

SUSPENSION STRAND

PLACING METHODS

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1. GENERAL

1.01 This section includes methods of placing suspension strand using a moving reel or a stationary reel.

1.02 This section has been revised to add precautions previously covered in Section 627-230-010 and to add information pertaining to the use of an aerial lift vehicle.

1.03 The aerial lift vehicle and/or the moving reel method should be used where the terrain is suitable for the operation of a vehicle along the pole line on which the strand is to be placed. Cable and strand should be placed on the road side of the line, where possible, but may be placed on the field side of the line. The vehicle should move in the direction of traffic whenever practical.

1.04 Suitable permanent or temporary guys (refer to the 621 Division of Plant Series Practices) are required where it is necessary to temporarily snub the tensioned strand.

2. PRECAUTIONS

2.01 *Insulating gloves must be worn by all workmen handling suspension strand, reels, ropes, associated trucks, trailers, etc. during placing, tensioning, and dead-ending operations on jointly used or on nonjoint sections involving power crossings.* In addition to wearing insulating gloves, avoid all body contact with the strand wires, guys, etc. *Insulating gloves shall be worn and body contact avoided until the strand has been placed in all suspension clamps, fully tensioned, dead ended, and permanent grounds attached where required.*

2.02 *Suspension strand, which is being placed on jointly used poles or on nonjoint sections involving power crossings, must be grounded in accordance with Section 627-230-203.*

2.03 All ropes used in conjunction with placing operations on jointly used lines or at power crossings shall be free of metallic strands and as dry as practicable. Do not use a winch line to place strand on joint use poles or on non-joint sections involving power crossings.

2.04 When placing suspension strand on jointly used poles or where crossings are involved, reels shall be adequately braked.

2.05 Exercise care when using a moving reel to prevent the strand from whipping or becoming fouled on the reel. Whipping may be caused by moving the vehicle too rapidly, too slowly, or at an uneven speed over rough ground. Whipping may also be caused by uneven tension on the strand as a result of the reel not turning smoothly. A properly tensioned reel brake should be used when placing strand.

2.06 Do not ride suspension strand unless it has been dead ended and is clamped at both ends of the span.

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PREVENTION OF FLIP-UPS AT LOW POLES

2.07 At upward changes of grade (low poles) on jointly used lines, special precautions are required during placing to prevent the pulling-in line and the strand from rising into possible contact with the power wires.

2.08 When pulling strand over drive hooks or over the suspension bolt, use a one-sheave cable block lashed to the low pole at the strand attachment level to restrain the pulling-in line and the strand. *Do not rely on placing the strand underneath the drive hook or suspension bolt.*

2.09 Use a one-sheave cable block lashed to the base of the low pole where strand is being pulled in along the ground (see 5.02).

2.10 When placing strand by the moving reel method, stop the placing vehicle just past the low pole and, using a 5/8-inch or larger manila rope, lash the strand securely to the base of the pole.

POWER CROSSINGS

2.11 When placing suspension strand on pole lines involving power crossings, *workmen handling the strand, pulling-in line, ropes, etc., must wear insulating gloves until the strand is fully tensioned, dead ended, and secured in all suspension clamps and permanent grounds attached.*

2.12 Where the strand crosses under a power wire in a span or on a jointly used pole line where there is any possibility of the strand being whipped up into contact with the power wire, hold the strand down by means of a 3/8-inch or larger rope to prevent a contact during the stringing or tensioning operations (see 4.14).

2.13 *Do not place suspension strand above power wires if their voltage is greater than 750 volts.* Where suspension strand is to be placed over trolley wires or power wires of not more than 750 volts, proceed as outlined in 4.16.

ROAD CROSSINGS

2.14 Where strand is to be placed over a highway, exercise extreme care to prevent the strand from becoming entangled with passing vehicles. Use a flagman for control of traffic, if required.

2.15 When placing strand over a highway while using the moving reel method, install temporary false dead ends, when required, to maintain road clearance until the strand is tensioned.

3. USING AN AERIAL LIFT VEHICLE

ROAD SIDE (Moving Reel)

3.01 Before operating the aerial lift, review the 649 Division of Plant Practices which cover the description and operation of approved aerial lifts. All safety precautions given in the applicable practice are to be observed.

3.02 The job should be surveyed and power crossings and other hazards noted prior to starting work operations.

3.03 Set the strand tensioning device or strand reel brake to apply enough tension on the strand to ensure that ground clearance requirements are met. On joint use leads, it is desirable to maintain enough tension to reduce sag to a minimum so the strand will not contact power wires should whipping occur.

3.04 Place the strand in the proper roller guides on the lift and make a *permanent* attachment of the strand at the *first* pole. On joint use leads or where power crossings are involved, *ground the strand.*

3.05 Move the truck to the second pole while keeping the boom as near as possible in alignment with the direction of pull (Fig. 1). Adjust the amount of tension on the strand as necessary to prevent whipping and to maintain the necessary above-ground clearance.

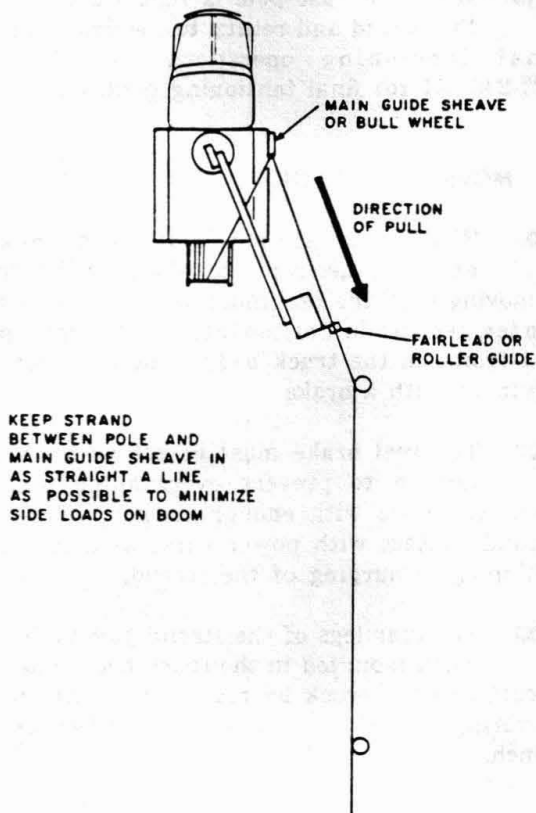


Fig. 1 — Aligning Boom with Direction of Pull

3.06 As the truck approaches the second pole, the driver, following instructions from the lift operator, will slow down and stop the truck as smoothly as possible. The truck should be stopped in a position that will enable the lift operator to swing the boom to the pole at a correct working position for placing the attaching hardware.

3.07 Place the strand in the cable suspension clamp. Tighten the clamp sufficiently to hold the strand in the clamp, but not so tight as to cause binding during final tensioning.

3.08 After the strand has been secured, realign the boom as near as possible with the direction of pull and proceed to the next pole.

3.09 If it becomes necessary to reduce the amount of sag in the spans, use a chain hoist and a strand puller to take up slack (see

1.04). If the lift truck is equipped with an electric tow line using a nonmetallic pulling line, the electric tow line may be used in place of the chain hoist and strand puller. On nonjoint sections where power crossings are not involved, the winch line may be used to remove excess sag. Remove enough slack to obtain the necessary ground clearance and hold the strand in place by placing a one-bolt clamp on the truck side of the suspension clamp.

3.10 For final tensioning methods, see Section 627-240-211. After final tensioning, tighten the strand suspension clamps and remove any one-bolt clamps that were used to hold the strand.

Note: After final tensioning, do not leave the suspension clamps loose in anticipation of tightening them as lashed aerial cable is placed. If the suspension clamps are left loose until after the lashing machine is transferred to the next span, strand tension will increase in the successive spans as the lashing operation progresses causing unequal tensions in the spans with the greater amount of tension in the latter spans. This may result in damage under storm-load conditions or cause difficulty in obtaining slack in the cable for installation of certain types of terminals.

FIELD SIDE (Stationary Reel)

3.11 The stationary reel method must be used for placing strand on the field side. The B Cable Reel Brake or other suitable brake must be used to maintain enough tension on the suspension strand to ensure that ground clearance requirements are met and to prevent the strand from fouling on the reel. On joint use leads, maintain enough tension to reduce sag to a minimum so the strand will not contact power wires should whipping occur. Ground the strand where required in accordance with Section 627-230-203. Follow applicable procedures given in Part 5 of this practice.

3.12 Position the reel, raise the end of strand, and pass it through the attachment on the first pole.

↗ 3.13 Secure the strand to the pulling line. Use the electric tow line or the winch line, depending on which piece of equipment is available, for a pulling line. If the winch line is used, add a length of 1/2-inch or larger manila rope to the winch line so there will be no electrical continuity between the strand and the truck.

3.14 Move to the second pole in the same manner used for road side placing. After the truck has come to a complete stop, swing the boom to a working position and place the attaching hardware. Using a rope sling on the pole to secure a strand puller, hold tension on the strand with the strand puller (Fig. 2, Step 1). Slack off on the pulling line and detach it from the strand (Fig. 2, Step 2). Move the basket to a position that will allow the pulling line to be passed behind the pole and reattached to the strand (Fig. 2, Step 3). Take up on the pulling line and remove the strand puller and rope sling. Take up further on the pulling line so the strand can be placed in the attaching hardware. As the truck moves away, align the boom with the direction of pull to reduce side loading. As each successive pole is reached, repeat the operation.

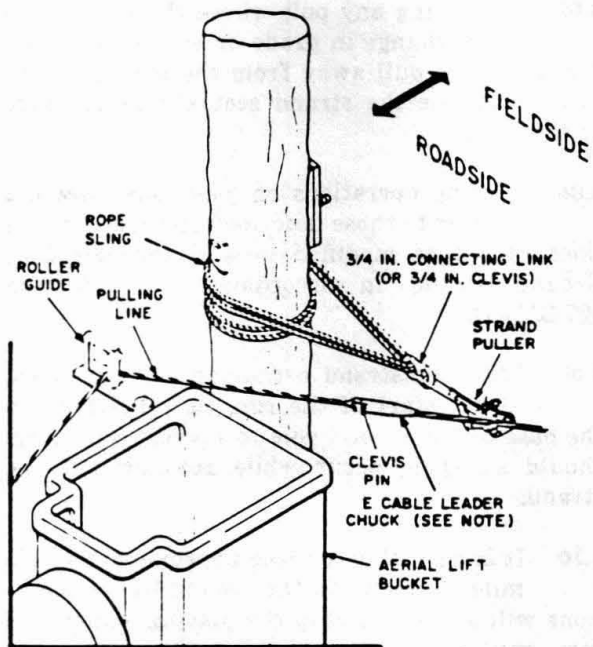
↗ 3.15 When the last pole is reached, dead end the strand and return to the first pole for final tensioning operations. See Section 627-240-211 for final tensioning methods.

4. MOVING REEL METHOD

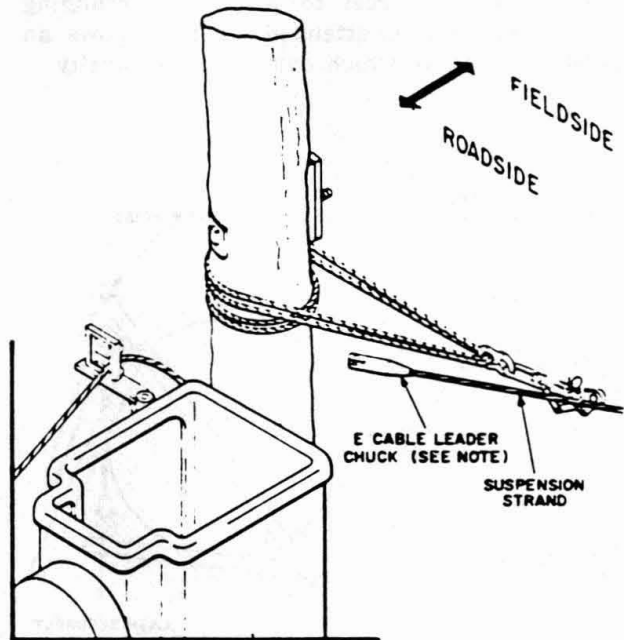
4.01 When an aerial lift vehicle is not available and it is desirable to place strand from a moving reel, the reel must be placed on a reel loader, reel trailer, or mounted on a strand payout frame in the truck body. The reel must be equipped with a brake.

↗ 4.02 The reel brake must be set with enough tension to prevent overrunning and on joint use lines with enough tension to prevent strand contact with power wires as a result of whipping or surging of the strand.

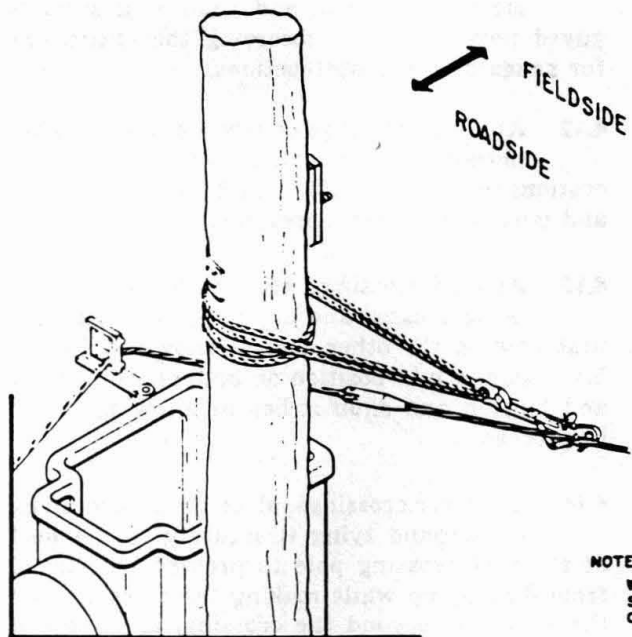
4.03 The rear legs of the strand payout frame, when mounted in the truck body, must be secured to the truck by rope slings without interfering with the operation of the truck or the winch.



STEP 1



STEP 2



STEP 3

STEP 1

USE ROPE SLING AND STRAND PULLER TO HOLD STRAND.

STEP 2

SLACK OFF ON PULLING LINE AND DETACH LINE BY REMOVING CLEVIS PIN FROM CHUCK.

STEP 3

POSITION BASKET ON FIELD SIDE OF POLE AND REATTACH PULLING LINE TO CHUCK. TAKE UP ON PULLING LINE AND REMOVE STRAND PULLER AND ROPE SLING. POSITION BASKET TO PLACE CABLE IN ATTACHMENT ON POLE.

NOTE:

WHERE E CABLE LEADER CHUCK WILL NOT FIT THE STRAND, ADD A SHORT LENGTH OF 6M STRAND AND A REDUCER STRANDLINK OR USE OTHER SUITABLE METHOD OF CONNECTING PULLING LINE TO STRAND.

Fig. 2 — Method of Passing Strand around Pole — Field Side Placing

4.04 Brake the reel to prevent overrunning when left unattended. Fig. 3 shows an adjustable brake which can be made locally.

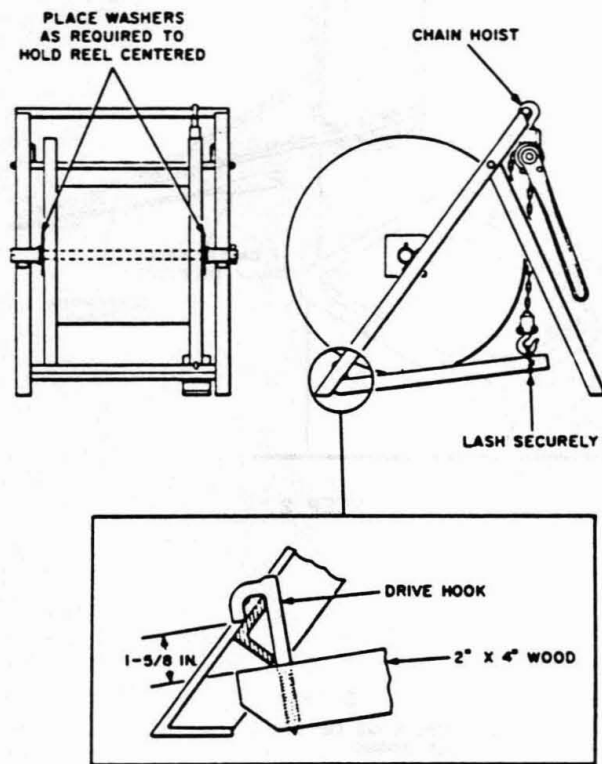


Fig. 3 — Brake for Strand Payout Frame

→ **4.05** On *nonjoint use lines*, dead end the strand permanently at the first pole.

4.06 Drive the vehicle slowly along the line allowing the strand to pay off on the ground. After the vehicle has moved at least 500 feet, the workmen following on foot may raise the strand with a handline or wire raising tool into the suspension clamps. Tighten the clamp sufficiently to hold the strand in the clamp but not tight enough to cause binding during final tensioning.

4.07 In passing any pole where there is an upward change in grade or where there is a corner with a pull away from the pole, stop the vehicle and tie the strand securely to the base of the pole.

4.08 Placing operations on *joint use lines* are similar to those described for nonjoint use lines except as modified in 4.09 through 4.11. Ground strand in accordance with Section 627-230-203.

4.09 With the strand permanently dead ended at the start of the run, tie the strand to the base of the second pole to prevent whipping, should snagging occur while running out the strand.

4.10 It is advisable to place approximately 1/4-mile of strand on the ground where conditions will allow and stop the placing vehicle before raising the strand into the suspension clamps. Tighten the clamps only enough to hold the strand in position without causing binding.

4.11 Pull up the strand to about one-half the stringing tension and snub at a suitable guyed pole, carefully observing the entire line for snags or other obstructions.

4.12 At road crossings or when crossing under power supply wires, stop the placing operations in the span before the crossing and raise and tension all strand previously placed.

4.13 At road crossings, stop traffic on the road being crossed and pay out strand past the first pole on the other side as shown in Fig. 4. Raise strand into position on both crossing poles and tension and snub it before allowing traffic to proceed.

4.14 At power crossings, place the strand along the ground tying it securely to the butt of the first crossing pole to prevent the strand from flipping up while making the crossing past the first pole beyond the crossing, as shown in Fig. 5.

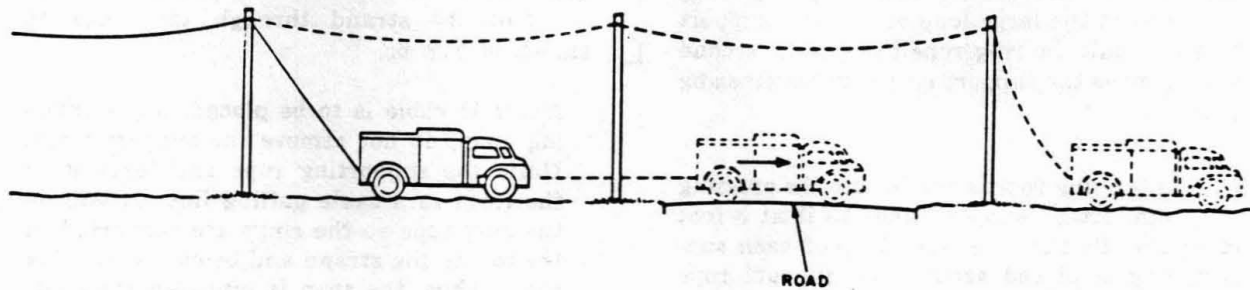


Fig. 4 — Placing Strand at Road Crossing

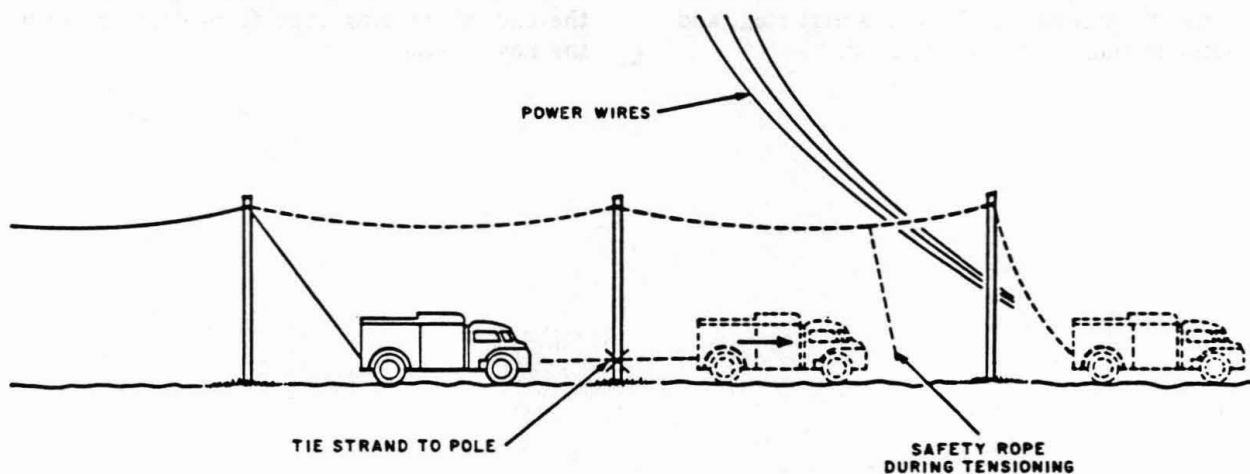


Fig. 5 — Placing Strand at Power Crossing

4.15 Raise the strand into position on both poles. Slowly tension and then snub the strand. Hold the strand with 3/8-inch or larger manila rope in the crossing span during raising or tensioning operations to prevent accidental contact.

4.16 Where the suspension strand is to be placed over trolley or power wires of not more than 750 volts, proceed as follows in the crossing span:

(1) Use three 1/2- or 5/8-inch ropes in placing the crossing strand. All ropes used in this operation must be manila or other nonmetallic material, and as dry as practical.

(2) Tie one rope (supporting rope) securely to the crossing poles about 1 foot above the desired attachment level of the suspension strand.

(3) Position the second rope (ring rope) over the crossing with midpoint of the ring rope held at the first pole and one end of the ring rope held at the second pole.

(4) At the first pole, attach the first support ring at about the midpoint of the ring rope. Place the large loop of the support ring over the supporting rope and close the ring.

↗ (5) Tie one end of the third rope (pulling line) to the large loop of the first support ring and pull the ring rope toward the second pole to move the support ring into the crossing span.

(6) As the ring rope is pulled into the crossing span, attach support rings to it at 3-foot intervals. Be sure the large loop of each support ring is placed around the support rope and the pulling line. Continue to place support rings as the support rope is pulled.

↙ (7) When the span is ringed, tie the ring rope securely to the crossing poles at a point below the suspension strand attachment level, untie the pulling line from the first ring, and pull additional slack as required.

↗ (8) Attach the strand to the pulling line and pull the strand through the rings as shown in Fig. 6.

Note: If cable is to be placed in the crossing span, do not remove the support rings. Untie the supporting rope and leave it in the rings as a cable pulling line. Retension the ring rope so the rings are supported at the top by the strand and below by the ring rope. Thus, the span is prepared for cable placing operations.

↗ (9) To remove the rings, untie the ring rope and pull it to the second pole. Add support rings at three-foot intervals from the last ring to the end of the ring rope to prevent the end of the ring rope from dangling into the power wires.

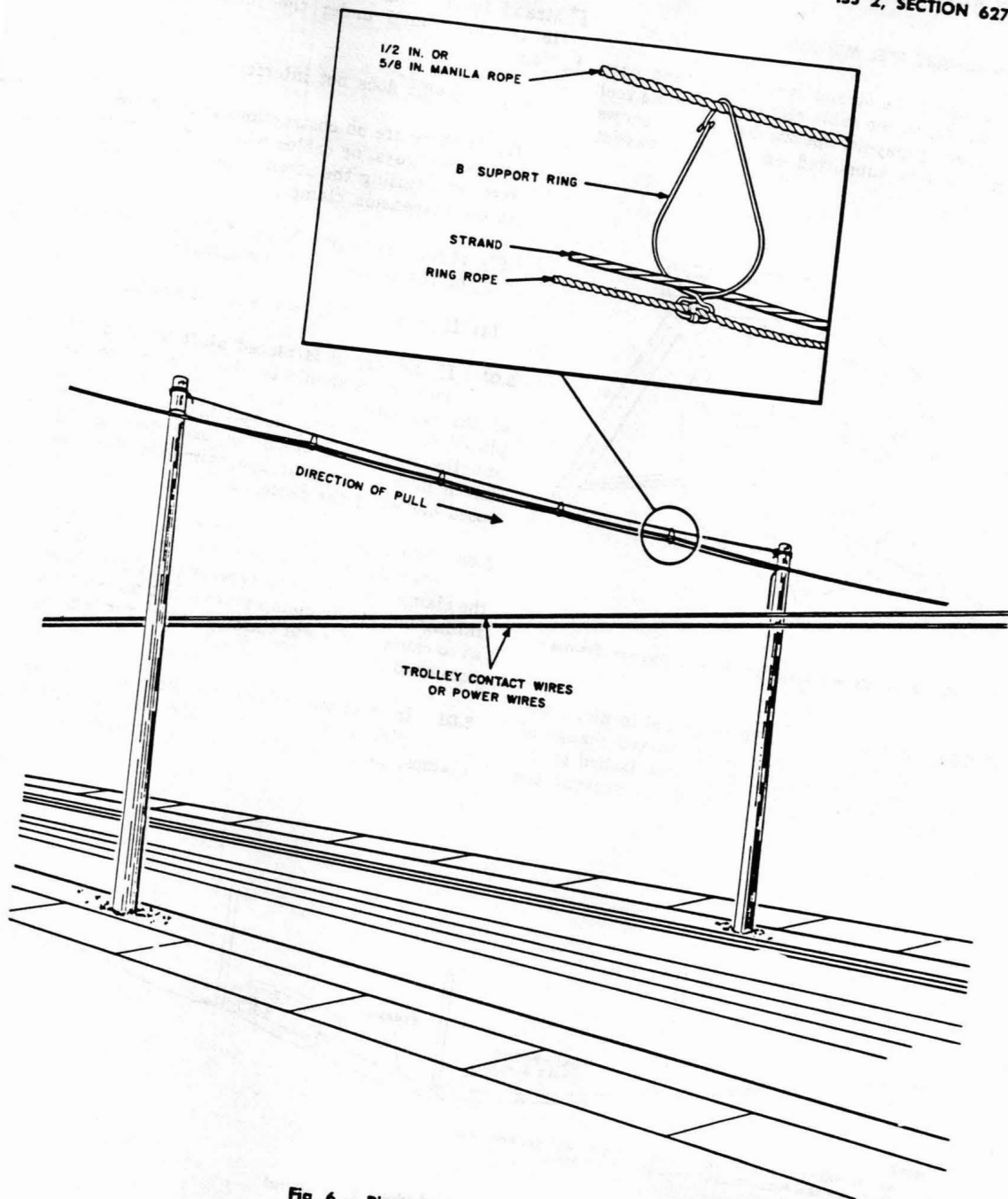


Fig. 6 — Placing Strand over Power Wires

5. STATIONARY REEL METHOD

5.01 Support the strand reel on a strand payout frame, on cable reel jacks, or on a reel trailer during payout operations. Fig. 7 shows the strand reel supported on a strand payout frame.

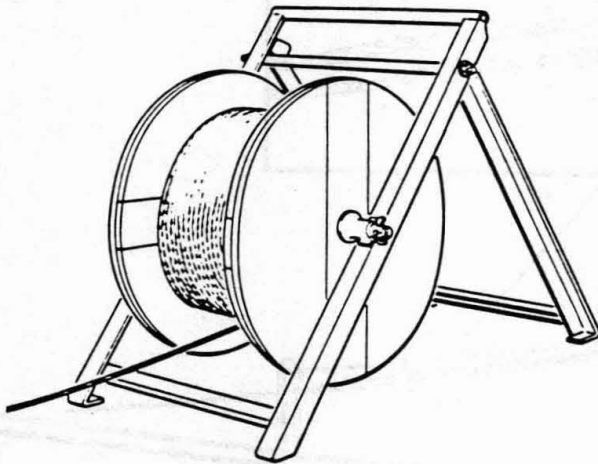


Fig. 7 — Strand Reel on Strand Payout Frame

5.02 If the strand is to be pulled in along the ground and there is an upward change of grade, use a one-sheave cable block lashed to the base of the low pole (Fig. 8) to prevent the

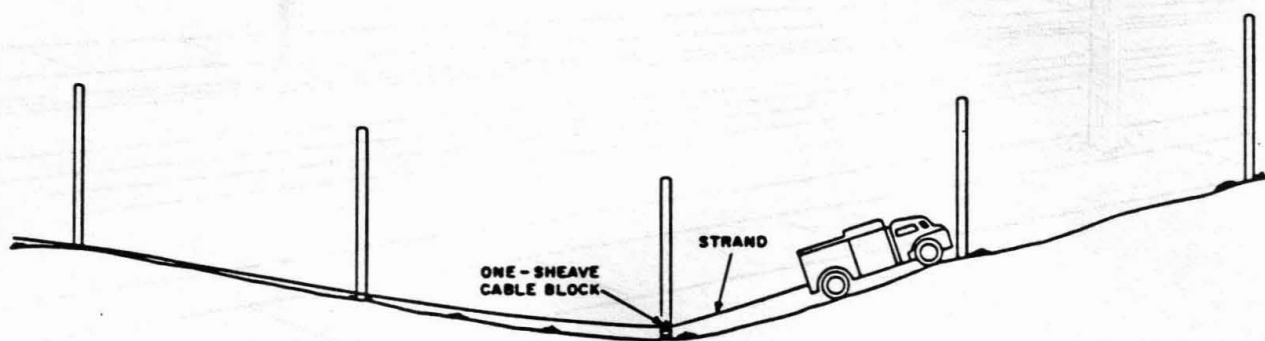
strand from rising. The strand may be pulled in on the ground under the following conditions:

- (1) If traffic does not interfere.
- (2) If there are no obstructions such as trees, wires, guys, or cables which would interfere with raising the strand from the ground to the suspension clamp.
- (3) If there is no possibility of the galvanizing on the strand becoming damaged.
- (4) If an aerial lift vehicle is not available.

5.03 If the strand is placed aloft while being run out, it should be placed in the groove of the suspension clamp, over the nut that is placed on the suspension bolt between the pole and the suspension clamp, or over drive hooks driven into the pole at approximately the proposed height of the cable.

5.04 When the strand is placed in the groove of the suspension clamp, tighten the nuts of the clamp sufficiently to prevent the strand from falling out of the clamp groove, but not so tight as to cause binding of the strand when it is being tensioned.

5.05 In sections where the strand is being placed on the nut behind the suspension clamps, place the strand in the groove of the



NOTE:
WHERE THERE IS A CHANGE IN GRADE, USE A ONE-SHEAVE CABLE BLOCK ON LOW POLE TO KEEP STRAND FROM RISING.

Fig. 8 — Pulling Strand along the Ground

suspension clamp and tighten as described in 5.04 at every sixth pole in straight sections, at all poles where there is a pull away from the pole, and at poles where there is a dip or high point. At all poles where the strand is placed behind the clamp, secure the clamp in a vertical position, as shown in Fig. 9, to help keep the strand in place.

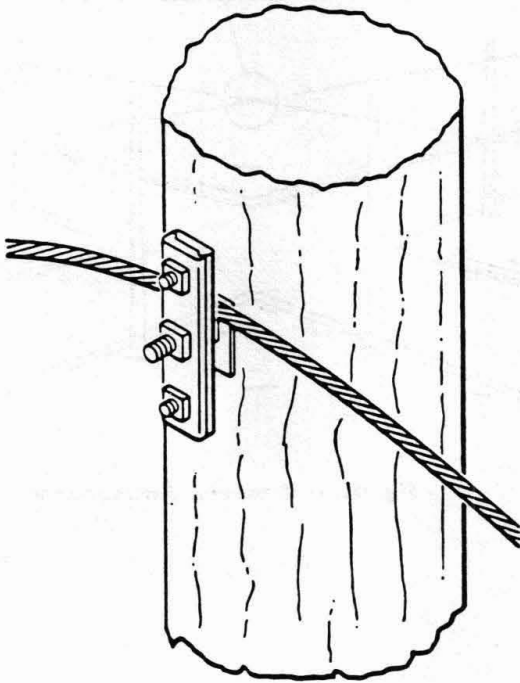


Fig. 9 — Pulling Strand behind Suspension Clamp

5.06 When running strand over drive hooks, drive the hooks into the pole, leaving only enough space between the pole and the hook to permit laying the strand in the hook. Place

suspension clamps at every sixth pole, corners, etc., as described in 5.05. Remove drive hooks after the strand has been tensioned and permanently attached.

5.07 Where trees interfere with placing the suspension strand, place a rope through or over the trees at the proper level and use the rope to pull the strand through. Use a wire raising tool for passing the rope through the trees.

5.08 When large tree limbs which cannot be removed are encountered near the proposed level of the cable, place the strand under the limbs so that the strand will tend to lift the limbs when it is pulled tight. The sag after the weight of the cable is added should then locate the strand just below the normal position of the limb.

6. BENDING AND CUTTING STRAND

6.01 Do not make small radius bends in strand around strand connectors or guy bolts at points marked by a band of paint. These bands indicate factory splices in individual wires of the strand.

6.02 Secure the strand before cutting to prevent the loose ends from flipping. Also, on 10M, 16M, and 25M strand, bind both sides of the point to be cut with a double layer of friction tape or wire serving to prevent the strand wires from spreading. The strand may be cut with strand cutters, a hacksaw, or a 3-cornered file.

6.03 Cut strand that is in place on the pole line as far away as practical from the strand puller or other temporary attachment holding the strand. Make a straight cut taking care not to rock the strand cutter while the cut is being made.

7. CROSSOVERS OR TURNS

7.01 Where one suspension strand is to cross over another, use two cable suspension clamps at the crossover as shown in Fig. 10. Place the strand for the branch (or smaller) cable above the strand which will support the main cable.

7.02 It is desirable to avoid corners at strand crossovers. However, if a corner is necessary, and the *pull does not exceed 7 feet*, the corner may be constructed using the same method as for straight crossovers *except* that a 3-bolt *guy clamp*, with a strand filler, must be placed on the line strand as shown in Fig. 11. This guy clamp placed inside the corner will reinforce the cable suspension clamp and keep it from sliding on the strand. A situation at a crossover that would require a corner with more than a 7-foot pull should be referred to the engineer.

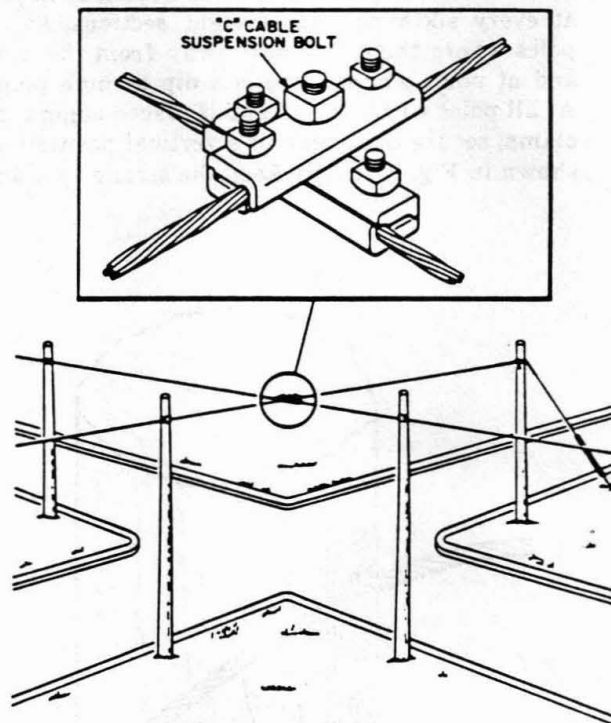


Fig. 10 — Crossover Arrangement

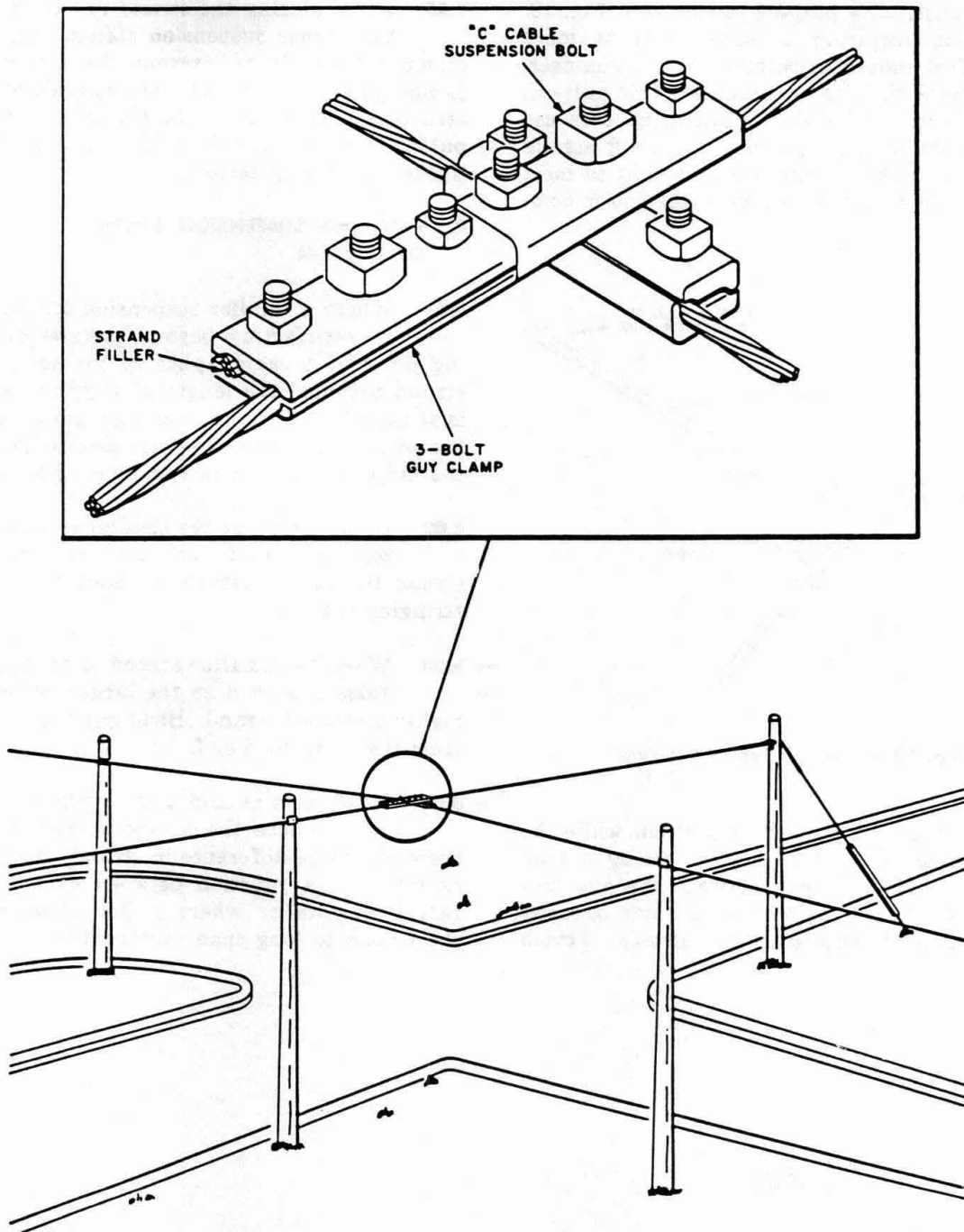


Fig. 11 — Crossover Arrangement with Corner not Exceeding a 7-Foot Pull

7.03 Avoid making turns in the span wherever practical but when a turn in the span is necessary and the corner pull is not more than 50 feet, construct a pull-off as shown in Fig. 12.

- A situation requiring a corner pull of more
- than 50 feet should be referred to the engineer. To determine the size of strand for this pull-off, refer to Section 621-400-013, but in no case use less than 6M strand. Attach the pull-off strand to the pole or stub at the proper height to meet all clearance requirements when the job is completed.

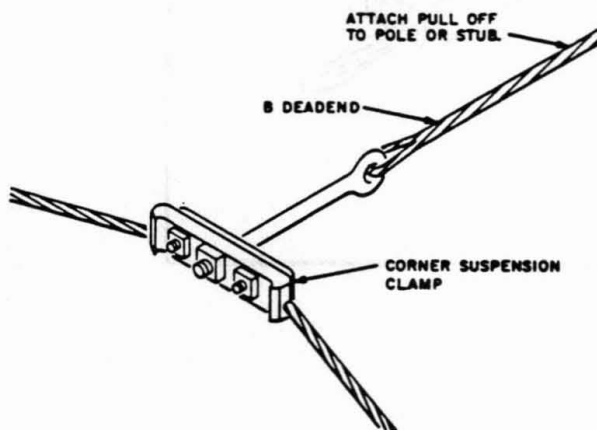


Fig. 12 — Pull-Off for Aerial Turn

7.04 To keep the pull-off in position while the strand is being pulled up, string a temporary 5/8-inch rope guy between the guy bolt of the pull-off and the pole on the side *opposite* the direction of pulling up the strand. Attach

the rope guy *above* the attachment level of the suspension strand.

7.05 After placing the strand in the groove of the corner suspension clamp, tighten the clamp sufficiently to prevent the strand from jumping out of the clamp while still allowing the strand to slide through the clamp as it is being pulled in or tensioned. After final tensioning, tighten the clamp securely.

8. REDUCING SUSPENSION STRAND SIZE OR TENSION

8.01 Where a smaller suspension strand would be satisfactory beyond the size diminishing point of a cable, splice in the smaller size strand provided the length of the smaller cable is at least 1000 feet. (Obtaining right-of-way for the anchor and guy may necessitate extending the larger strand for one or more spans.)

8.02 If the length of the smaller strand will be *less* than 1000 feet, continue the larger strand the entire distance without reducing the stringing tension.

- **8.03** When the smaller strand is used, place a false dead end on the larger or the more highly tensioned strand. Head guy the pole away from the false dead end.

- **8.04** Head guys should also be placed at locations where the strand is continuous if there is a large difference in strand tension. For example, at a junction between cables of different weights or where a line changes from short span to long span construction.