CABLING METHODS - CENTRAL OFFICE
SECURING SWITCHBOARD CABLE

CONTENTS PAGE

1. GENERAL

1.01 This section is reissued to present the methods and procedures recommended for use in securing switchboard cables to either rack or trough in non-electronic as well as in electronic central offices. Due to numerous additions and the rearrangement of this section, marginal arrows indicating changes have been omitted. Remove and destroy all copies of, and Addendum 1 to, Section 256-050-204, Issue 2.

1.02 For methods and procedures pertaining to running and handling switchboard cables, refer to Section 256-050-203. The information applicable to butting, stripping, and fanning switchboard cables is presented in Section 256-050-205. The methods and procedures required for connecting switchboard cable are provided in Sections 256-050-208 (wrap and solder method), 256-050-211 (solderless wrap method), and 256-152-200 (quick connect method).

2. TOOLS AND MATERIALS REQUIRED

2.01 The following listed tools and materials are recommended to secure switchboard cables to rack or trough as applicable:

(a) Needle, Chicago, Long.

(b) Needle, Chicago, Short.

(c) Needle, Lacing, Loop.

(d) Tool, 287 (Evans Needle) - Neuses 287.

(e) Tool, Tie, Cable - Panduit GS-2B.

(f) Cable Lacing Twine.

3. SECURING CABLE IN TROUGH

3.01 Trough, as referenced in this Part, is considered as cable runway with an aluminum pan over the runway slats, see Figure 1. Normally, cable trough will also have cable retaining posts and/or runway support bars. These posts and/or support bars are spaced evenly throughout the entire length of the runway. The retaining posts serve to retain the cable on the trough, eliminating extensive cable stitching. The runway support bars are used to hang the cable trough from the ceiling, auxiliary framing, or to support a "B" deck cable rack.

3.02 A permanant "Chicago" stitch must be made at the location of break-offs when the switchboard cable is run on trough. The "Chicago" stitch is to be used primarily on the group of cables that are breaking-off; however, if desired, it can also be used on the cable continuing on the trough. Normally, the cables continuing on the trough do not have to be stitched as the cable retaining posts and the runway support bars will retain the switchboard cables continuing on the trough.

Non-Electronic Office Cable Stitching

3.03 In non-electronic central offices, use "Chicago" stitching on the cable trough

prior to the break-off and on every other vertical strap as necessary so that the cables are kept in a flat drop (see Figure 2). Prior to the actual vertical break-off, perform the "Chicago" stitching on the trough in the following manner:

(a) For large diameter cables lace not more than two cables under a single stitch.

(b) For small diameter cables lace four or more cables under a single stitch as the cable diameter permits.

NOTE: Do not bunch or group the break-off cables in non-electronic central offices as bunching or grouping of these cables might cause extensive cable crossover. For this reason the use of cable ties is not suggested on the trough or break-off points.

3.04 Where switchboard cables break-off the cable trough onto vertical racks (see Figure 3), sew the cables at the first horizontal strap of the vertical rack (after the break-off) and at every other horizontal strap thereafter. On vertical racks perform the required stitching in the following manner:

(a) For large diameter cables lace only one cable under each stitch.

(b) For small diameter cables lace two or more cables under a single stitch, dependent upon cable diameter and holding capabilities.

Electronic Office Cable Stitching

3.05 In electronic central offices either "Chicago" stitching or cable ties (whichever is desired or practicable) may be used on the cable trough, prior to the break-off and on the vertical racks, if racks are used (see Figure 4). The switchboard cables used in electronic central offices may be grouped or bunched together as they do not have to break-off the trough flat or spread out as in non-electronic offices.

3.06 Where switchboard cables break-off the cable trough onto vertical racks or into equipment, stitch or cable tie the cables in a group at the top strap of the appropriate vertical frame or channel. Band or cable tie the cable groups approximately every six to 12 inches down the rest of the vertical channel or drop (see Figure 5).

NOTE: After butting the electronic central office switchboard cables, cable tie or band the cables prior to each vertical break-off as shown in Figure 5.

4. SECURING CABLE ON RACK

4.01 Rack, as referenced in this Part, is considered as cable runway equipped with cross slats only, without an aluminum pan and possibly without cable retaining posts (see Figure 6).

4.02 When cable rack is used in either electronic or non-electronic offices, secure the switchboard cable to the rack with cable lacing twine at every other slat on the horizontal cable runs. This will eliminate cable sag. On cable bends, secure the cable to one slat before and one slat after a cable bend. Generally, stitching with cable lacing twine holds the cables more securely and presents a neater appearance on the horizontal racks in both types of central offices.

4.03 Additional cable lacing or stitching must be used wherever deemed practical to avoid cable sag or strain.

4.04 For cable break-offs, employ the same lacing or cable tying methods used with cable trough. Refer to Paragraphs 3.03, 3.04, 3.05, and 3.06.

5. CABLE TIES AND CABLE STITCHING METHODS

Cable Tie Methods

5.01 The description and methods of applying cable ties to cable is given in Section 075-170-100.

Cable Stitching Methods

5.02 The methods of tying the "Chicago" stitch around cables is shown in Figure 7. For securing the cables to cable rack slats, the cable should be laced or stitched using the following procedures:

(1) Cut suitable lengths of lacing twine.

Use double strand twine long enough to lace the cables in the particular section. For large cables, lace two under a stitch. For smaller cables, lace four or more under a stitch as the size of the cable permits.

(2) Place starting stitches on the cable slats where required (Figure 8).

(3) Lace the cables as shown in Figure 9 and 10.

NOTE: In lacing cable, do not pull the twine tight enough to damage the cable sheath.

(4) Dead end cable stitches as shown in Figure 11.

(5) When necessary, splice the lacing twine as shown in Figures 12, 13, and 14.

6. PRECAUTIONS

Cable Radius at Bends

6.01 For switchboard cables in electronic or non-electronic offices, it is required to maintain specific radii when making cable bends. The minimum allowable radius for switchboard cables is 6-inches for 202, 302 and 402 conductor cables and 3-inches for all smaller cables carrying less conductors. However, caution should be exercised to avoid crimping, splitting the cable sheath, or damaging conductors within the cable by straining a bend or pulling a radius too tight.

Damage to Cable Sheath

6.02 When securing cable stitches or cable ties to runway or vertical drops, make certain that the tie or lace is not pulled so tight that it cuts the cable sheath or conductors. Check that a sharp portion of the trough, rack, or slat does not cut into the cable sheath but that the tie or stitch holds the cable in a secure position.

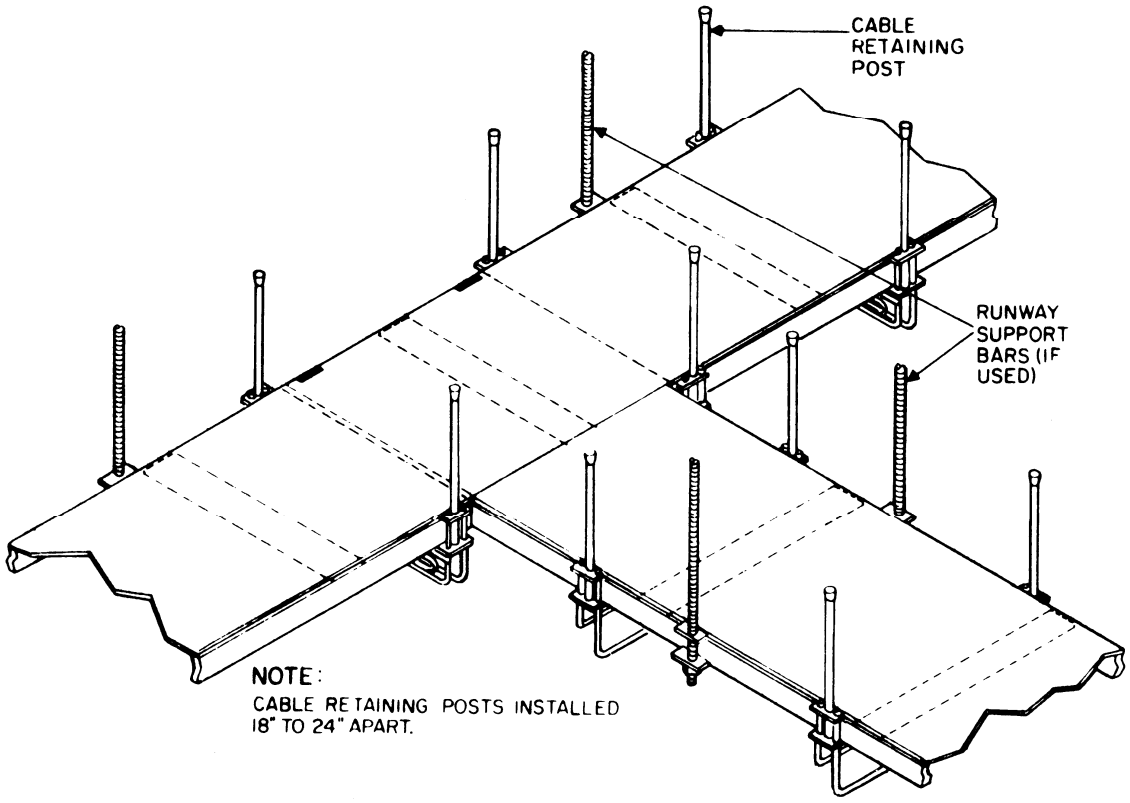


Figure 1. Cable Trough with Cable Trough Pans Installed.

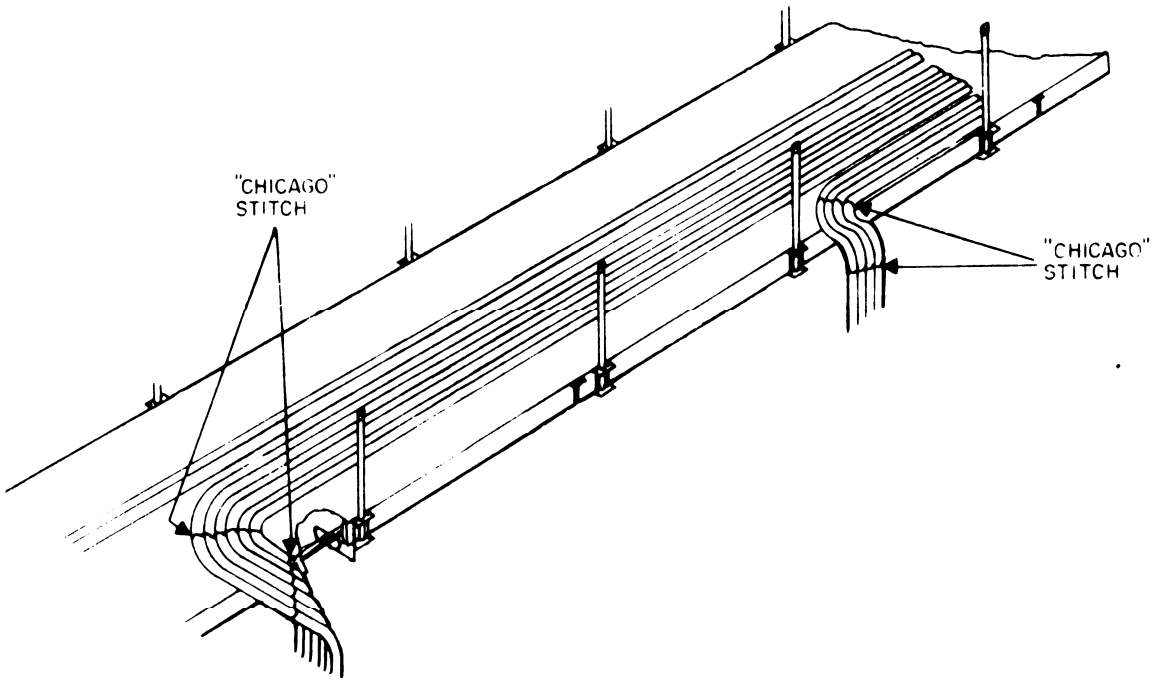


Figure 2. Typical Cable Run on Trough Showing Break-Offs and Stitching at Break-Offs.

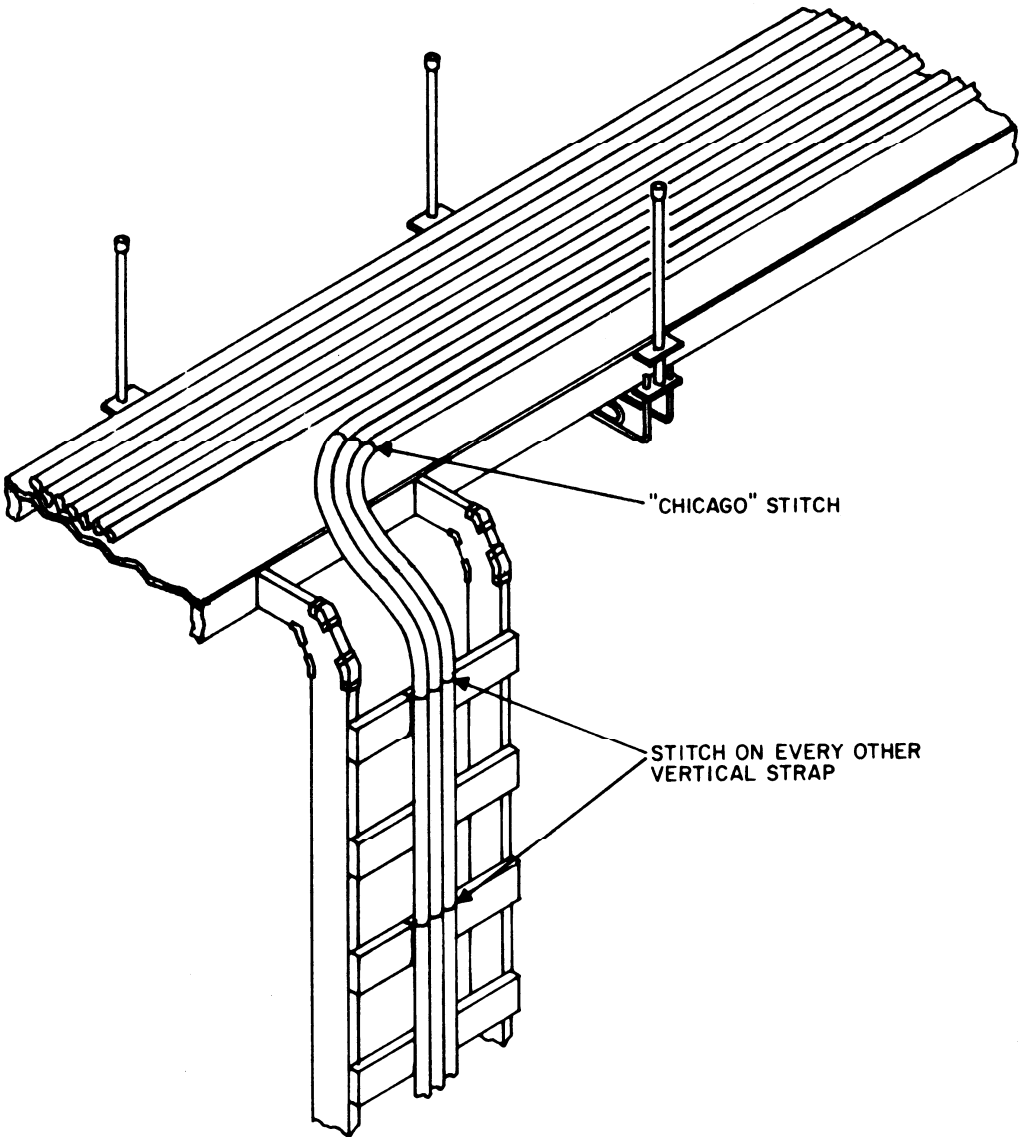


Figure 3. Stitching Cables on Vertical Break-Offs (Non-Electronic Central Offices).

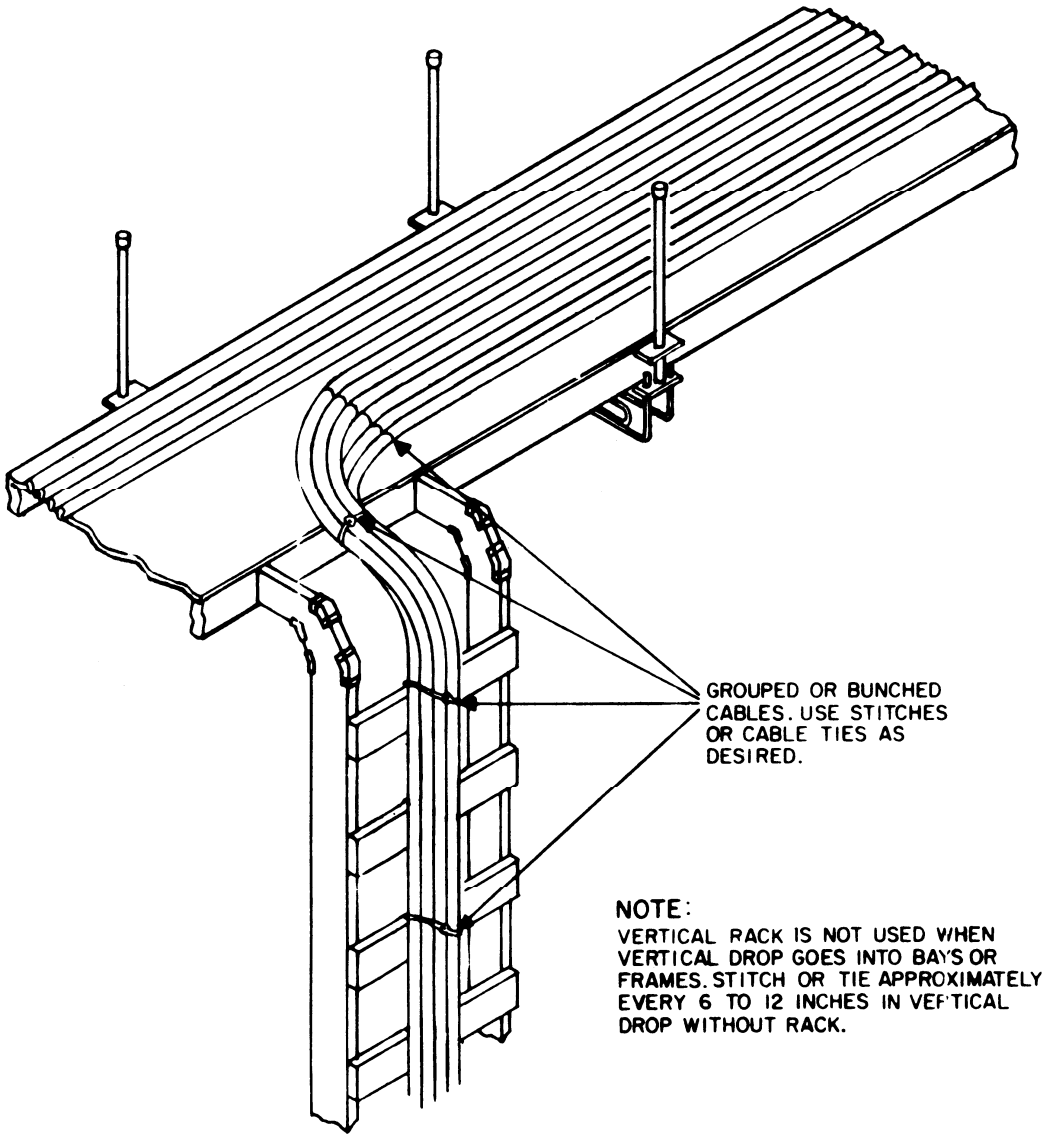


Figure 4. Method of Forming and Securing Cable From Trough to Vertical Rack in Electronic Offices.

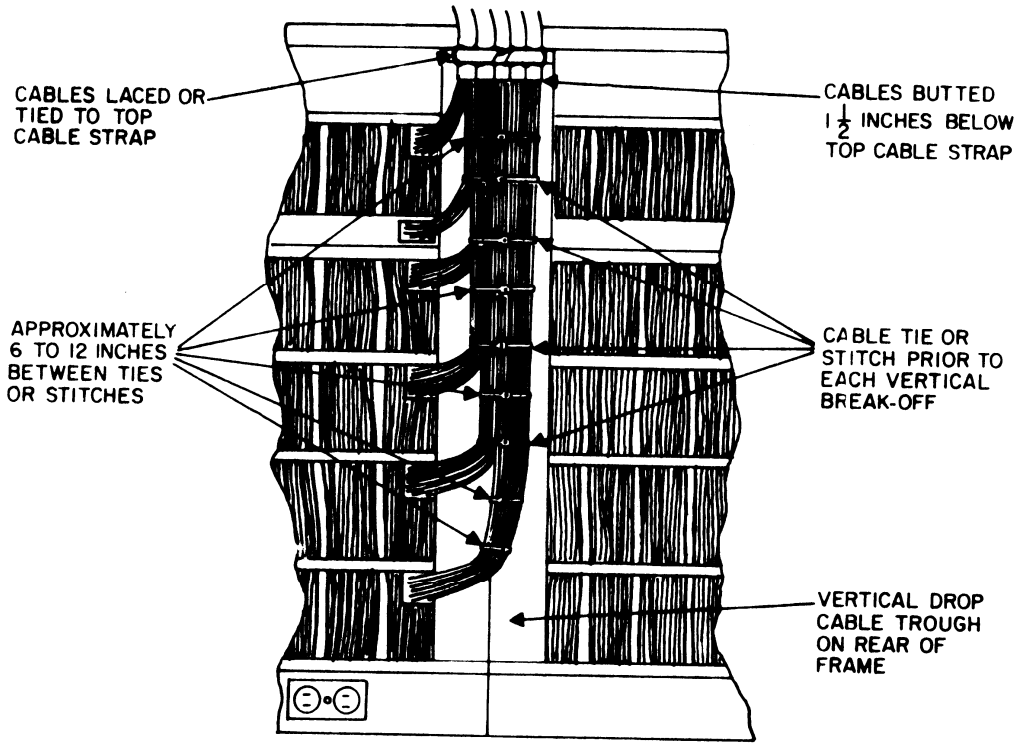


Figure 5. Cable Tying or Stitching on Electronic Office Vertical Drop. (Matrix Type Frame.)

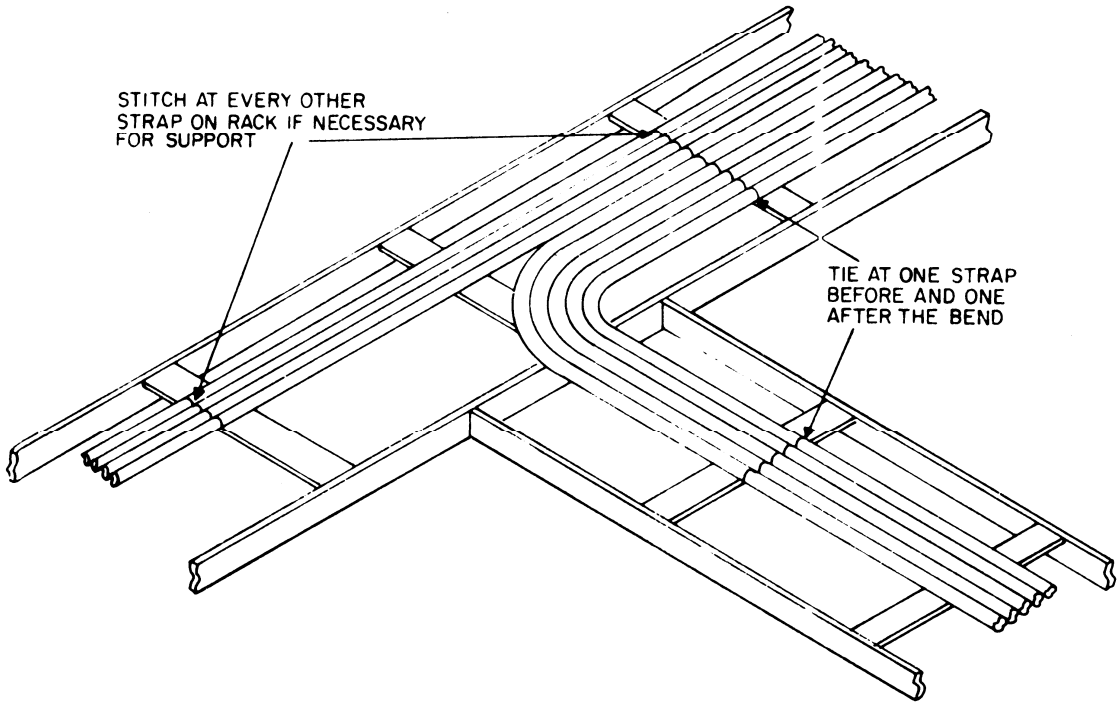
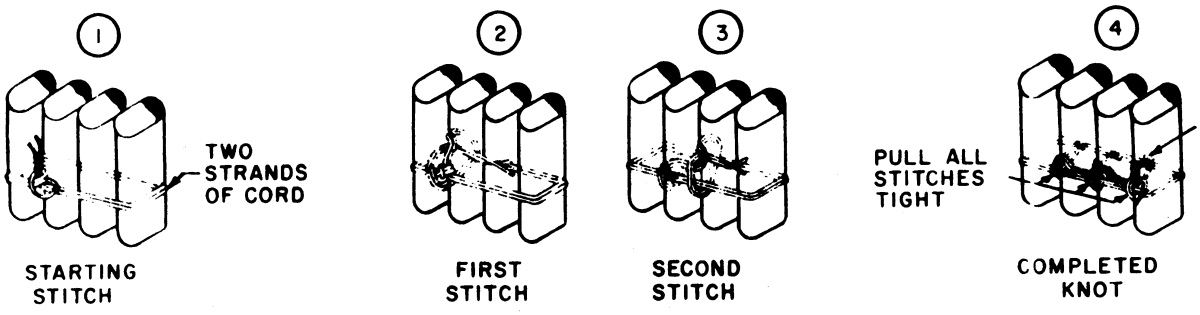
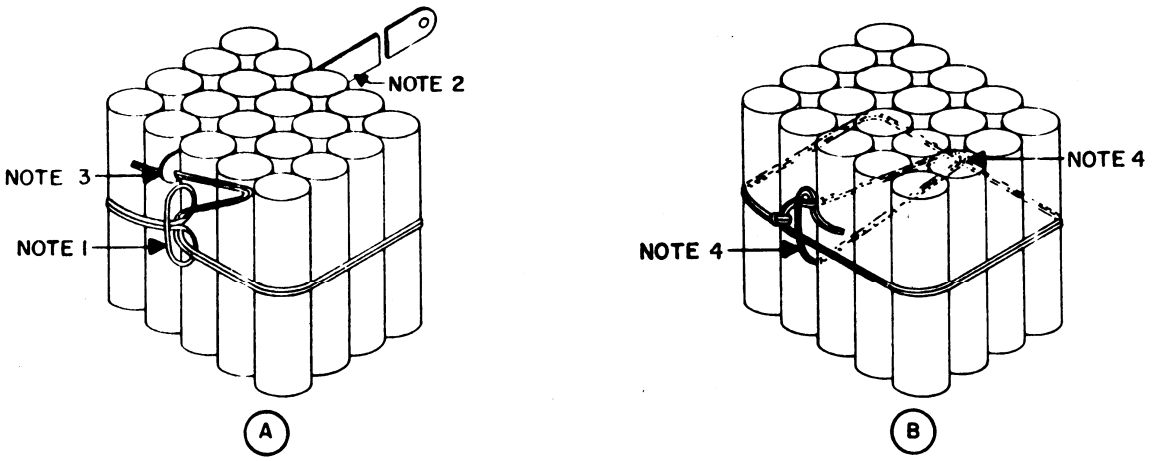
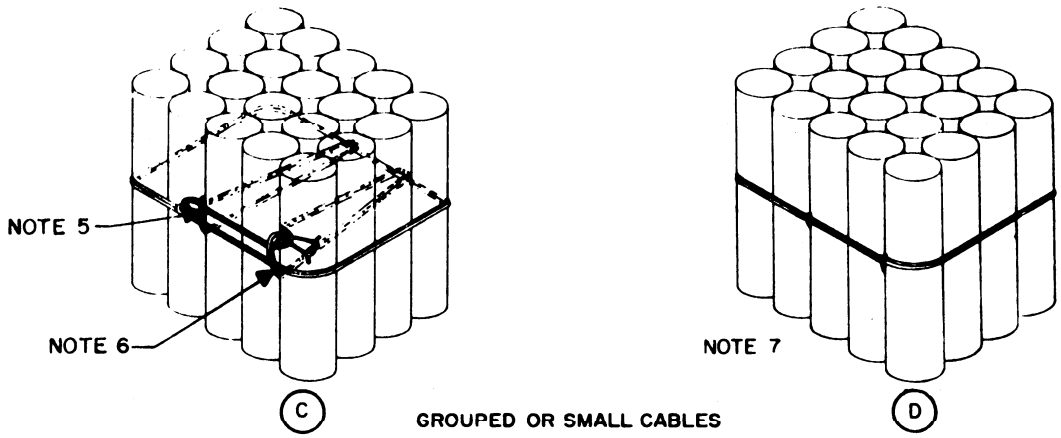


Figure 6. Cable Stitching on Cable Rack.



VERTICAL FLAT CABLES





GROUPED OR SMALL CABLES

NOTES:
1. MAKE STARTING STITCH AROUND CABLES - PER (A) .
2. USE CHICAGO NEEDLE FOR PASSING TWINE BETWEEN CABLES - PER (A)
3. HOOK END OF LACING TWINE WITH SEWING NEEDLE - PER (A) .
4. WHEN PASSING TWINE BETWEEN CABLES, LEAVE ENOUGH SLACK ON BOTH SIDES TO MAKE IT EASY TO GRASP THE TWINE WHEN TIGHTENING THE STITCH - PER (B) .
5. PULL OUT SLACK BEFORE STARTING NEXT STITCH - PER (C) .
6. MAKE THE LAST STITCH AS SHOWN. TIGHTEN STITCH AND DEAD END WITH A SQUARE KNOT - PER (C) .
7. REAR VIEW OF COMPLETED STITCH - PER (D) .

Figure 7. Methods of Tying the "Chicago" Stitch.

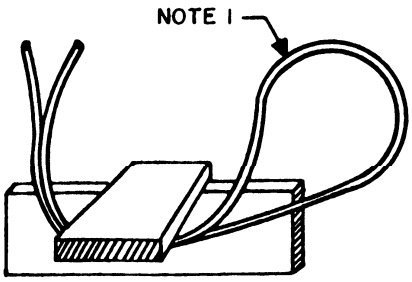


FIGURE 8a

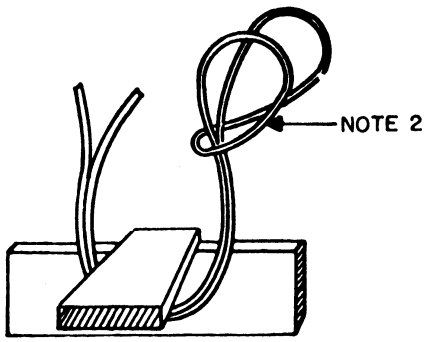


FIGURE 8b

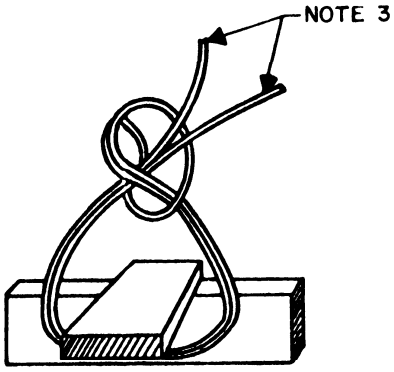


FIGURE 8c

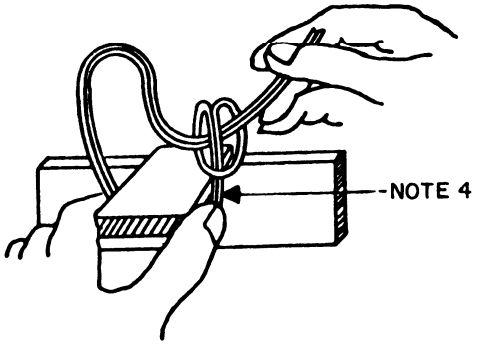


FIGURE 8d

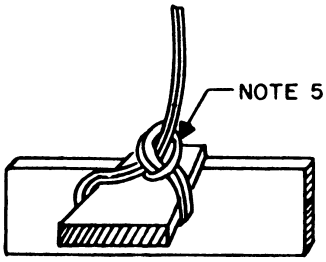


FIGURE 8e

NOTES:
1. DOUBLE A LENGTH OF LACING TWINE, EVEN UP THE ENDS, AND PASS UNDER THE SLAT (FIGURE 8a).
2. DOUBLE LOOP END BACK ON ITSELF (FIGURE 8b).
3. PLACE FREE ENDS THROUGH LOOP (FIGURE 8c).
4. HOLD IN POSITION AND PULL OUT SLACK (FIGURE 8d). AVOID CROSSED STITCHES UNDER SLAT.
5. COMPLETED STITCH (FIGURE 8e). TIGHTEN SECURELY ON SLAT.

Figure 8. Starting Stitch.

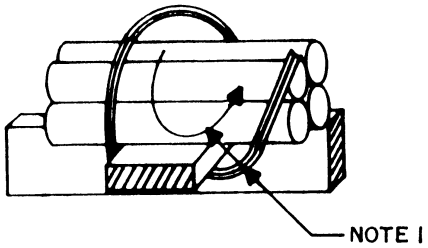


FIGURE 9a

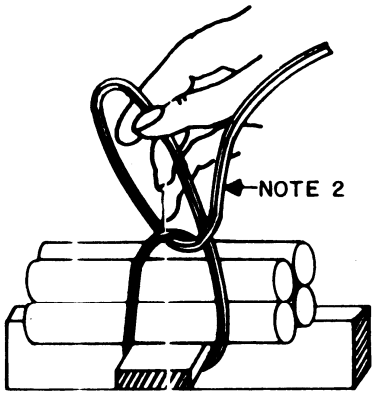


FIGURE 9b

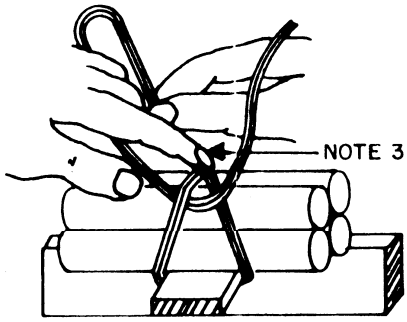


FIGURE 9c

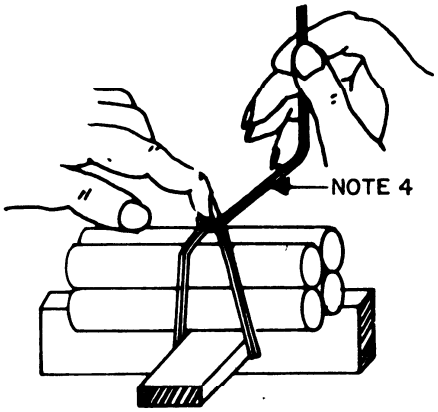


FIGURE 9d

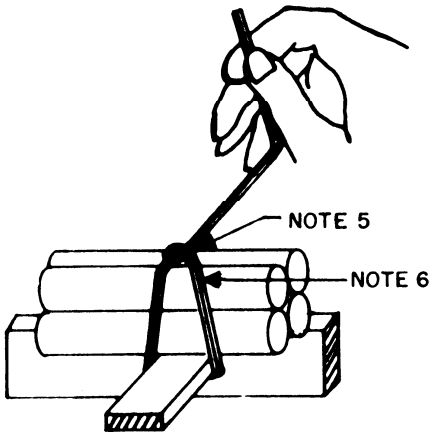


FIGURE 9e

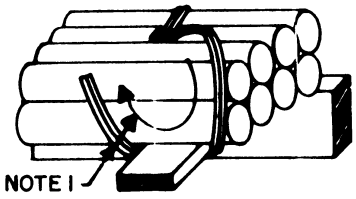


FIGURE 9f

NOTES:

1. PLACE FREE ENDS UNDER SLAT (FIGURE 9a). THE DIRECTION UNDER THE SLAT SHALL BE REVERSED ON ALTERNATE STITCHES (FIGURE 9a AND 9f).
2. PLACE FREE ENDS OVER TWINE AND BACK THROUGH THE LOOP (FIGURE 9b).
3. TIGHTEN STITCH UNDER THE SLAT AND HOLD WITH FINGER (FIGURE 9c). AVOID CROSSED STITCHES UNDER SLAT.
4. REMOVE SLACK BY PULLING UP AND TO THE RIGHT. KEEP LOOP ON TOP OF CABLE (FIGURE 9d).
5. TIGHTEN STITCH BY PULLING TO RIGHT AND DRAWING LOOP TO TOP FRONT OF CABLE. REMOVE SLACK AND TIGHTEN WITH A STEADY EVEN PULL (FIGURE 9e).
6. STITCH WILL BE FURTHER TIGHTENED WHEN SUCCEEDING STITCH IS TIGHTENED (FIGURE 9e).

Figure 9. "Kansas City" Stitch.

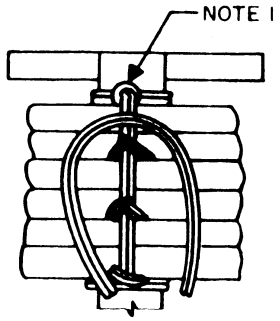


FIGURE 10a

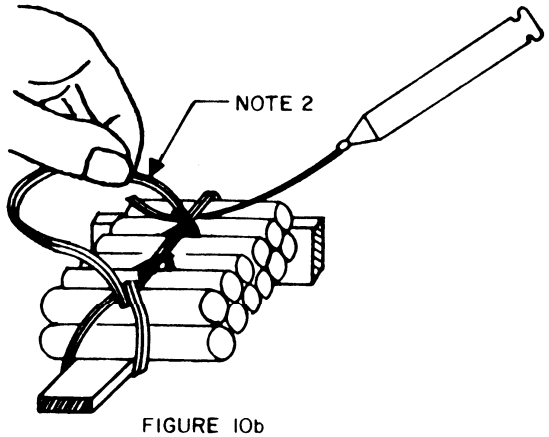


FIGURE 10b

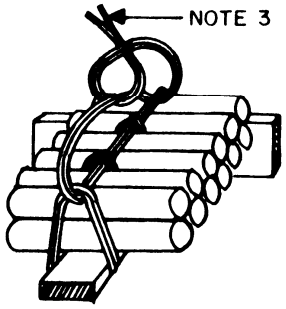


FIGURE 10c

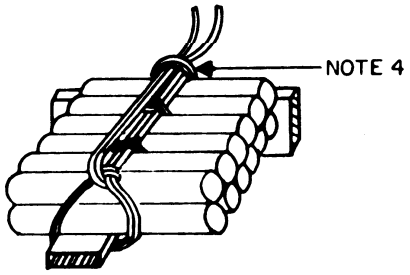


FIGURE 10d

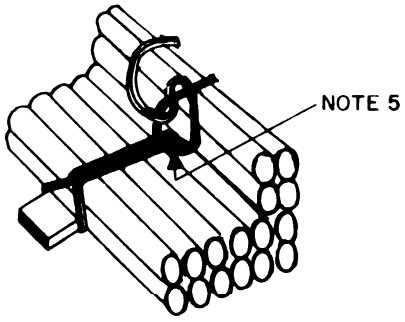


FIGURE 10e

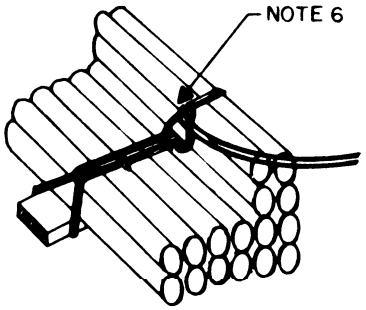
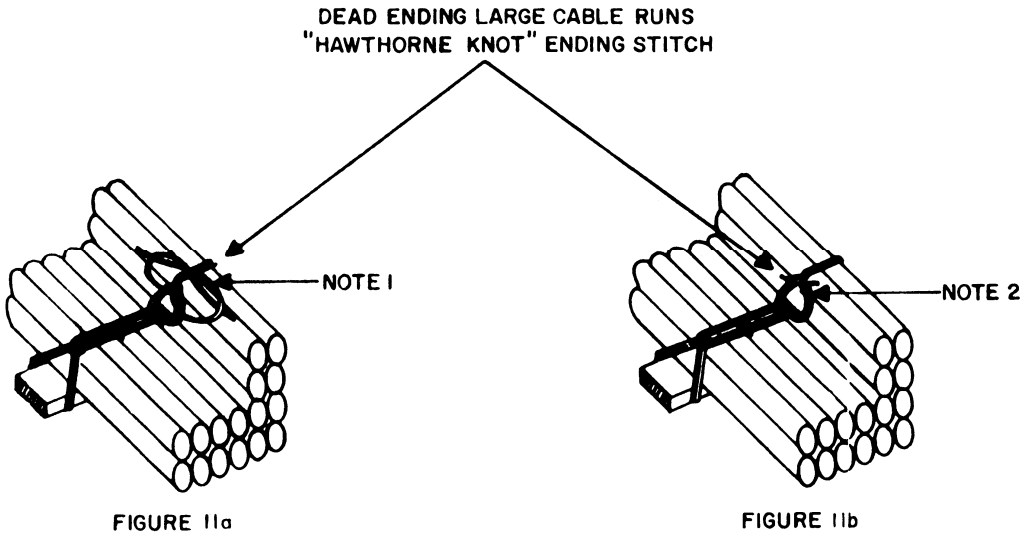


FIGURE 10f

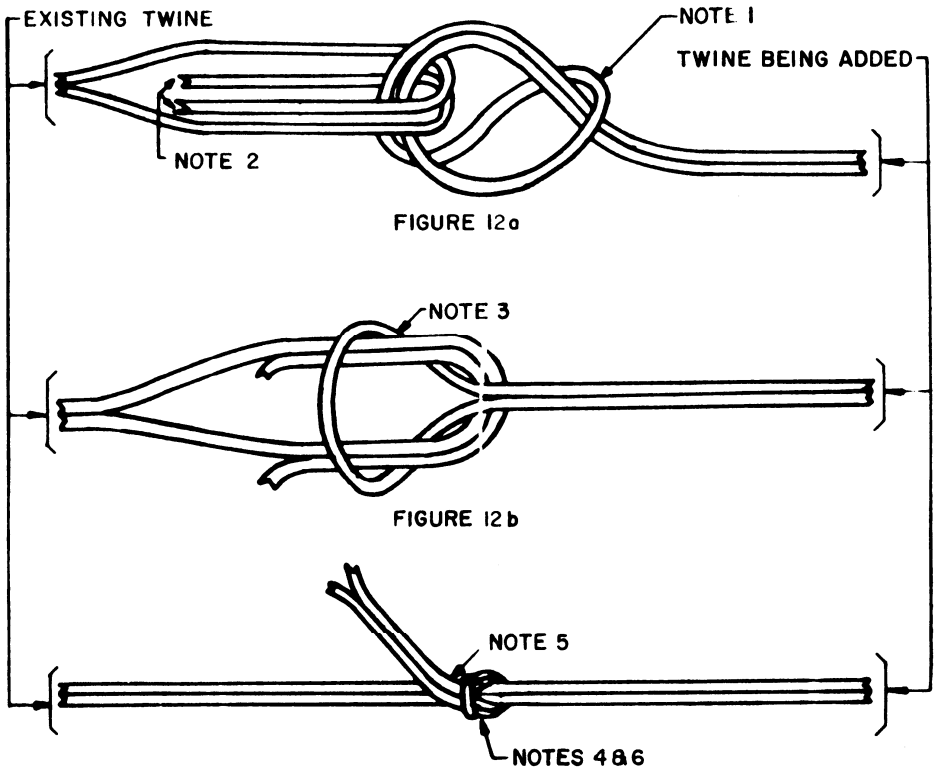
NOTES:
1. KEEP STITCHES IN STRAIGHT LINE IN CENTER OF STRAP (FIGURE 10a).
2. PULL END OF TWINE UNDER FIRST STITCH WITH AN EVANS NEEDLE (FIGURE 10b).
3. LOOP END OVER TWINE AND BACK THROUGH LOOP (FIGURE 10c).
4. TIGHTEN KNOT OVER TOP OUTSIDE EDGE OF CABLE (FIGURE 10d).
5. MAKE "KANSAS CITY" STITCH THROUGH THE FIRST BOTTOM STITCH IN ACCORDANCE WITH FIGURE 10e.
6. TIGHTEN KNOT IN PREPARATION FOR SEWING NEXT GROUP OF CABLES OR DEAD END AS SHOWN IN FIGURE 11.

Figure 10. Lacing Second Layer of Cable.



NOTES:
1. FORM KNOT AS SHOWN IN FIGURE 11a.
2. TIGHTEN KNOTS SECURELY AND CUT OFF ENDS OF TWINE AS SHOWN IN FIGURE 11b.

Figure 11. Dead-Ending Cable Stitches.



NOTES:
1. MAKE LOOP FOR STARTING STITCH IN TWINE BEING ADDED (FIGURE 12a).
2. PLACE EXISTING TWINE ENDS THROUGH STARTING STITCH LOOP IN OPPOSITE DIRECTIONS (FIGURE 12a).
3. SLIDE LOOP OF STARTING STITCH BACK OVER EXISTING TWINE (FIGURE 12b).
4. TIGHTEN KNOT (FIGURE 12c).
5. CUT OFF EXCESS TWINE AFTER TIGHTENING (FIGURE 12c).
6. WHEN LACING CABLE, PLACE THE KNOT AS CLOSE TO THE CABLE BEING LACED AS POSSIBLE SO IT WILL NOT INTERFERE WITH LACING THE SUCCEEDING CABLES (FIGURE 12c).

Figure 12. Splicing Double Strand Lacing Twine.

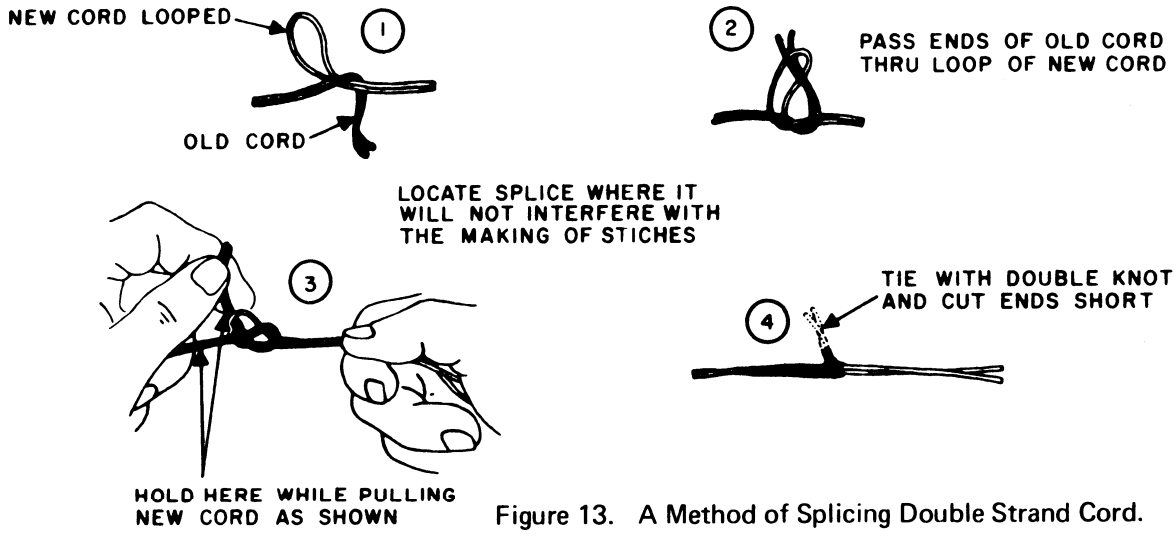
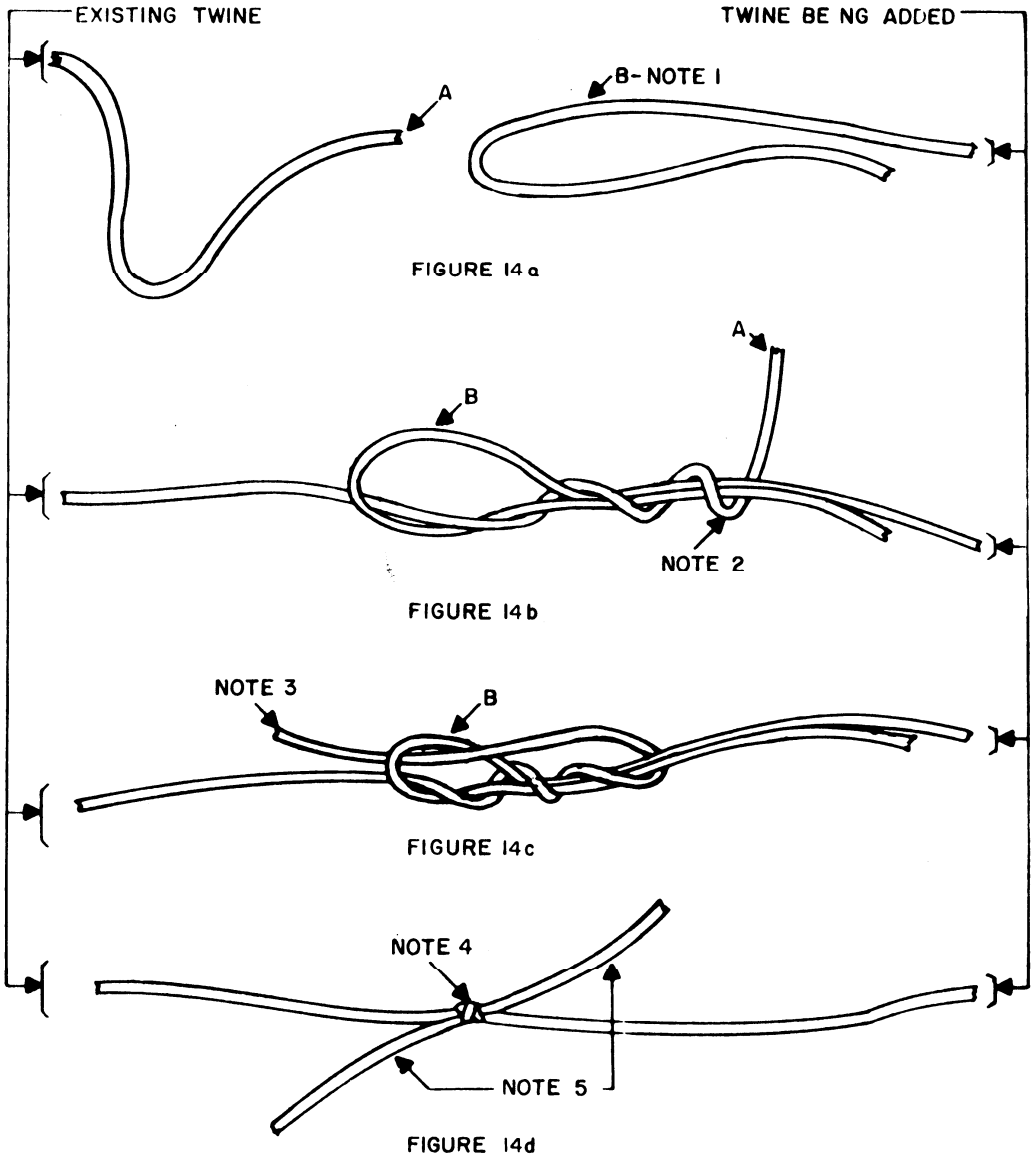


Figure 13. A Method of Splicing Double Strand Cord.



NOTES:

1. ON THE END OF THE TWINE BEING ADDED (LOOP B) MAKE A STARTING LOOP (FIGURE 14a).
2. PLACE THE END OF EXISTING TWINE "A" THROUGH THE LOOP AND WRAP AROUND LOOP "B" TWO TURNS (FIGURE 14b).
3. RETURN END "A" THROUGH LOOP "B" (FIGURES 14 b AND c).
4. TIGHTEN THE KNOT BY PULLING BOTH ENDS (FIGURE 14c).
5. CUT OFF EXCESS TWINE AFTER TIGHTENING THE KNOT (FIGURE 14d).

Figure 14. Splicing Single Strand Lacing Twine.