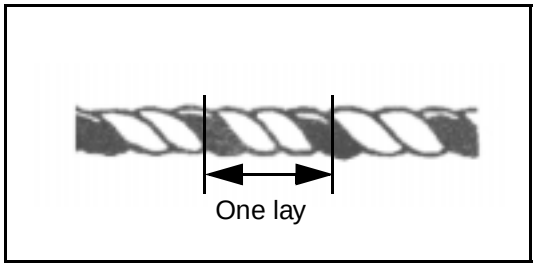

Figure 1-16. Lay length

- Replace the wire rope when 1.25 percent of the total rope wires are broken in one strand in one lay.
- Replace wire rope with 200 or more wires (6 x 37 class) when the surface wires show flat wear spots equal in width to 80 percent of the diameter of the wires. On wire rope with larger and fewer total wires (6 x 7, 7 x 7, 7 x 19), replace it when the flat wear spot width is 50 percent of the wire diameter.
- Replace the wire if it is kinked or if there is evidence of a popped core or broken wire strands protruding from the core strand. See Figure 1-17.
- Replace the wire rope if there is evidence of an electrical arc strike (or other thermal damage) or crushing damage.
- Replace the wire rope if there is evidence of "birdcage" damage due to shock unloading. See Figure 1-17.

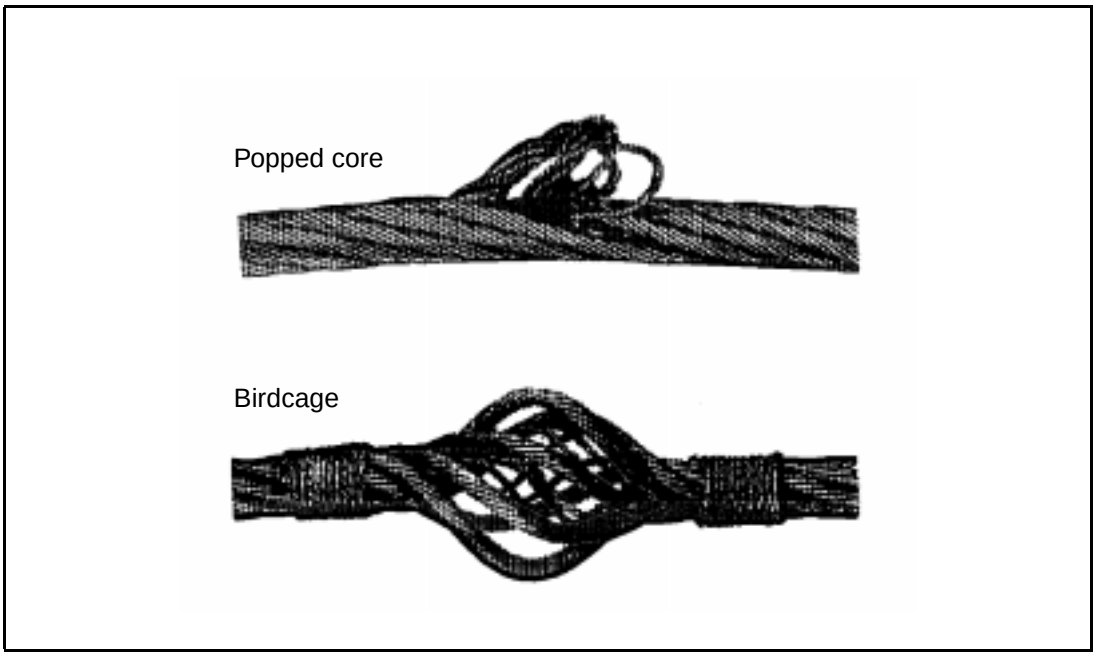

Figure 1-17. Unserviceable wire rope

CAUSES OF FAILURE

Wire rope failure is commonly caused by—

- Sizing, constructing, or grading it incorrectly.
- Allowing it to drag over obstacles.
- Lubricating it improperly.
- Operating it over drums and sheaves of inadequate size.
- Overwinding or crosswinding it on drums.
- Operating it over drums and sheaves that are out of alignment.
- Permitting it to jump sheaves.
- Subjecting it to moisture or acid fumes.
- Permitting it to untwist.
- Kinking.

after applying the working load and at frequent intervals thereafter. Retightening is necessary to compensate for the decrease in rope diameter that occurs when the strands adjust to the lengthwise strain caused by the load. Position the clips so that they are immediately accessible for inspection and maintenance.

CLAMPS

A wire clamp can be used with or without a thimble to make an eye in wire rope (see *Figure 2-51).* Ordinarily, use a clamp to make an eye without a thimble. It has about 90 percent of the strength of the rope. Tighten the two end collars with wrenches to force the clamp to a good snug fit. This crushes the pieces of rope firmly against each other.

Figure 2-51. Wire-rope clamps

WEDGE SOCKET

Use a wedge-socket end fitting when it is necessary to change the fitting at frequent intervals (see *Figure 2-52, page 2-38).* The efficiency is about two-thirds of the strength of the rope. It is made in two parts. The socket itself has a tapered opening for the wire rope and a small wedge to go into this tapered socket. The loop of wire rope must be inserted in the wedge socket so that the standing part of the wire rope will form a nearly direct line to the clevis pin of the fitting. A properly installed wedge-socket connection will tighten when a strain is placed on the wire rope.

BASKET-SOCKET END FITTING

The basket-socket end fittings include closed sockets, open sockets, and bridge sockets (see Figure 2-53, page 2-38). This socket is ordinarily attached to the end of the rope with molten zinc and is a permanent end rifting. If this fitting is properly made up, it is as strong as the rope itself. In all cases, the wire rope should lead from the socket in line with the axis of the socket.

WARNING

Never use babbitt, lead, or dry method to attach a basket socket end fitting.

POURED METHOD

The poured basket socket is the most satisfactory method in use (see *Figure 2-54, page 2-39*). If the socketing is properly done, a wire rope, when tested to destruction, will break before it will pull out from the socket.

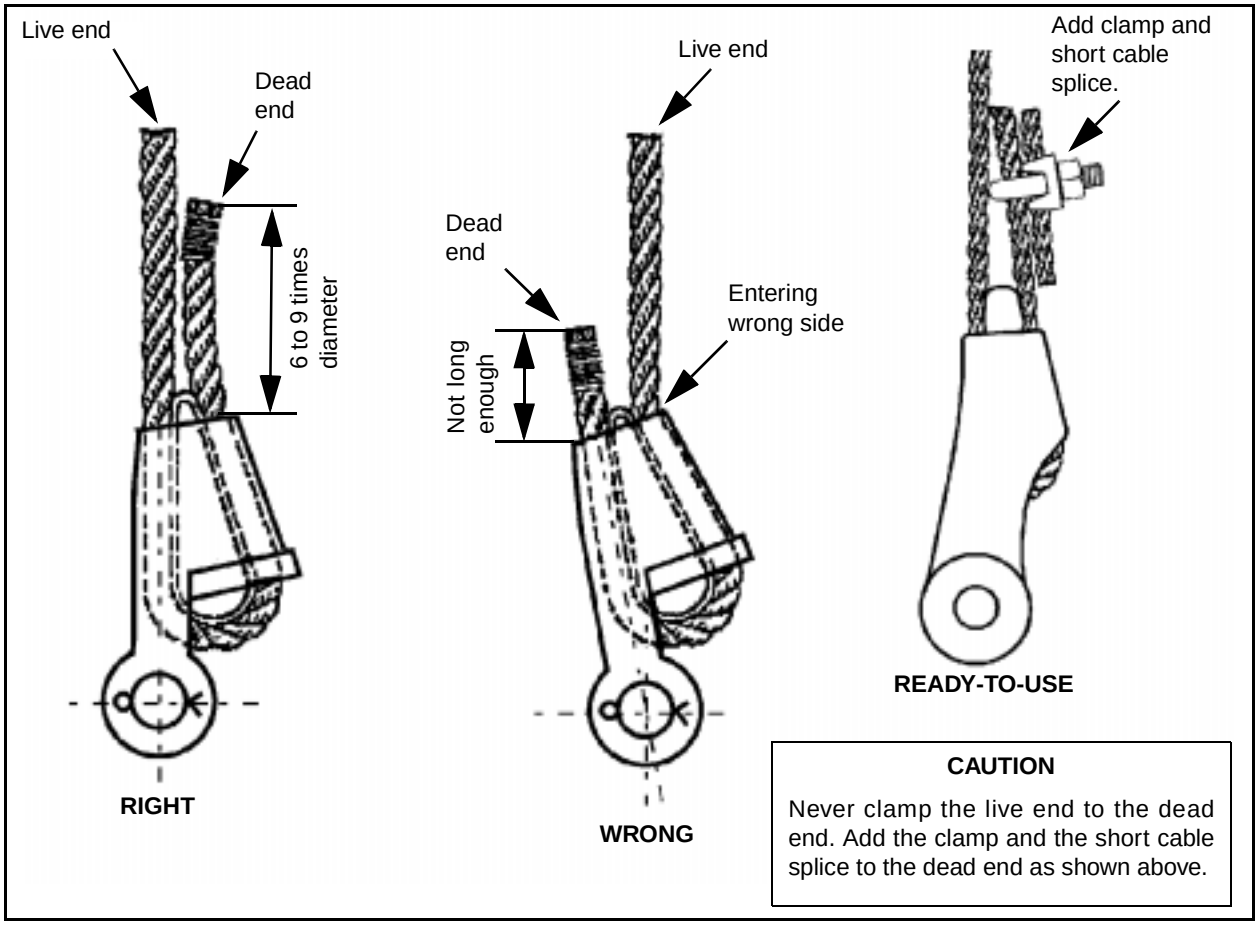

Figure 2-52. Wedge socket

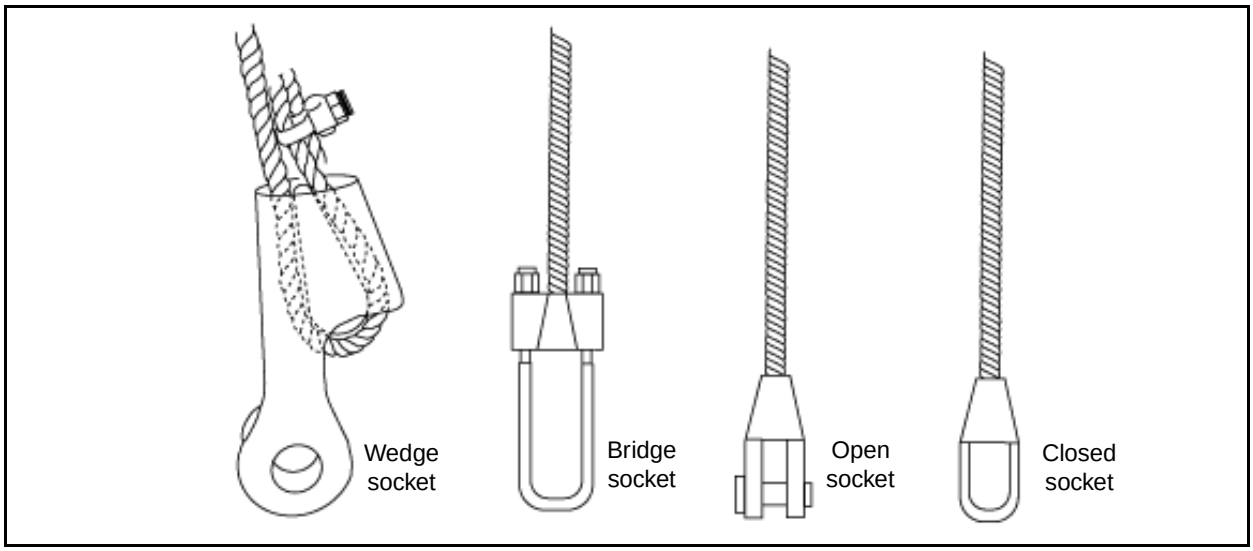

Figure 2-53. Basket-socket end fittings

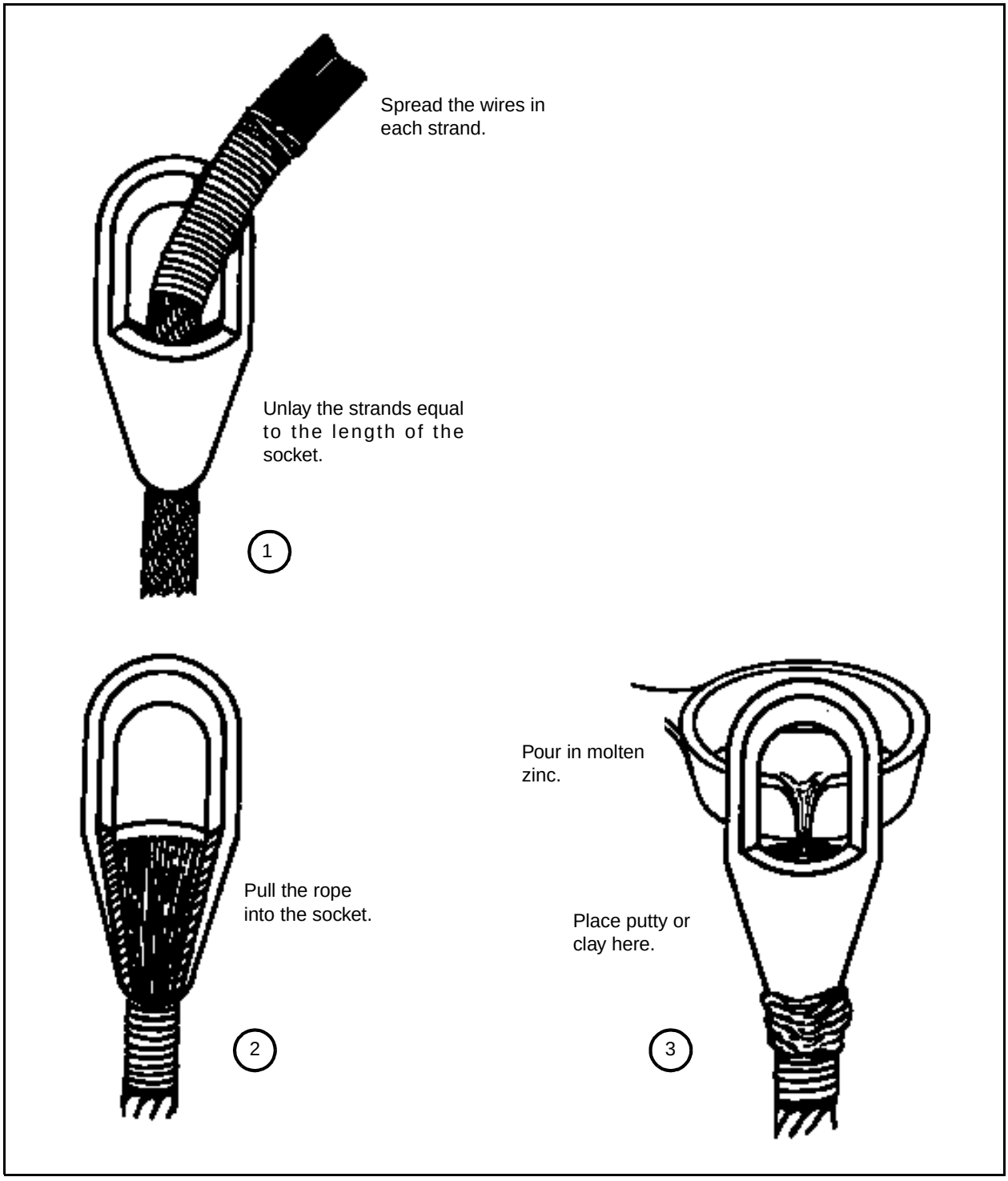

Figure 2-54. Attaching basket sockets by pouring

STANCHIONS

The standard pipe stanchion is made up of a 1-inch diameter pipe (see *Figure 2-56*). Each stanchion is 40 inches long. Two 3/4-inch wire-rope clips are fastened through holes in the pipe with the centers of the clips 36 inches apart. Use this stanchion, without modifying it, for a suspended walkway that uses two wire ropes on each side. However, for handlines, remove or leave off the lower wire-rope clip. For more information on types and uses of stanchions, see *TM 5-270*.