CABLE DANCING—PREVENTION METHODS

CONTENTS PAGE

1. GENERAL

1.01 This section covers information on the methods for the prevention of cable dancing.

1.02 This section is reissued to indicate:

- Self-supporting disc-insulated coaxial cable can be spiraled without being damaged.
- Use of B Strand Tie Straps when cables are side by side.
- Use of E Modified Cable Leader to prevent the spiraling of self-supporting coaxial cable.
- Use of B Guy Hooks to deadend strand.

1.03 The suspension strands of cables subject to dancing and the auxiliary strands installed to prevent dancing should be dead ended on B Guy Hooks as they are less likely to fail than guy bolts when subjected to the additional strain.

1.04 A cable car will not pass a strand tie strap. When it is necessary to ride a strand on which these straps are installed, proceed as follows:

(a) When the car reaches the strap, loop a handline around the strands behind the car, and remove the clamping detail from the strand being ridden.

(b) Raise the free end of the strap sufficiently to allow the car to pass.

(c) Reinstall the strap and remove handline.

2. RECOMMENDED TREATMENT

2.01 Permanent corrective measures to prevent cable dancing should not be taken until the entire cable has been surveyed and studied. Factors to consider are as follows:

(a) Frequency and severity of dancing

(b) Span length and cable size

(c) Location and number of corner poles

(d) Amount of pole shifting

(e) Number of cables involved

(f) Type of cable sheath (lead or polyethylene).

2.02 The proper dance preventative measure to be applied to any given situation will depend upon many variable factors. The generally accepted methods are: spiraling of the cable, use of an auxiliary strand, and use of B Cable Dampers on single cable lines. Multi-cable lines may be both spiraled and strapped. See Table A for the recommended treatment to be used on various types of cable lines.

3. SINGLE LASHED SMALL POLYETHYLENE SHEATHED CABLE LINES

3.01 Spiraling the cable is the most effective method of preventing dancing on single lashed cable lines with polyethylene sheathed cable up to 1-1/2 inch in diameter. ***Do not spiral lead-sheathed or lashed disc-insulated coaxial cable.*** ▶However, self-supporting disc-insulated coaxial cable can be spiraled as outlined in Part 5. Spiraling is done to break the uniform cross-section of cable and strand, thereby canceling the effect of wind forces responsible for dancing.◀

TABLE A — RECOMMENDED TREATMENT FOR PREVENTING DANCING

TYPE OF CABLE LINE	SEE NOTE	PART REFERENCE
Single Lashed Polyethylene Sheathed — 1-1/2 Inch Diameter	1	3
Single Lashed Polyethylene Sheathed — Over 1-1/2 Inch Diameter	2,3,4	4
Single Lead Sheathed	2,3,4	4
Coaxial Cable	2,3,4	4
Self-Supporting Cable	1	5
Self-Supporting Coaxial	1	5
Multi-Cable Lines	1,5	3,6

Note 1: Spiraling.
Note 2: Inverted auxiliary strand.
Note 3: Auxiliary strand.
Note 4: B Cable Damper.
Note 5: B Strand Tie Straps.

3.02 Fig. 1 shows the method of spiraling lashed cable. The instructions following are based on the assumption that all spans shown in Fig. 1 are equal in length. In the field it is important that a system of spiraling be planned:

(1) According to the span lengths to obtain the desired number of spirals in each span

(2) To avoid spiraling at pole-mounted terminal locations or in spans containing branch cable splices

(3) To avoid spiraling at corner pole locations.

3.03 Cable can be spiraled at strand-mounted terminal locations if care is used to prevent damage to terminal, stub, and splice. However, it is advisable to plan jobs to avoid doing work operations at these locations. Straight splices will not affect the spiraling operation.

3.04 The spirals are obtained by the following steps:

(1) At pole No. 1 spiral the cable and strand in the direction shown in Fig. 1 until there is a complete spiral every 15 to 20 feet in the span to the ***left*** of the pole. For example, in a 200-foot span, 10 to 13 spirals are required. This will result in lashing wire becoming loose in the span to the right of the pole, allowing the cable to fall to the bottom of the strand and remain there except where it will make a rapid crossover approximately every 15 to 20 feet. This resultant pattern permits dancing to reoccur in a mild form.

(2) Therefore, at pole No. 2 spiral the cable and strand in the opposite direction as shown in Fig. 1, until there is a complete spiral every 15 to 20 feet in the span to the ***right*** of the pole. Assuming the spans are of equal length, this will result in a spiral every 7 to 10 feet in the span between poles No. 1 and 2, which prevents the cable from falling to the bottom of the strand and prevents further dancing. The fact that the lashing wire is loose is unimportant.

(3) At poles No. 4 and 7 repeat the spiraling operation like that completed at pole No. 1. At poles No. 5 and 8 repeat the spiraling operation like that completed at pole No. 2. Follow this same pattern for the remainder of the line that is to be spiraled.

3.05 Spiraling should be done by using the B Cable Spiraler which is described in Section 081-410-120 and Addendum.

3.06 Do not ride spiraled cables. Perform work operations from an extension ladder, truck-mounted platform ladder, or aerial lift truck.

4. SINGLE CABLE LINES—OTHER

4.01 ***General:*** To prevent damage to single cable lines other than polyethylene-sheathed cable up to 1-1/2 inches in diameter use one of the following methods. The method to be used will depend upon the existing conditions. When the inverted auxiliary strand or auxiliary strand method is not applicable, the damper method is used.

(a) Inverted auxiliary strand method

(b) Auxiliary strand method

(c) B Cable Damper method.

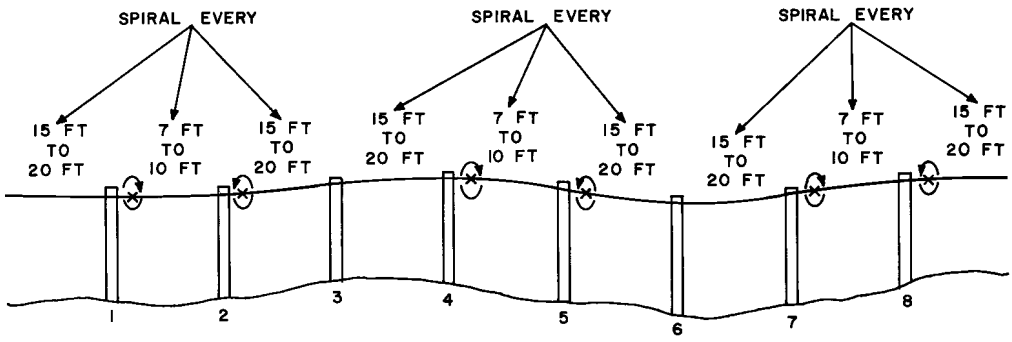


Fig. 1—Spiraling Single Lashed Polyethylene Sheathed Cable

Inverted Auxiliary Strand Method

4.02 The inverted auxiliary strand method of preventing or reducing cable dancing consists of placing a 2.2M strand below the cable suspension strand, with B Strand Tie Straps between the two strands to form a semirigid structure. This arrangement offers resistance to vertical motion of the cable and its suspension strand.

4.03 This method may be used only when specified ground clearances will permit.

4.04 In spans less than 200 feet, tie straps are usually required only at the 1/4- and 2/3-span points. If dancing continues to be experienced, add a tie strap at the 1/2-span point. In spans over 200 feet, tie straps are required at the 1/4-, 1/2-, and 2/3-span points. Fig. 2 illustrates the auxiliary strand and tie strap arrangements.

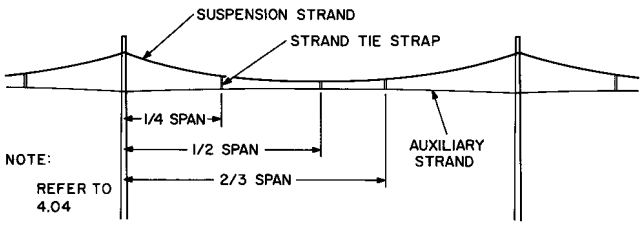


Fig. 2—Inverted Auxiliary Strand

4.05 Check existing guying and make any additions necessary to support the load imposed by the auxiliary strand. The auxiliary strand should be considered as adding 2000 pounds to the loading. At auxiliary strand deadends where it is necessary to head guy for the auxiliary strand only, use 2.2M strand for the guy with lead/height ratio of 3/4 or better.

4.06 The auxiliary strand attachments should be located on the same side of the pole as the cable suspension strand, not less than 12 inches below the maximum 60 F sag of the cable suspension strand with the cable in place. Fig. 3 and 4 show the methods of attachment.

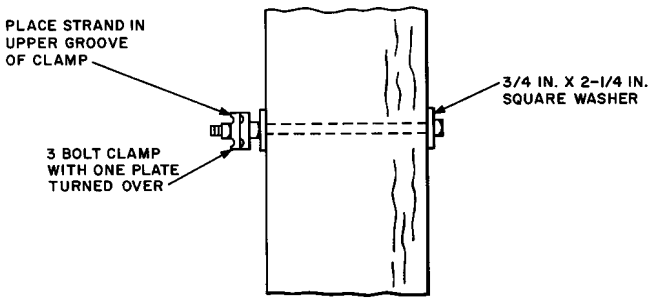


Fig. 3—Attaching Auxiliary Strand to IN-Line Pole

4.07 Place 2.2M auxiliary strand at the tension or sag indicated in Table B.

4.08 Two methods of sheath protection from abrasion by B Strand Tie Straps, one-bolt

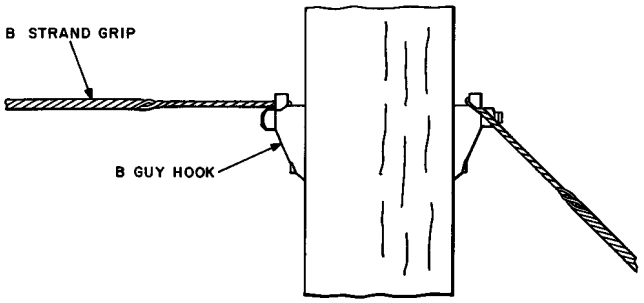


Fig. 4—Attaching Auxiliary Strand to Dead-End Pole

clamps, or cable suspension clamps at lashed cable are as follows:

(a) ***Preferred Method:*** Separate the strand and cable at the attachment point with wooden wedges and install a cable guard under the lashing wire. Place a lashed cable support around the guard at the attachment location. Make one wrap of the support around the guard under the lashing wire and two wraps including the wire as shown in Fig. 5. Remove the wedges after the attachment is completed.

TABLE B — TENSIONING AND SAG OF 2.2M AUXILIARY STRAND

AVERAGE SPAN LENGTH (FEET)	TEMPERATURE (DEGREES F)							
	—20	0	20	40	60	80	100	120
	STRINGING TENSION (POUNDS)							
	1000	950	900	850	800	750	700	650
	APPROXIMATE SAG (INCHES)							
150	2.5	2.5	3.0	3.0	3.5	3.5	3.5	4.0
200	4.5	5.0	5.0	5.5	6.0	6.0	6.5	7.0
250	7.0	7.5	8.0	8.5	9.0	9.5	10.5	11.0
300	10.5	11.0	11.5	12.0	13.0	14.0	15.0	16.0
350	14.0	15.0	15.5	16.5	17.5	19.0	20.0	21.5
400	18.5	19.5	20.5	21.5	23.0	24.5	26.5	28.5
450	23.5	24.5	26.0	27.5	29.5	31.0	33.5	36.0
500	29.0	30.5	32.0	34.0	36.0	38.5	41.5	44.5
550	35.0	36.5	39.0	41.0	43.5	46.5	50.5	54.0
600	41.5	44.0	46.0	49.0	52.0	55.5	59.5	64.0

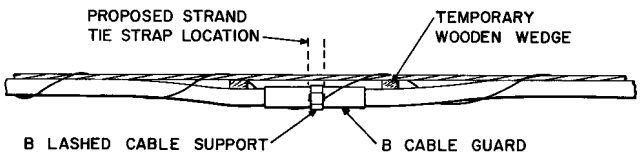


Fig. 5—Preferred Method of Sheath Protection

(b) ***Alternate Method:*** If necessary, the lashing wire can be cut and terminated on cable lashing clamps. Spacers and lashed cable supports are then used as shown in Fig. 6.

4.09 At the 1/4- and 2/3-span points install appropriate B Strand Tie Straps shown in Fig. 7. The length of strap depends on the 60 F sag of the cable suspension strand with the cable in place as indicated in Table C.

4.10 For inverted strand at the 1/2-span point, form and place an S Reinforcing Strap as shown in Fig. 8.

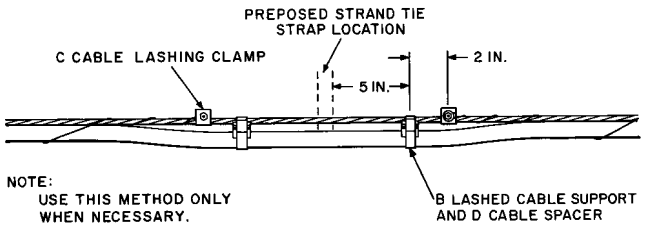


Fig. 6—Alternate Method of Sheath Protection

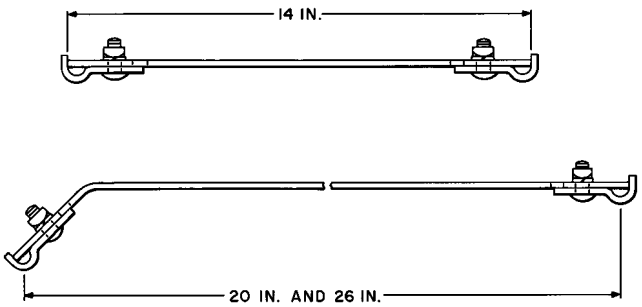


Fig. 7—B Strand Tie Straps

TABLE C — LENGTH OF B STRAND TIE STRAPS	
LENGTH OF STRAP (INCHES)	MIDSPAN SAG WITH CABLE IN PLACE AT 60 F (INCHES)
1/4-SPAN POINT	
14	32 or less
20	33 to 56
26	Over 56
2/3-SPAN POINT	
14	72 or less
20	73 to 128
26	Over 128

4.11 Install the B Strand Tie Strap as follows:

(1) Loosen nut on the carriage bolt sufficiently to enclose the strand in the groove.

(2) Place the strap with clamp and head of carriage bolt under the suspension strand, ie, between the strand and cable.

(3) Turn nut down fingertight.

(4) Wrap three layers of lead serving tape around the 2.2M auxiliary strand at the attachment point.

(5) Attach clamping detail and strap so the auxiliary strand tends to tie down the suspension strand.

(6) Position the strap properly and tighten both nuts securely. The completed installation is shown in Fig. 9.

4.12 Where 20- and 26-inch tie straps are used, the bent end of the strap should be attached to the cable suspension strand. Where the 14-inch tie strap is used, a bend of approximately 45 degrees should be made about 4 inches from one end and this end attached to the cable suspension strand as shown in Fig. 9.

Auxiliary Strand Method

4.13 The auxiliary strand method of reducing or preventing cable dancing consists of placing an auxiliary strand of equivalent size above the cable suspension strand to partially support the cable weight through B Strand Tie Straps.

4.14 Tie straps are required at the 1/4- and 2/3-span points in spans less than 200 feet, and at the 1/4-, 1/2-, and 2/3-span points in spans of 200 feet and over. If dancing continues, add a tie strap at the 1/2-span point in the shorter spans. Fig. 10 illustrates the auxiliary strand and tie strap arrangement for spans of 200 feet and over.

4.15 Check existing corner and dead-end guying and make any additions necessary to support the load imposed by the auxiliary strand. For guying purposes consider the auxiliary strand as an additional suspension strand.

4.16 The auxiliary strand should be placed on the same side, and at least 24 inches above the bolt supporting the strand and cable. Greater separation is desirable where it can be obtained. Place the auxiliary strand at the stringing tension

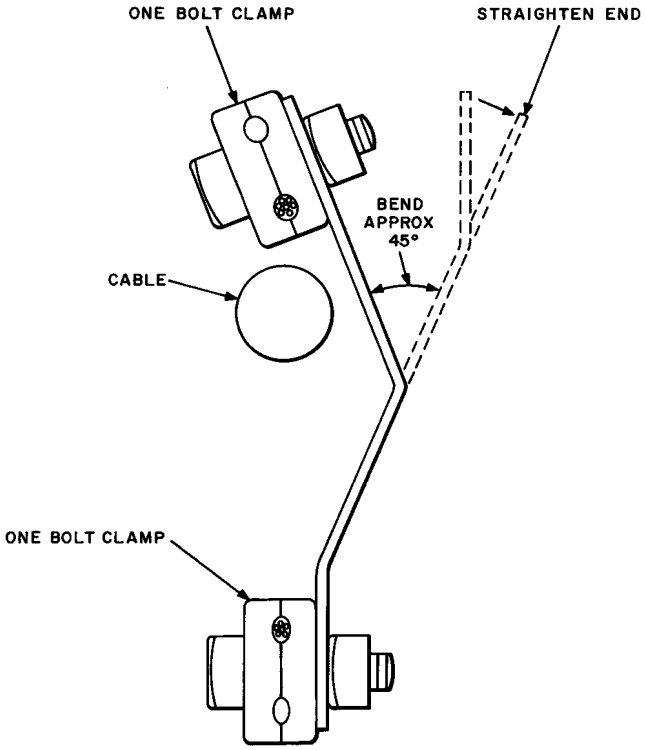


Fig. 8—S Reinforcing Strap Placed on Inverted Strand 1/2 Span Point

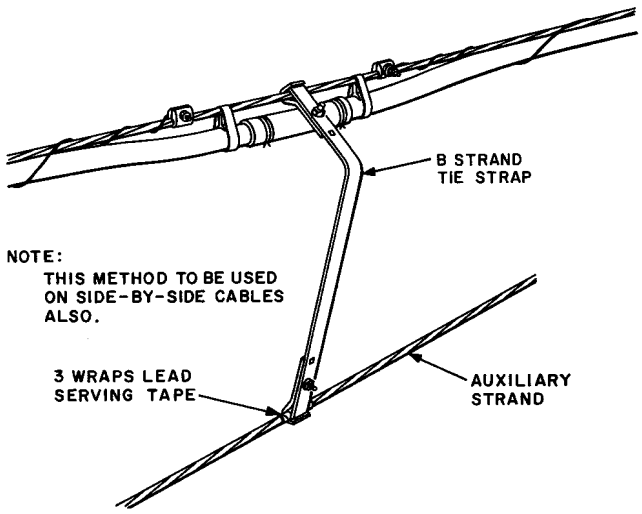


Fig. 9—B Tie Strap Placed 1/4 and 2/3 Span Points on Inverted Auxiliary Strand

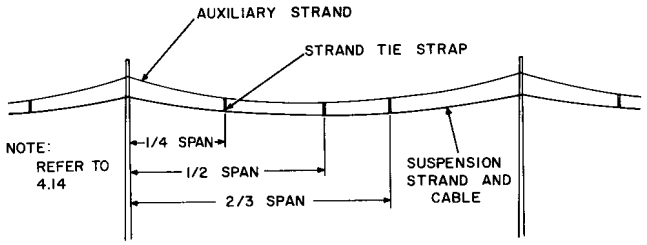


Fig. 10—Auxiliary Strand and Strand Tie Straps

shown for the appropriate sized strand in Section 627-210-011.

4.17 Install 14-inch tie straps between the two strands at the locations indicated in Fig. 10 so the auxiliary strand partially supports the cable weight. Protect the sheath from abrasion at these locations by using the method shown in Fig. 5 or 6.

4.18 Install the strand tie strap as outlined in 4.12, omitting (4). Fig. 11 shows an attached tie strap.

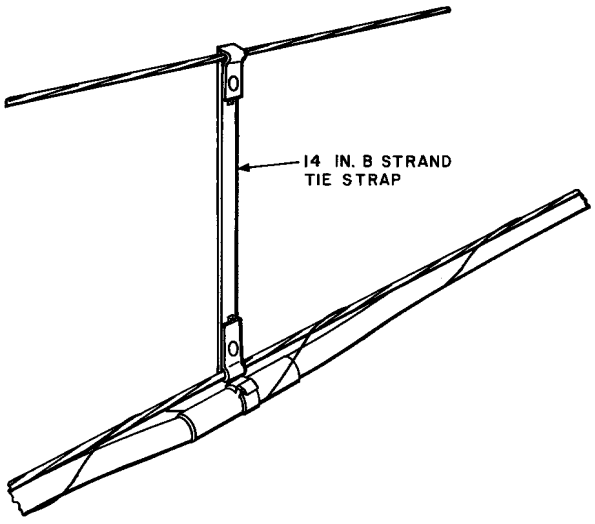


Fig. 11—14-Inch B Strand Tie Strap Placed With Cable Guard

4.19 For ease of installation attach the B Strand Tie Strap to the cable suspension strand first and then to the auxiliary strand. When the strands are widely separated, loop a handline around the strands, pull them together and hold while installing the strap.

B Cable Damper Method

4.20 When neither the inverted nor auxiliary strand methods of reducing or preventing cable dancing are applicable, the B Cable Damper can be used on lines carrying either lead- or polyethylene-sheathed cables.

4.21 The B Cable Damper consists of a spring-supported weight, encased in an airtight housing, equipped with a bracket for attaching the damper to the strand. Damping results from the action of the weight on the spring and by the movement of the air back and forth between the weight and the cylindrical housing. The weight behaves as a double-acting piston as it moves up and down in response to cable vibration. The overall height of the damper is 32 inches and its weight 35 pounds.

4.22 The damper when assembled for shipment has a 3/8-inch lock rod inserted between the weight and lower end of the housing to prevent movement of the weight during transportation and handling. The B Cable Damper is shown in Fig. 12.

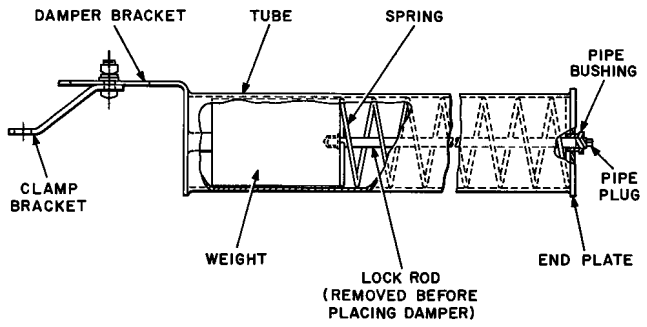


Fig. 12—B Cable Damper

4.23 To place the damper in an operating condition, remove the rod as follows:

(1) Place the damper in a horizontal position to prevent sudden release of the weight.

(2) Remove the 3/8-inch pipe plug and lock rod.

(3) Replace the pipe plug tightly, applying pipe joint compound to the threads to maintain an airtight condition of the housing.

(4) Raise the damper slowly to the vertical position.

4.24 To effectively reduce or prevent cable dancing, the B Cable Dampers must be installed as indicated in Table D. Where winds are unusually severe, it may be necessary to use an additional damper. For spans of 150 feet or less the additional damper should be placed at the 1/4-span point and for longer spans at the 1/2-span points (Fig. 13).

4.25 To install the damper, first determine the location by measuring. Should the lashing wire at this point interfere with the attachment of the 3-bolt cable suspension clamp, from which the damper is to be suspended select the closest point where the clamp can be installed between turns of the lashing wire without rearranging it. Place a B Cable Guard on the cable and secure it with lashing wire to protect the cable sheath.

4.26 Using a C Cable Suspension Bolt in the center hole of a cable suspension clamp, attach the suspension clamp and the clamp bracket of the damper to the strand as shown in Fig. 14. Tighten all nuts securely. Place the cable damper in position, secure it to the clamp bracket by inserting the center bolt, and tighten the nut with lockwasher sufficiently to hold the assembly. Allow the damper to assume its normal vertical position. Insert the outer bolts, place lockwashers and nuts and tighten the assembly securely (Fig. 15). For proper operation it is important that the damper is in a vertical position regardless of the grade of the line.

4.27 An alternate method of installing a B Cable Damper consists of cutting and terminating the lashing wire with cable lashing clamps and placing lashed cable supports and spacers. No sheath protection is needed with this method (Fig. 16).

4.28 B Cable Dampers should be inspected periodically to determine the condition of the lashing wire and cable and check the tightness of the bolts. The suspension strand at the edges

TABLE D — RECOMMENDED PLACEMENT OF B CABLE DAMPERS		
SPAN LENGTH, FT	LOCATION OF B DAMPER—SEVERE WINDS	LOCATION OF B DAMPER—UNUSUALLY SEVERE WINDS
150 or less	2/3 Point	1/4 and 2/3 Points
151 to 600	1/4 and 2/3 Points	1/4, 1/2, and 2/3 Points

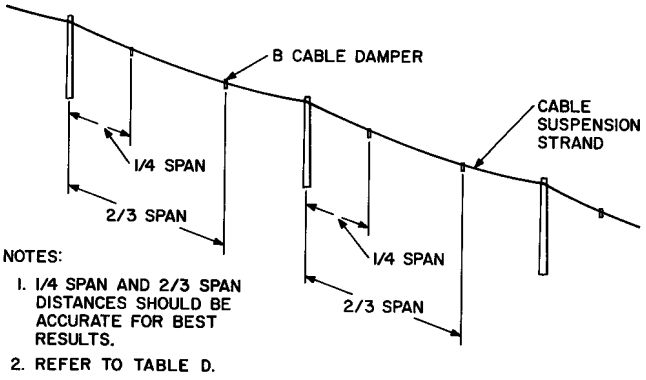


Fig. 13—Spacing B Cable Dampers 151- to 600-Foot Spans

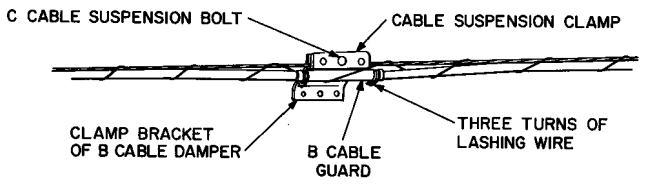


Fig. 14—Strand Attachment B Cable Damper

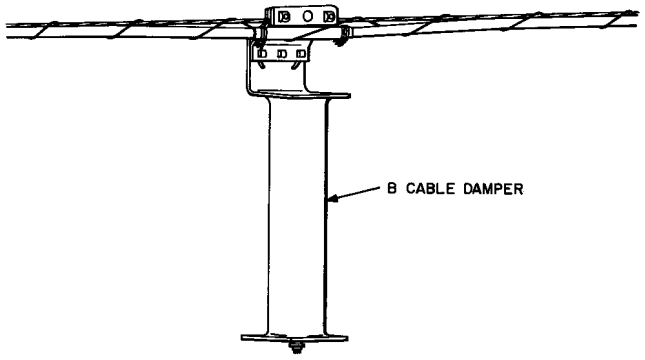


Fig. 15—B Cable Damper Installed

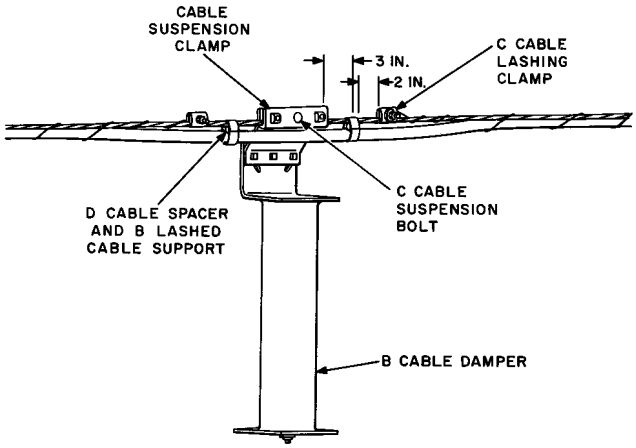


Fig. 16—B Cable Damper Installed With Lashing Wire Terminated

of the cable suspension clamp should be inspected for evidence of strand fatigue.

4.29 When B Cable Dampers are removed from the line, they should be lowered slowly to the horizontal position to ease the impact of the weight against the top of the housing. Dampers should be kept in this position until the lock rod has been installed to prevent movement of the weight during handling and transportation.

5. SELF-SUPPORTING CABLE

5.01 Self-supporting cable except disc-insulated coaxial cable should be spiraled as it is placed where cable dancing conditions are anticipated; however, with the exception of spans in which branch splices are located, it can be spiraled at any time if dancing occurs. ◗When placing self-supporting disc-insulated coaxial cables by the stationary reel method attach a modified E Cable Leader to the leading end of the cable. This

method will prevent spiraling as the cable is pulled into place. Should this cable spiral while being placed, a cable block can crush the coaxial tube. The cable can be spiraled after it has been placed and tensioned without being damaged by the spiraling.◀

5.02 Dancing in self-supporting cable can be minimized by spiraling the cable in opposite directions at alternate poles. Make a complete spiral approximately every 20 feet throughout the length of cable where dancing has occurred or might be expected to occur. For example, to obtain a spiral every 20 feet in 180-foot spans, the cable must be spiraled nine times at each alternate pole.

5.03 If the spans are of uneven length, spiral the cable until the desired number of spirals is obtained in the longer span.

5.04 Where self-supporting cable is on a pole with other cables, spiral and place strand tie straps between it and the other strands as shown in Part 6.

5.05 To install a B Strand Tie Strap on self-supporting cable:

(1) Slit the webbing for about 6 inches.

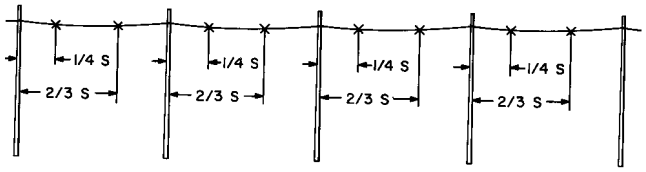
(2) Place a B Cable Guard cut to half length over cable to protect from abrasion.

(3) Attach strap to jacketed strand in usual manner.

(4) ▶Place three turns of vinyl tape around strand and cable at end of slit to prevent them from pulling apart.◀

6. MULTI-CABLE LINES

6.01 Where multi-cable lines consist of polyethylene cables or one or more polyethylene cables and one lead cable, spiral the polyethylene cables when 1-1/2 inches in diameter or less as covered in Part 3 and place B Strand Tie Straps between the strands. This will reduce the amount of cable dancing, thereby preventing plant damage. The tie straps should be located at the 1/4 and 2/3 points of each span. Where consecutive spans are to be equipped, the progressive arrangement should be at the 1/4 and 2/3 points, as shown in Fig. 17. The length of strap to be used depends upon the separation between the two strands at the point of attachment as indicated in Table E.



NOTE:
1/4 SPAN AND 2/3 SPAN DISTANCES SHOULD BE ACCURATE FOR BEST RESULTS.
S—SPAN LENGTH
X—LOCATION OF B STRAND TIE STRAP

Fig. 17—B Strand Tie Strap Spacing Multi-Cable Lines

TABLE E — LENGTH OF B STRAND TIE STRAP FOR POINT OF ATTACHMENT

LENGTH OF STRAP (INCHES)	SEPARATION AT POINT OF ATTACHMENT (INCHES)
14	Not more than 16-1/2
20	16-1/2 to 22-1/2
26	22-1/2 to 29

6.02 Cables placed side-by-side on opposite sides of a pole, cables placed one above the other, or multi-cable combinations of both should be connected with B Strand Tie Straps. Where straps are connected both horizontally and vertically, install the cable outside the straps at the point where the two straps are placed on the same strand. Cable should ***not*** be placed between the straps as ***damage to cable would result.***

6.03 If a lashed cable is involved, it will be necessary to protect the sheath of the lashed cable from abrasion under the tie strap as outlined in 4.09.

6.04 Install the B Strand Tie Strap as follows:

(1) Loosen nut on carriage bolt.

(2) Place the strap on strand with clamp under suspension strand. If 20- or 26-inch tie straps are used, the bent end of the tie strap should be attached to the strand in the higher position. The 14-inch strap has no bend. In some cases where small poles are involved and the cables vary appreciably in weight, the strap may bear against the upper cable sheath unless the strap is bent to provide clearance. In such cases, a bend of approximately 45 degrees should be made near one end of the 14-inch strap and this end attached to the strand in the upper position.

(3) Turn nut down fingertight.

(4) Attach clamping detail and strap to other strand.

(5) Properly position the strand tie strap on lashed cable strand and tighten both nuts securely (Fig. 18).

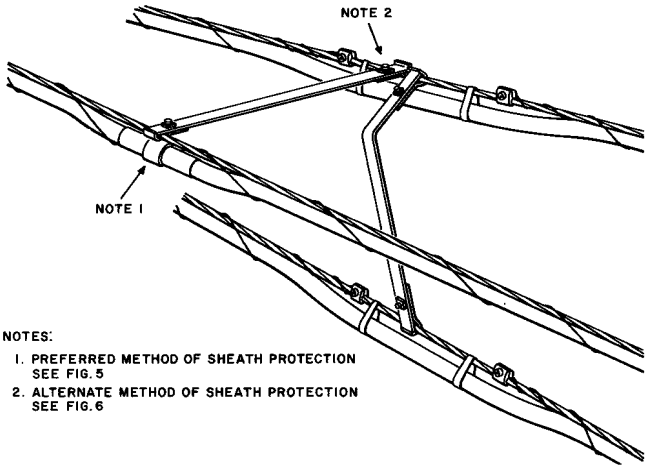


Fig. 18—B Strand Tie Strap Attached on Multi-Cable Lines