SECURING CABLE AND WIRE SEWING

CONTENTS

1. GENERAL

1.1 Scope of Section

1.11 This section covers the securing of switchboard cable and wire on cable racks by sewing with twine.

1.111 "Wire" or "wires" as used in this section cover all codes of bulk wire ordered in installers cable running lists including flexible cordage such as KS-15141 and KS-15143.

1.12 Sewing is an approved method for securing cables when cable clips or cable rack brackets are not specified or where the use of clips or cable rack brackets is not practicable. Sewing is also used where cables in retaining brackets will not otherwise retain their position and where clipping is not permitted as covered in Section 301 of this handbook.

1.2 General Information Pertaining to the Arrangement of Tools, Precautions, Verifications, Specs and Drawings and Figures

1.21 Refer to Section 1 of this handbook for information pertaining to these items.

1.3 Specific Precautions

1.31 Sewing twine may break if given a quick jerk or if one strand is pulled tighter than the other.

1.32 Particular care should be taken to avoid eye injuries due to the breakage of twine when sewing cables which are located at or slightly above eye level and especially when performing this operation in congested places. Safety glasses are to be worn at all times. See Handbook 0 for details.

1.33 Avoid cuts and bruises by tightening with a steady pull. Protect hands as necessary using a 1" compress, piece of adhesive tape, or R-4248 Fingerless Leather Gloves.

1.34 Avoid placing tools, material or other objects on cable racks, ladders or scaffolding where they may be accidentally pushed off or fall on those below. Keep tools in cases provided for them.

1.35 Observe the condition of the cable and wire as it is being grouped and secured and repair any damaged insulation. See Section 140 of this handbook.

2. INSTALLING EQUIPMENT

2.1 The tools and supplies generally used for operations covered by in this section are covered in Section 300 of this handbook.

3. ARRANGEMENT AND GROUPING OF SWITCHBOARD CABLES

3.1 Place the maximum number of cables under a stitch, space the stitches and use the number of strands of twine as shown in Figure 1.

3.2 Not placing the maximum number of cables under a stitch or the securing of cables to cable rack cross straps more often than specified does not necessarily improve the quality of the job but may cause additional work on subsequent additions.

4. SECURING BY SEWING

4.1 Starting Stitch

4.11 Make the starting stitch on cable rack as shown in Figure 2 when securing the first group of cables. Place the stitch approximately 3/4" from the outer edge of the cable rack stringer. The knot should be in the center of the strap when the stitch is tightened.

4.2 "Kansas City" Stitch

4.21 The "Kansas City" Stitch is used when sewing cable to cable rack straps, cable brackets, or to supports. This stitch is made as a continuation of a starting stitch.

4.22 Use the method shown in Figure 3 to make the Kansas City stitch.

4.23 Determine the number of cables to be placed under the stitch from Figure 1.

4.24 After completing each stitch, place the ends of the twine so that they will not interfere with running in additional cables. Keep the line of the stitches straight on the center line of the cross strap as shown in Figure 4.

4.25 To sew a succeeding layer to a lower layer of cables, loop the twine back across the cables in the lower layer and continue according to the method shown in Figure 5.

4.3 Ending Stitch

4.31 Two methods of ending the Kansas City stitch when sewing cables to cable rack straps, cable supports or cable brackets are illustrated in Figure 6. Use the Hawthorne knot except where a small group of cables requires a more secure fastening than can be obtained by this knot, in which case a square knot should be used.

4.4 Sewing on Additions

4.41 When cables are added to an existing run sewed at every strap, sew the additional cables in accordance with the requirements of this section. Where existing cables are sewed at every other strap, the added cables are to be sewed in the same manner as the existing cables. Fasten the starting stitch to the stitches holding the last cable of the present run, looping the starting stitch around the old stitch.

4.42 To sew additional cables to runs previously wire clipped, secure starting stitch under wire clips.

4.5 Sewing Miscellaneous Runs of Cable

4.51 Arrange the stitches in miscellaneous runs as illustrated in Figure 7.

4.511 When sewing the first layer, place the number of cables under a stitch according to the table in Figure 1 and loop the stitches the same as when sewing regular runs as illustrated in Figure 3.

4.512 When sewing the second layer, place the number of cables under a stitch according to Figure 1. One of two conditions will be found in making the loop at the end of each stitch. Make the loop of each stitch as described for the condition at that point.

4.5121 One condition is where the loop falls at a point such as at (A) in Figure 7 where the stitch of the first layer loops under the cross strap. Loop the twine through the stitch of the first layer as illustrated at (A) in Figure 7.

4.5122 The second condition is where the loop falls at a point such as at (B) in Figure 7, where the stitch of the first layer does not pass under the cross strap. Loop the twine through the first layer and under the cross strap as indicated at (B) in Figure 7.

4.513 When sewing layers above the second layer, arrange the length of each stitch so the twine at the end of the stitch will loop through the stitch of the preceding layer in line with a loop or a series of loops the first of which passes under the cross strap as at (A) in Figure 7. Form and end the stitches and loops in the same manner as when sewing a regular cable run as illustrated in Figure 6.

SWITCHBOARD CABLES TO BE SEWED UNDER 1 STITCH

Cable		Horizontal Resting Runs			Vertical or Inverted Horiz. Runs (See Note 1)			No. of Cables Under 1 Stitch	Sew at Every Strap (See Note 2)	Sew at Every 3rd Strap (See Note 2)
Type	Size	Round	On Edge	On Flat	Round	On Edge	On Flat			
Round	Up to 1/2"	X						6		X
	Over 1/2" to 3/4"	X						5		X
	" 3/4" to 1"	X						3		X
	" 1"	X						2		X
	Up to 1/2"				X			5	X	
	Over 1/2" to 3/4"				X			2	X	
	" 3/4"				X			1	X	
Oval	All		X					6		X
	All 2 Cables Wide			X				10 (See Note 3)		X
	All					X		3	X	
	All 1 Cable Wide						X	5	X	
Flat	All 1 Cable Wide		X	X				5		X
	All 1 Cable Wide					X	X	5	X	
Misc.	Mixed	The number of cables under one stitch should be the maximum shown above for the largest size cable under each stitch. For oval cables use the largest dimension to determine the number of cables to be included under a stitch.								

NOTE 1: Applies only to small installations, where due to the limited number of cables, flat type clips are not provided.

All new vertical or inverted horizontal runs except as covered above are to be clipped as covered in Section 312. Arrange to secure clips for these runs if they have not been furnished.

On additions when the pileup (including the added cables) exceed 4" the run should be equipped with clamps per ED-91987-01 when called for in the job specification.

NOTE 2: Use 2 strands of twine for sewing all horizontal and vertical runs.

Use 2 strands of twine for sewing inverted horizontal runs when the ultimate depth is less than 8". Use 4 strands when the ultimate depth is 8" or more.

NOTE 3: Where it is difficult to hold ten cables in place and sew them under one stitch, it is permissible to split the group of cables and sew them four or six cables under a stitch.

FIG. 1 SWITCHBOARD CABLE SEWING REQUIREMENTS
(PARS. 3.1, 4.23, 4.511, 4.512)

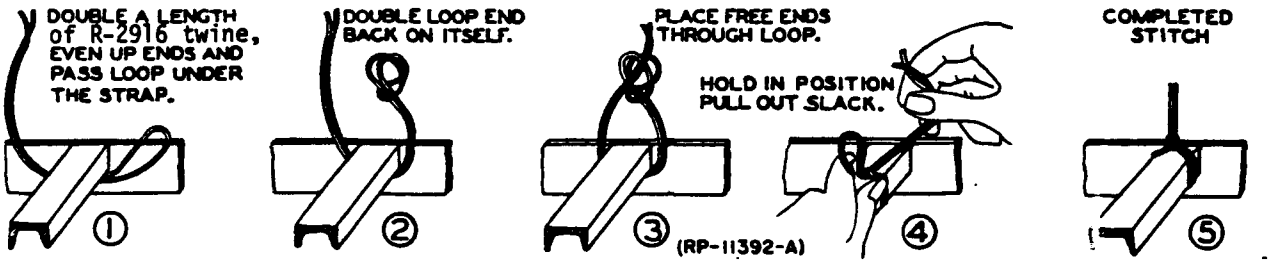

FIG. 2 STARTING STITCH
(PAR. 4.11)

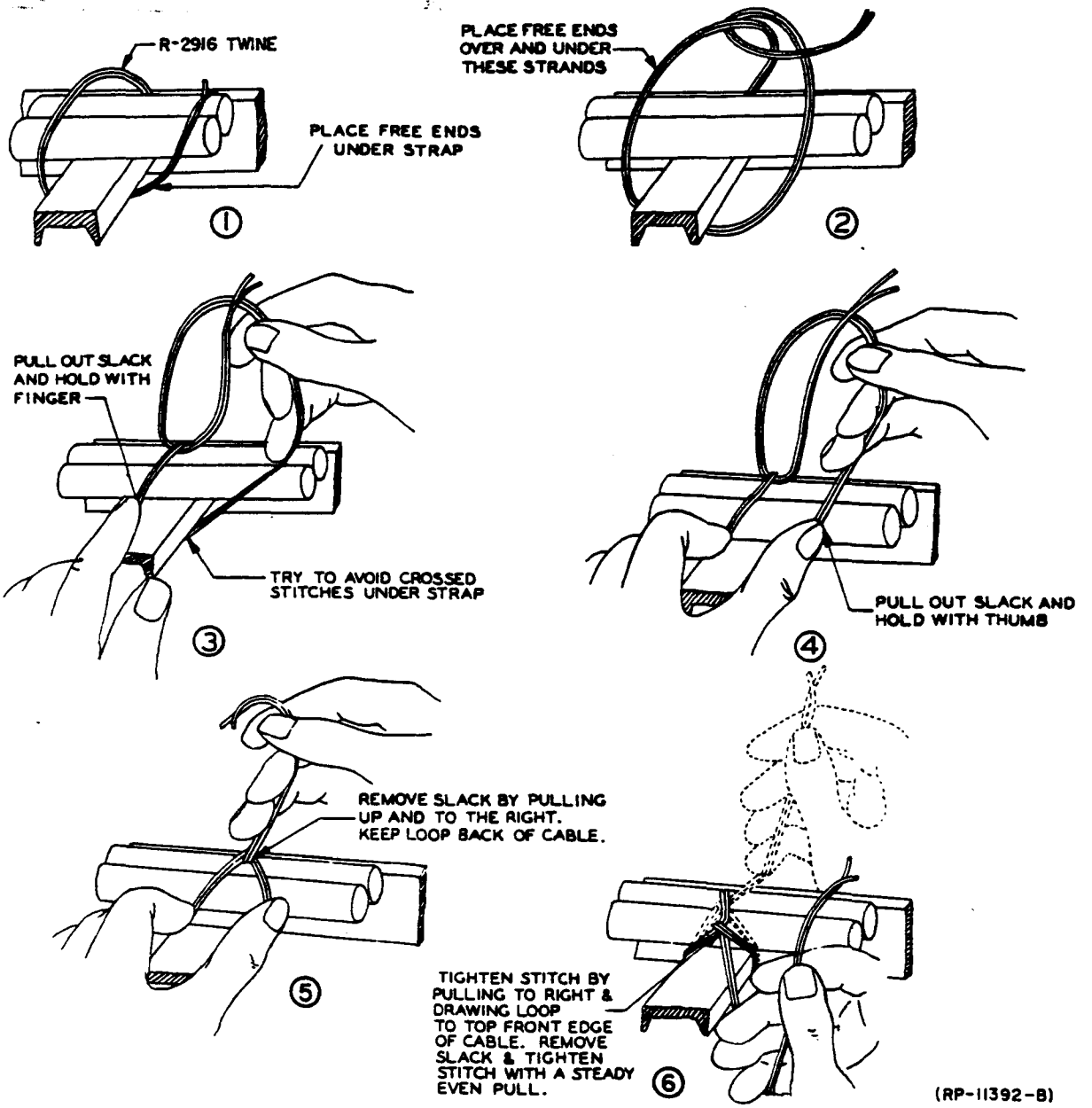

FIG. 3 KANSAS CITY STITCH
(PARS. 4.21, 4.511)

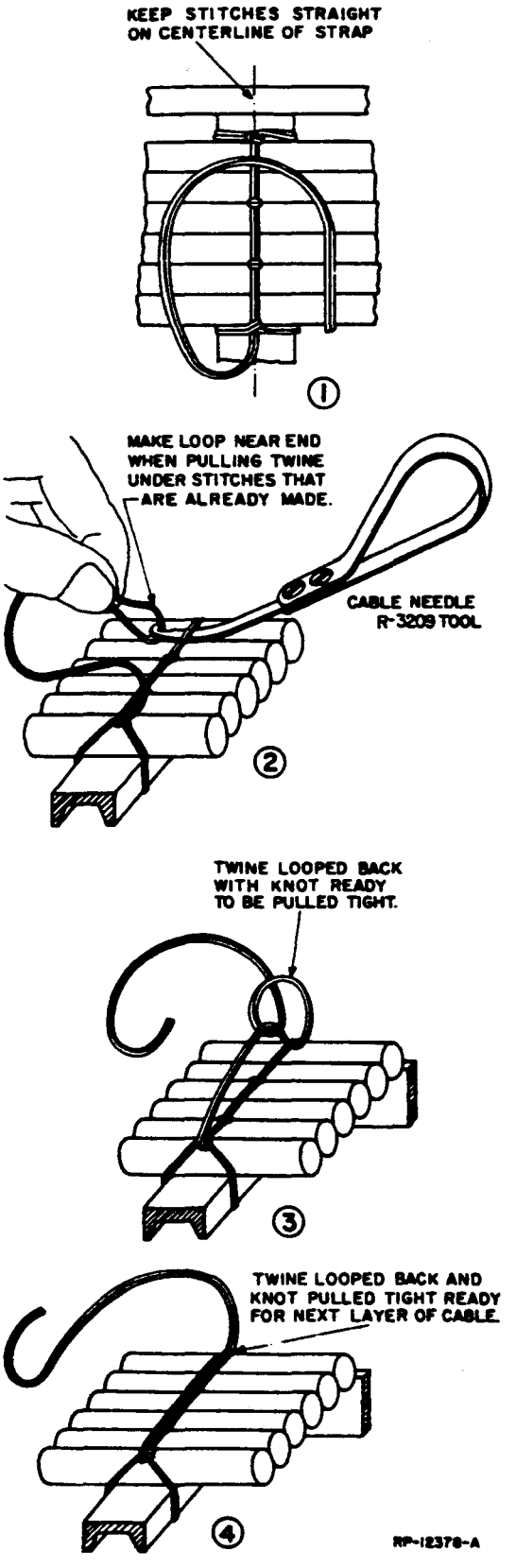

FIG. 4 FIRST LAYER
(PAR. 4.24)

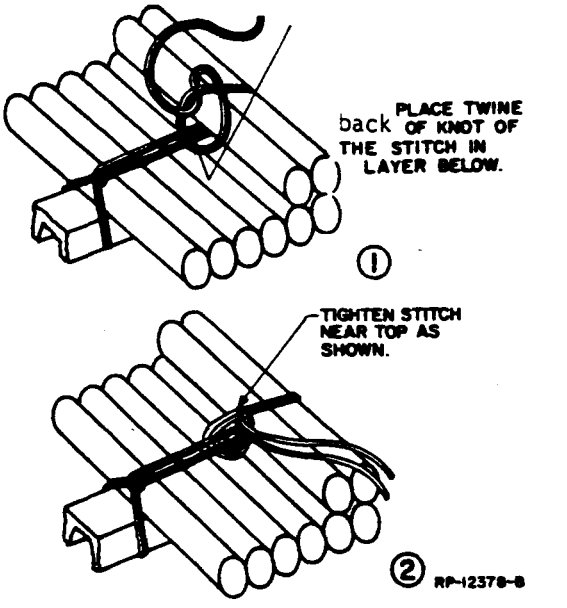

FIG. 5 SECOND LAYER
(PAR. 4.25)

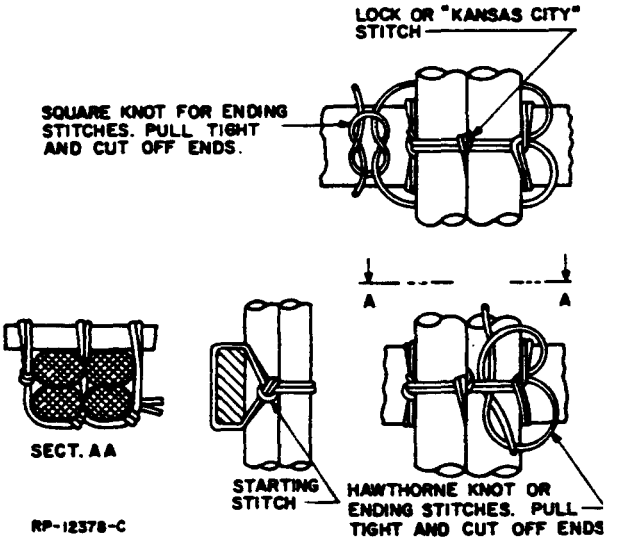

FIG. 6 METHOD OF ENDING STITCHES
(PAR. 4.31, 4.513)

4.6 Securing Cable at Turning Points

4.61 Sew cables to supports provided at turns in the same manner in which they are sewed to cable rack cross straps. See Figure 8.

4.62 Cables on horizontal runs will in general be sewed at every third strap. On turns in the same plane, sew cables at straps adjacent to start and completion of turn and at such intervals in turn as will insure the cables retaining their proper position.

4.63 Where cables turn off of cable racks and the last cross strap before the turn is not a normal sewing location (See Figure 1), sew cables to this strap to insure cables being secured at the last cross strap before the turn off.

4.631 On layers other than the bottom layer secure cables to several adjacent cables at the position of the cross strap before the turn with a hand of two strands of R-2916 Twine made with a starting stitch and ended in a square knot.

4.632 Stitches or bands placed at turn off points need not be continued above the layer where the last cables turn off.

4.64 Where cables turn through the rack and the last cross strap is not a normal sewing location, sew the cables to this strap.

4.641 Stitches on these straps need not be continued above the layer where the last cables turn through the rack.

4.7 Sewing Wire Run With Cable, Shielded and Rubber Covered Wire and Local Power Cable Forms

4.71 Secure wires run with switchboard cable in the same manner as the switchboard cables with which they are associated.

4.72 Place wires between cables, as far as practicable, so they will be protected by the regular cables with which the, are associated.

4.73 Sewed local power cables, which are run separately, should be installed in the same manner as switchboard cables of a similar size.

4.74 Sew shielded wire in the same manner as switchboard cable.

4.75 When sewing all rubber covered wire such as KS-15141 and KS-15143 flexible cordage, place pieces of fiber cut from P-409474 or 1/64 gray sheet fiber RM-583101 around the wire and locate it centrally under the stitch to prevent the twine cutting into the insulation. Use R-3428 gray plastic tape if fiber is not available.

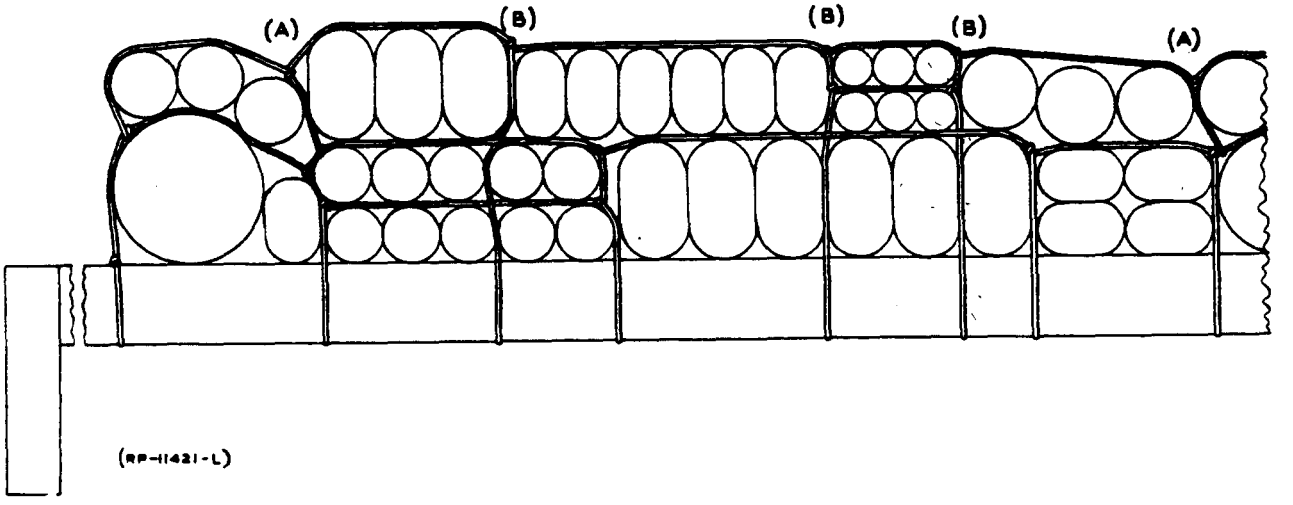

FIG. 7 METHOD OF SEWING RUNS OF MISCELLANEOUS CABLE
(PARS. 4.51, 4.5121, 4.5122, 4.513)

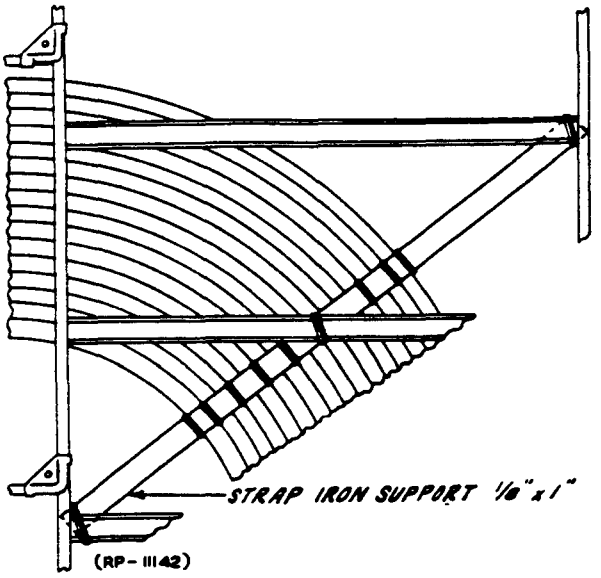

FIG. 8 SEWING CABLE TO SUPPORTS AT TURNS (PARS. 4.61)

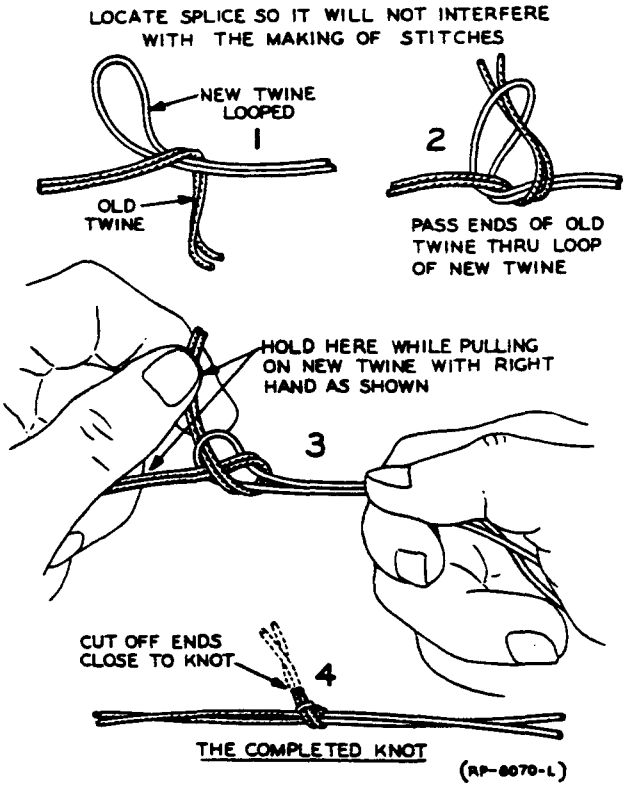

FIG. 9 SPLICING DOUBLE STRANDS OF TWINE (PAR. 4.81)

4.8 Splicing Twine

4.81 Splice twine as shown in Figure 9 whenever it is too short or when it breaks. If possible, make the splice where it will not be seen and where it will not interfere with the making of stitches.

5. VERIFICATION

		VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS	REFERENCE Par. No.	REFERENCE Fig. No.
	5.1	Sewing		
(P)	5.101	Starting stitch properly made.	4.11	2
(P)	5.102	Starting stitch approximately 3/4" from edge of cable rack and knot centered.	4.11	
(P)	5.103	Kansas City Stitch properly made.	4.21	3
	5.104	Proper number of cables under stitches.	4.23,3.1	1
(P)	5.105	Miscellaneous runs properly sewed.	4.511 to 4.513	7
(P)	5.106	For first layer, proper number of cables under a stitch according to Figure 1.	4.511	1 & 3

5. VERIFICATION (Cont'd)

	VERIFICATION ITEMS AND BRIEF STATEMENT OF REQUIREMENTS	REFERENCE Par. No.	REFERENCE Fig. No.
	5.1 Sewing (Cont'd)		
(P)	5.107 For second layer, proper number of cables under a stitch according to Figure 1.	4.512	1
	5.108 When the loop falls at a point, as at point (A) in Figure 7 and the stitch of the first layer loops under the cross strap, loop the twine through the stitch of the first layer as illustrated at (A) in Figure 7.	4.5121	7
	5.109 When the loop falls at a point, such as at (B) in Figure 7 and the stitch of the first layer does not pass under the cross strap, loop the twine through the first layer and under the cross strap as indicated in Figure 7 at (B).	4.5122	7
	5.110 Layers above the second layer sewed so that the twine at the end of the stitch will loop through the stitch of the preceding layer in line with a loop or series of loops, the first of which passes under the cross strap as at (A) in Figure 7.	4.513	6, 7
	5.111 Cables at turning points secured as follows:		
	5.112 Cables sewed to supports provided at turns in same manner used to sew at cross straps.	4.61	8
	5.113 Cables at turns secured at start and completion of turn and at such intervals in turn to insure cables retaining their proper position.	4.62	
	5.114 Cables which turn off or turn through the rack sewed to last cross strap before turn where this strap is not a normal sewing location.	4.63 or 4.841	
	5.115 Shielded wire sewed in same manner as switchboard cable.	4.74	
	5.116 Protect rubber covered wire such as KS-15141 and KS-15143 flexible cordage with 1/64" fiber at all sewing points.	4.75	
	5.117 Twine spliced properly.	4.81	9
(P)	5.118 Splice placed where it does not interfere with stitches; concealed if possible.	4.81	9

[Vertical lines at side of paragraphs indicates requirements.

Engineering Planning Manager
(Installation)

Reason for Reissue:
Removed reference to lead covered cable and No. 12 Twine.