

NAVSHIPS 900171

ELECTRONIC INSTALLATION  
PRACTICES MANUAL

CHAPTER 9  
CABLING

BUREAU OF SHIPS

NAVY DEPARTMENT

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Approved 27 June 1951  
Change 1 29 October 1951  
Change 2 23 May 1952

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ELECTRONIC INSTALLATION  
PRACTICES MANUAL

This manual is intended for the use of the electronic installation worker. It may be used as a reference book on installation practices or in training beginners in Naval electronic installation work.

Subject matter in this text is intended as supplementary to, but not superseding existing and applicable specifications.

Appreciation is extended to the various Naval Shipyards, Commercial Firms, Service Representatives and Manufacturers who were contacted and without whose cooperation this manual would not be possible.

## SECTION 7

### LACING AND BINDING

#### 1. INTRODUCTION.

Good workmanship shows up in lacing and binding done with the skill and neatness that prove pride in workmanship. This is one place where you can't count on a coat of paint to hide a poor job.

#### 2. PURPOSE OF LACING AND BINDING.

Conductors within an equipment, panel box, or junction box need to be kept in place; otherwise the wiring makes a maze that is not only untidy, but is hard to trace and confusing when changes or repairs are needed. When the conductors are properly laced, they support each other and make a single, neat cable.

#### 3. METHODS.

When a cable is laced, the individual conductors should be laid straight and parallel to each other; they should not be twisted together. Straight cabling makes a smooth job in which each conductor can be traced; twisted wiring makes a lumpy, rough-looking cable in which wires cannot be traced.

#### 4. LACING MATERIALS.

A waxed cord, called lacing cord, is used for binding the conductors. The cord comes in two sizes; #6 is used for small or medium sized cables, #8 is used for larger cables.

A shuttle on which the lacing cord can be wound makes it easier to handle the cord. The construction of such a shuttle is shown in Figure 9-58. It may be made of aluminum, brass, fiber, or plastic; steel is not recommended because of rusting.

#### 5. LENGTH OF CORD.

The amount of cord needed to lace a cable is about 2 1/2 times the length of the cable run, if single cord is to be used, or about 5 times if double cord is to be used.

#### 6. SPARES.

Always serve spares separately and secure to actives with a few telephone hitches to avoid complete re-lacing in the event spares are utilized.

#### 7. STARTING.

If the shuttle is to be used, wind on enough cord to fill it. Cord for double lacing should be spooled off and doubled before winding into the shuttle; start the two loose ends onto the shuttle first so as to leave a loop at the starting end.

In starting a lace, a telephone hitch, Figure 9-59, square knot, Figure 9-60 or lock stitch, Figure 9-61 may be used. Note that when the telephone hitch is used, at least two hitches should be made at the start, and when the lock stitch is used, wrap 10 to 12 turns tightly around cable.

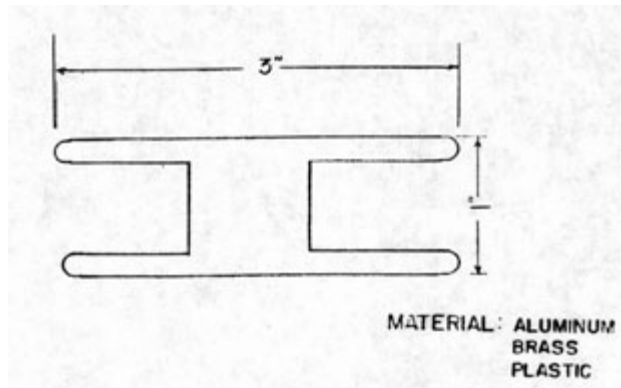


FIGURE 9-58  
LACING SHUTTLE

9-99

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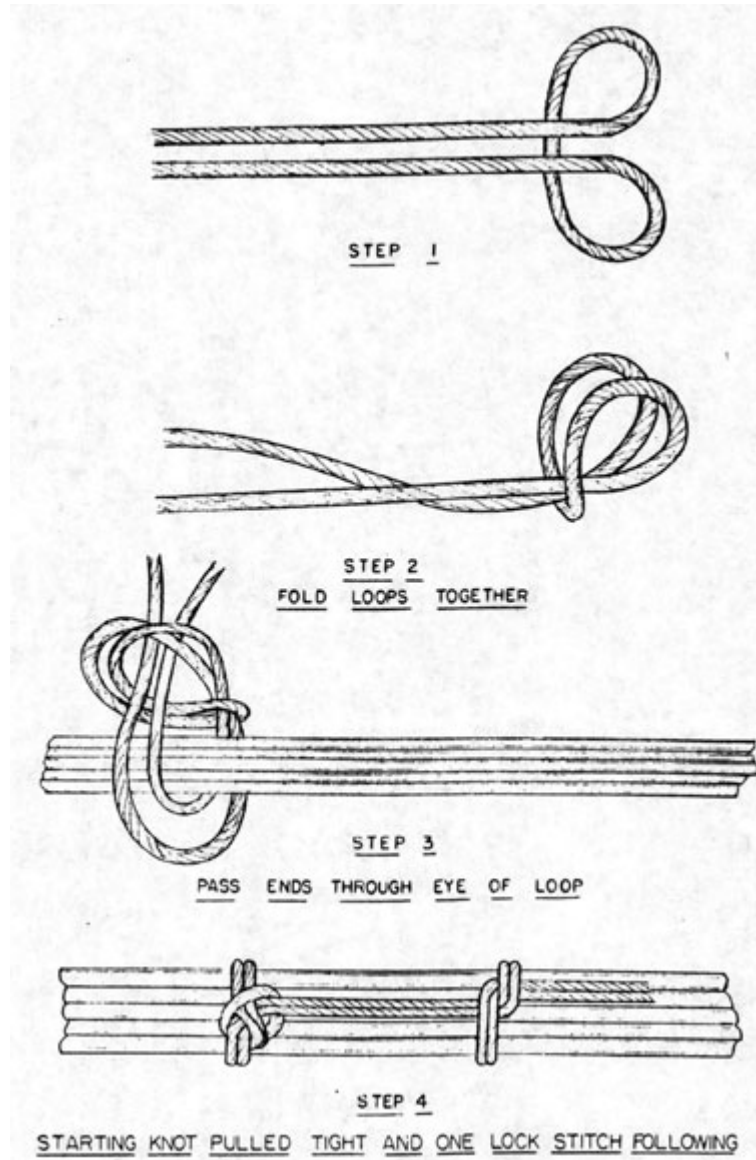


FIGURE 9-59  
TELEPHONE HITCH

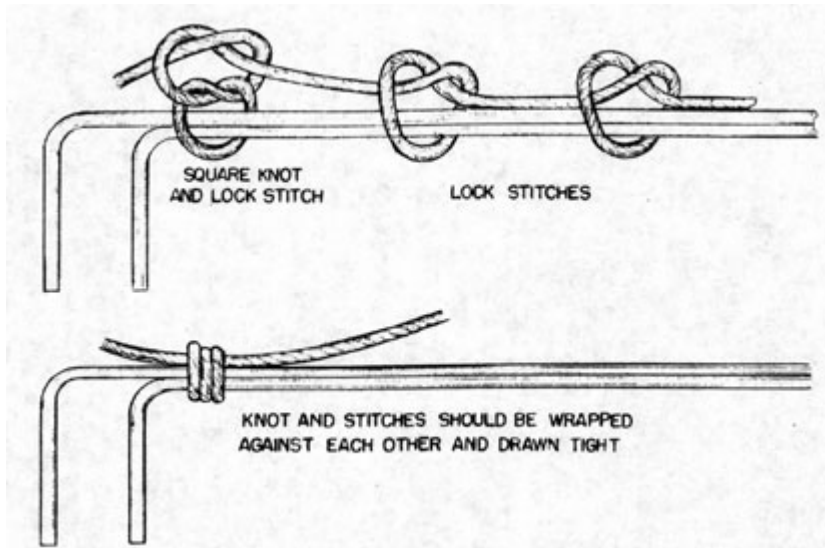


FIGURE 9-60  
STARTING THE LACE WITH A SQUARE KNOT AND TWO LOCK STITCHES

9-101

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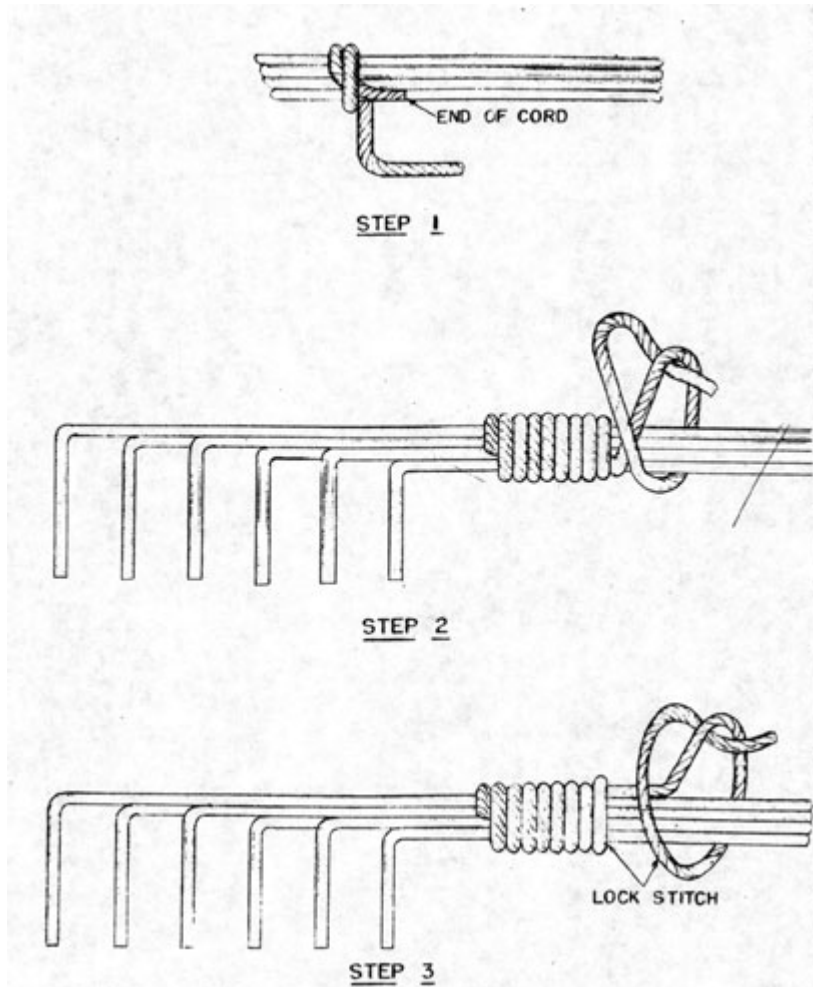


FIGURE 9-61  
STARTING A LACE WITH A LOCK STITCH

## 8. LACING.

The stitch used in keeping the conductors together under pressure is the lock stitch. Between lock stitches, a running stitch Figure 9-62 is used at approximately 1/2 inch intervals. The running stitch is kept parallel to the conductors in the cable and should not be wound around it. The lock stitch keeps the running stitch pressed against the cable.

The details of the lock stitch are shown in Figure 9-61; the manner in which the lock stitch is made may vary, but the "over and under" form is necessary to prevent unraveling of entire cable lacing, in the event one or more stitches are cut.

## 9. BREAKOUTS.

When breakouts occur (Figure 9 -63) always double lock stitch before the breakout, then continue on for single breakouts.

When a cable divides into two or more smaller cables, wrap several turns at the dividing point; Figure 9-64, make a lock stitch and continue lacing one of the branches. The other branch may be started as a new run. When only one conductor is branched out from the main cable, it is branched at a double lock stitch without any variation in distance between lock stitches

If the branch has two or more conductors it should be laced.

## 10. BENDS.

When bends occur in cable runs, always make the bend before lacing, to keep the bend in place (Figure 9-65).

## 11. AN ALTERNATE METHOD.

Figure 9-66, consists of a series of individual bindings along the cable run. A piece of cord about 2 inches longer than that required to make 12 turns around the cable will give the correct length. Wind 10 to 12 turns tightly over a 1 inch loop. At the last turn, push the end of the lacing cord through the loop which extends under the binding. Pull loose end under binding. Repeat as often as required.

## 11. TERMINATION.

The termination of a lacing may be made by 3 or 4 lock stitches together tied down with an overhand knot or as shown in Figure 9-67.

## 12. TWO OR MORE CABLES.

When two or more multi-conductor cables enter an enclosure it is good practice to lace each cable group separately, so that tracing conductors back by color coding will not be confusing and to use cable replacement.

Where two or more groups run along together, the laced groups may be secured to each other with a few telephone hitches (Figure 9-68).

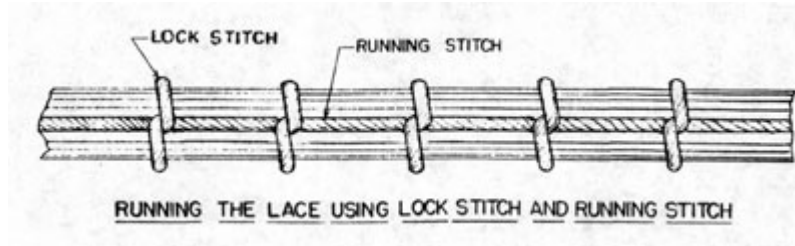


FIGURE 9-62  
RUNNING THE LACE

9-104

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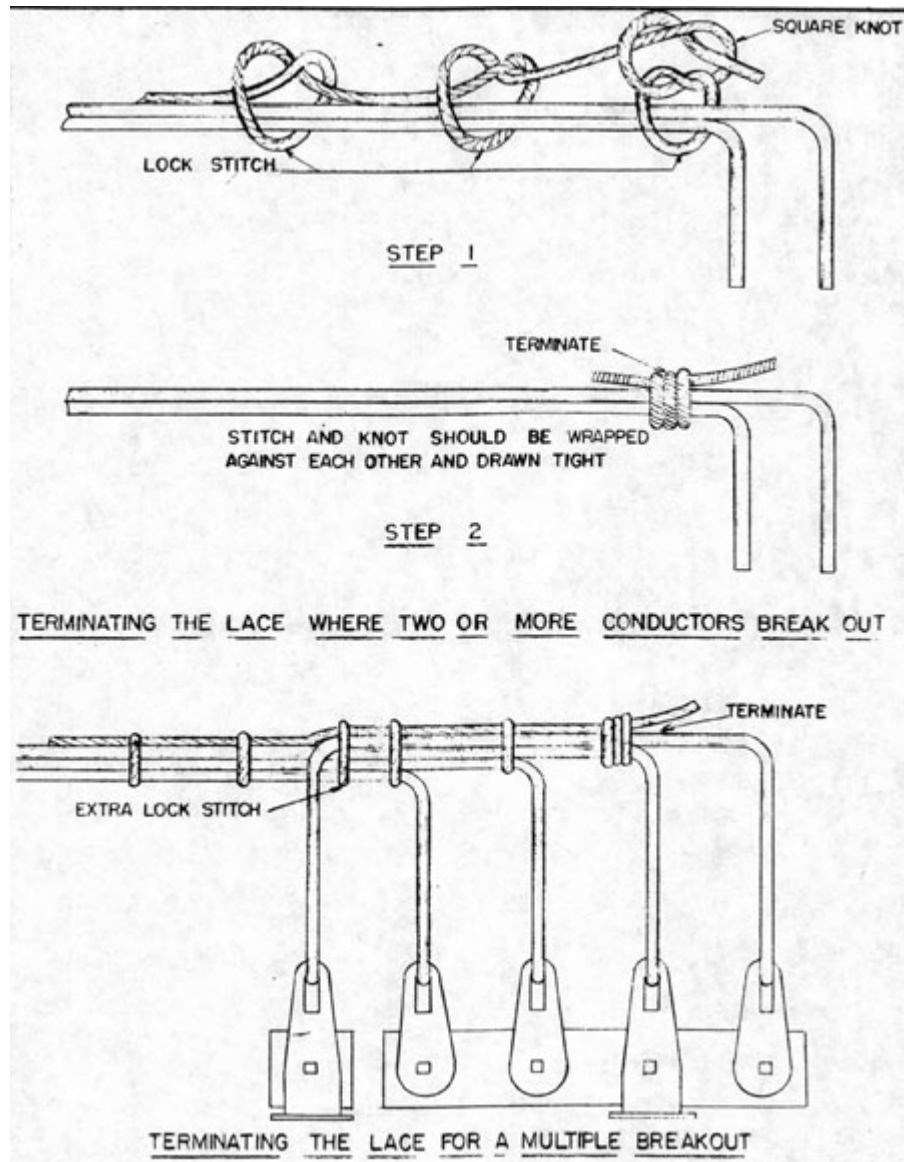


FIGURE 9-63  
METHOD OF LACING AT BREAKOUTS

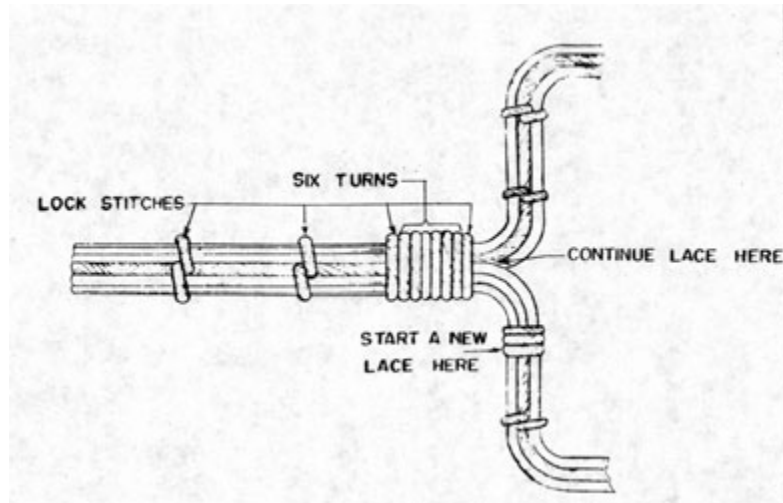


FIGURE 9-64  
METHOD OF LACING WHERE CABLES DIVIDE INTO BRANCHES

9-106

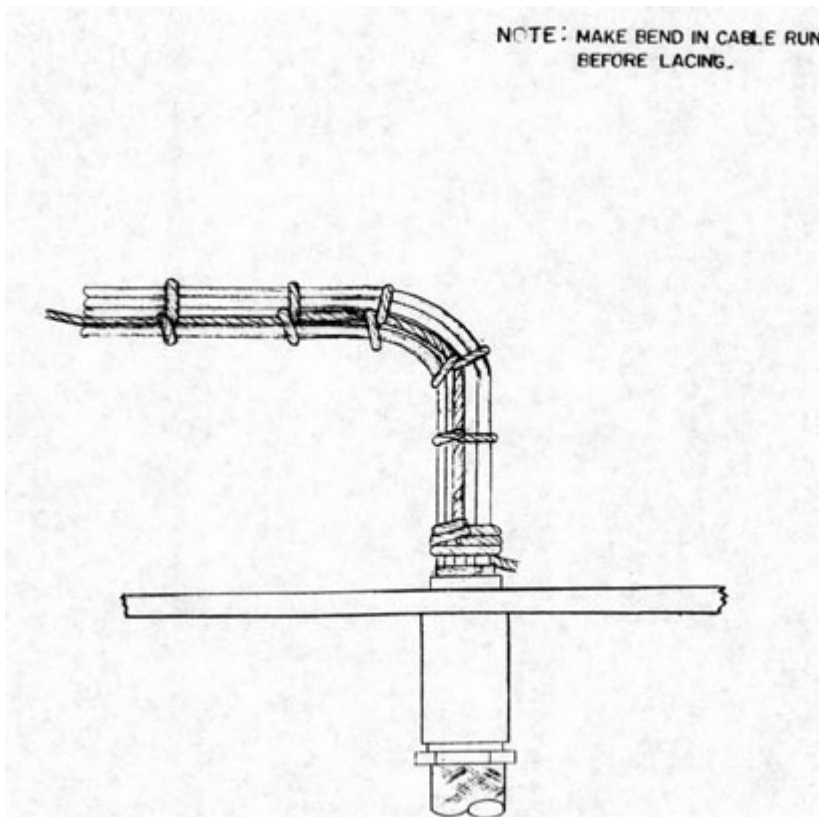


FIGURE 9-65  
METHOD OF LACING AT A BEND

9-107

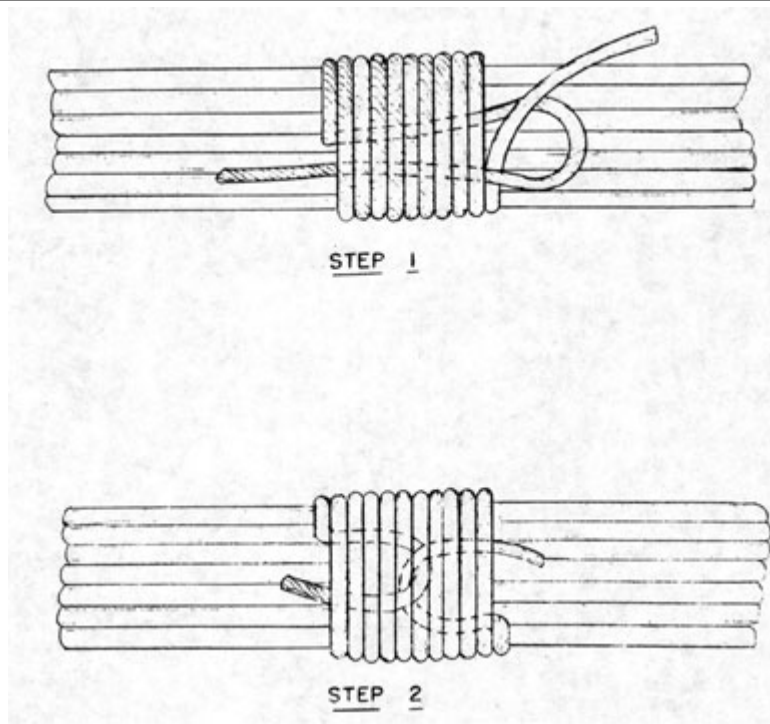


FIGURE 9-66  
METHOD OF LACING CABLES USING INDIVIDUAL BINDINGS

9-108

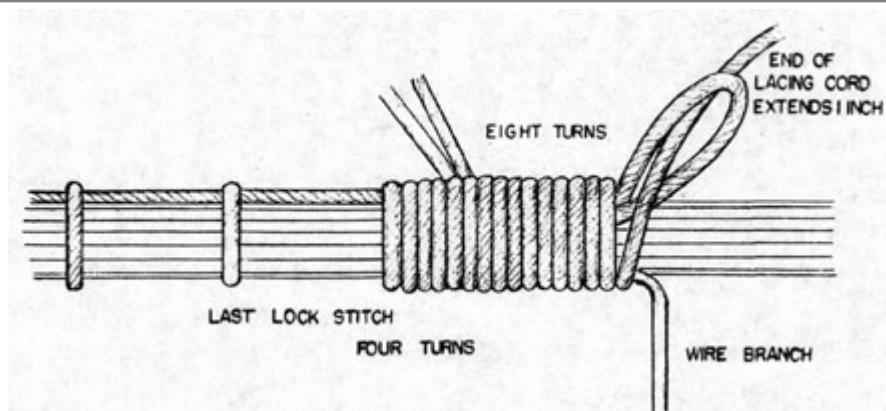


FIGURE 9-67  
METHOD OF TERMINATING THE LACE

9-109

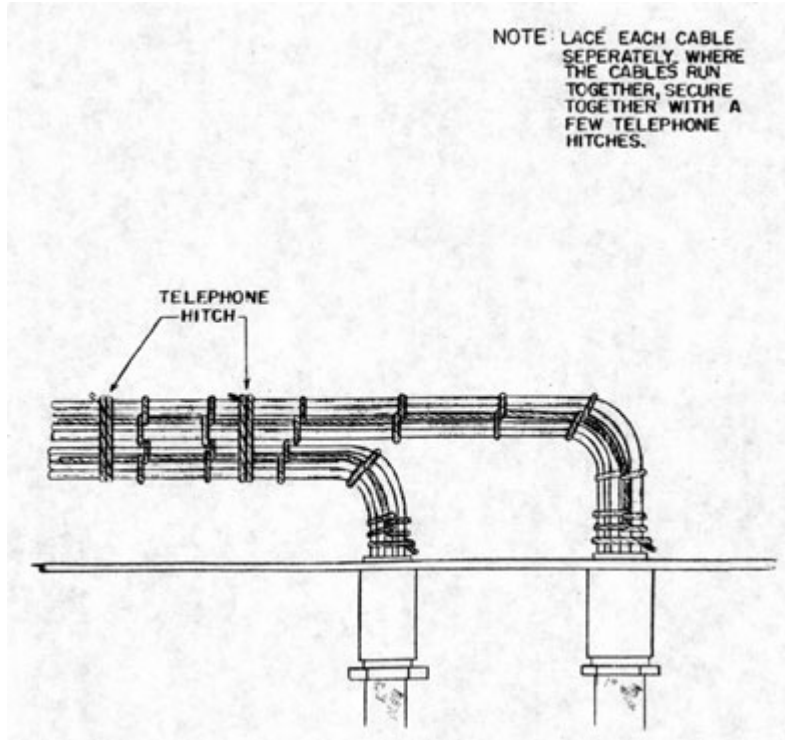


FIGURE 9-68  
METHOD OF LACING WHERE TWO OR MORE CABLES RUN TOGETHER