

UNDERGROUND CABLE PLACING

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1. GENERAL

1.01 This practice covers the general methods used to place underground cables.

1.02 This practice is reissued to delete the restrictions listed to protect against sheath damage caused by buckling. Other revisions are identified by revision arrows.

1.03 The high production method of placing underground cables, including the use of special equipment, is covered in Practice 628-200-209. The special methods that must be used for placing CONECS (Connectorized Exchange Cable Splicing) cable are covered in Practice 628-200-205. The split cable feeder required when placing CONECS cable is covered in Practice 081-410-116. The "rod-and-place method" using the Champion duct rodder is covered in Practice 649-321-100. Lightguide cable placing is covered in Practice 628-200-216.

1.04 For purposes of this practice, a deep manhole is defined as any manhole where the ducts are 10 feet or more below grade or located where they cannot be reached with one length of cable feeder tube. It is desirable to use deep manhole methods where the ducts are 5 to 10 feet below grade and *heavy cable* is being placed.

2. PRECAUTIONS

2.01 Before starting any underground cable placing operations, all personnel must be thoroughly familiar with the 620 Division of the AT&T Practices. The practices covering the following operations should be given special emphasis:

- (a) Guarding and protecting work areas—Practice 620-135-010
- (b) Testing and ventilating manholes—Practice 620-140-501
- (c) Occupational exposure to lead dust—Practice 620-100-010

NOTICE

This document is either
AT&T - Proprietary, or WESTERN
ELECTRIC - Proprietary

Pursuant to Judge Greene's Order of August 5, 1983, beginning on January 1, 1984, AT&T will cease to use "Bell" and the Bell symbol, with the exceptions as set forth in that Order. Pursuant thereto, any reference to "BELL" and/or the BELL symbol in this document is hereby deleted and "expurgated"

(d) Precautions pertaining to smoking or use of open flames around manholes—Practice 620-102-010

(e) Removing and replacing manhole covers—Practice 620-150-010

(f) Signals used in outside plant construction work—Practice 620-020-020.

2.02 When placing lead sheath cable, precautions must be taken to limit the amount of exposure to lead when handling lead and from airborne lead dust. Lead dust is released into the atmosphere any time the sheath of **older** lead sheath cable is disturbed. The inhalation of lead dust, the transfer of lead dust from the hands to the nose or mouth, and the ingestion of lead from food, drink, and tobacco products that have been exposed to lead dust can have adverse effects on the health. The handling of **new** lead sheath releases only negligible amounts of lead dust; however, to effectively remove the potential hazards presented when working with lead, the lead handling procedures covered in Practice 620-100-010 must be strictly observed.

2.03 All personnel involved in placing underground cable must be trained in the operation of the equipment and construction apparatus that is to be used.

2.04 **Communications must be established and maintained** between the cable feeding location, any intermediate manholes (pull through), and the pulling equipment during all pulling operations.

2.05 **Practice good housekeeping.** Arrange material in the vicinity of the manhole so it will not fall into the manhole or interfere with pedestrian or vehicular traffic.

2.06 Inspect manhole ladders each time before using and replace promptly when found in a deteriorated condition. When the bottom of the ladder is in water or otherwise invisible, remove the ladder for inspection.

2.07 Each time before use, inspect pulling irons for significant corrosion and to make sure they are securely anchored in the wall.

2.08 If work is done with a truck not equipped with an overhead exhaust and the truck is stationed near a manhole, locate the truck so the exhaust gas will not blow into the manhole or be picked up by the manhole blower.

2.09 Locate gasoline- and propane-driven generators, blowers, pumps, etc., so the exhaust fumes will not blow into the manhole.

2.10 Exercise caution when entering and leaving manholes, particularly those located on traveled thoroughfares. Always use a ladder when entering or leaving manholes. When ascending from the manhole, always face oncoming traffic. Keep hands free of materials or tools when ascending or descending ladders. **Never use a cable, coil case, or apparatus case as a step.**

2.11 When working in manholes, exercise care to prevent damage to cables while setting up the pulling apparatus or while using tools of any kind.



♦Rig all pulling equipment to avoid damaging in-place cables during the pulling/placing operation.♦

2.12 **Do not place hands on a moving winch line.** Be sure that B sheave guards are properly installed as outlined in Practice 649-305-101.

2.13 **Employees should not enter manholes or remain in manholes during cable placing or removal operations. (See note.) Should it be necessary to check for proper alignment of equipment, the employee can enter the manhole if:**

- (a) The employee remains clear of the equipment and outside the angle formed by the pulling line or cable.
- (b) The winch line has only enough tension to provide normal alignment of the equipment.

Note: Employees may be permitted in a manhole under certain conditions during the placing of connectorized exchange cable and lightguide cable. Refer to Practices 628-200-205 and 628-200-216.

2.14 Reels that are delivered on the job, but are not to be set up immediately for placing operations, should be securely blocked or secured to a pole or other substantial support to prevent rolling or movement by unauthorized persons. Do not leave reels on a grade or in a traffic lane.

2.15 Mark cable reels left on street or highways overnight in accordance with local regulations. Otherwise, barricade and light with flasher lights or red lanterns not later than 1/2 hour before sunset.

3. PRESURVEY

3.01 The route of the proposed underground cable should be presurveyed, giving special attention to the following:

- (a) Location of manholes in regard to traffic for setup and pulling directions
- (b) Safeguarding work area including any special precautions required because of traffic or pedestrians
- (c) Special permits that may be required
- (d) "No Stopping" or "No Parking" areas (note the hours that pulling equipment can be located on the street)
- (e) Manhole facilities and arrangements including:
 - (1) Duct selection
 - (2) Fluid in manhole; e.g., water, gasoline, oil
 - (3) Pumping requirements:
 - **Water:** Additional pumps required because of the heavy flow of water into the manhole. Additional drain hoses in areas where proper drain facilities are not available. Salt to prevent icing on the sidewalks, streets, or highways during cold weather.
 - **Gasoline or oil:** Do not pump until all safety precautions have been taken to guard the technician and public (Practice 620-145-010). When required, notify fire and police depart-

ments for means of removing oil from sidewalks, streets, or highways.

(4) Special rigging requirements, absence of pulling irons, duct alignment for pull-through, etc.

(f) Need for special equipment.

4. TOOLS

4.01 Some of the tools generally required when placing underground cables and the practices describing the tools are as follows:

PRACTICE	TITLE
081-410-105	B Connecting Link
081-410-102	Cable Grips
081-410-116	Cable Feeder and Cable Lubricator
081-500-105	E Chain Hoist
081-510-101	Manila Rope
081-510-203	Blocks
081-511-101	Plastic Rope
081-520-100	C Manhole Sheave
081-520-101	Cable Sheaves
081-520-102	Pulling Frame
081-520-105	C Quadrant Block
081-520-115	Wire Rope Snatch Block
649-040-200	Wheel Chocks
649-210-116	"Truco" Cable Reel Trailer
649-210-121	B Cable Reel Brake
649-210-122	AT-8413 Cable Reel Brake
649-210-134	Handling and Transporting Large Cable Reels

PRACTICE	TITLE
649-305-101	B Sheave Guard
649-310-011	Wire Rope
649-315-100	AT-8136 L1A Power Reel
649-321-100	Champion Duct Rodder

5. CHECKING DUCT AND PLACING PULLING LINE

5.01 Check to determine if the selected duct, as indicated on the running sheet or print, has been rodded. If more than one duct in the same section is found rodded, make sure the correct duct is used.

5.02 If the duct has been rodded with B fishline (polypropylene rope), place the pulling line in accordance with Practice 649-325-101.

5.03 If the duct has been rodded with wire, attach the wire to the pulling line of a winch truck located at one end of the section. At the other end of the section, attach the wire to a power reel mounted on a second truck. The use of an AT-8368 L1A fairlead on the second truck will guide the wire from the manhole to the power reel while permitting the truck to be aligned so the winch is centered on the manhole opening. Pull the first few feet slowly to determine if any obstructions are in the conduit. After this, make a normal steady pull until the winch line has

completely replaced the wire in the duct. Disconnect the winch line from the threading wire. A typical setup is illustrated in Fig. 1.

5.04 In questionable or overly troublesome duct runs and/or before pulling large size cables, it is usually wise to "slug" the duct. Two pulling vehicles or winch trucks are then required. To accomplish the slugging operation, connect an F conduit mandrel, duct swab, or short piece of cable, equal to or slightly larger than the cable to be placed, between the winch line that has just been pulled in and the winch line of the companion truck and pull through the duct to determine whether the conduit section is satisfactory for use. If any obstruction is found, clean the duct as outlined in Practice 628-200-200.

Note: The F conduit mandrel is made of unyielding materials and should be drawn through clay tile ducts with care. If forced through clay tile ducts, the duct walls or webs may be broken.

5.05 To check the ability of 3-1/4 inch single bore or multiple concrete conduit to allow the passage of cables having a pulling eye cap of 3-3/16 inches in diameter, an F conduit mandrel should be pulled through the conduit.

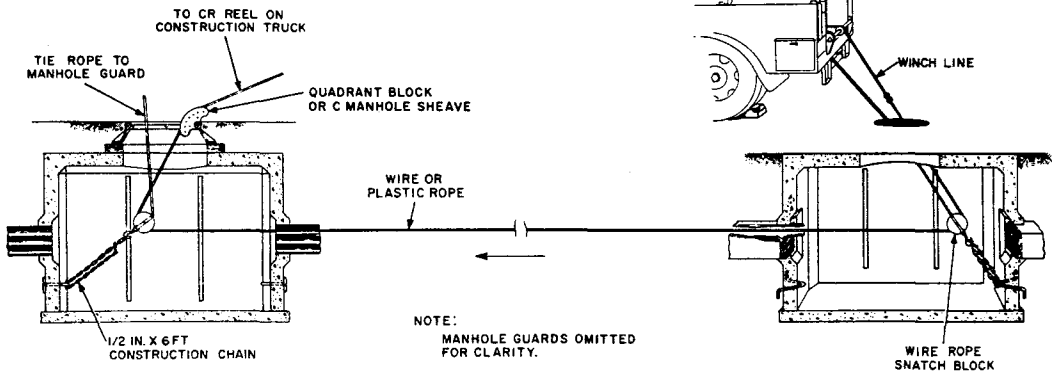


Fig. 1—Placing Winch Line in Duct



When a short length of cable with a pulling eye at each end is to be used as the mandrel, make certain that the cap on each end is dressed into the cable sheath so that it will not catch in a duct joint.

6. CHECKING REEL AND CABLE MARKINGS

6.01 Before setting up a reel, check the reel number and the size, gauge, and length of cable on it with the information given on the running sheet or print.

6.02 Cable for placing in underground conduit should be ordered equipped with pulling eyes and under air pressure. Read the air pressure prior to and after placing to determine whether sheath defects have occurred during placing. Record these readings on a linen tag attached to the end of the cable for further checking by the employee who later joins the conductors.

6.03 Distinctive markings are provided on the sheath ends of PIC cables and on the reel head and sheath ends of video pair cables in order to avoid crossover splicing between successive lengths after placing.

6.04 When the count of the video pairs in the outer end of the cable is *counterclockwise*, the cable is marked with a band of green tape and the inner end with a band of yellow tape.

6.05 When the video count at the outer end of the reel is *clockwise*, the cable is marked with yellow tape and the inner end with green tape.

6.06 The inner and outer sheath ends of 400-, 600-, and 900-pair PIC cables are also marked with bands of colored tape to indicate the progression of the unit count. Looking into the end of the cable, green indicates *counterclockwise* rotation and yellow indicates *clockwise* rotation.

6.07 Cables so marked must be placed so that at each splice point one cable end is marked with green tape and the other is marked with yellow tape.

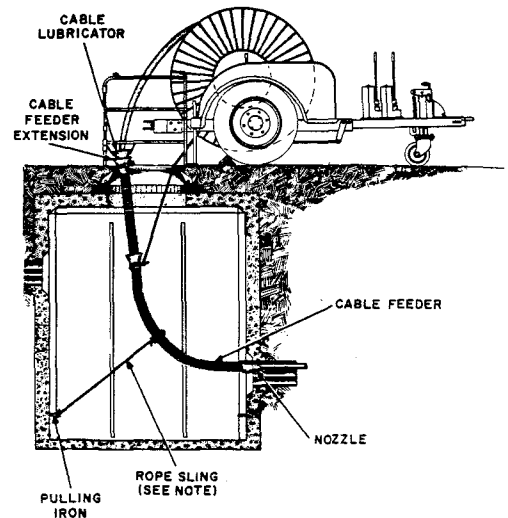
6.08 Cables containing defective pairs are painted red on the end.

7. SETTING UP CABLE REEL

7.01 Inspect cable reels for flange protrusions which could damage the cable sheath. Also inspect for any obstructions that could interfere with proper unwinding of the cable.

7.02 Set up the reel on a cable reel trailer (Fig. 2) equipped with a brake so that reel rotation can be controlled. **Do not** use a plank or any other improvised arrangement to brake the reel. Refer to the 649-210 layer of the AT&T Practices for cable reel trailer and cable reel brake information.

7.03 When handling a heavy cable reel, careful control of its movement must be maintained. Never roll a reel with a technician in front of it and never permit the reel to tilt. Where uneven ground is encountered, provide a substantial runway of heavy planks leveled by blocking so that the reel does not tilt.



NOTE:
ATTACH 3/4 IN. ROPE SLING OR EQUIVALENT FROM CABLE FEEDER TO PULLING IRON TO MAINTAIN PROPER CURVATURE.

Fig. 2—Supporting Cable Reel with Cable Reel Trailer

7.04 If the duct line in which the cable is to be pulled contains a curve, set up the reel at the manhole nearest the curve if conditions permit.

7.05 Set up the reel on the same side of the manhole as the conduit section in which the cable is to be placed. The reel should be in alignment with the duct and in such a position that the cable can be passed from the top of the reel in a long, smooth bend into the duct without twisting. *Never pull the cable from the bottom of the reel. Never leave a moving reel unattended.*

7.06 If the reel is lagged, secure the banding to the lags at several points to prevent the banding from flying off when it is cut.

7.07 It is essential that the reel be in proper alignment and level during the placing operation, as incorrect locating of the reel will cause unnecessary binding which will result in uneven cable feed.

8. PULLING APPARATUS

8.01 If the manhole is equipped with pulling-in irons, use a B or C quadrant block or a B or C cable sheave with the B or C cable sheave shackle as illustrated in Fig. 3 and 4, respectively. For manholes having 24-inch openings, the B or C quadrant block or L or M cable sheave must be used with the B or C cable sheave shackle.

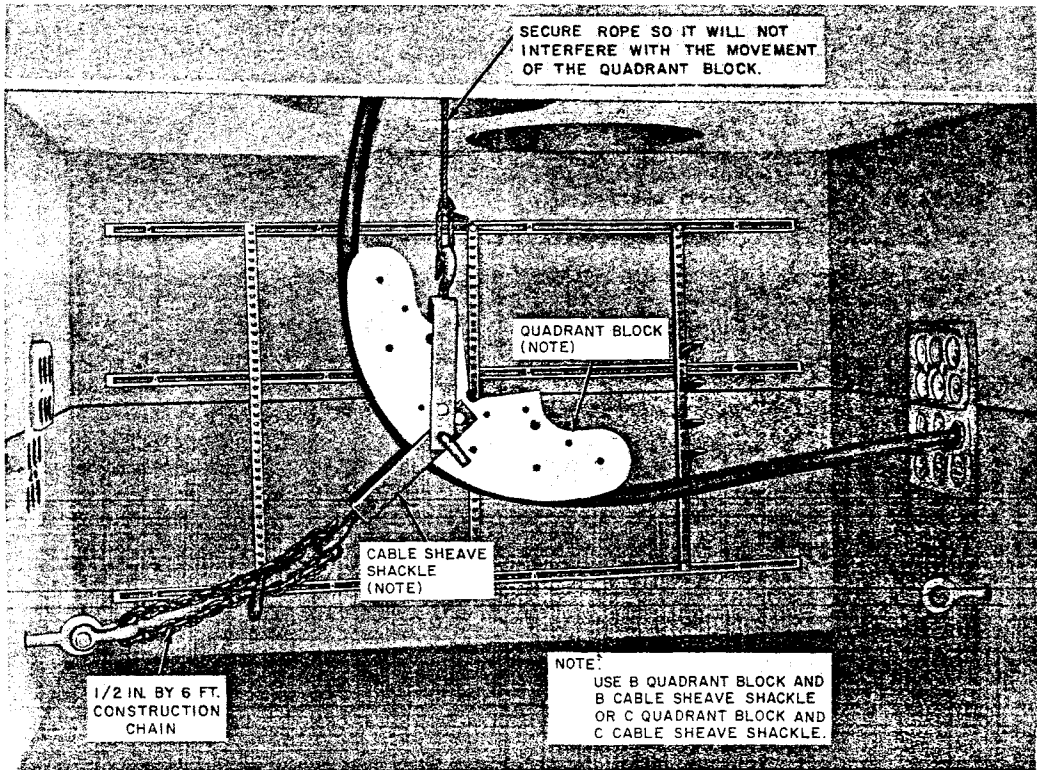


Fig. 3—Pulling Arrangement Using Quadrant Block and Cable Sheave Shackle

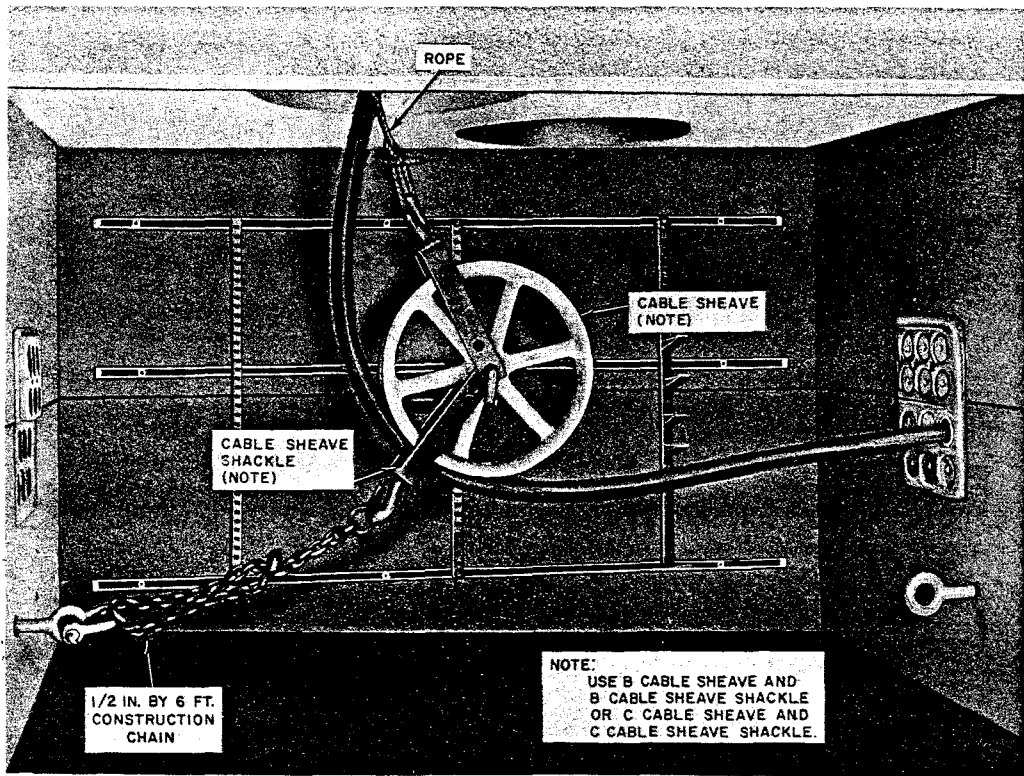


Fig. 4—Pulling Arrangement Using Cable Sheave and Cable Sheave Shackle

8.02 When it is not possible to locate the winch truck adjacent to the manhole, a quadrant block or the C manhole sheave should be used as illustrated in Fig. 5 and 6, respectively.

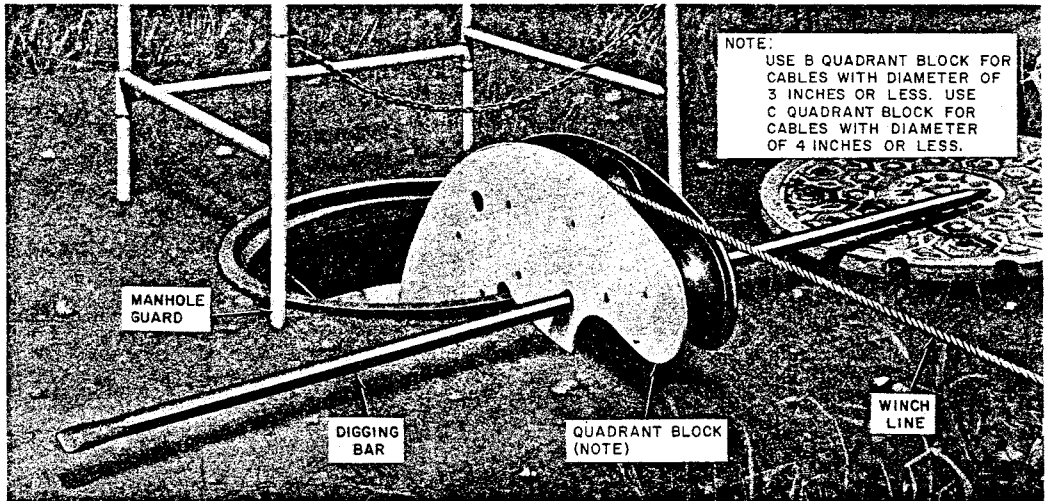


Fig. 5—Pulling Arrangement Using Quadrant Block

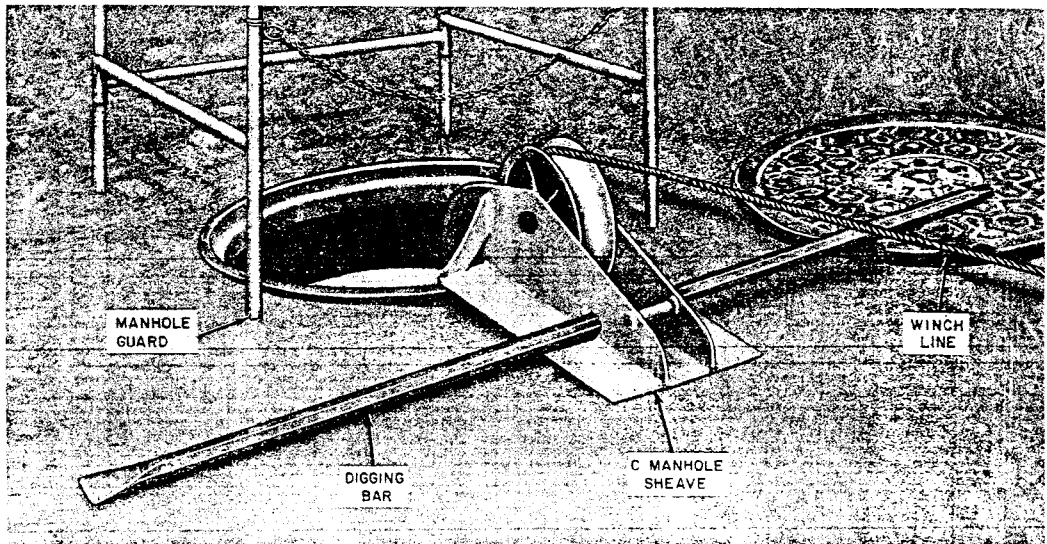


Fig. 6—Pulling Arrangement Using C Manhole Sheave

8.03 If the manhole is not equipped with pulling-in irons, use the C, D, or equivalent pulling frame for placing cable. Place the pulling frame in a vertical position with the quadrant block or cable sheave placed in the frame as illustrated in Fig. 7 and 8, respectively. To prevent the frame from moving, 4- by 4-inch hardwood timber should be used at the floor

of the manhole. Figure 9 illustrates an S or T cable sheave placed in the top of the pulling frame and the additional blocking required in the manhole opening to support the frame. If it is necessary to make the pull at an angle to the conduit run, further bracing should be placed to prevent any lateral movement of the frame.

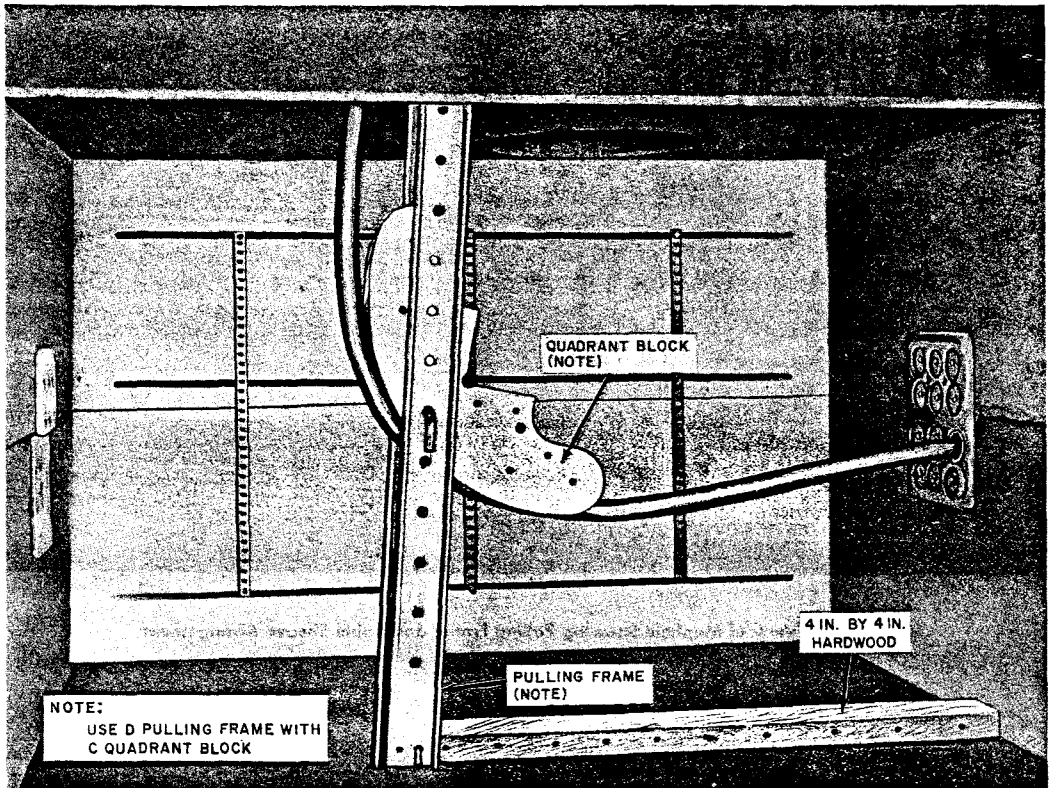


Fig. 7—Pulling Arrangement Using Pulling Frame and Quadrant Block

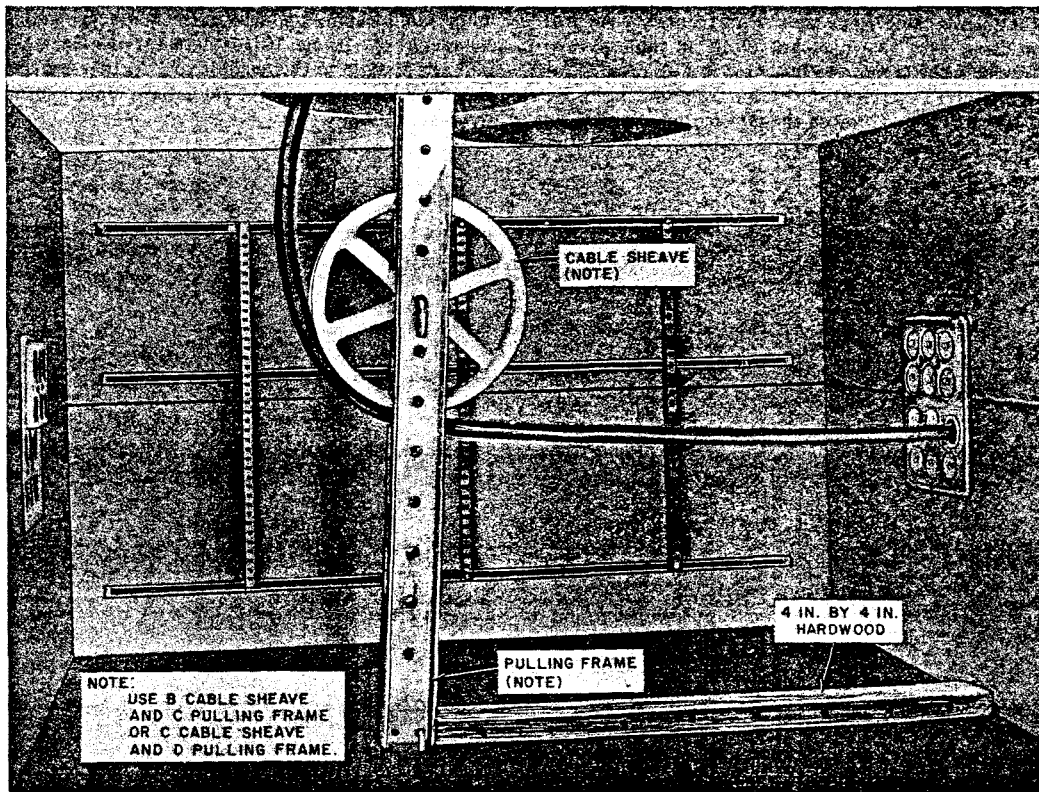


Fig. 8—View of Manhole Showing Pulling Frame and Cable Sheave Arrangement

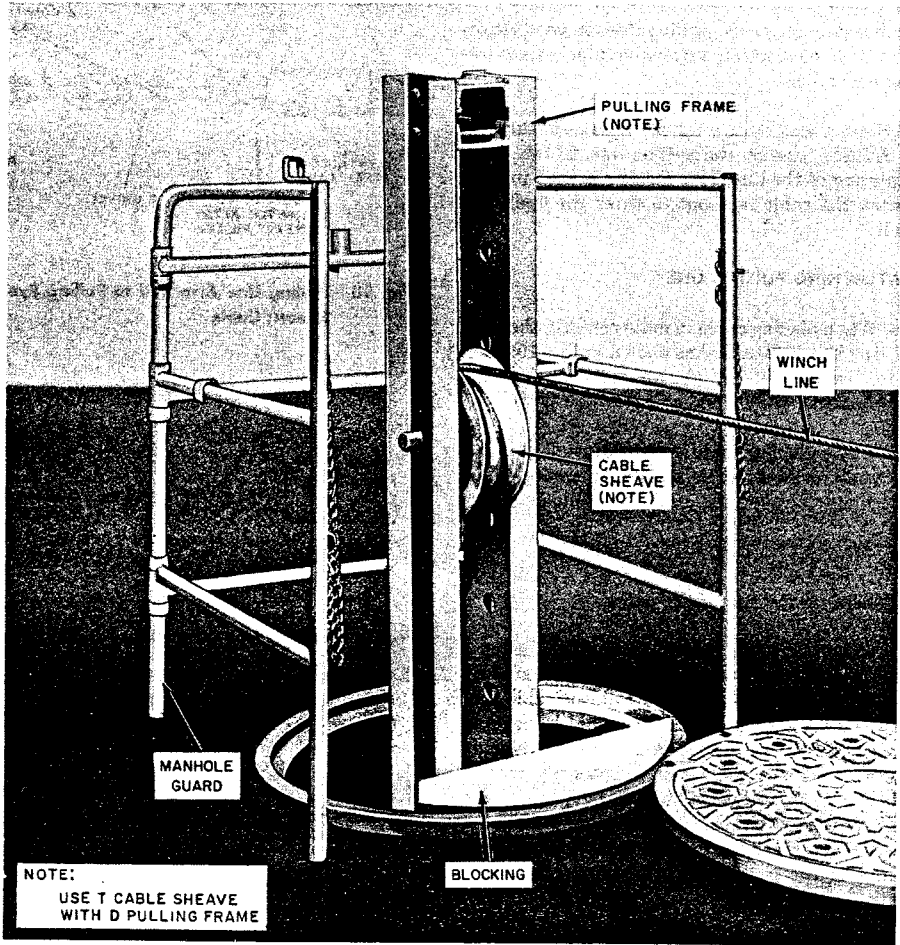


Fig. 9—View Above Manhole Showing Pulling Frame and Cable Sheave Arrangement

9. LINE FOR PULLING

9.01 Use only approved pulling lines in good condition in connection with cable placing and removing operations.

9.02 Place a marker, consisting of several turns of friction tape on the pulling line, 20 feet from the cable end of the line. This marker is used to indicate when the cable is about to enter the pulling manhole.

10. ATTACHING PULLING LINE

10.01 When placing cable in main conduit, the pulling line is attached as shown in Fig. 10 or 11. Refer to Practice 081-410-105 for the sizes and safe working loads of the B connecting links.

10.02 When placing cable in subsidiary ducts, laterals, or other short sections, a cable grip or core hitch may be used, subject to the following conditions:

- (a) For light pulls in clean duct, use a cable grip placed on the end of the cable.
- (b) For harder pulls, cable may be pulled using a cable grip as shown in Fig. 12 except that rings are not beaten into plastic. Instead, the cable grip and about 6 inches of the cable should be covered with several layers of friction tape. Before placing the grip, seal the cable end temporarily with a cable cap as described in the 633 Division of the AT&T Practices. The cable grip method should not be used where dual plastic sheath cable is involved, because of the possibility of stripping the outer sheath.
- (c) When a heavy pull is anticipated, a core hitch can be made as shown in Fig. 13 but only where there is no possibility of the duct being wet. Cover the entire hitch and 6 inches of the sheath with several wrappings of friction tape. Use only B, C, or D lubricant to lubricate the wrappings.
- (d) When a heavy pull is anticipated and there is a possibility of the duct being wet, the cable grip method covered in paragraph 10.02, subparagraph (b), may be used if the pulling load can be reduced by thoroughly swabbing the duct and applying lubricant recommended for long pulls (Part 13, Table B).

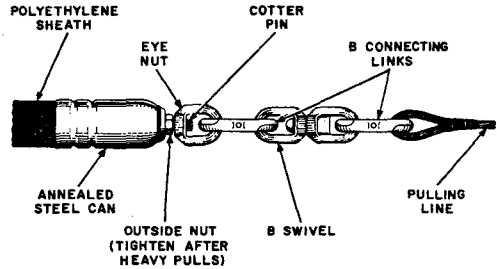


Fig. 10—Pulling Line Attached to Pulling Eye on Plastic Sheath Cable

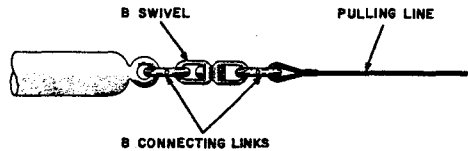
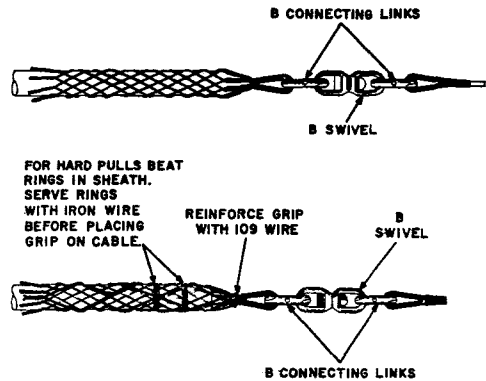


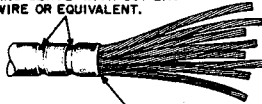
Fig. 11—Pulling Line Attached to Pulling Eye on Lead Sheath Cable



CAUTION: THE STRANDS OF WOVEN CABLE GRIPS BECOME WORN WITH USE. IN PLACING OR REMOVING THE GRIP BE ALERT FOR BROKEN STRANDS OR OTHER WORN PARTS WHICH MAY INJURE THE HANDS.

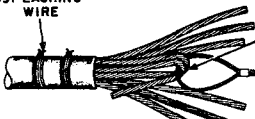
Fig. 12—Cable Grips on Cable

BEAT 2 RINGS IN LEAD SHEATH
(NOT IN PLASTIC SHEATH)
AND SERVE WITH O91 LASHING
WIRE OR EQUIVALENT.



REMOVE 18 IN. SHEATH.
BURN OFF INSULATION
AND TWIST WIRE TO
FORM 8 STRANDS.

O91 LASHING
WIRE



BEAT IN SHEATH
AROUND CORE OF CABLE.

THREAD STRANDS OF
WIRES THROUGH EYE
FROM OPPOSITE SIDES.

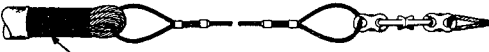
FRICTION TAPE
WRAPPING



WIRE ROPE SLING EQUIVALENT
OR GREATER IN STRENGTH
THAN THE PULLING LINE



BIND STRANDS IN PLACE
WITH PIECE OF LASHING WIRE.



MAKE TIGHT SERVING OF HOUSELINE AROUND WIRES.
COVER ENTIRE HITCH WITH SEVERAL WRAPPINGS OF
TAPE AND COAT WITH CABLE LUBRICANT.

Fig. 13—Core Hitch

11. FEEDING AND PULLING CABLE

11.01 The cable feeder is used to protect and guide the cable into the duct. Where an extension section of the cable feeder is required, its nozzle end should be fitted into the bell end of the main section.

Note: When pulling maximum size cable in 4-inch round, single bore conduit, the 4-inch HS nozzle is the only one which accommodates the pulling eye end cap (3.672 inch dia). If this nozzle is not used, the feeder cannot be secured for the pull until after the eye has entered the duct. In addition, the inner diameter (3.625 inches) of the AT-6058 feeder extension will not accept this maximum size pulling eye. The C CONECS cable feeder may be used as an alternate and will accommodate *all* pulling eyes.

11.02 Thread the pulling line from the duct through the cable feeder, and through the cable lubricator when it is used, before the connection is made between the line and the cable. If the C CONECS feeder is used, refer to Practice 081-410-116.

11.03 Throughout the placing operation, keep the cable lubricator (in the mouth of the feeder or extension) filled with lubricant until only 5 or 6 turns of the cable remain on the reel.

11.04 Before starting to pull, check the equipment carefully to make sure that it is properly set up in order to minimize the chance of interruption once pulling has started. Tension should be kept on both the cable reel and the pulling line at the start of the pull. Excessive slack and the twist of the pulling line may cause the connecting links to turn and catch in the duct. As far as possible, the cable should be pulled in without stopping until the required amount of cable is in each manhole. A pulling speed of 100 feet per minute is desirable. Figure 14 illustrates cable being placed in underground conduit.

11.05 Before placing the cable, verify that the cable is under air pressure and note the reading on the pressure gauge. After the cable has been placed, check the air pressure. If there is no drop in pressure, indicate the pressure reading on the linen tag attached to the cable end. If there has been a drop in pressure, flash test each end of the cable for leaks (if there is no pressure, charge the cable with air). If the end of the cable is damaged, repair the damage and charge the cable with 7 to 9 psi of air and flash test.

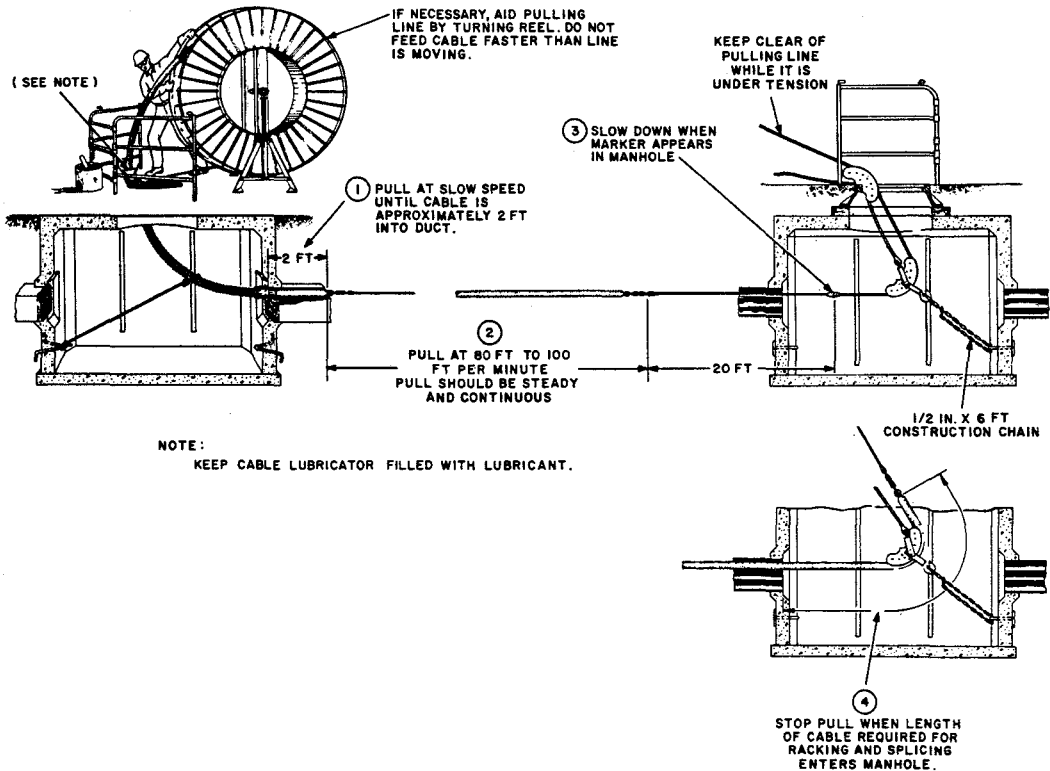


Fig. 14—Placing Cable in Underground Conduit

If the ends are not damaged, and there has been a drop in pressure, notify your supervisor.

11.06 Watch the cable carefully as it unreels and inspect for sheath defects. If a defect is noticed, stop the pull. Any cracks or breaks in the sheath should be repaired and pressure tested before placing the cable. Remove kinks or any irregularities in the sheath of lead cable with a lead dresser.

11.07 Pay careful attention to signals as the cable is being pulled so the pulling may be stopped instantly whenever necessary. Use a talk circuit, or radio when available, between the reel and the pulling truck.

11.08 When it is necessary to stop the pulling operation, the winch operator should stop the winch but not release tension unless signaled to do so. In starting up again, the resistance of the cable should be overcome by gradually increasing the tension in steps a few seconds apart until the cable starts to move.

11.09 Figure 15 illustrates the LG-345 leadergard which can be inserted into a duct to prevent cable damage from sharp duct edges. It is particularly advantageous at pull-through manholes to guide the cable into the duct of the front section and to prevent cable sheath abrasion at the duct entrance. To place the leadergard, form it into a cylinder slightly smaller than the duct and insert it into the duct.

11.10 When an LG-345 leadergard is not available for use at pull-through manholes, guide the end of the cable into the duct of the front section; then place a cable feeder nozzle around the cable and slide it into the duct to protect the cable. This will prevent sheath abrasion if the ducts are out of line. (See note, paragraph 11.01.)

11.11 Tighten the nut on the pulling eye of plastic-sheathed cables with a wrench after a hard pull to maintain pressure on the sealing gasket.

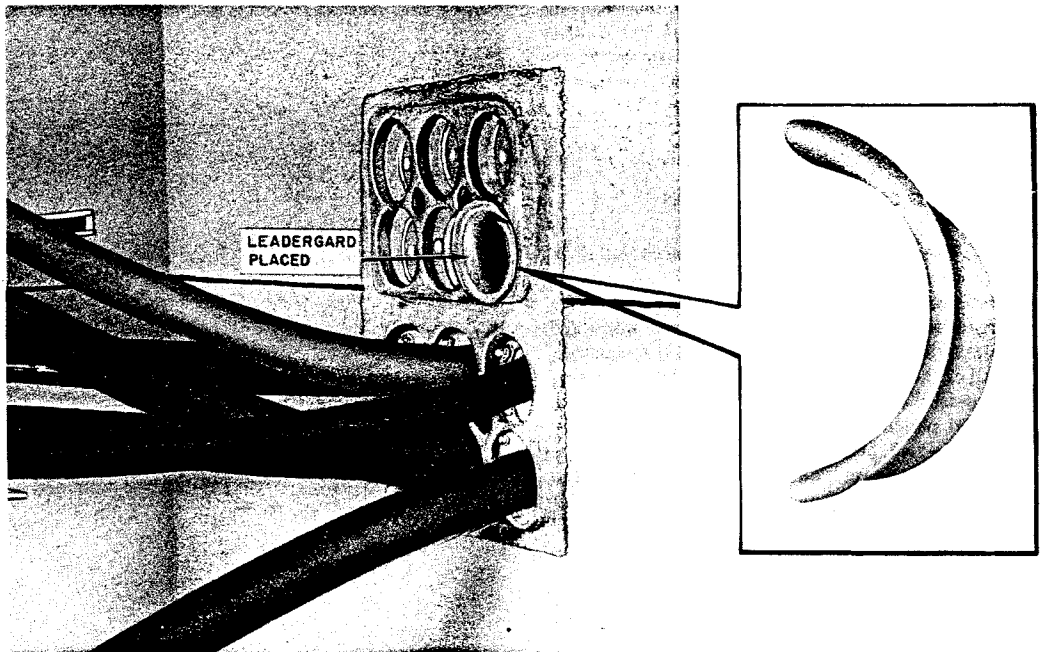


Fig. 15—LG-345 Leadergard

11.12 Pull sufficient slack to rack the cable at pull-through manholes, plus the amount needed to rack and splice at the end manholes. The amount of slack necessary for racking pull-through manholes can be determined by bending a flexible rule to the final position the cable will occupy and subtracting the straight length of the cable from the length of the final setup.

11.13 Slack for racking plastic-sheathed cables in pull-through manholes may be pulled back by hand for small cables or with the cable shoes and cable racking jacks for larger cables. Use the split cable grip and chain hoist on lead-sheathed cable. If it is necessary to use the split cable grip on plastic-sheathed cable, protect the sheath with two half-lapped layers of 2-inch friction tape before placing the grip.

11.14 If a discrepancy should occur between the lengths of the cable ends and the lengths shown on the running sheet or print, measure the length of the conduit section and consult the supervisor.

12. PLACING CABLE IN DEEP MANHOLES

12.01 When placing cable in deep manholes or in horizontal tunnels served by deep shafts, problems arise that are not normally encountered in underground cable placing. For example, when full size plastic sheath cable is being placed in a manhole, the pull of the cable from the reel may be as much as 500 pounds. With lead-covered cable, the pull may be up to 800 pounds. These loads create problems in braking the reel, holding the last few turns of cable remaining on the reel, and lowering the end of the cable into the manhole or shaft.

12.02 When placing cable where the duct is 10 feet or more below grade or when the duct is located in such a position that it cannot be reached with one length of feeder tube, the procedures outlined in paragraphs 12.03 through 12.07 should be used. It is also desirable to use this method when placing **heavy cable** where the ducts are 5 to 10 feet below grade.

12.03 Slow the reel when the last layer of cable appears on the reel (Fig. 16).

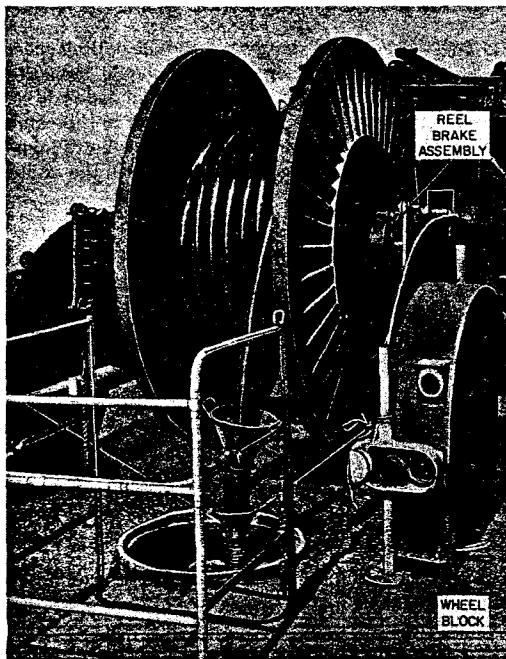


Fig. 16—Reel Slowed When Last Layer of Cable Appears

12.04 Stop the reel when no less than four turns of cable remain on the reel and attach a split cable grip to the cable just above the cable lubricator (Fig. 17). Tie a 5/8-inch manila rope to the grip using a bowline knot and secure the other end of the rope to the cable reel trailer frame keeping the rope tight and parallel to the cable lead.

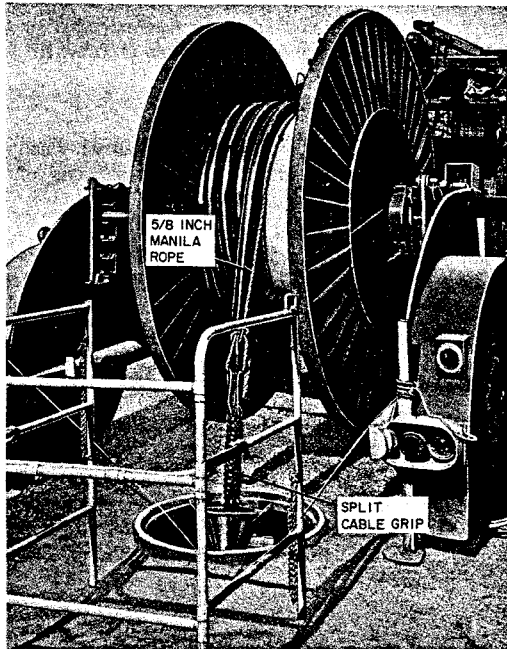


Fig. 17—Split Cable Grip in Place

12.05 Loosen the cable reel brake so that the reel may be turned freely by hand. Rotate the reel to loosen the cable turns to permit the end of the cable to be pulled out of the cable port on the reel. The loose turns can readily be pushed toward the center of the drum so that the end of the cable is accessible. Place a cable grip over the end of the cable and using a bowline knot attach a length of 5/8-inch manila rope to the eye of the grip as shown in Fig. 18. The rope should be passed four times around the drum in the same direction as the cable. The rope should be long enough to reach to the bottom of the manhole or shaft after being passed four times around the reel. Coil the free end of the rope on the ground near the manhole.

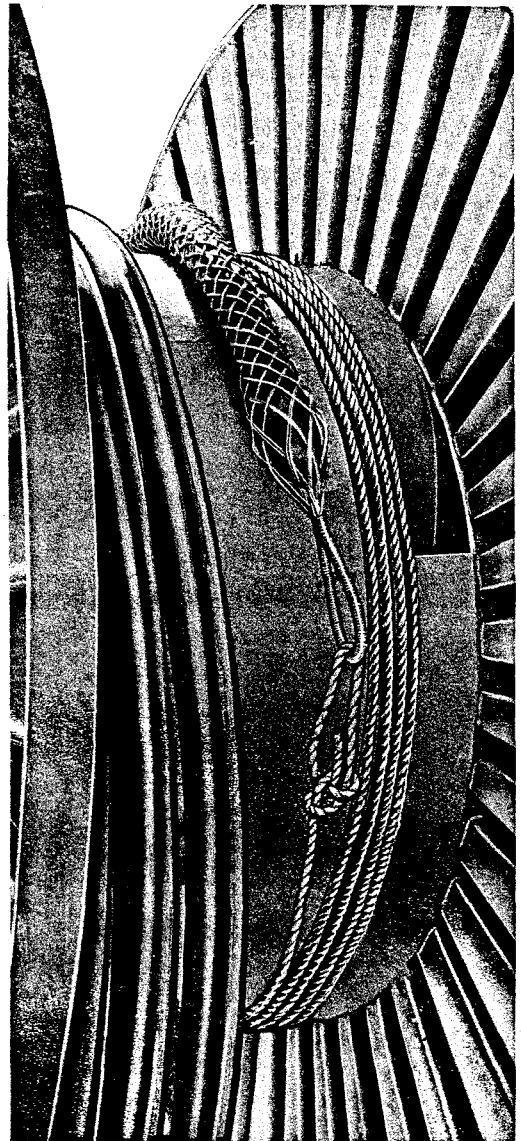


Fig. 18—Cable Grip on End of Cable

12.06 Rotate the reel to remove the slack in the cable and tighten the cable reel brake to the same setting used for pulling cable. Untie the rope securing the split grip and remove the grip.

12.07 Resume the cable pull and, as the reel turns, guide the rope onto the drum to replace the cable leaving the reel as shown in Fig. 19. When the end of the cable leaves the reel, four turns of rope will remain and the rope will be wound on the drum at the same rate of speed as the cable is being lowered. Continue the pull until the desired amount of cable is in the manhole.

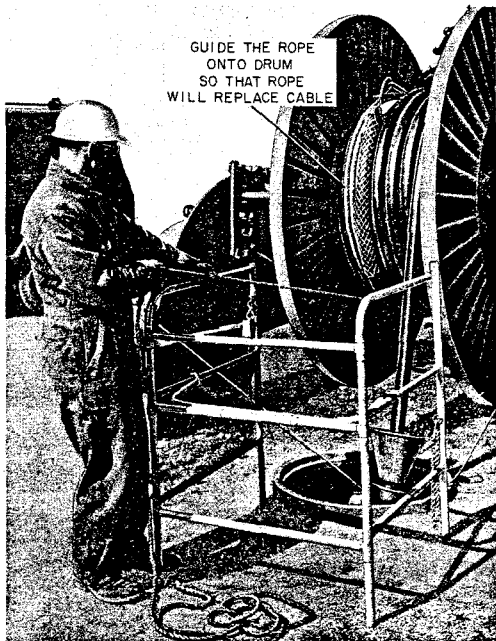


Fig. 19—Last of Cable Being Lowered

13. LUBRICATING CABLES

13.01 The standard cable lubricants and the conditions covering their use are shown in Table A. Only approved cable lubricants should be used.

13.02 The quantities of lubricant recommended for various sizes of cable are given in Table B.

13.03 Lubricant is not normally required when placing lead sheath cable in sections of 150 feet or less that have no sharp bends.

13.04 Lubricant is not normally required when placing plastic sheath cable in sections 300 feet or less that have no sharp bends.



Regardless of length and cable size, certain duct runs may be known to be difficult or the degree of difficulty may be questionable for the pull. When these conditions exist, appropriate lubricant should always be used.

TABLE A

APPROVED CABLE LUBRICANTS

	B CABLE LUBRICANT	C CABLE LUBRICANT	D CABLE LUBRICANT
CHARACTERISTICS	<ul style="list-style-type: none"> ● Mixture of Bentonite and water. Freezes at about 32°F. ● Water soluble. Ineffective in wet ducts. ● Dries out when exposed to air. ● Removed with water. 	<ul style="list-style-type: none"> ● Mixture of Bentonite, water, and ethylene glycol. Freezes at about 10°F. ● Water soluble. Ineffective in wet ducts. ● Dries out when exposed to air. ● Removed with water. 	<ul style="list-style-type: none"> ● Naphthenic oil base with corrosion, oxidation, and water solubility inhibitors. Working temperature range—20°F to 140°F. ● Is not water soluble. ● Does not dry out when exposed to air. ● Removed with KS-7860 cleaner.
APPLICATIONS	<ul style="list-style-type: none"> ● For pulling standard lengths of cable into ducts with sharp bends when ambient temperatures are above 32°F. ● For all types of cable sheath. 	<ul style="list-style-type: none"> ● For pulling standard lengths of cable into ducts with sharp bends when ambient temperatures are below freezing. Lubricant should be protected from cold until ready to be applied. ● For all types of cable sheath. 	<ul style="list-style-type: none"> ● For pulling long lengths of cable into ducts with sharp bends. ● For use at all ambient working temperatures. ● For pulling cable in wet duct. ● For pulling cable into occupied ducts. ● For pulling cable into corrugated ducts. ● For all types of cable sheath.

TABLE B

**APPROXIMATE QUANTITY OF LUBRICANT
REQUIRED FOR 100 FEET OF CABLE**

CABLE SIZE (OD IN INCHES)	POUNDS OF LUBRICANT (NOTE 1)			
	NORMAL PULLS		LONG PULLS AND PULL THROUGHS	
	B OR C LUBRICANT	D LUBRICANT (NOTE 2)	B OR C LUBRICANT	D LUBRICANT (NOTE 2)
Less than 1-3/8	5	1.5 to 2	10	3 to 3.5
1-3/8 to 2	7.5	2.5	12.5	4.5
Larger than 2	10	3 to 3.5	15	5

Notes:

- Quantities given are approximate for plastic sheathed cable in plastic conduit that is relatively clean, dry, and straight. In concrete, clay, etc., conduit quantities required will be more, generally. The condition of the duct, the presence of sweeps or bends, as well as the conduit material, are factors that must be considered when determining quantities of lubricant required.
- As a rule, one-third of a 40-pound pail of D lubricant will be sufficient for placing a 600-foot length of 3-inch od plastic sheathed cable in plastic conduit.

14. SEALING CABLE ENDS

14.01 Cable ends that have been cut must be sealed and pressure restored as soon as practical to prevent moisture from entering the cable. This can be done temporarily with the B or C cable caps described in Practice 081-852-128.

14.02 After pressure has been restored, pressure test all seals and pulled ends to determine if

any sheath breaks are present. Repair any leaks. Record the pressure on a linen tag attached to the end of the cable for further checking by the splicer.

14.03 Red paint on the ends of cables shipped from the factory indicates defective pairs in the cable. If any cable containing defective pairs needs to be cut by placing forces, the defective pair identification must be maintained in accordance with the procedures covered in Practice 632-020-200.

15. TYING CABLE ENDS

15.01 To prevent damage to the cable ends in the manhole and at the duct, tie them to the cable racks as shown in Fig. 20. Any bending required should be done carefully to avoid damage to the sheath.

15.02 An excessive length of cable left in a manhole should be looped around the hole in long sweeping bends and tied securely in a location where it will not obstruct the working space in the manhole.

15.03 Place extra protection around the cable in the end of the duct if there is a possibility of sheath damage from the ragged edges of broken ducts and where the cable is installed in steel pipe duct. An LG-345 leadergard can be used advantageously in the mouth of such a duct.

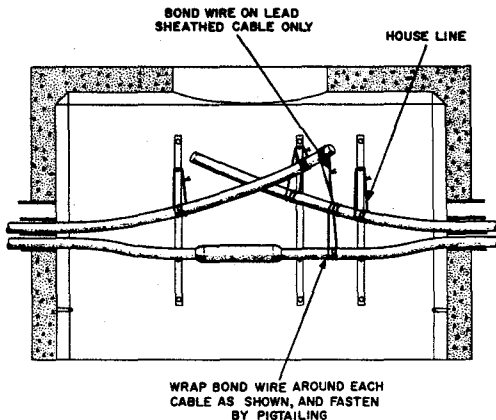


Fig. 20—Temporary Tying and Bonding of Underground Cable

15.04 Do not leave lead-sheathed cable in contact with any foreign pipes in the manhole.

16. TEMPORARY BONDING

16.01 Bond lead-sheathed cable, as soon as it is placed, to an existing cable other than one in which there is an insulating joint or to the manhole hardware. Steel construction wire provides a good bond when used as illustrated in Fig. 20.

16.02 Place no bonds on polyethylene-sheathed or poly-jacketed lead sheathed cable ends unless specified on work details. Do not allow the metal cap and pulling eye to come or remain in contact with any lead sheath or hardware in the manhole. In placing a temporary tie on the pulling eye, houseline should be used.

17. SEALING DUCTS

17.01 Before leaving the manhole at the completion of placing operations, be certain that the requirements for sealing ducts have been met.

17.02 General requirements for duct sealing and appropriate methods and materials are covered in the 628-220 layer of the AT&T Practices.