PART III
COMMON CUSTOMER EQUIPMENT GENERAL INSTALLATION

PRACTICE NUMBER	TITLE
475-025-200	Public Relations Plant Personnel
475-050-301	Installer/Repairman Customer Trouble Ticket & Readout—Install-Form 155A Description and Method of Completion
475-100-001	**Addendum**—General Station Installation
475-100-001	General Station Installation Procedures
475-300-001	Drop Wire Disposition with Discontinuance of Service
475-300-403	**Addendum**—Stringing Sags and Span Limits
475-300-403	Stringing Sags and Span Limits
475-300-406	Drop Wire At Aerial Terminals
475-300-407	Drop and Station Wire Separation and Mechanical Protection
475-300-408	Drop Wiring Tree Interference
475-300-410	Span Clamps—Strand Attachments
475-300-411	Drop Wire Clamps Installation
475-300-412	Drop and Block Wiring—Tree Attachments Installation
475-300-414	Drop and Block Wiring—Terminal Post Caps and Insulators
475-300-417	Drop and Block Wiring—Wiring At Strand Mounted Terminals
475-300-420	Drop and Block Wiring—Guard Arm Hooks Installation and Requirements
475-300-500	Station Wire and Cable Attaching and Fastening
475-300-700	Drop and Block Wiring—Testing and Fault Locating
475-301-401	Drop Wiring—Pole-to-Pole and Pole-to-Building Spans Placing Drop Wire
475-301-405	Drop Wiring—Power Exposure Up to 300 Volts Placing Drop Wire
475-301-410	Drop Wiring—Power Exposure 300 to 750 Volts Placing Drop Wire
475-301-605	Drop Wiring—Power Exposure Up to 300 Volts Lowering and Replacing Drop Wire
475-301-610	Drop Wiring—Power Exposure 300 to 750 Volts Lowering and Replacing Drop Wire
475-302-401	Drop Wiring—Fastening and Equipping First Attachments of Drop Wire Runs to Building
475-302-405	Drop Wiring—Drop Wire Runs On and Inside Buildings Fastening and Equipping Intermediate and Last Attachments
475-305-402	Selection of Route For Station Wire and Cable
475-305-405	Concealing Wire and Cable Without Conduit or Raceways

PRACTICE NUMBER	TITLE
475-310-412	Drop and Station Wiring Attachments on Aluminum, Steel, and Vinyl Siding
475-400-401	**Addendum**—Portable Telephone Installation
475-400-401	Portable Telephone Installation
475-400-409	Wire Terminal Type 107A2 and 101B Installation

PUBLIC RELATIONS
PLANT PERSONNEL

1. GENERAL

1.01 Public relations is defined as the art of developing goodwill and understanding between a person, firm, or institution and the public. Good customer contacts by plant personnel will contribute greatly to building and maintaining a favorable reputation in the community. Each visit to a customer's premises should be considered an opportunity to improve the customer's appreciation and understanding of the service we render.

1.02 Courtesy and friendliness must be shown at all times. When we perform our work efficiently and cheerfully, the customer recognizes and appreciates it.

1.03 Personal consideration for others is one of the most important aspects of good public relations in the plant job. We must give special attention at all times to our appearance, conduct, and actions to make the best impression for ourselves and our company. For example:

a. Drive company vehicles safely and courteously.

b. Do not park a company vehicle in the customer's driveway or anywhere that might inconvenience other drivers or pedestrians.

2. CONTACT WITH CUSTOMERS

2.01 A favorable first impression is an important factor in creating good customer contacts. Your appearance should be such that you will be welcomed anywhere your job takes you.

2.02 Always let the customer know immediately that you have arrived to start the job. Be considerate of the customer when gaining admittance. Call the customer by name and introduce yourself by name: "Mrs. _____ I am _____ with the telephone company. I have come to (install) (repair) your telephone." If the customer seems unsure of your identity, show her your I.D. card.

2.03 If no one is at home, leave the "no access" card in the prescribed manner.

3. GOING ABOUT THE JOB

3.01 While good service is important in achieving good public relations, the little things we do greatly affect our customer's reactions. Complete answers to a customer's questions, courtesy, and an eagerness to be helpful are some of the "little things" that are so important in the telephone business. Other indications of your courtesy and consideration include:

a. Explain and demonstrate the advantages of complete telephone service. When talking to customers, use the customer's language, not "telephone terminology."

b. Let the customer indicate where the telephone is to be located.

c. Show the customer where wiring should be placed and where it will be necessary to drill or bore holes; get consent before starting the job.

d. When it is necessary for you to enter a closed room, request permission.

e. If it is necessary to move furniture or fixtures, request the customer's permission. Always return these items to their original location when the job is completed.

f. Let the customer know where you are, especially if you have to leave the premises before the job is complete.

g. Plan your work so that you do not have to make trips back and forth from your truck.

h. Keep tools and materials close to your work area.

i. Be careful of children who may want to watch or "help" you.

j. If you must smoke, smoke away from the customer's home.

k. Clean up after the job is completed.

l. Protect the customer's property, using care not to soil carpets or walls. Do not stand on chairs, stools, or other items that belong to the customer; use company step ladders.

m. If you accidentally damage any furniture or property, show the damage to the customer, apologize, and inform him that your supervisor will make proper settlement. Report the damage to your supervisor as quickly as possible.

3.02 Whenever a new or change of address order is completed, the customer should be offered a telephone directory. Another service our plant personnel are in a position to render our customers is assisting them in the proper use of their telephone directories. These instructions should be given in a manner that both pleases and educates our customers:

a. Impress the customer with the time saving advantages of looking up the desired number in the directory.

b. Point out that information in the introductory pages explains how to make local and DDD calls, as well as emergency and telephone service calls.

c. If available, give the customer a copy of the "Personal Telephone Booklet" and show how convenient it is to use this handy reference for frequently called numbers or DDD calls.

3.03 Handling Customer Complaints–Sometimes a plant employee will encounter a situation where the customer is very critical of something that has happened between him and the company. As far as the customer is concerned, the plant employee *is* the telephone company and must be willing to assume responsibility for any errors, etc. Do not "pass the buck" or place the blame on a mysterious "they" which would give the customer an impression of a disorganized company. Take advantage of the situation to see what can be done to correct the misunderstanding. If you cannot correct the situation yourself, be sure that the matter is referred to someone in the company who can.

4. LEAVING THE JOB

4.01 Let the customer know the job has been completed. Be sure all furniture and/or fixtures are put back in place and gather up all tools and equipment.

4.02 A friendly "Goodbye, Mrs._____ I hope you enjoy your telephone service, " always leaves a good impression

4.03 Close the door carefully and quietly. Use the walkway to your truck and be careful of shrubbery and flowers.

4.04 When you can, try to keep customers informed about our business and our problems; the better informed our customers are about us, the more likely are we to enjoy all the benefits of a good company reputation. Always remember that you, as an individual and a representative of the company, can best promote goodwill and understanding between our company and the public.

INSTALLER/REPAIRMAN CUSTOMER TROUBLE TICKET & READOUT-INSTALL—FORM 155A DESCRIPTION AND METHOD OF COMPLETION

1. GENERAL

1.01 This practice provides a description and method of completion of the Installer/Repairman Customer Trouble Ticket & Readout-Install report, Form 155A.

1.02 Form 155A is similar to Form 155 which is used in the Summary of Reported Troubles (SORT) plan and described in CTSP 400-950-023. However, Form 155A is for the use of installers, repairmen, or combination men **only.**

1.03 Form 155A **is not to be routed to the Data Processing Center,** but it is recommended that employees who use this form should be familiar with the procedures of the SORT plan which are covered in the CTS 400-950 series of practices.

1.04 The primary purpose of Form 155A is to provide Plant with a standard dispatch ticket for installation and repair.

2. DESCRIPTION AND USE OF FORM 155A PADS

2.01 Each pad of Form 155A contains 50 tickets. Trouble codes are printed on the inside front cover and the back cover as follows:

a. The inside front cover lists the Customer Trouble Report Codes. See Exhibit I.

b. The inside back cover lists the Disposition of Trouble Codes. See Exhibit II.

c. The outside back cover lists the Cause of Trouble Codes. See Exhibit III.

2.02 The front side of Form 155A is the Customer Trouble Ticket which is designed to record all information pertaining to troubles that require dispatching. The Customer Trouble Ticket should be used to record trouble visits, routines and preventive maintenance work or other assignments not otherwise covered by a standard work order. See Exhibit IV and paragraph 3.

2.03 The reverse side of Form 155A is the Readout-Install portion, which is designed to record all information pertaining to an installation that is dispatched by telephone.

3. COMPLETION OF CUSTOMER TROUBLE TICKET—FRONT SIDE OF FORM 155A—EXHIBIT IV

3.01 The following information must be filled in to correctly close out a trouble ticket:

a. Name and address of customer.

b. Telephone number of customer.

c. Aux Line—TRK/STA (if applicable).

d. Originating equipment.

e. Trouble reported.

f. Time received.

g. Class of service.

h. Urgency.

i. Facilities and test information.

j. Disposition code (taken from the inside back cover of the Form 155A pad).

k. Trouble cause (written).

l. Cause code (taken from the back cover of the Form 155A pad).

m. Time cleared.

n. Employee number.

3.02 At the end of each working day, craftsmen will turn in the pad or completed tickets 155A used that day to the supervisor.

4. COMPLETION OF READOUT-INSTALL PORTION—REVERSE SIDE OF FORM 155A—EXHIBIT V

4.01 When an installer calls in for his work assignment, the dispatcher will read the information

to him from the Contact Memo. The installer will record this information on the Readout-Install portion of Form 155A as follows:

a. Name and address of customer.

b. Telephone number assigned to the customer.

c. Order number (taken from the Contact Memo).

d. Install instructions.

e. Assignment blocking for cable and terminal.

f. Cross connect information (when applicable).

g. Central office information (when applicable).

h. Bridging number (if any).

i. Remarks (any information regarding the order or change in the original instructions/information that might be of interest to the supervisor.

4.02 Upon completion of each order, the installer should call in and clear out his order.

4.03 At the end of each working day, craftsmen will turn in the pad or completed tickets used that day to the supervisor.

NOTE: It is suggested that supervisors retain the completed copies of Form 155A on file for a period of 90 days and then discard them.

CUSTOMER TROUBLE REPORT CODES

GROUP 1—CAN'T DIAL

11—No Dial Tone
12—Can't Break Dial Tone
13—Receiver Off on Line
14—Won't Accept Coins
15—Slow Dial Tone
16—Double Connection Lift Rec.
17—Can't Dial D.D.D.

GROUP 2—CAN'T COMPLETE CALL

20—Busy Signal While Dialing
21—Dial Tone Returns While Dialing
22—Can't Raise Operator
23—No Ring Back Tone
24—Busy Signal On Completion of Dialing
25—Called Party Should Answer
26—Reaching Wrong Number
27—Reaching a Recording
28—Double Connection While Dialing
29—Ring Trip

GROUP 3—CAN'T HEAR—CAN'T BE HEARD

30—Double Connection While Talking
31—Can't Hear
32—Can't Be Heard
33—Cuts Off—Cuts Back
34—Clicking on Line
35—Dial Tone While Talking
36—Garbled Copy (Data/Teletype)
37—Noisy
38—Crosstalk
39—Other (Specify)

GROUP 4—CAN'T BE CALLED

41—Bell Doesn't Ring
42—Can't Break Ring
43—Bell Rings, No One On Line
44—Receiving Wrong Rings
45—Other (Specify)

GROUP 5—TELEPHONE SET

51—Telephone Set (All or Part) Broken/Damaged
52—Loose Mounting
53—Station Wiring Broken/Damaged
54—Lamps/Keys
55—Other (Specify)

GROUP 6—MISCELLANEOUS

60—Lease Equipment
61—Recording/Answering Equipment
62—Automatic Dialer
63—Data Set/Typewriter
64—Paystation Equipment (incl. Booth)
65—PBX/PABX Common Equipment
66—Key System Common Equipment
67—Identifying Wrong
68—Outside Plant Defect
69—Other (Specify)

GROUPS 7, 8, and 9—EXCLUDED

71—Referred In
81—Detected
91—Customer Excluded

EXHIBIT I. Inside Front Cover

DISPOSITION OF TROUBLE CODES

GROUP 1–STATION SETS

110 Transmitter
115 Receiver
120 Cord
125 Handset
130 Ringer
135 Dial Rotary
140 Dial Touch Tone
145 Lamp/Light
150 Network
155 Switch Hook
160 Coin Chute
165 Coils
170 Housing
175 Common Equipment
180 Other (Specify)

GROUP 2–OTHER STATION EQUIPMENT

210 Automatic Answering Device
215 Automatic Dialing Unit
220 Teletypewriter/Data
225 Mobile Radio
230 Key System Common Equipment
235 Booth
240 Other (Specify)

GROUP 3–STATION WIRE

305 Drop Aerial
310 Drop Buried
315 Protector
320 Inside Wire or Cable
325 Ground Wire
330 Other (Specify)

GROUP 4–PBX, PABX, CENTREX

410 Keys, Cords and Plugs
415 Lamps and Jacks
420
425
430 Switch Mechanism
435 Trunk Equipment
440
445 Common Equipment
450 Batteries/Power Equipment
455 MDF and Protection
460 Other (Specify)

GROUP 5–OUTSIDE PLANT

510 Cable-Aerial
515 Cable-Underground
520 Cable-Buried
525 Aerial Wire, Including C Wire
530 Pole Line (Guys, Poles & Arms)
535 Distribution Wire, RD, SD, and UD
540 Protection
545 Fibre
550 Cable Terminal Aerial
555 Cable Terminal House
560 Cable Terminal Pedestal and U.G.
565 Other (Specify)

GROUP 6–CENTRAL OFFICE

Common
610 Frame
611 Trunk Signaling Equipment
612 Ringing Equipment
613 Power Equipment
Dial Switching
630 Line Equipment
631 Bank or Shelf Wiring
632 Misc. Subsidiary Equipment
633 Linefinder
634 Selector 1
635 Selector 2
636 Selector 3
637 Selector 4
638 Selector 5
639 Connector
640 Reverting Call Switch
641 Tickets Equipment
642 Paystation Repeaters
642 Common Control, Electromechanical
644 Common Control, Electronics
645 Crossbar Switch
646 Identifying Equipment
647 Other (Dial)
Manual
650 Switchboard
Circuit Equipment
660 Carrier, Subscriber
661 Carrier, Toll and Exchange (EAS)
662 Radio, Microwave
663 Radio, Mobile Base Station
664 Multiplex
665 Test Jacks
666 Voice Amplifier
667 Trunk Equipment
668 Lease Line Equipment
669 S.F. Signaling Equipment
670 Other Signaling Equipment
Miscellaneous
680 Communication
681 Other (Specify)

GROUP 7–OTHER TROUBLE CODES

710 Receiver Off Hook (Incl. CPH)
715 Test O.K.
720 Found O.K. Central Office
725 Found O.K. Outside
730 Referred Out

CAUSE OF TROUBLE CODES

GROUP 1–MANMADE

11–Company Workman
12–Other Workman
13–Customer Action
14–Other (Specify, incl. vandalism)

GROUP 2–PLANT OR EQUIPMENT

20–Dirt
21–Deterioration
22–Adjustment
23–Wet
24–Broken
25–Defective

GROUP 3–WEATHER

30–Lightning
31–Rain or Flood
32–Wind
33–Sleet and Ice
34–Snow

GROUP 4–TRAFFIC OVERLOAD

40–All Trunks Busy
41–All Senders Busy
42–All Ticketers Busy
43–Other (Specify)

GROUP 5–MISCELLANEOUS

51–Insects and Animals
52–Trees and Foliage
55–Other (Specify)

GROUP 6–UNKNOWN

61–Unknown (TOK, FOK/CO, FOK/OS)
62–Referred Out

CLASS OF SERVICE CODES

1–BUS (Business)
2–RES (Resident)
3–RUR (Rural)
4–PPS (Public Paystation)
5–SPPS (Semipublic Paystation)
6–PBX, PABX
7–CEN (Centrex)
8–KEY (Key System)
9–MOB (Mobile)
0–OTH (Other)

CLEARING TIME CODES

01–0-1 Hour
02–1-2 Hours
03–2-3 Hours
04–3-4 Hours
05–4-5 Hours
06–5-6 Hours
07–6-7 Hours
08–7-8 Hours
09–8-9 Hours
10–9-10 Hours
11–10-11 Hours
12–11-12 Hours
13–Over 12 hours but the same day
24–Less than 24 hours but not the same day
25–Over 24 Hours

EXHIBIT II. Inside Back Cover

EXHIBIT III. Outside Back Cover

475-050-301 Form 155A

CUSTOMER TROUBLE TICKET

Name and Address:

Cust. Tel. No. | Aux. Line — TRK/STA

Originating Equip. | Connecting No.

Trouble Reported | Code

TIME RECEIVED

Mo	Day	Time AM PM	B/S 1	A/S 2	Rec'd By

CLASS OF SERVICE

Bus 1	Res 2	Rural 3	PPS 4	SPPS 5	PBX 6
Centx 7	Keys 8	Mobile 9	Other 0		

URGENCY		APPT TIME	APPT ERROR	
Emerg 1	OOS 2	AM PM	Missed 1	No Access 2

FACILITIES & TEST INFO

Cable	Pair	Term	BP	Party	Route

Test

Tstd By	Time Tstd	Time Disp	Mo	Day

Trouble Found & Work Done | Code

Trouble Cause | Code

FIELD COPY

TIME CLEARED

Mo	Day	Time AM PM	Clearing Time

ADVERSE REPORT | EMPLOYEE NO.

Repeated 1	Subsequent 2	Install 1	

EXHIBIT IV

Form 155A

READOUT — INSTALL

Name:

Address:

Telephone Number

Order Number

INSTALL

Service	Color	Type	Location

ASSIGNMENT

CABLE		TERMINAL	
Number	Pair	Number	B.P.

CROSS CONNECTS

Dist. Ca.	Dist. Pr	Dist. Box No.	

CENTRAL OFFICE

LF, GP, LLF.	LF, TERM	B.B. No.	Conn. No.	Ring Des.	Pty. No.

VG	HG	VF	LLA #	ANI	CLASS

BRIDGING NO.

Remarks:

EXHIBIT V

INSTALLATION
GENERAL STATION INSTALLATION PROCEDURES

1. GENERAL

1.01 This addendum is to correct wiring information and to add number card installation information.

1.02 With red pencil or ink, make the changes shown in paragraph 2 of this addendum. In the margins of the subject paragraphs write the words "See Addendum".

1.03 File this addendum directly in front of CTSP 475-100-001.

2. CHANGES

2.01 Change paragraph 4.01 f. to read:

f. Terminate inside wire green conductor on terminal L1 (tip +) and inside wire red conductor on L1 (ring -).

2.02 Add paragraph 4.04 which reads:

4.04 Be sure number is stamped on the number card and promptly installed in the telephone.

INSTALLATION
GENERAL STATION INSTALLATION PROCEDURES

1. GENERAL

1.01 This practice covers the general installation and testing procedures to be followed in making a new telephone installation, reinstallation, reconnection of left-in station, or inside move.

1.02 In case the customer objets to regulations covered in this practice, and satisfactory arrangements cannot be made, consult your supervisor before proceeding with the installation.

2. GAINING ACCESS FROM CUSTOMER

2.01 No attempt to gain access to customer's premises shall be made without the consent of the owner or his agent. Entry should not be made unless accompanied by some authorized person other than a telephone employee.

2.02 Always be willing to show identification before entering the premises; be neat, courteous, and adept in all work.

3. LOCATION OF TELEPHONE

3.01 In choosing the best location for the telephone, be guided by a location's advantages, disadvantages, and the following desirable environmental conditions:

a. Moderate, normal-temperature range.

b. A nonexplosive atmosphere.

c. A water-free or low humidity area.

NOTE: If the location has a surrounding factor which conflicts with one of these conditions, special station equipment and procedures, as covered in other appropriate practices, shall be used.

3.02 The telephone location shall be chosen with the following advantages kept in mind :

a. Acceptable to customer.

b. Suitable for maintenance.

c. Easily heard ring.

d. Free from accidental mechanical damage.

e. Free from off-hook trouble.

f. Close to conduit facilities.

g. Close to approved bellbox cabinet or telephone set alcove (LWH, 12 x 9 x 12 inches).

3.03 Try to avoid, wherever possible, the following objectionable features when selecting a telephone location:

a. Site readily accessible to small children.

b. Site close to grounded object or water (sink drainboards, bathtubs, radiators, etc.)

c. Necessity to drill holes.

d. Need to have wire and cable exposed.

e. Finely finished mounting surface (marble, ceramic tile, glass tile, expensive paneling).

f. Closeness of fluorescent fixture (minimum separation, 24 inches).

3.04 On Desks or Tables

When installing a telephone on a desk or table, these considerations shall be kept in mind:

a. Which hand does customer use?

b. Will holes be drilled?

c. Will cable and wire be exposed?

3.05 This procedure shall be observed before installing the telephone on a table or desk:

a. Inspect the desk for special manufacturer-provided features (built-in connecting block brackets or knock-out holes with rubber grommets for telephone line cord).

b. Determine if connecting block can be located high on one of desk panels just below top of the desk to hold line cord off floor.

c. If part of the telephone circuit is contained in a housing separate from the telephone set housing, check to determine whether this part can be located inside the knee well of the desk or on the underside of the table.

4. INSTALLING TELEPHONE

4.01 Proceed as follows in installing the telephone:

a. Refer to practices covering the particular type of telephone being installed or to manufacturer's drawings.

b. Install the drop, protector, ground, and station wiring as covered in other practices.

c. Terminate the locally grounded conductor of the inside wire to the ground terminal of the telephone set connecting block for desk mounted sets or to the ground terminal in wall mounted sets.

d. Connect one clip of a hand test telephone to the ground terminal.

e. With the other clip of the hand test telephone, contact in turn the green and red inside wire conductors. If the inside wire is poled correctly, a click will be heard in the hand test telephone receiver as red conductor is contacted. If not, rearrange the drop wires at protector.

f. Terminate inside wire red conductor on terminal L1 (ring -) and inside wire green conductor on L2 (tip +).

NOTE: For most telephones the ring (negative line) connects to red (or ridged) interior wire conductor; right-hand station protector terminal; and right-hand cable terminal stud. (Ring Red, Right Ridged)

4.02 Use the following procedure when connecting telephones equipped with SATT dials to party lines.

a. Perform the procedure described in paragraph 4.01 a. through e.

b. Connect one clip of the hand test telephone to the red inside wire.

c. Connect the other clip to one of the line terminals of the connecting block on desk mounted sets or the line terminal in wall mounted sets.

d. With the telephone handset on hook, listen on the receiver of the test set for one or a series of clicks while dialing a 5 on the telephone set dial. If nothing is heard, move the test clip on the line terminal to the other line terminal and test in the same manner.

NOTE Refer to practices for individual telephone sets or manufacturer's drawings. The switch hook arrangement on some telephones (for example: A.E. Co. self compensating) is such that access to internal telephone set wiring will be required to verify that ground pulses are actually being applied to the tip line cord conductor.

e. Terminate the green conductor (tip +) of the inside wire on the terminal on which the click or clicks were heard and the red conductor (ring -) of the inside wire to the other terminal.

4.03 For reinstallation or reconnection of telephones with SATT dials, use procedure a. and/or b. below:

a. Check polarity of wiring at the protector or station connecting block.

b. Check the polarity of the telephone set as described in paragraph 4.02.

5. TESTING

5.01 After the installation is completed, perform tests to verify ringing, dial speed, and noise level.

5.02 Proceed as follows :

a. Bell rings - verify through ring-back.

b. Dial speed - verify that dial operates within speed tolerances.

c. Noise level - make talking test when "O.K.'ing" service order.

5.03 Before leaving customer's premises, assure that customer is familiar with operation of the particular telephone set installed.

DROP AND BLOCK WIRE DISPOSITION WITH DISCONTINUANCE OF SERVICE

1. GENERAL

1.01 This practice describes the disposition of drop and block wire with discontinuance of service or temporary disconnection.

1.02 The ends of all disconnected wires, which are intended for future use, shall be tagged at the points of disconnection. The tag shall indicate the address of the building end of the drop wire.

2. DISPOSITION OF WIRE

2.01 All drop and block wire shall be left in place, with disconnections made at appropriate locations, except in the following instances where they shall be removed :

a. On service disconnections where the wire run may create an unsafe condition.

b. Upon request of the property owner or his authorized agent.

c. In connection with rerouting or repair work.

3. DISCONNECTIONS

3.01 Disconnect the drop wire at the cable terminal for individual lines, party lines connected at terminal binding posts, generator feeds, and battery feeds which are not exposed to contact with foreign circuits of more than 300 volts potential, or with lightning disturbances (see Figure 1).

3.02 At aerial cable terminals, wire terminals, and outside building terminals, the drop shall be doubled back at the first ring and taped to itself with three wraps of friction tape (Figure 2).

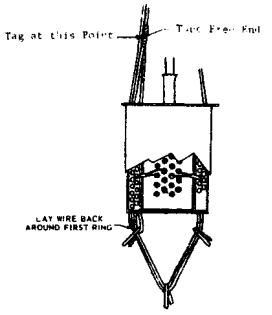


Figure 1. Drop Wire Disconnected at Pole Mounted Terminal

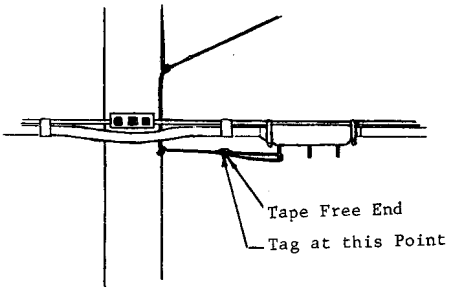


Figure 2. Drop Wire Disconnected at Strand Mounted Terminal

3.03 At cross-connecting terminals, open wire leads, and party line taps outside of the terminal, remove the jumper wires, bridging connectors, and bridged drop wires, respectively. Tape as described in 3.02.

3.04 At underground cable terminals, tape bare wire after folding it back neatly inside the terminal. Be sure rubber grommets and gaskets are sealing properly.

3.05 Where the line is subject to possible contact with foreign circuits of more than 300 volts potential or with lightning disturbances, use the following procedure:

a. Disconnect party lines and other bridged circuits at the bridging point.

b. Twist the free end of the wire back on itself beyond the first ring or point of attachment, and tape as shown in Figure 3.

c. The station protector shall remain in place unless the subscriber requests that it be removed.

d. If the station protector is removed:

(1) The drop wire shall be removed.

(2) Where protectors are mounted inside buildings, plug the drop wire entrance hole. Where the protector is mounted outside the building, tape the inside wire and bend the ends back into the entrance hole and plug the hole.

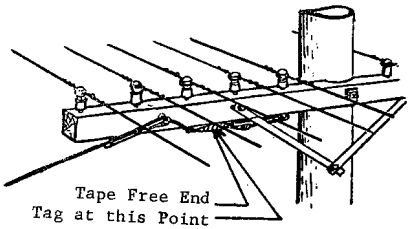


Figure 3. Drop Wire Disconnected at Open Wire Location

DROP AND BLOCK WIRE
STRINGING SAGS AND SPAN LIMITS
INSTALLATION

1. GENERAL

1.01 This addendum is to provide information to reduce drop wire vibration and dancing.

1.02 With red pencil or ink make the addition as shown in paragraph 2 of this addendum. In the margin of the subject paragraph write the words "See Addendum".

1.03 File this addendum directly in front of CTSP 475-300-403.

2. ADDITION

2.01 Add paragraph 1.05 which reads as follows:

1.05 Drop wire should be twisted one complete turn for each ten feet of span length at the time of installation to reduce vibration and dancing.

DROP AND BLOCK WIRE STRINGING SAGS AND SPAN LIMITS INSTALLATION

1. GENERAL

1.01 This practice prescribes the recommended span length limits for drop wires and also the minimum sags at which drop wire shall be placed.

1.02 For the following reasons, it is important that the proper sag be provided in drop wiring:

a. Drop wires which are too taut will sometimes vibrate at buildings and cause undesirable noises.

b. Insufficient sag and stretching the wire will shorten its life or will place excessive strain on the drop wire supports.

1.03 Whenever practical, run the drop wire under rather than over obstacles to avoid contacts due to stretching the wire.

1.04 Where it is impractical to obtain the minimum desirable sag because of clearance requirements or obstacles, provide as much sag as conditions allow.

2. SPAN LENGTH LIMITS

2.01 Pole-to-pole spans of drop wire shall not exceed 200 feet.

2.02 Where a cable lead or an extended messenger is available for intermediate support, pole-to-pole drop wire spans may exceed 200 feet.

2.03 Where pole-to-pole span lengths without cable or extended messenger exceed 200 feet, consult your supervisor before placing intermediate supports.

2.04 Span lengths to privately owned poles shall not exceed 160 feet and they shall be limited to one drop wire. For span lengths longer than 160 feet consult your supervisor.

2.05 The length of pole-to-building drop wire spans shall not exceed 160 feet unless specific approval is obtained. Intermediate attachments between pole and building shall be used where span lengths exceed this limit or where proper sag for normal span lengths cannot be obtained.

2.06 In span clamp-to-building spans, the tension in the span shall not be great enough to pull the cable or messenger out of line. Intermediate attachments between the span clamp and the building shall be made to obtain the required ground clearance if enough ground clearance cannot be maintained without pulling cable out of alignment.

3. SAGS FOR DROP WIRE

3.01 The minimum sags for drop wire are shown in Table 1. Since these sags are minimum, they shall be increased up to 20% wherever possible, depending upon field conditions. The sag values shall never be decreased without prior approval of the supervisor.

3.02 To determine the sag in the drop wire, sight between the attachments at both ends of the drop wire and determine the distance between the drop wire at its lowest point and the straight line between attachments. See Figure 1.

TABLE 1

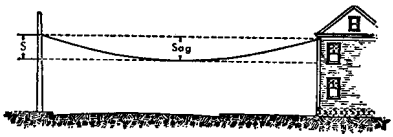
Parallel Drop Wire Sag

(18 AWG Coppersteel Conductors)

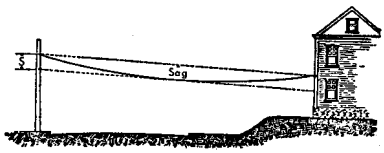
SPAN LENGTHS	Pole to Building Spans: STORM LOADING AREA LIGHT AND MEDIUM	Pole to Building Spans: STORM LOADING AREA HEAVY	Pole to Pole or Span Clamp Spans: STORM LOADING AREA LIGHT AND MEDIUM	Pole to Pole or Span Clamp Spans: STORM LOADING AREA HEAVY	NO. OF INTERMEDIATE ATTACHMENTS
50' or less	6"	6"	6"	6"	NONE
51' to 75'	1'	1'	1'	1'	NONE
76' to 100'	2'	2'	1-1/2'	1-1/2'	NONE
101' to 125'	3'	4'	1-1/2'	2'	NONE
126' to 160'	4'	6'	2-1/2'	3'	NONE
161' to 200'*	--	--	2-1/2'	2-1/2'	1
201' to 249'	--	--	4-1/2'	4-1/2'	1
250' to 300'	--	--	7'	7'	2
Over 300'	--	--	See Note #2		

* NOTE 1: For span lengths from 160 feet and up, minimum sags are computed before intermediate attachments are made. The attachments are to be evenly spaced and placed to provide proper ground clearance.

NOTE 2: For spans over 300 feet in length, intermediate attachments shall be approximately 80 feet to 100 feet apart.



Attachments on Same Level



Attachments on Different Levels

Figure 1. Sighting Drop Wire Sag

DROP & BLOCK WIRING

DROP AND BLOCK WIRE AT AERIAL TERMINALS

1. GENERAL

1.01 This practice describes the methods and procedues to be used in the wiring of terminals on aerial and block wire.

1.02 When terminating drop or block wires, not more than two pair of wires should be bridged on one binding post.

1.03 When working in a terminal, perform the following:

a. Remove foreign matter with a terminal brush.

b. Report broken or missing terminal covers to your supervisor.

c. Trim frayed wires to prevent leakage between conductors or binding posts.

d. Turn down finger tight all nuts of unused binding posts to keep contact surfaces as clean as possible.

e. Pull any excess slack out of wires in ring run.

f. Rearrange any disconnected wires in accordance with existing practices covering disposition of wires.

g. Pull drop wires tight enough to provide a neat appearance but not so tight that sharp bends will be placed on the wires at the rings.

h. Use plastic insulated twisted pair station wire or main frame jumper wire for cross-connecting within outside terminals.

i. Use only the approved terminal wrench to tighten lugs.

j. Be sure terminal cover is on properly before leaving terminal.

2. SELECTION OF RINGS

2.01 Drive rings should be used for ring runs on poles and arms. Bridle rings should be used for building terminal ring runs where the use of drive rings creates a safety hazard.

2.02 Tables A and B should be used as a guide to ring capacities and correct usage of rings.

2.03 See Figure 14 for an illustration showing typical drive ring pole attachments.

TABLE A

Ring Type	Drop Wire	Bridle Wire
7/8" Drive Ring	8	12
Type C (1/4") Bridle Ring	12	16
*Type A (1-5/8") Bridle Ring	26	26

*Use Type A ring for wire runs serving terminals larger than 26 pair.

TABLE B

Ring Type	Use With
7/8" or 1-1/4" Drive Ring	Guard Arms
1-1/4" Toggle Bridle Ring	Cable Arms

3. CABLE TERMINALS

3.01 After cutting the drop wire to the proper length, cut the insulation between the conductors with a drop wire slitting tool for a distance of approximately 3". Use diagonal pliers to remove sufficient insulation (approximately 1") from each conductor to permit proper terminating. Be careful not to nick the conductors with the diagonal pliers.

3.02 Nuts and washers found to be dirty or corroded should be cleaned with emery cloth. If corrosion is severe, nuts and washers should be replaced.

3.03 Terminate the plain conductor on the lefthand binding post or fuse, and the tracer conductor on the righthand binding post or fuse. If fuses or binding posts are on a vertical plane, terminate the plain conductor on the top fuse or binding post of the pair, and the tracer conductor on the bottom fuse or binding post of the pair. Figure 1 shows termination twisted pair wire and parallel wire.

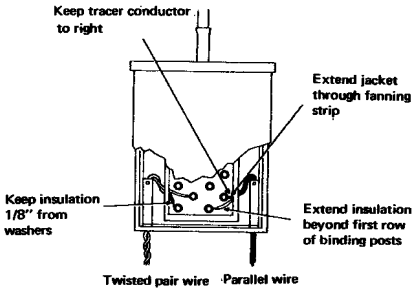


FIGURE 1. Terminating Twisted Pair and Parallel Wire

3.04 The nuts on fuses and binding posts should be turned down with a terminal wrench to obtain firm contact and the conductors arranged so that they will be separated from adjacent binding posts.

3.05 When two conductors are terminated on the same binding post, place first conductor under the lower washer and the second conductor between the washers (see Figure 2).

3.06 When necessary to terminate a third drop wire, use a drop wire terminal to bridge the additional wire outside the cable terminal. Remove one drop wire from the terminal binding post and place it and the third wire in the drop terminal (see Figure 3).

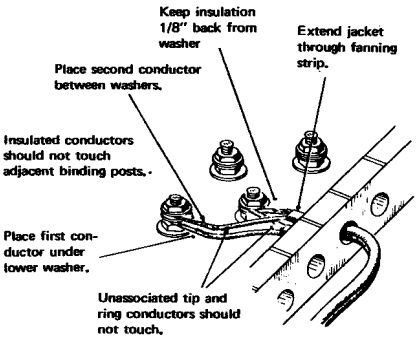


FIGURE 2. Two Conductors Terminated on One Building Post

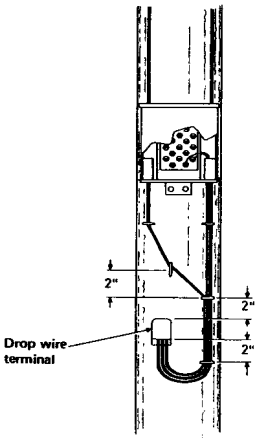


FIGURE 3. Termination of Additional Wire

4. POLE AND BUILDING MOUNTED TERMINALS

4.01 Use 7/8" drive rings at 11 pair terminals to provide wiring facilities (see Table A).

4.02 Do not force drop wire through rings. If the capacity of the 7/8" drive ring is exceeded, the terminal should be checked by your supervisor.

4.03 Separation of rings on poles shall not exceed 24". If existing rings are spaced more than 24" apart, an additional ring should be centered between the two rings.

4.04 Run the drop wires down the side of the terminal (opposite the side on which wires are to be terminated) and through the three rings below the terminal. When slack is required to transfer a drop wire to another cable pair, remove the wire from the lower ring and run it through the two top rings beneath the terminal.

4.05 When the necessary slack cannot be obtained by routing the drop wires as described in paragraph 4.04, splice out the drop wire in the vertical run above the terminal and run the wire through all three rings below the terminal (see Figure 4).

4.06 For terminals having a wiring channel in the center of the terminal, place wiring facilities on poles as shown in Figure 5.

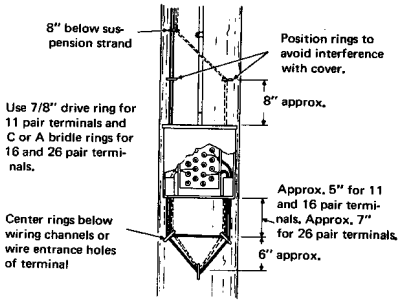


FIGURE 4. Rerouting Drop Wire Below Terminal

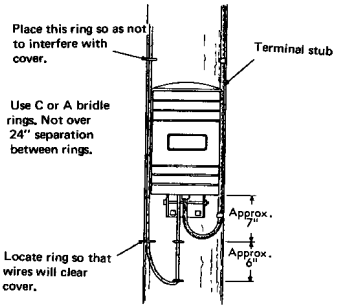


FIGURE 5. Terminals with Center Wiring Channels

4.07 Place wiring facilities for cable terminals mounted on buildings according to Figures 6 and 7.

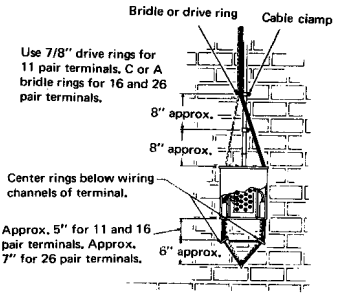


FIGURE 6. Building Mounted Cable Terminal (Top Entrance)

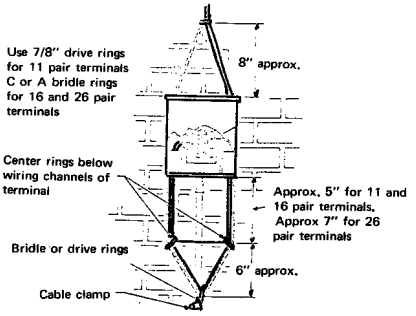


FIGURE 7. Building Mounted Cable Terminal (Bottom Entrance)

5. TYPE B AND TYPE BB TERMINALS

5.01 Run drop wire through the two rings at the end of the fuse chamber or binding post chamber on which the wire is to be terminated. Provide slack by cutting off the wire at the opposite fanning strips after pulling the drop wire taut through the fanning strip hole.

5.02 For cross-connections, use plastic insulated twisted pair station wire or main frame wire. Terminate the plain conductor on the left-hand binding post and the tracer conductor on the right-hand binding post.

5.03 Terminate wires according to procedure described in paragraph 3.01.

5.04 Run cross-connect wires through rings (see Figure 8) and provide slack by cutting the shortest conductor at the binding post of the pair furthest from the fanning strip.

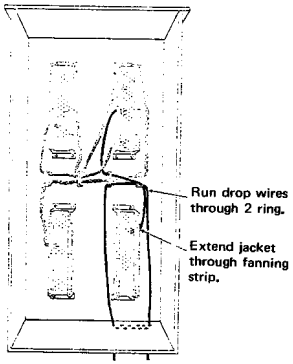


FIGURE 8. Cross-Connecting Wires

5.05 If two or more distribution cable pairs are required to form a party line, connect the pairs to the feeder cable pair. Run cross-connect wires in type B terminals through rings located at the top of the terminal.

6. TYPE BD, BE, BF AND BG TERMINALS

6.01 Wires should be terminated according to the procedure described in paragraph 3.01.

6.02 Follow the procedure described in paragraph 5.05 for connecting distribution cable pairs.

6.03 Provide wiring facilities on poles in accordance with Figures 9 and 10.

6.04 Run the drop wire through one of the wire entrance holes in the bottom of the terminal and as near the back of the terminal as practicable. The drop wire should be run upward on the side of the chamber opposite the binding post on which it is to be terminated, through the two rings at the top of the terminal and downward to the proper wiring hole for the assigned cable pair.

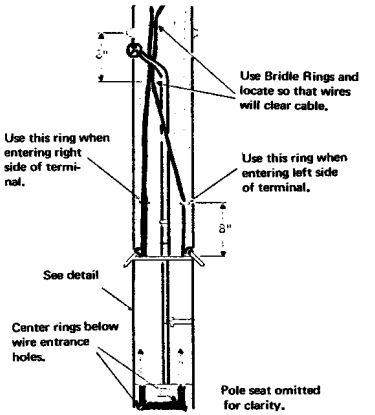


FIGURE 9. Pole Wiring Facilities

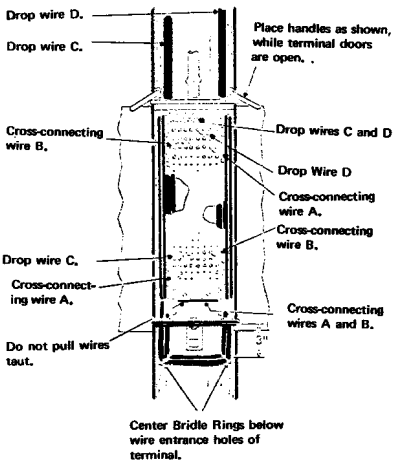


FIGURE 10. Cross-Connecting Terminal Wiring

6.05 When slack is required to transfer a drop wire, remove the wire from one or both rings at the top of the terminal. If additional slack wire is needed for subsequent changes, splice out the drop wire inside the terminal between the bottom and the first ring at the top of the terminal. Run the wire through these two rings as described in paragraph 6.04.

7. CROSS-CONNECT TERMINALS

7.01 Run cross-connecting wires through the holes immediately above the binding posts to the right of the wiring holes, and use the holes immediately below the binding posts to the left of the wiring holes (see Figure 10).

7.02 For Type BD 304 and Type BD 404 terminals with binding posts to the right of the wiring holes use the lower two wiring holes for the nearest two pairs of binding posts. Use the higher hole for the furthest two pairs of binding posts. When the binding posts are to the left of the wiring holes, reverse the procedure.

7.03 When cross-connecting cable pairs are in an adjacent half of the chamber, run cross-connecting wires in the channel at the rear of the face plate extension, passing in the rear of the guards at the bottom of the chamber. Do not run cross-connecting wires in the rings provided for drop wires at the top of the terminal.

7.04 Terminate wires according to the procedure outlined in paragraph 3.01.

7.05 Dispose of cross-connecting wires and drop wires in accordance with existing practices.

8. SHEATH MOUNTED TERMINALS

8.01 Run drop wires to the terminal from the adjacent pole except where wires are distributed from a span clamp located between the terminal splice and the pole, or from cable extension arms.

8.02 Run wires through all rings at the rear of the terminal, around the ring at the far end, and then below the terminal to the proper wire entrance holes of the assigned binding posts. Do not pull wire tightly around the last ring. If slack is required for reconnections and changes, remove the wire from one or two terminal rings in order to reach the binding posts. Splice out the drop wire behind or near the terminal and run the wire through the ring at the far end as for an initial installation.

8.03 Drop wire runs to sheath mounted terminals are shown in Figure 11. The same method applies to terminals installed on ring supported cable. Run wires through rubber grommets in wire entrance holes. Place two drop wires through a wire entrance hole when required.

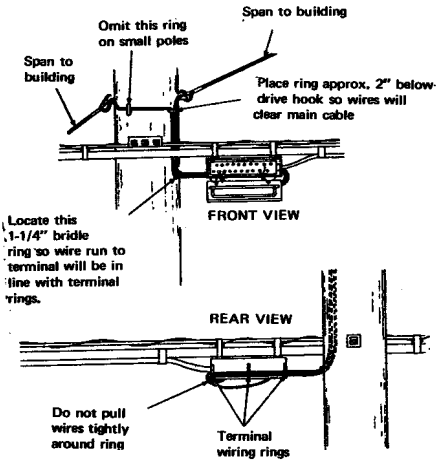


FIGURE 11. Drop Wire Run to Sheath Mounted Terminal

8.04 Two wires may be bridged on a pair of binding posts of the sheath-mounted terminals. Wires terminated on the same binding post should enter the same wire entrance hole. Where three or four wires are to be bridged, use drop wire terminals in the normal manner to tap the drops between the pole and the last wiring ring on the back of the terminal.

8.05 Run wires from terminal to guard arm as illustrated in Figure 12.

8.06 Terminate drop wires in sheath mounted terminals by cutting the wire to the proper lengths (see Figure 13).

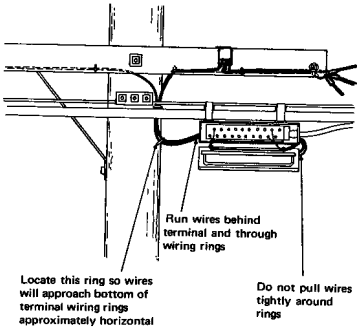


FIGURE 12. Wire Run from Terminal to Guard Arm

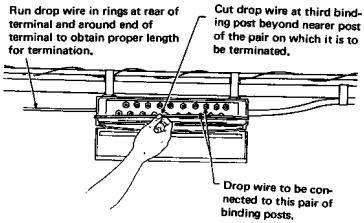


FIGURE 13. Drop Wire Termination

8.07 Pair numbers of the terminal progress from left to right, regardless of whether the stub is brought out of the right or left side of the terminal.

8.08 Terminate the plain conductor on the left-hand binding post and the tracer conductor on the right-hand post of each pair.

8.09 Replace lost or damaged grommets. For installation at the wire entrance, cut through the rim of the grommet at a point in line with the scored portion. Place the grommet around the wire so that the groove is completely engaged with the edge of the wire entrance hole.

9. READY ACCESS TYPE TERMINALS

9.01 Ready access terminals are for use on plastic insulated conductor cable and will accomodate cables up to two and two-tenths inches outside diameter.

9.02 Drop wires are inserted through the proper grommet hole in the base so that they match the binding posts on the terminal block. The grommets should be pierced with a screwdriver or similar tool. The wire is then threaded through the drop wire retainer rings which are attached to the base (see Figure 14). Enough slack should be allowed for future rearrangements.

9.03 It is not necessary to remove the cover to work in the installed unit. Remove the semicircular cover clamps, free the clips holding the cover to the base and lift one side of the neoprene cover for working space.

9.04 The ready access terminal enclosure provides for splicing with or without the No. 105 terminal blocks. The unit can be mounted anywhere along the cable.

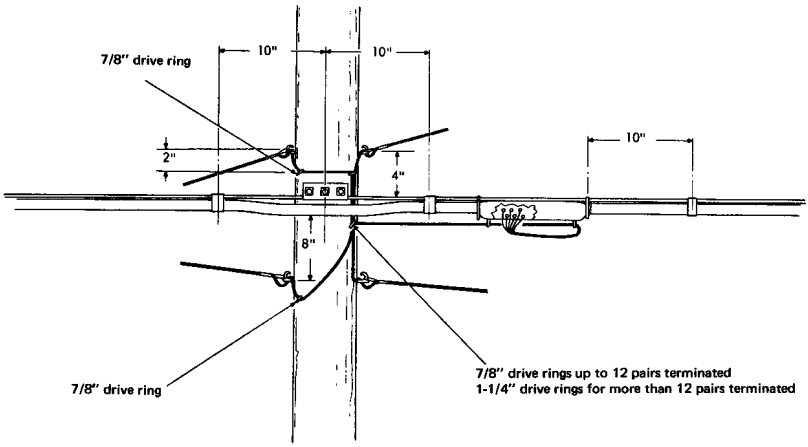
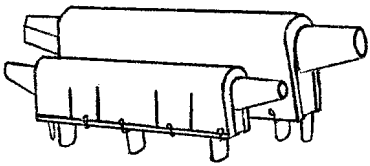


FIGURE 14. Ready Access Terminal



Ready Access Closure

DROP AND STATION WIRE SEPARATION AND MECHANICAL PROTECTION

1. GENERAL

1.01 This practice is reissued to include information contained in CTSP 475-300-404 and current separation and mechanical protection information.

1.02 All copies of CTSP 475-300-404 should be destroyed.

1.03 If any differences exist between clearances specified in this practice and those specified by the National Electrical Code, those which are the most stringent will apply.

2. MATERIAL

2.01 The following material may be required:

a. E wire guard, CTS #02-26-021-2.

b. P wire guard, CTS #02-26-023-9.

c. Plastic tube 3/8 inch x 6 inches, CTS #20-79-004-0.

d. Vinyl tape (see CTS Tape, Vinyl).

e. D drop wire clip, CTS #68-11-016-2.

f. D drive ring (see CTS Ring, Drive).

g. Insulated screw eye (see Eye, Screw, Insulated).

h. C porcelain knob, CTS #68-34-001-0.

i. E drop wire clip, CTS #68-11-017-1.

3. GENERAL PRECAUTIONS

3.01 All wire installed in explosive atmospheres shall be placed in accordance with the instructions pertaining to that equipment.

3.02 Wire shall not be placed in pipe or conduit containing electric light and power wires or cables. Wires shall not be placed in the same outlet box or junction box, unless separated from the electric light and power wires by a suitable insulating partition.

3.03 Whenever practicable, avoid running telephone wire in the same conduit, molding, or runway with signal circuits which are operated by battery or from a step-down transformer. Strict adherence to this recommendation will minimize the possibility of interference by either or both parties during placing or maintenance activities.

3.04 Cold water pipes sweat under certain conditions; therefore cross wire **over** rather than under the pipes.

3.05 Exposed drop wire shall not enter a building through the same entrance hole with protected telephone wires.

4. DEFINITION OF TERMS

4.01 The following definitions are for terms applying to electrical conductors used in Tables A, B, and C.

a. Bare Wires: A conductor having no covering or insulation whatsoever.

b. Open Wiring: A wiring method using clamps, knobs, tubes, and flexible tubing for the protection and support of insulated conductors run in or on buildings, and not concealed by the building structure.

c. Electric Service Drop: The overhead service conductors between the last pole or other aerial support and the first attachment to the building.

d. Nonmetallic Sheathed Cable: An assembly of two or more insulated conductors having an outer sheath of moisture resistant, flame retardant, nonmetallic material.

5. SEPARATIONS

5.01 Separations specified in Tables A, B, and C apply to crossings and parallel runs.

NOTE: The separations shown in Tables A, B, and C are minimum requirements. Greater separations shall be provided where readily obtainable.

5.02 In Tables B and C, the specified separations must be obtained for parallel runs.

5.03 The specified separations must be obtained at crossings designated **NO LESSER ALTERNATIVE** in Tables B and C.

5.04 Separations and protection requirements for wiring which are placed on outside walls of buildings and are to be extended to off-premises stations, outdoor stations, loud ringing bells, etc., are the same as those specified for drop and station wire, shown in Table B.

5.05 Separations of less than 6 feet between drop, station wiring, or telephone ground wires and **lightning wires or rods** are permissible under the following conditions:

a. Where telephone, power, and lightning rod ground connections are made to a common grounding medium as specified in CTSP 475-500-410.

b. Where separate driven ground rods are used for telephone, power, and lightning rod installations, **and the ground rods are bonded together** as specified in CTSP 475-500-410.

NOTE: The separation should not be less than 4 inches in any case.

5.06 Table A lists the minimum separations that shall be obtained between drop wire in the span to a building and foreign conductors or metallic objects.

5.07 Table B applies only to telephone wiring (drop or station) attached to the building and feeding a protector (fuseless or fused).

5.08 Table C applies only to telephone wiring between the protector (fuseless or fused) and the telephone equipment and to telephone wiring requiring no protector.

5.09 Tables B and C list the minimum separations between telephone wiring and foreign conductors or metallic objects outside or inside buildings.

6. MECHANICAL PROTECTION

6.01 Where it is not practicable to obtain recommended minimum separation at crossings other than those shown as **No Lesser Alternative** in Tables B and C, or where wire or cable runs are subject to mechanical damage, abrasion, or excessive heat, a protective covering is required as shown in Figure 1. The protective covering should be used as follows:

a. Plastic tube, P wire guard, or two layers of vinyl tape extending 2 inches beyond each side of object being crossed.

b. P wire guard, plastic tube, or two layers of vinyl tape shall be used in all cases where telephone wiring is subject to abrasion or mechanical damage. E wire guard (plastic tubing) may be used in place of vinyl tape or P wire guard on station wiring within buildings where improved appearance is desired. See Figure 2.

6.02 Where station wire passes through wall or floor adjacent to wall or baseboard, protection with vinyl tape or E wire guard is not required unless wire is subject to mechanical damage or abrasion.

6.03 Figures 3 through 16 are typical examples of wiring that requires protection.

NOTE: **Do not run wires or cables through removable gratings.**

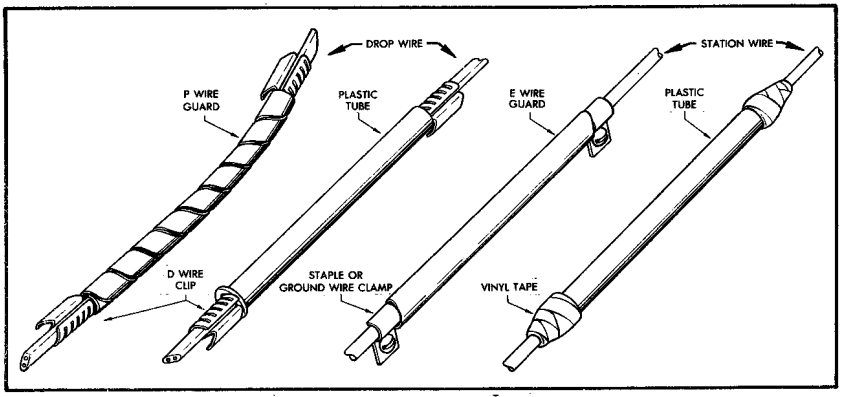


FIGURE 1. Securing Wire Guards

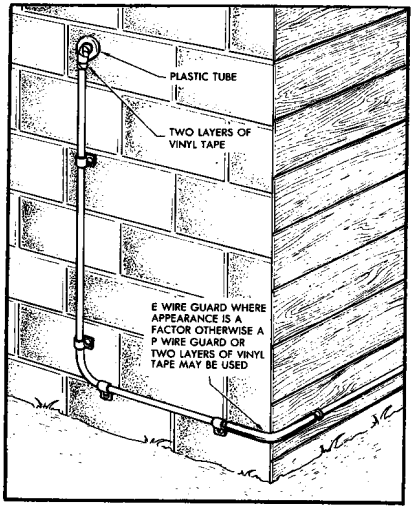


FIGURE 2. Use of Vinyl Tape or E Wire Guard on Station Wire

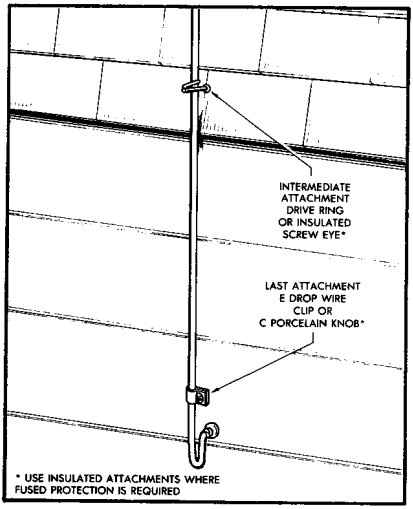


FIGURE 4. Drop Wire Crossing Wood or Stucco on Wood Building Projection

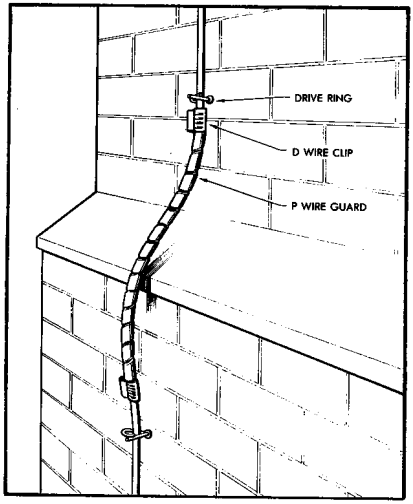


FIGURE 3. Drop Wire Crossing Masonry Building Projection

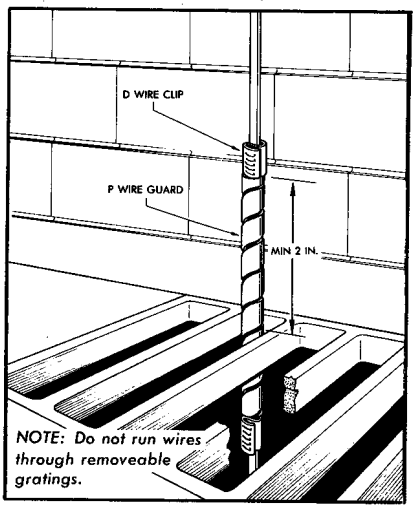


FIGURE 5. Protecting Drop Wire Run Through Stationary Metal Grating

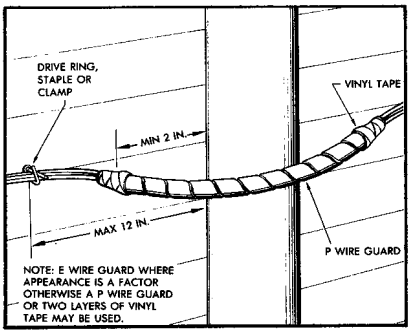


FIGURE 6. Station Wires Crossing Over Pipe

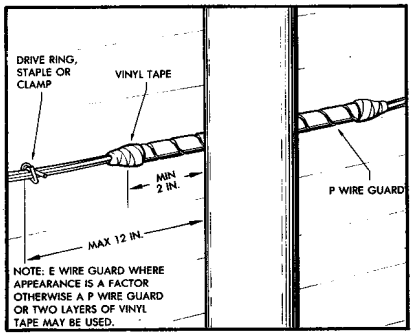


FIGURE 7. Station Wires Crossing Behind Pipe

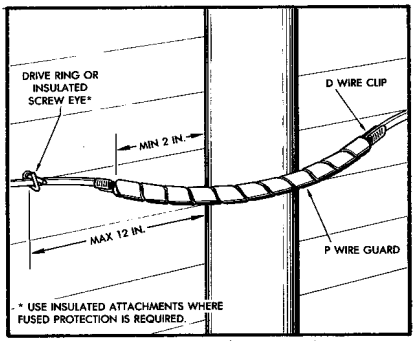


FIGURE 8. Drop Wire Over Pipe

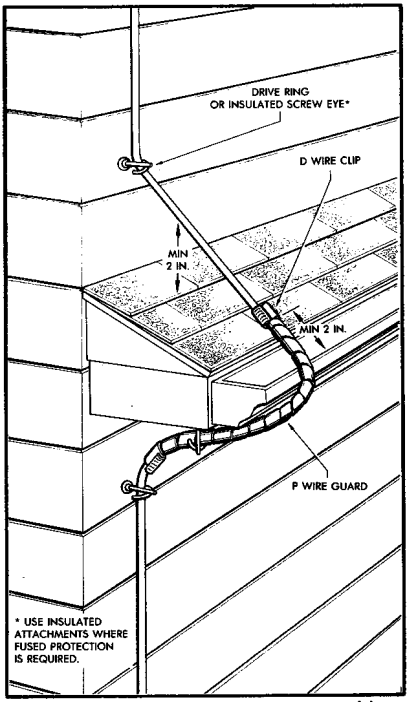


FIGURE 9. Drop Wire Crossing Building Overhangs and Gutters

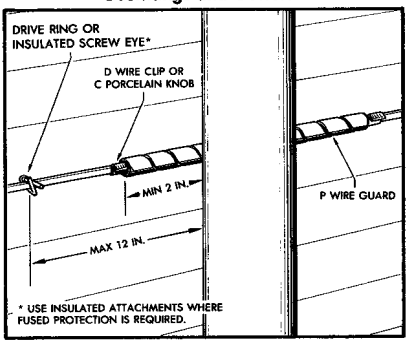


FIGURE 10. Drop Wire Crossing Behind Pipe

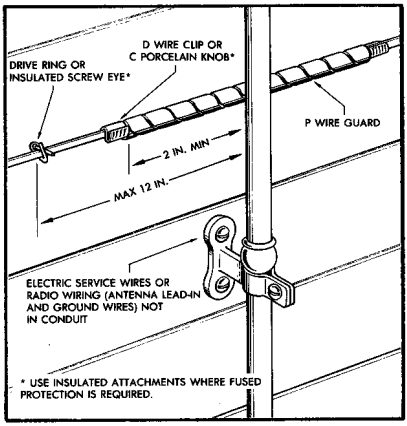


FIGURE 11. Drop Wire Crossing Behind Foreign Wire

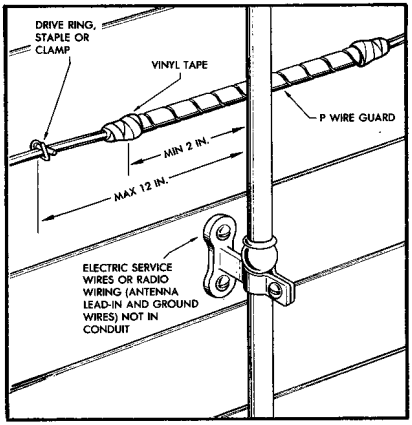


FIGURE 12. Station Wires Crossing Behind Foreign Wire

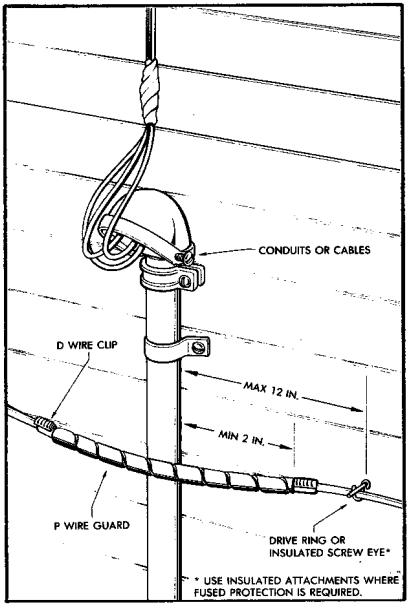


FIGURE 13. Drop Wire Crossing Over Conduit

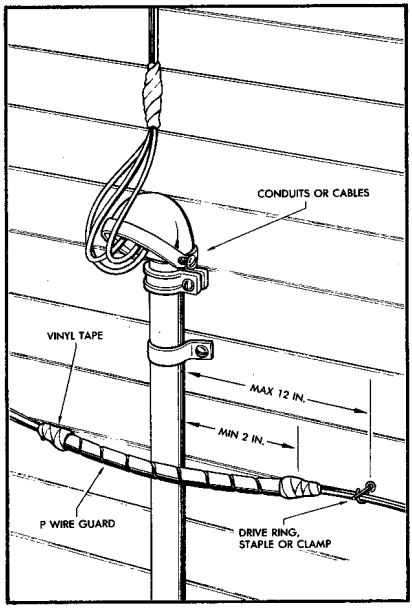


FIGURE 14. Station Wires Crossing Over Conduit

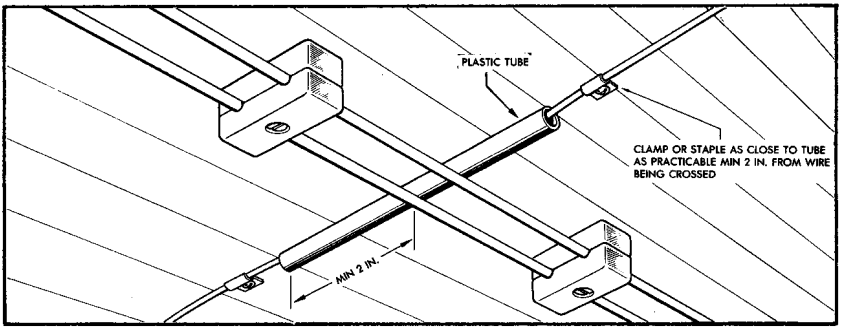


FIGURE 15. Station Wire Crossing Open Electric Light Wires (Drawing 1 of 2)

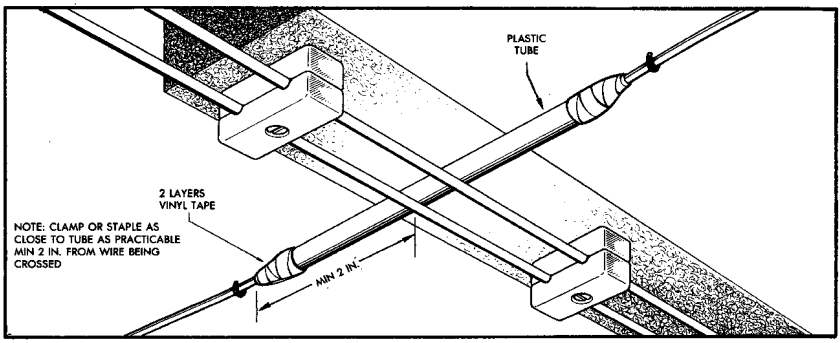


FIGURE 15. Station Wire Crossing Open Electric Light Wires (Drawing 2 of 2)

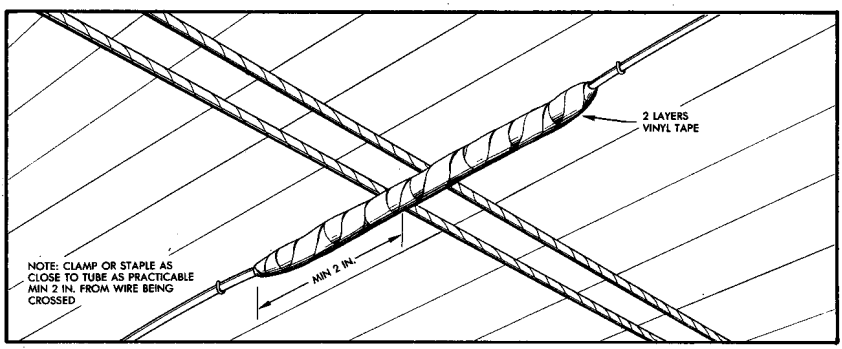


FIGURE 16. Station Wire Crossing Signal Wires

TABLE A. Drop Wire Spans to Buildings

Minimum separations between drop wire spans to buildings and type of plant involved, are as follows:

TYPE OF PLANT INVOLVED		DROP WIRE SPAN TO BUILDING MINIMUM SEPARATION	
		CROSSING	PARALLEL
Electric Supply	Electric service drops or open wiring not over 750 volts.	2 ft.	1 ft.
	Wires in conduit, or in armored or nonmetallic sheath cable.	4 in.	4 in.
Radio and Television	Antenna lead-in and ground wires.	2 ft.	1 ft.
Signal Wires	Open wiring.	2 ft.	1 ft.
	Wires in conduit or cable.	4 in.	4 in.
Communication Wires	Foreign open wiring.	2 ft.	1 ft.
	Foreign wires in conduit or cable.	4 in.	4 in.
	Community television systems coaxial cables with shields at ground potential.	4 in.	4 in.
Metallic Objects	Rain spouts, gutters, etc.	4 in.	4 in.
Ground Wires	Ground wires (except radio, television, and lightning ground wires).	4 in.	4 in.
Lightning	Lightning wires and rods.	6 ft.	6 ft.
Signs	Neon sign and associated wiring from transformer.	1 ft.	1 ft.

TABLE B. Wiring Between Building Attachment and Telephone Protector

This table applies only to telephone wiring (drop or station) attached to buildings and feeding a fuseless or fused protector. Minimum separations between telephone wiring outside or inside buildings, and type of plant involved, are as follows. Separations apply to crossings and parallel runs.

TYPE OF PLANT INVOLVED		MINIMUM SEPARATIONS	PROTECTION REQUIRED IF MINIMUM SEPARATIONS CANNOT BE OBTAINED SEE NOTE 1
Electric Supply	*Bare light or power wire of any voltage.*	5 ft. See Note 2	No Lesser Alternative See Note 2
	Electric service drops or open wiring not over 750 volts.	4 in.	P Wire Guard extending 2 inches beyond each side of object being crossed
	Wires in conduit, or in armored or nonmetallic sheath cable, or power ground wires.	2 in.	
Radio and Television	Antenna lead-in and ground wires.	4 in.	
Signal Wire	Open wiring or wires in conduit or cable.	2 in.	
Communication Wires	Foreign open wiring and wires in conduit or cable.	2 in.	
	Between exposed and unexposed Telephone Company wires.		
	Between exposed Telephone Company wires.	None	
	Community television systems coaxial cables with shields at ground potential.	None	
Metallic Object	Downspouts and gutters.	2 in.	P Wire Guard or two layers of vinyl tape required in all cases to resist abrasion
	Stationary gratings, etc.	2 in.	
Telephone Ground Wire		None	
Sign	Neon signs and associated wiring from transformer.	6 in.	P Wire Guard, 12 inches long See Note 3
Lightning System	Lightning rods and wires.	6 ft.	See Paragraph 5.05.
Pipe	Steam or hot water or heating ducts.	3 in.	See Note 4
Telephone Ground Rods to Other Ground Rods.		6 ft.	No Lesser Alternative

Note 1: Applies only to crossings. For parallel runs the indicated minimum separations must be maintained.

Note 2: *Power is to be turned off if working above bare wire.* Ladders shall be placed to maintain a 5-foot minimum clearance.

Note 3: To prevent accidental breakage, avoid neon sign location of alternate run is possible.

Note 4: Excessive heat may damage plastic-insulated wires, therefore avoid heating ducts and other heat sources.

TABLE C. Separation and Physical Protection for Wiring Between Protector and Telephone Equipment

This table applies only to telephone wiring from fuseless or fused protector to telephone equipment and to telephone wiring requiring no protector. Minimum separations between telephone wiring outside or inside buildings, and type of plant involved, are as follows. Separations apply to crossings and to parallel runs.

TYPE OF PLANT INVOLVED		MINIMUM SEPARATIONS	PROTECTION REQUIRED IF MINIMUM SEPARATIONS CANNOT BE OBTAINED SEE NOTE 1
Electric Supply	*Bare light or power wire of any voltage.*	5 ft. See Note 2	No Lesser Alternative See Note 2
	Open wiring not over 300 volts.	2 in.	See Note 3
	Wires in conduit, or in armored or nonmetallic sheath cable, or power ground wires.	None	
Radio and Television	Antenna lead-in and ground wires.	4 in.	See Note 3
Signal or Control Wires	Open wiring or wires in conduit or cable.	None	
Communication Wires	Community television systems coaxial cables with shields at ground potential.	None	
Telephone Drop or	Using fused protectors.	2 in.	See Note 3
	Using fuseless protector or where no protector required.	None	
Telephone Ground Wire		None	
Sign	Neon signs and associated wiring from transformer.	6 in. See Note 4	Station wire with a grounded shield or lead cable with sheath grounded. Ground requirements same as for signaling ground. See CTSP 475-500-410
Lightning System	Lightning rods and wires.	6 ft.	See Paragraph 5.05
Pipe	Steam or hot water or heating ducts.	3 in.	See Note 5
Stationary Grating, Metal Shutter Grillwork, etc.		P Wire Guard, or two layers of vinyl tape required in all cases to resist abrasion.	

Note 1: Applies only to crossings. For parallel runs the indicated minimum separations must be maintained.

Note 2: *Power is to be turned off if working above bare wire.* Ladders shall be placed to maintain a 5-foot minimum clearance.

Note 3: Plastic tube; E or P wire guard; or two layers of vinyl tape extending 2 inches beyond each side of object being crossed.

Note 4: To prevent accidental breakage, avoid neon sign location if alternate run is possible.

Note 5: Excessive heat may damage plastic-insulated wires, therefore avoid heating ducts and other heat sources.

DROP AND BLOCK WIRING
TREE INTERFERENCE

1. GENERAL

1.01 This practice describes methods of avoiding or correcting tree interference to drop wire runs.

1.02 Tree pruning shall be done in accordance with local and state laws. Consult the proper authorities before trimming any trees.

2. AVOIDING TREE INTERFERENCE

2.01 When making a drop wire run, avoid running drop wires through tree foliage and branches to prevent damage to insulation due to abrasion. Obtain clearance in terms of feet rather than inches between drop wires and tree branches or foliage to avoid contact as a result of tree growth.

2.02 By one of these methods, tree interference can usually be avoided:

a. By locating the first building attachment to obtain tree clearance.

b. By positioning span clamps so that future growth of trees will not cause interference.

c. Providing required joint-use clearances can be obtained, distribute from a different pole or different point on the same pole than would ordinarily be selected.

d. By running drop wire below the bottom branches of the tree.

e. By contacting buildings other than the one to be served, provided that the property owner's permission has been secured in advance and the building is on the same premises.

f. By trimming trees, as per paragraph 4.08, when permission can be obtained from the proper authorities.

g. By obtaining a reassignment to another terminal, provided the length of the drop wire will not exceed the maximum limit.

2.03 Locating first building attachment.

a. Select a location for the first attachments which will be free of tree interference, when possible. A longer span of drop wire (not to exceed 200 feet) or longer building run is perferred to running a drop wire through trees. Drop wires may be run over driveways where adequate clearance is available.

b. Consider the type of tree as some grow very rapidly and could cause damage to drop wires in the future. Since limbs will be lower when weighted down with sleet, snow, or foliage and will be higher during other periods, consider the season when running drop wires over or under branches.

3. WIRE GUARDS

3.01 Wire guards shall be placed on drop wires under the following conditions:

a. When it is otherwise impractical to obtain clearance from branches, twigs, and foliage for a two-year period.

b. Where drop wire runs through a tree or foliage require protection from abrasion.

c. Where drop wires pass adjacent to guy wires or other obstructions liable to cause damage.

3.02 Installing wire guards.

a. Extend wire guard protection at least three feet beyond each side of the tree when protection is required from twigs or foliage in order to provide for future growth. Use care to center a tree guard at the point of contact with tree limbs, trunks, or branches.

b. The "P" wire guard, consisting of a helically wound plastic tape, shall be used to provide protection from tree damage. After the wire guards are positioned, secure them by placing a "D" clip at each end. Do not tape or seal the ends of the tubing. This action allows water to drain out and air to circulate thereby preventing corrosion.

c. Crimp the "D" clip with a pair of pliers as shown in Figure 1.

4. TREE TRIMMING

4.01 Where drop wires cannot be routed to obtain clearance, trimming of trees is generally the preferred method to avoid abrasion of drop wire, rather than the placing of wire guards.

4.02 When trees should be trimmed that are on state highways, county roads or city streets, contact your supervisor for proper authorization before trimming any tree. Where trees are on private property, make every reasonable effort to obtain consent to trim the trees.

4.03 When trimming trees, give attention to good public relations and to complying with safety practices, especially in regard to adequate warning signs. Observe these precautions when trimming trees:

a. Keep street and highways clear of branches.

b. Protect fences, lawns, etc., against damage from falling branches.

c. Keep the public from entering the area in which branches are likely to fall.

d. Do not leave tools where they can cause accidents.

4.04 When requesting permission to trim trees on private property, the owners should be informed of the extent of tree pruning and should be told how the work will be done. In order to maintain the health and good appearance of the tree, only trained and experienced workmen should be assigned to trim trees. Brush shall be removed at the time the tree is trimmed unless other specific arrangements are made.

4.05 When the property owner objects to the trimming of his tree, all reasonable efforts should be made to overcome his objections and, at the same time, to retain his good will. Some of the following subjects may develop his interest and overcome his objections:

a. Reference to other nearby tree trimming which has been satisfactory with the property owner.

b. Poor service or lack of service to himself and possibly his neighbors due to contact of the wires with branches of the tree.

c. The pruning of fruit trees with the thought of improving the yield.

d. The tools provided to do a scientific job.

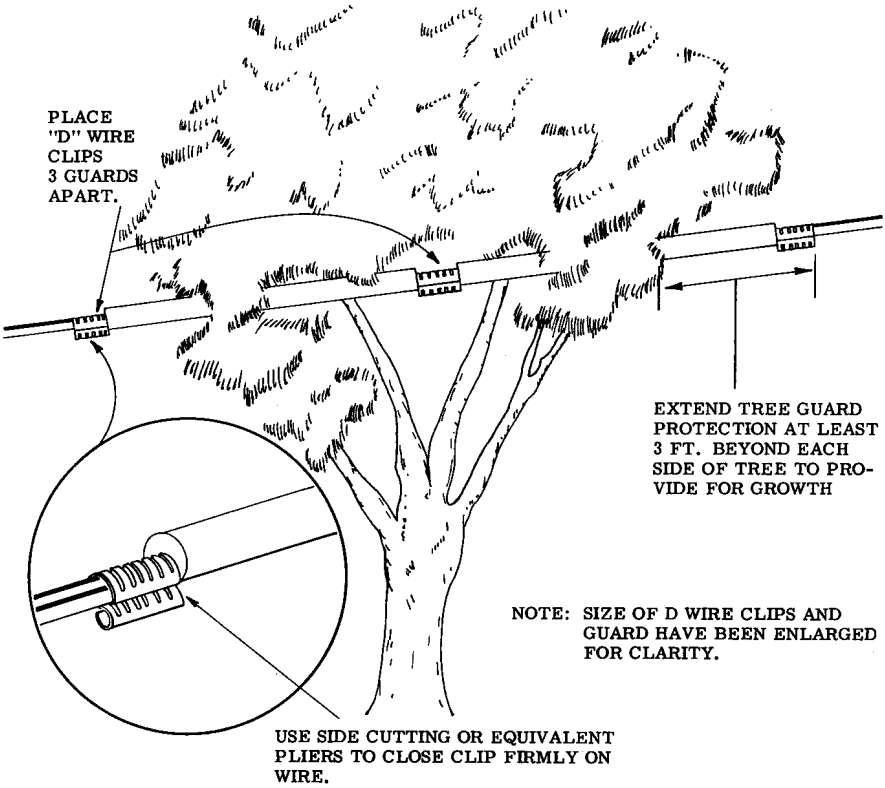


Figure 1. Positioning P Wire Guards

4.06 It is better to approach the property owner for the privilege of pruning fruit trees during the dormant season. When trimming these trees, the shape is secondary to the health of the tree and every effort shall be made to do the work in a careful and scientific manner.

4.07 Trimming trees in the fall and winter permits branches to be removed easily, and trees which require heavy trimming will not bleed excessively during the dormant season. Although the dormant period is the most favorable trimming time, summer pruning has the following advantages:

a. Cuts heal more rapidly and therefore, there is less chance for injurious agents to become established.

b. Opening of the tree to sunlight often retards some insects and fungus diseases.

c. Pruning will often stimulate fruit growth.

d. Often the clearance obtained during this season is more lasting.

4.08 Well shaped trees are a good advertisement of workmanship. If a little extra time is required to produce good results, it is time well spent. When trimming trees, observe the following methods:

a. Use a flush cut on a limb at the point of intersection with the main branch or trunk. (A flush cut is one having the cut surface parallel to the remaining limb so that no stub remains.) A treated flush cut will prevent or retard sprout growth, make the cut inconspicuous, and will heal more rapidly. Where upright limbs are cut, an angle should be made on the final cut to provide a watershed. Such cuts shall be made at crotches or joints.

b. Large limbs should be roped first to prevent breaking off at the cut. If the limb is very large, it should be taken down in sections. Use care not to underestimate the weight of limbs. Use a block and tackle, if necessary, to eliminate a safety hazard.

c. On large limbs, the cut is made from the top side with a preliminary cut on the underside to prevent splitting or peeling of the bark. The final cut should be flush with the supporting surface and without a rough surface. Do not attempt to make an undercut meet the top cut, but complete the top cut to leave a smooth surface. Use a top cut whenever conditions permit, because it produces less strain on the butt and supporting ropes.

d. Make a bottom saw cut when it is necessary to raise a large limb during the sawing operations (where wires are underneath the limb).

e. Where it is necessary to swing a limb sideways because of obstructions, make a side cut on the opposite side on which the limb is to be swung. This action will allow the bark and remaining wood to serve as a hinge. If there is a possibility of the limb splitting, wrap a few turns of rope beneath the cut to prevent splitting beyond that point.

f. Shade trees should be trimmed to provide not less than one year's clearance, as they are weakened by repeated loss of foliage. Shade trees should be rounded off symmetrically and without holes to detract from the tree's beauty. Some irregularities will result from trimming vertical growth on lateral branches; however, when leaves come out, a more even appearance will result.

g. Particular attention should be given to trimming those vertical or horizontal branches which grow in the direction of the drop wire. If practical, provide as much as three years' clearance.

h. Fruit trees should be trimmed so that they will produce more fruit on the smaller outside branches; therefore, as few as possible of these branches should be removed.

i. The ultimate object in tree trimming should be to train the branches to grow either above or below the drop wire.

SPAN CLAMPS–STRAND ATTACHMENTS

1. GENERAL

1.01 This practice describes the use and installation of the universal span clamp and methods of running drop wire from the span clamp to the pole. The uses and methods of placing other types of span clamps are quite similar to those of the universal span clamp.

1.02 Span clamps are used only when it is impractical to serve the customer directly from the pole, guard arm or cable arm in the normal manner. Some of the conditions which require the use of a span clamp are:

a. To prevent drop wires from crossing each other on the span.

b. To avoid crossing private property other than the property being served. Span clamps shall be placed on property lines wherever possible.

c. To avoid tree interference in pole to building runs.

d. To provide pole climbing space.

e. To avoid buildings and other obstacles.

f. To obtain clearance from clotheslines, power service drops and other obstacles.

1.03 The following limiting conditions should be observed in placing span clamps:

a. Bronze strand is used in corrosive areas. Never use a universal strand clamp with bronze strand; use a bronze strand clamp instead.

b. Where a span clamp is required to provide climbing space on a jointly used pole, and where there is a cable splice, place the span clamp on the side of the pole opposite the cable splice.

c. When a span clamp must be placed on the splice side of a pole to provide climbing space, place the span clamp wherever convenient to maintain a distance of 30 inches from the pole, but never directly over the splice.

2. INSTALLATION PROCEDURES

2.01 Universal span clamps may be used on lashed (figure eight) and ring supported cable. A clamp shall not support more than two drop wires at one time.

2.02 The following procedure is used to place span clamps:

a. Loosen the nut of the clamp until the jaws open sufficiently to place the clamp on the strand.

b. Place the clamp on the strand between the wrappings of prepared lashed cable, with the hook side of the clamp facing the building to be served. The sheath of lashed cable is protected with a lashed cable support placed as described in paragraph 2.03.

c. Take up on the nut until the clamp is firmly bolted to the strand.

2.03 A lashed cable support is placed on the sheath of lashed cable as follows:

a. The cable support buckle is held as close to the span clamp as possible.

b. The first wrap of the support is placed on the cable only, passed between the lashing wire and the cable and through the buckle.

c. The second wrap is placed under the strap and over the lashing wire and the wrap threaded through the buckle.

d. The wrapping is snugly pulled around the cable, the free end bent back on the buckle and the excess cut off, leaving approximately one inch. The tail should be tucked under the buckle.

2.04 Figures 1 and 2 illustrate the universal span clamp installed on lashed or figure eight cable.

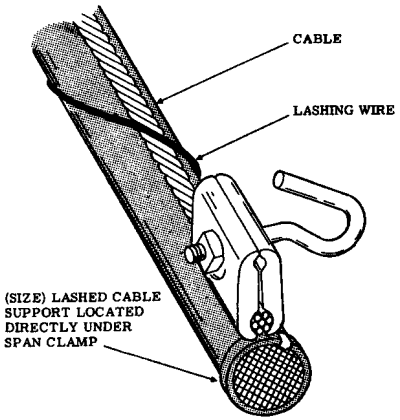


FIGURE 1. Lashed Cable

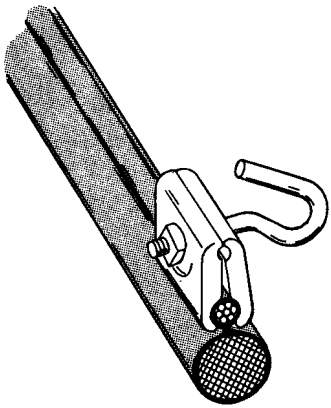


FIGURE 2. Figure Eight Cable

3. RUNNING DROP WIRE TO SPAN CLAMP

3.01 Since two drop wires per span clamp are the maximum, place the second strand clamp 4 inches beyond the first when 3 drop wires are required. This spacing of clamps will prevent chafing of the drop wires. If more than 4 drop wires are required from a pole to pole or strand to building run, report it to your supervisor.

3.02 Where a span clamp is more than 4 feet from the pole, support the drop wire as shown in Figure 3. The drop wire clamp on the span to the building shall be attached in the top position clearance between the drop wire and cable.

3.03 Where the distance between a span clamp and cable suspension bolt is less than 4 feet, the drop wire is supported as shown in Figures 4 and 5.

3.04 Where drop wires are run from guard arms to span clamps, support the drop wire as shown in Figure 6.

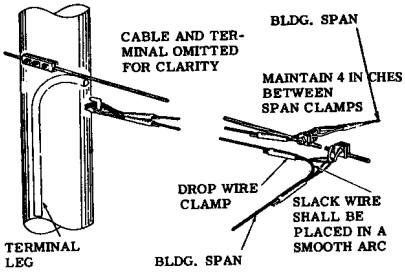


FIGURE 3. Span Clamp More Than 4 Feet From Pole

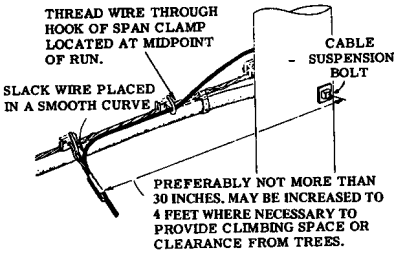


FIGURE 4. On Lashed Cable

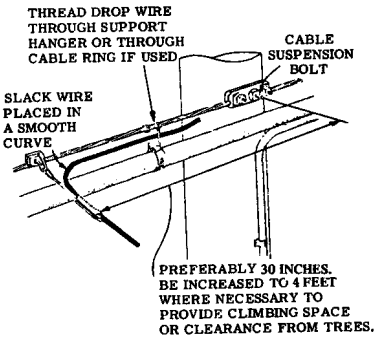


FIGURE 5. On Ring Cable

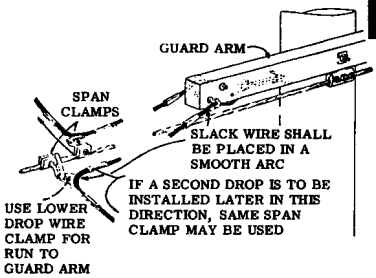


FIGURE 6. Runs From Guard Arms To Span Clamp

DROP WIRE CLAMPS
INSTALLATION

1. GENERAL

1.01 This practice provides the description of and installation procedure for the PS-6 drop wire clamp.

2. DESCRIPTION

2.01 The PS-6 drop wire clamp (Figure 1) consists of a stainless steel wedge, bail, shell, and plastic shim. The plastic shim makes removal easy and prevents installation damage.

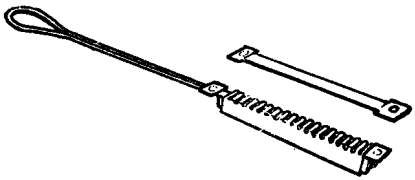


FIGURE 1. Drop Wire Clamp

2.02 Drop wire clamps are used for attachment to poles, crossarms, and the first attachment on buildings. The PS-6 drop wire clamp is designed for use with reinforced dumbell wire.

3. INSTALLATION

3.01 Following is the installation procedure for the PS-6 drop wire clamp:

a. Place the bail over the hook or knob by spreading the shaft (not the eye) of the bail.

b. Pinch the shaft of bail together while pulling the eye toward the knob. This action will cause proper positioning of eye on the knob.

c. Place the shell of the clamp over the wire with the narrow end pointing toward the knob or hook. The wire should be flat in the shell before the wedge is inserted. See Figure 2.

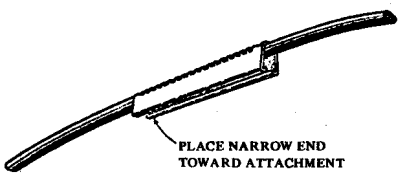


FIGURE 2. Placing Clamp Shell

d. Place the plastic shim under the drop wire inside the clamp shell by inserting the shim edgewise and twisting its end until the shim snaps in place. See Figure 3.

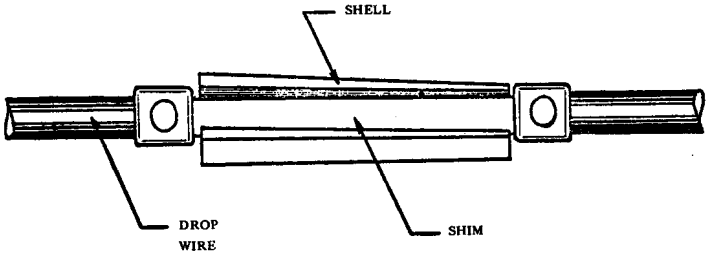


FIGURE 3. Insert Shim In Clamp Shell

e. Insert the wedge loosely under thy clamp with point of wedge directed toward the attachment. If necessary, bend the loop of the clamp at the point of contact with the wedge to facilitate inserting the wedge. Do not bend the drop wire excessively. See Figure 4.

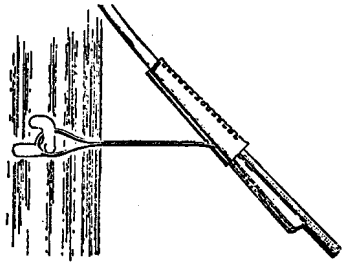


FIGURE 4. Inserting Clamp Wedge

f. Where necessary to adjust slack, slip the wire through the loose shell until the proper amount of sag has been secured. During this operation, hold the shell in this position with the thumb, as illustrated in Figure 5.

g. When the proper sag has been obtained, pull the shell firmly against the wedge. Tap the wedge firmly with a blunt tool to drive it home.

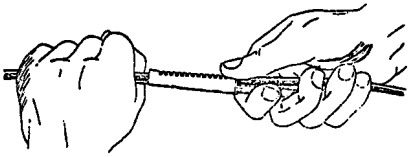


FIGURE 5. Obtaining Proper Sag

3.02 In case the drop wire clamp leaves the groove of the knob at an appreciable angle, give the clamp three half-turns to prevent the bail from pulling off the knob. Twist the clamp by hand with the shell in place. Remove the shell and install the drop wire. Reassemble the clamp.

DROP & BLOCK WIRING

TREE ATTACHMENTS – INSTALLATION

1. GENERAL

1.01 This practice provides information on the installation of tree attachments used on drop wire runs.

1.02 Since tree attachments can be a source of trouble, they are to be used only where no other means of obtaining the proper clearance is available. Tree attachments shall not be made unless permission to place poles cannot be obtained or where poles would not provide the proper clearance.

1.03 With permission of the owner tree attachments may be used under the following conditions :

a. Tree attachments may be made to shorten the span from highway to building, provided the installation can be made so that wires will have the proper clearances.

b. Where it is necessary to raise the drop wire to clear a tree limb or to obtain the required clearance from foreign circuits.

c. Do not attach drop wires to tree limbs or trunks which are less than 3 inches in diameter because of the greater movement of smaller limbs.

d. When tree attachments are used, allow at least one foot more sag in each span than specified in the sag table to compensate for the swaying of the tree.

1.04 A ladder shall be used to climb trees whenever it is found necessary to make a tree attachment. *Tree* climbers may be used when use of a ladder is not practical. Never use pole climbers to climb trees. The gaffs on climbers used for pole climbing are generally not long enough to penetrate the bark and thus will not enter solid wood far enough to obtain a firm hold.

2. INSTALLATION

2.01 To limbs or trunks 6 inches or more in diameter:

a. Drop wire attachments to limbs or trunks 6 inches or more in diameter shall be made with drive hooks and drop wire clamps. Do not attach more than three drop wires (6 clamps) to one drive hook. See Figure 1.

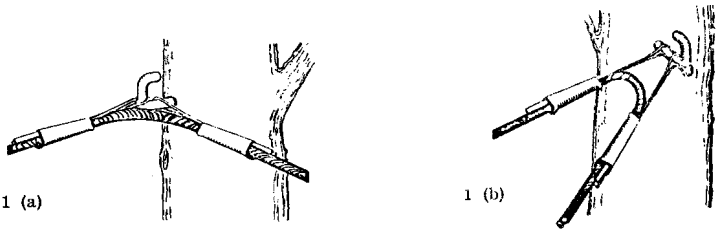


Figure 1. Tree Attachment To 6-Inch Diameter Trunk

2.02 To limbs or trunks from 3 to 6 inches in diameter:

a. Use C bridle rings and drop wire clamps when attaching drop wires to limbs or trunks from 3 to 6 inches in diameter. Not more than one drop wire clamp may be attached to one bridle ring. See Figure 2.

b. Do not use bridle rings for attaching drop wires which cross streets or highways when there is a pull away from the limb. On drop wires not requiring double deadends, the drop wire may be attached to bridle rings with a straight drop wire clip, as illustrated in Figure 3.

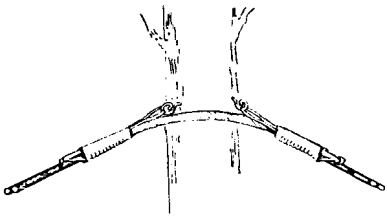


Figure 2. Tree Attachment To 3- To 6-Inch Diameter Trunk

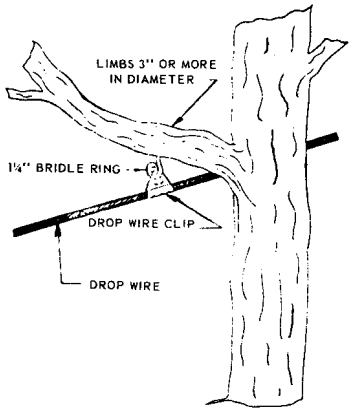


Figure 3. Drop Wire Clip Tree Attachment

DROP AND BLOCK WIRING

TERMINAL POST CAPS AND INSULATORS

1. GENERAL

1.01 This practice presents the protective measures to be taken on circuits used for special service requirements.

1.02 These measures consist of placing binding post caps and insulators on the binding posts of special service lines in all cable terminals at which the circuits are brought out, including multiple appearances. This is to prevent service interruptions due to accidental contact.

1.03 Among the special service lines which require protection from accidental contact are:

a. Military circuits.

b. Private line service furnished to the government.

c. Special facilities for use in a major disaster.

d. Remote control, signal and alarm including fire, police burglar alarm, and various instrument metering circuits.

e. PBX battery and generator supply for hospitals, police, fire departments, and others who perform emergency service for the public.

f. Teletypewriter, including ticker service lines.

g. Telephotograph and television.

h. Carrier telegraph and telephone.

i. Radio telephone.

j. Program supply (e.g. radio, etc.).

k. Miscellaneous circuits on which special protection is prescribed by order.

1.04 Extreme care shall be exercised when working on or near protected lines not to interfere with, or do unauthorized work on these lines. This could cause a momentary open, short circuit cross or unbalanced condition which could result in serious service interruptions.

1.05 The red binding post cap or any binding post insulators shall be removed only when authorized by the local testboard or by a service order for service discontinuance. Then all caps and insulators associated with a particular service shall be removed at the time the service order (for service discontinuance) is completed. In the event that such caps are overlooked, they shall not be removed for subsequent reuse of pair unless authorized by the local testboard.

1.06 Designation tags shall be used only at working appearances and when specified on service orders. In such cases, tags shall be attached to the drop, block, or cross-connecting wire at a point in the wire run of the terminal so that the tag or attaching string cannot come in contact with any binding posts.

2. BINDING POST CAPS AND INSULATORS

2.01 The binding post cap is a red neoprene cap with a tear slit and hole. The cap, which can be used on a working or non-working binding post, completely covers the cable terminal binding posts. The caps provide protection against accidental contact. See Figure 1.

2.02 For special service lines which end in terminals not suited to use of binding post caps, the binding post insulator is provided. It is a phenol fiber sleeve, slotted lengthwise. See Figure 2.

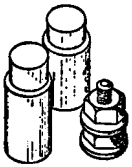


FIGURE 1. Binding Post Cap

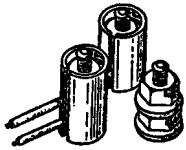


FIGURE 2. Binding Post Insulator

3. PLACING BINDING POST CAPS

3.01 Use this procedure to position binding post caps:

a. Thoroughly clean the binding posts to be protected and the terminal face plate.

b. Tighten the spare nuts of the binding post, finger tight.

c. Check that all moisture around binding post has been removed.

d. Force the cap, but do not twist, over the binding post until its skirt is in good contact with the face plate.

e. Position any appropriate drop or bridle wires inside the hole at the end of the slit in the cap.

4. PLACING BINDING POST INSULATORS

4.01 This procedure is used to position binding post insulators:

a. Follow procedures outlined in paragraph 3.01 a. through c.

b. Force the insulator over the binding post until its skirt is in good contact with the face plate.

c. Be sure the fit is snug; if necessary, wrap plastic tape around the binding post inside the insulator.

d. Position any appropriate wires inside the slot.

5. DESIGNATION TAGS

5.01 Aluminum designation tags are available for identifying all types of services. In no case shall the circuit numbers of special service lines be on designation tags. Tags are to be used *externally* at terminal, protector and connecting block locations.

6. MATERIAL INFORMATION

ITEM	CATALOG NO.
Binding Post Cap	68-34-008-7
Binding Post Insulator	70-58-047-2
Metal Designation Tag	51-77-020-2

DROP & BLOCK WIRING

WIRING AT STRAND MOUNTED TERMINALS

1. GENERAL

1.01 This practice provides procedures for the routing and terminating of drop and block wiring at strand mounted terminals.

2. WIRING AT SHEATH MOUNTED CABLE TERMINALS

2.01 Drop wires should preferably be run to the terminal from the adjacent pole, except where they distribute from a cable extension arm or from a span clamp installed between the terminal and terminal splice. A drop wire distributing from a span clamp so located should be run directly from the span clamp to the terminal.

2.02 Route drop or block wires through the three rings (or the two hangers in older design terminals) at the rear of the terminal, around the ring (or hanger) at the far end, and below the terminal to the proper wire entrance holes of the assigned binding posts. Do this on initial wire connection and also on reconnections if the wire is long enough to reach the binding posts without being pulled tightly around the last ring (or hanger). If it is necessary to obtain slack for reconnections, the wire may be removed from one or two terminal rings (or one hanger) in order to reach the binding posts. If sufficient slack cannot be obtained in this manner, splice out the shortened wire behind or near the terminal and route the wire through the three rings (or two hangers) as for an initial connection.

2.03 Typical illustrations of drop wire runs to strand-mounted terminals are shown in Figure 1 through Figure 4. Lashed cable is illustrated but the same general methods apply to terminals installed on ring-supported cable.

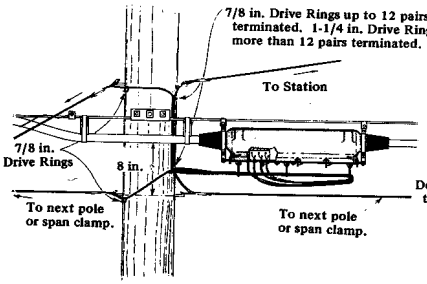


FIGURE 1–Wiring 49-Type Terminal at Pole

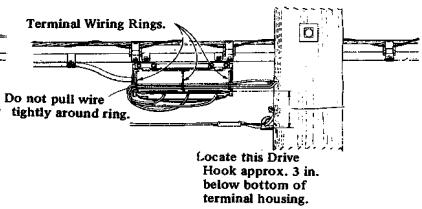


FIGURE 2–Rear View of Running Wires to Terminal from Drive Hooks

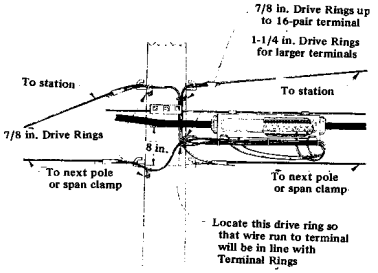


FIGURE 3–Wiring 61-Type Terminal at Pole

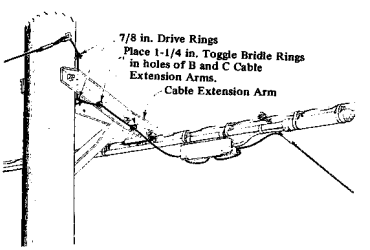


FIGURE 4–Running Wires to Terminal from B or C Cable Extension Arm

2.04 Where the terminal is installed on a cable which is supported by strand attached to a building, place a cable ring for the drop or block wires approximately 3" beyond each end of the terminal, with the rings not encircling but resting against the outside of the main cable. The wires entering the terminal should pass through one of these rings before being run through the three terminal rings, as illustrated in Figure 5. Where there is less than 2" separation between the strand and the building wall, disregard the wiring rings at the rear of the terminal and place three 7/8" drive rings in corresponding positions in the building wall, approximately 3" below the terminal.

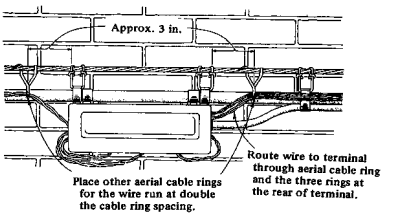


FIGURE 5–Running Wires to Terminal Installed on Strand Supporting Block Cable Attached to a Building

2.05 When running wires to a terminal installed on strand supporting cable attached to a building, cut, drop, or bridle wire to the proper length for termination. See Figure 6.

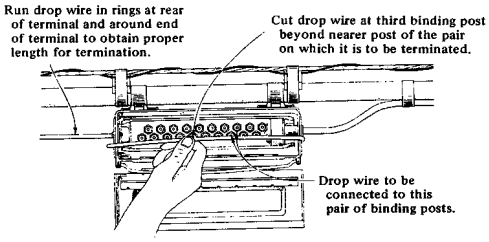


FIGURE 6–Obtaining Proper Length of Wire for Termination

2.06 Terminate drop and block wires at the terminal as follows:

a. Skin and clean the ends of the conductors. With C drop wire it is necessary to remove approximately 2 1/2" of the outer covering.

b. Break through the grommet in the wire entrance hole immediately below the proper pair of binding posts, using long-nose pliers or other suitable tool. In older design terminals, it is necessary to break through the cork strip at the center of the wire entrance hole before the wire can be inserted through the slit in the rubber strip located behind the cord strip.

c. Insert the wire through the grommet as illustrated in Figure 7, and terminate it on the binding posts in the usual manner.

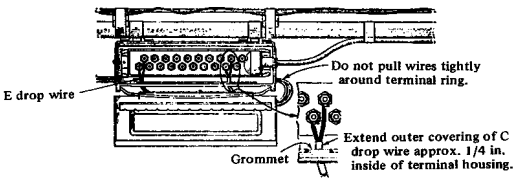


FIGURE 7–Terminating Wires at Terminals

2.07 Two wires may be bridged on a pair of terminal binding posts. Wires terminated on the same binding post should enter the same wire entrance hole. Where 3-4 wires are to be bridged, bridle wires between the terminal and a 101B wire terminal should be run through the three rings at the rear of the sheath-mounted terminal in the usual manner.

2.08 When connecting service cables or buried wire to strand-mounted terminals, run bridle wires from a 101B wire terminal or D wire terminal in the same manner as drop or block wires.

2.09 When a wire is disconnected from the binding posts, straighten the ends of the conductors sufficiently to avoid dislodging the grommet and pull the wire out of the terminal. Tape the end of the disconnected wire to itself at a point behind the terminal which will not cause the wire to be pulled tightly around the end ring (or hanger).

2.10 Lost or deteriorated grommets should be replaced. To install the grommet where a wire enters the terminal, cut through the rim of the grommet at a point in line with the scored portion. Place the grommet around the wire so that the groove is completely engaged with the edge of the wire entrance hole.

DROP AND BLOCK WIRING

GUARD ARM HOOKS INSTALLATION AND REQUIREMENTS

1. GENERAL

1.01 This practice covers the installation of guard arm hooks, and the methods of running drop wires from guard arms.

2. GUARD ARM HOOK INSTALLATION

2.01 A properly installed guard arm is shown in Figure 1.

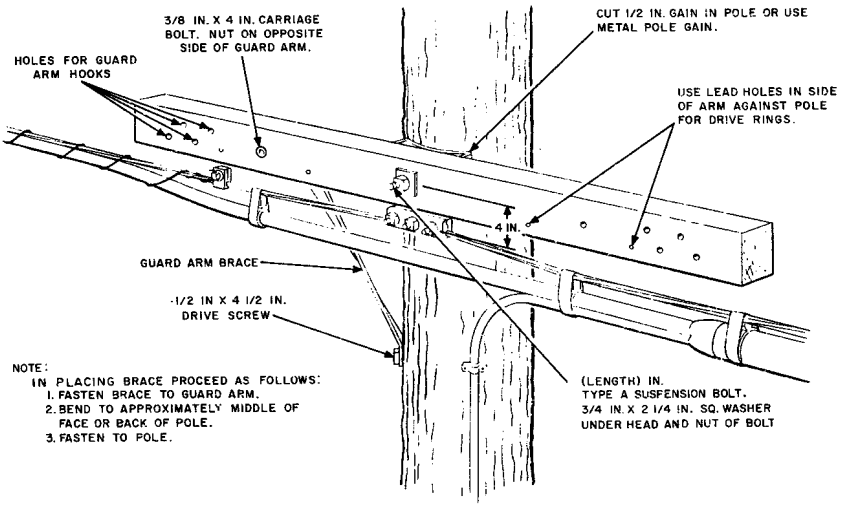


FIGURE 1. Guard Arm Installed

2.02 A metal pole gain installed (as shown in Figure 2) may be used to avoid the necessity of cutting a gain in the pole.

2.03 Guard arm hooks are used to attach wires to guard arms and also to cross arms other than the DE-type when more than two drop wires must be attached to the same hook. On a guard arm, install the hooks in the holes provided at the ends of the guard arm. See Figure 3. When the guard arm hooks are used on a crossarm, it may be necessary to drill a 9/16 or 5/8 inch hole for each hook required in the side of the crossarm. Center the hole between the top and bottom of the arm and between pins or closer to the pole if adequate clearances can be obtained and climbing space is not obstructed.

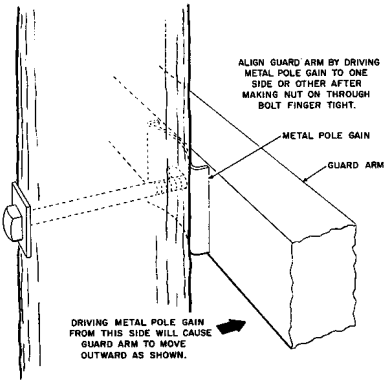


FIGURE 2. Metal Pole Gain Installed

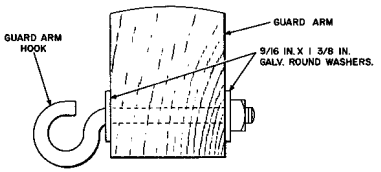


FIGURE 3. Guard Arm Hook Installed

2.04 A total of five drop wires, pulling in any direction, may be attached to one guard arm hook. When placing B or C multiple drop wire, consider one multiple drop equal to three drop wires.

3. WIRE RUNS FROM GUARD ARMS

3.01 Distribute drop wires from a guard arm as shown in Figures 4 and 5.

3.02 Attach the drop wire clamp to the guard arm hook by passing the wire tail of the clamp over the hook. Pass the drop wire through the hook, unless the hook is congested, and secure the drop wire in the clamp. Run the wires on the guard arm and pole in a neat manner with sufficient slack so there will be no strain or sharp bends in the drop wire at the drive rings, hooks, or clamps.

3.03 If brackets and knobs have been previously installed on the guard arm and are in serviceable condition, drop wires may be distributed from vacant grooves of the knobs. No more than two drop wires shall be attached to a T knob or more than one drop wire attached to an S knob.

3.04 When installing, removing, or rearranging drop wires, it may be necessary to place and distribute from a new guard arm hook at the opposite end of the guard arm instead of using an existing hook, in order to balance the load on the guard arm.

3.05 When several drop wires are attached to one guard arm and are run to the same building, it is desirable to distribute from both ends of the guard arm to equalize the load, provided the required climbing space will be maintained.

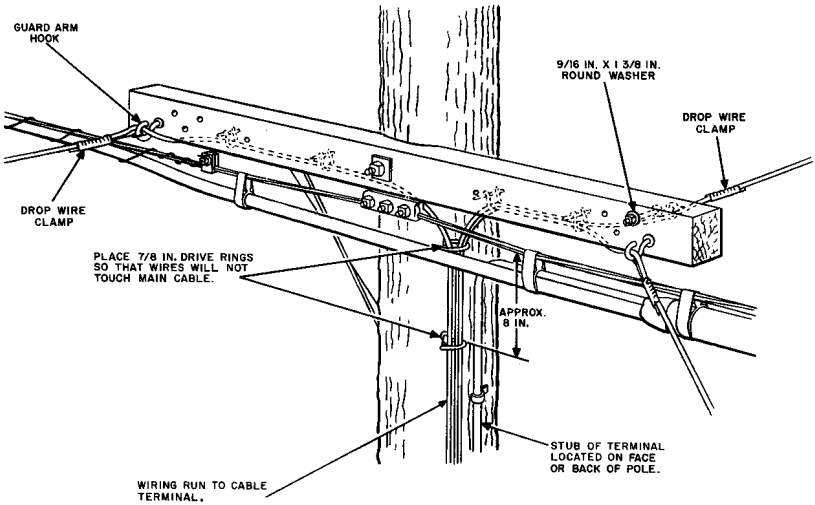


FIGURE 4. Cable Terminal Mounted on Face or Back of Pole

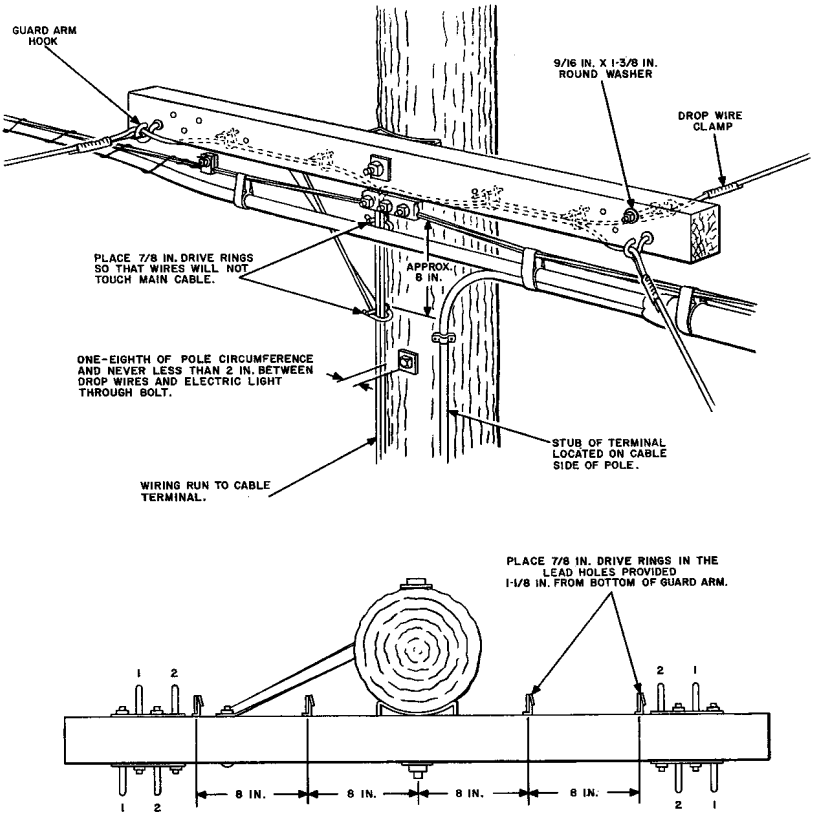


FIGURE 5. Cable Terminal Mounted on Cable Side of Pole

3.06 When making runs along the lead from guard arm to guard arm or from guard arm to pole, dead end the drop wires as shown in Figures 6, 7, and 8.

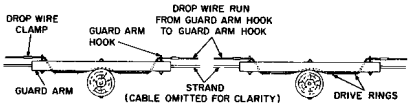


FIGURE 6. Drop Wire Run Along Lead From Guard Arm to Guard Arm

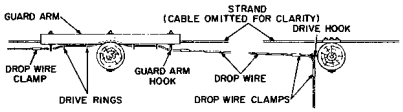


FIGURE 7. Drop Wire Run Along Lead From Guard Arm to Pole

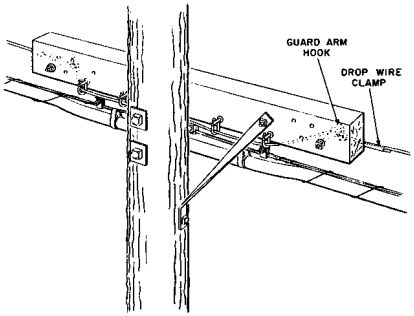


FIGURE 8. Wiring at Intermediate Guard Arm for Run Along the Lead

STATION WIRE AND CABLE ATTACHING AND FASTENING

CONTENTS

1. GENERAL

1.01 This practice provides information on the proper type and size of attachments and fasteners to be used for various surfaces when attaching station wire and cable. For information on fastening drop wire, refer to CTSP 475-302-401 and CTSP 475-302-405.

2. SURFACES ENCOUNTERED

2.01 Use galvanized fasteners outdoors and enameled or nongalvanized fasteners indoors.

2.02 Masonry or Substantial Brick Veneer:

a. In general, the same fasteners apply in making attachments to masonry and substantial brick veneer. Veneering is considered substantial when:

(1) The veneer thickness is 3-3/4 inches (as observed at an outside corner).

(2) The bricks are joined firmly with mortar.

b. On masonry and substantial brick veneer, drill holes for all attachments as close to the center of bricks as practicable and use care to avoid damaging and loosening the bricks. In the case of face brick or ornamental types of brick, holes for intermediate and last attachments may be drilled in the seam to avoid breakage.

2.03 Thin-Wall Brick Veneer: Thin-wall brick veneer is considered as veneering having a thickness of less than 3-3/4 inches (as observed at an outside corner, some corners are mitered) or having bricks that loosen or crack easily when drilled. Make attachments to thin wall veneering as follows:

a. First Attachment: Attach to suitable woodwork with galvanized wood screws. When suitable woodwork is not available, attach to the brick veneer surface by drilling a clearance hole in the seam to permit a galvanized wood screw to be passed through the brick portion of the wall and screwed into the wood backing or studding. The screw should penetrate at least 1 inch into the wood backing or studding.

b. Intermediate and Last Attachments: Attach to brick veneer with suitable anchoring device. Drill holes in center of bricks; if bricks begin to crack or loosen, make the attachments to seams or to wood trim. On slab type veneering (approximately 1 inch thick), secure intermediate and last attachments to the wood backing in the manner specified for first attachments.

2.04 Wood:

a. Staples, galvanized wood or tapping screws, or nails are generally the standard fasteners on wood; however, hollow wall anchors, plastic anchors, or toggle bolts are recommended as fasteners on plywood and masonite when a more substantial fastener is needed for heavier apparatus.

NOTE: Do not use staples on exterior surfaces in damp climates.

b. On woodwork, drill lead holes for fasteners and screw type fixtures to avoid splitting the wood and to obtain maximum holding power. Locate fasteners in studding where practicable.

c. Studs in buildings of wood frame construction may usually be located by one of the following methods:

(1) **Buildings finished with clapboards:** By location of heads of nails used in fastening clapboards to studding, or where clapboards join.

(2) **Buildings finished with shingles or stucco:** By sounding; by locating studs in cellar or attic; by location of heads of nails used in fastening trim to studding.

2.05 Stucco on Wood: For stucco on wood buildings, attach to substantial wood trim with galvanized wood screws. Where required to install fixtures on stucco finished walls, drill a clearance hole for tapping screw or screw-type fixture, preferably by means of an installer drill in a ratchet brace or electric drill with masonry bit. If there is a wood backing, the spring of a hammered drill will knock the stucco loose. Use care to avoid cracking the stucco. Locate screws in studding where practicable.

2.06 Plaster on Lath, Rock Lath, Plaster Board: Plastic anchors, hollow wall anchors or toggle bolts are used to make attachments. However, when a substantial fastener is required for heavier apparatus, it will be necessary to locate the studding as in paragraph 2.04 c. and use tapping screws. The holding power of hollow wall fasteners is such that any movement or shifting of weight tends to loosen them. This must be considered at all times so that costly maintenance and hazards are not built into plant. If wood lath is used under plaster and can be entered by a slanting lead hole, a secure attachment can usually be made. Locate the lath before drilling the attachment hole.

2.07 Rigid Composition Shingles:

a. In general, galvanized wood screws are required in making attachments through composition shingles.

b. On buildings finished with rigid composition shingles, make attachments to substantial wood trim where practicable. If suitable wood trim is not available, locate the clearance holes for fasteners on the shingles as follows:

(1) Rectangular shaped shingles installed with the long dimension horizontal: Locate the hole midway between the vertical edges of the shingle and approximately 3/4 inch above the bottom edge.

(2) Rectangular shaped shingles installed with the long dimension vertical: Locate the hole at the midpoint of the visible shingle height and approximately 3/4 inch from either vertical edge.

(3) Shingles installed in diamond formation: Locate the hole near a nail hole and approximately 3/4 inch from either exposed edge of the shingle.

c. When more than one screw is required to attach a drop wire fixture, observe the following in locating the clearance hole for the screw:

(1) House bracket: The distance between the edge of the shingle and the nearest hole should be approximately 3/4 inch.

TABLE A. Spacing Requirements of Attachments

FASTENERS		SPACING				
		HORIZONTAL		VERTICAL RUN		FROM CORNER
		FEET	INCHES	FEET	INCHES	INCHES
Cable Clamps	More than 12-pair cable		16	4		2
	Less than 12-pair cable		16		16	2
Cable Clasps	More than 12-pair cable		14	3		2
	Less than 12-pair cable		14		14	2
Adhesive Clips			12		12	2
Station Wire Clamps			16		16	2
Ground Wire Nail			16		16	2
Staples	Station Wire		7-1/2		7-1/2	1
	25-pair inside wiring cable		12		12	2
Adhesive Cable Tie		4				2 thru 8-1/2*
Bridle Rings		4		8		2 thru 8-1/2*
Drive Rings		4		8		2 thru 8-1/2*
Wire Loops		4		8		2 thru 8-1/2*
Toggle Bridle Rings		4		8		2 thru 8-1/2*
Beam Clamp		4		8		2 thru 8-1/2*
Utility Clip	Used on Beams	4		8		2 thru 8-1/2*
	Used on Hanger Wires	As Required				

When changing direction of wire or cable runs where wire loops, bridle rings, drive rings, toggle bridle rings, and beam clamps are used, the fasteners should be spaced to hold the wire or cable at approximately a 45-degree angle.

TABLE B. Clearances and Lead Holes for Fasteners and Screw-Type Fixture

FASTENER OR FIXTURE	CLEARANCE HOLE			LEAD HOLE		
	SIZE AND TYPE OF DRILL					
	INSTALLER	POINT	CARBON STEEL TWIST	INSTALLER	POINT	CARBON STEEL TWIST
	IN.					
Toggle Bolt	Clearance Hole					
1/4	5/3 or 3/4					
5/16	5/8 or 7/8					
Toggle Bolt Ring 3/4 and 1-1/4	3/4					
S and L Insulated Screw Eyes	3/16 by 5-1/2		No. 12 or 3/16		3/32	No. 42 or 3/32
Bridle Rings 1-1/4—1-5/8					1/8	
Drive Rings 5/8 and 7/8					3/32	No. 42 or 3/32*
1-1/4					11/64	
Angle Screw 5/16	5/16 by 7-1/2		5/16		11/64	No. 18 or 11/64
3/8	3/8 by 8		3/8	1/4 by 6-1/2		1/4
Tapping Screw + No. 7		11/64	No. 20		5/64	
No. 8		No. 13	11/64		3/32 or No. 333	
No. 10	3/16 by 5-1/2		No. 12 or 3/16		3/32	No. 42 or 3/32
No. 14	1/4 by 6-1/2		1/4		1/8	No. 30 or 1/8
Wire Loop Fasteners, Drive Anchors, Plastic Anchors, Hollow Wall Anchors	*The maximum holding power of these anchoring devices in any given quality of masonry depends upon obtaining a drilled hole corresponding to the outside diameter of the unexpanded anchor and of sufficient depth to allow the nail to be driven its full length. The diameter and length are generally indicated on the anchor. The depth of hole required varies with the thickness of the fixture to be installed at the point of support. In all installations the minimum depth of hole required is equivalent to the length of the anchor plus the distance the nail or screw will extend beyond the anchor (approximately 3/16 inch).*					

NOTES:

1. *Installer drills are bit stock twist drills and are used in the ratchet brace.*
2. *Carbon steel twist drills are straight shank drills and are used in the hand drill.*
3. *Drill points are used in the automatic drill and will drill lead holes approximately 1-1/2 inches deep. Where deeper holes are required, use twist drills in the hand drill.*
4. *Use masonry drills for drilling the seam between bricks.*
5. *Use masonry drills or star-faced stone drills in drilling holes for toggle bolts. Two sizes of holes are listed to cover the different types of approved toggle bolts. Drill the smaller hole if it will accommodate the toggle bolt.*
6. *Apply paraffin wax or soap to the threads of wood screws or screw-type fixtures to facilitate turning them into wood.*

* *Do not drill lead hole in poles.*

\+ *Tapping screws have an AB thread suitable for sheet metal or wood and are available with pan head.*

(2) Corner bracket: The bracket should be located so as to bear evenly on the shingles with the hole nearer the porcelain knob located approximately 3/4 inch from the edge of the shingle.

NOTE: Because of the brittleness of rigid composition shingles, and where mounting of attachments cannot be avoided, the following precautions shall be observed.

(1) Place ladder carefully against the shingles.

(2) Use only well-sharpened drills.

(3) Never use drills which require the use of a hammer on composition shingles.

(4) Do not apply excessive pressure to the brace when drilling clearance holes through the shingles.

(5) Wood screws should not be tightened excessively as the pressure on the shingle might cause it to break.

2.08 Metal and Vinyl (Siding, Paneling, or Desk):

a. Be sure protrusion of fasteners will not cause damage or injury. Fasteners for siding, paneling, or desks can be of the following variety: tapping screw, plastic anchor, toggle bolts, or hollow wall anchors. There is also a possibility of using an adhesive clip for a wire. See CTSP 475-310-412 for information on attaching to aluminum, steel and vinyl siding.

b. Aluminum and vinyl siding presents other problems. The customer should be contacted to determine the type of siding and method used to install it. This will determine type of fastener or attachment to be used. Permission should be obtained at this time for proposed wire runs, etc. See CTSP 475-310-412.

c. When using an extension ladder against metal, vinyl or aluminum siding, use care to prevent damage.

CAUTION: It is possible for foreign voltage to be present on buildings covered with metal siding. Test siding with B voltage tester before starting any work.

3. ATTACHING AND FASTENING GROUND WIRE

3.01 Fasteners (Figure 1): Space ground wire fasteners as follows:

NOTE: If possible, locate nail or tapping screws that are used for fasteners so they will enter studding.

a. Space 24 inches apart on ordinary ground wire runs.

b. Space 16 inches apart when wire is subject to displacement.

c. Place on every beam when spanning beams. (Avoid spanning beams unless there is no alternative.) Stay as close to wall as possible.

d. Place within 3 inches of wall when run parallel to wall on beams (to discourage articles being hung on wire).

NOTE: Staples are not recommended for use in plaster.

4. ATTACHMENTS USED IN FINISHED ROOMS AND OFFICES

NOTE: Refer to Table A for spacing requirements.

4.01 Staples: Table C shows the staples recommended for wood surfaces with finishes available.

TABLE C. Selection of Staples

STAPLES				
FINISH	SIZE (INCHES)		SHAPE OF CROWN	USE
	LENGTH	WIDTH		
*Zinc or Ivory	3/8	5/32	Rounded	With station wire and small gauge ground wire in all type wood
†Vinyl				
*Zinc or Ivory	3/8	3/16		
†Vinyl				
*Zinc Coated	5/8	1/2	Flat	Inside wire cables up to 1/2-inch in diameter

* *For indoor use.*

† *For outdoor use or where appearance is unimportant.*

NOTE: Staples are not recommended for use in plaster or on exterior surfaces in damp climates.

4.02 Ground Wire Nail: This nail is used to fasten ground wire to plaster or wood surfaces. It can be used with station wire if care is taken to ensure that the wire is sufficiently secured by the arm of the nail.

4.03 Station Wire Clamp: This clamp is used to support station wire. Table D lists fasteners to be used with clamps.

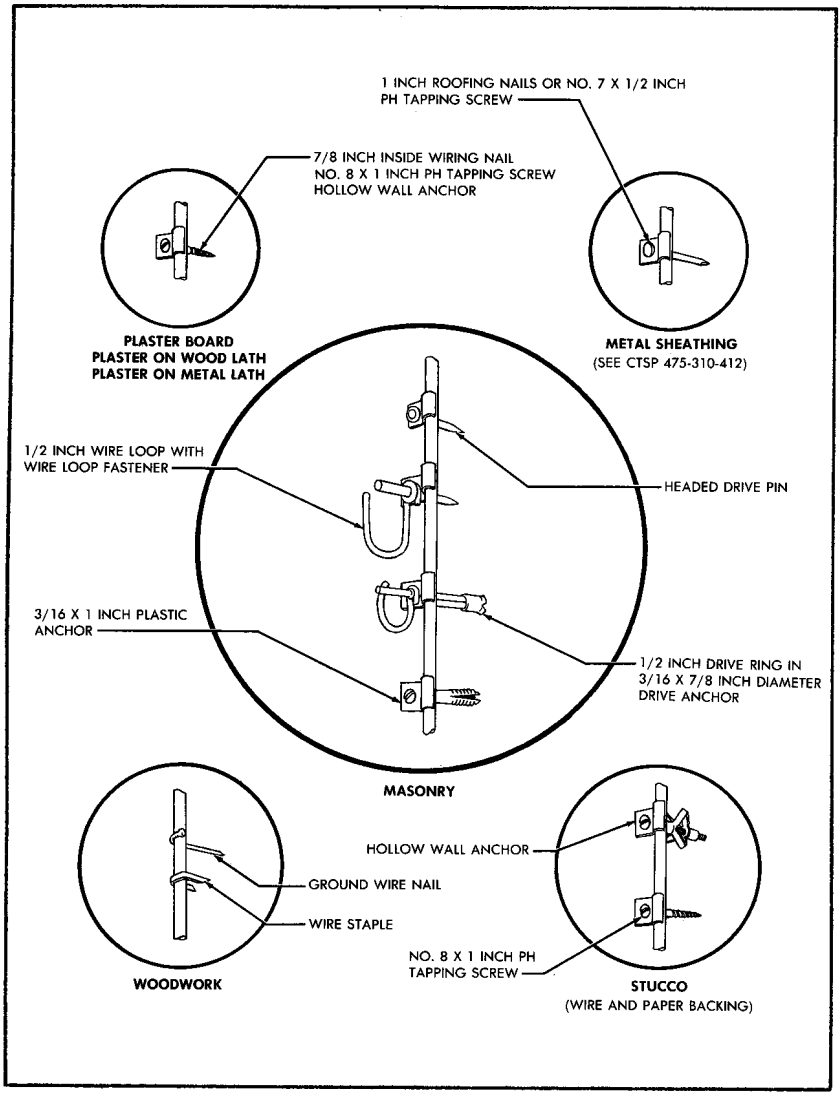


FIGURE 1. Fasteners for Ground Wire

TABLE D. Fasteners for Station Wire Clamp

SURFACE	FASTENER
Vinyl or Asbestos Siding See CTSP 475-310-412	No. 7 x 1/2 in. PH tapping screw
	No. 6 x 5/8-in. galvanized wood screw. Plastic Anchor, 3/16 x 1 in.
Wood, Indoors	No. 7 x 1/2 in. PH tapping screw
Wood, Outdoors	No. 6 x 5/8-in. RH galvanized wood screw
Stucco (Wire and Paper Backing)	No. 8 x 1-in. PH tapping screw or Hollow-Wall anchor (correct size)
Masonry	No. 2 Masonry Fastener

4.04 Cable Clamps and Cable Clasps: These attachments are used to support inside wiring cable or more than one station wire. Table E lists fasteners to be used with clamps and clasps.

4.05 Adhesive Cable Clips (Figure 2):

a. The adhesive cable clips are extruded vinyl, used as a fastening clamp for cable or wire on wooden and metal furniture. These clips have a pressure sensitive foamed, vinyl adhesive backing and are available in four sizes. See Table F.

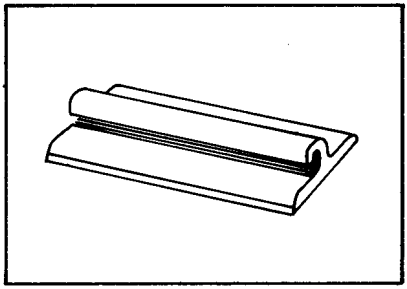


FIGURE 2. Adhesive Cable Clips

b. Use these clips to secure or store unsightly and hazardous slack in inside wire, cables, and telephone cords.

c. Space on 12-inch centers for horizontal and vertical runs. From corners they shall be placed on two-inch centers.

d. The adhesive clips can be mounted on most dry, clean, and smooth surfaces. To mount, pull off wax-covered paper from the back of the clip. Press the adhesive clip against the area chosen for mounting.

e. To remove the adhesive clip, pry up one corner until the edge can be grasped by the fingers and lift off clip. Do not scrape mounting surface with screwdriver or any other tool to remove remainder of adhesive. Remove surplus by saturating with hot water and peeling off by hand.

NOTE: Do not try to reuse adhesive clip.

5. ATTACHMENTS USED IN CELLARS, FACTORIES OR WHERE APPEARANCE IS UNIMPORTANT

NOTE: In general, the same types of attachments used in finished rooms apply for cellars, factories or where appearance is unimportant. However, they should be of an appropriate finish. In addition to these attachments, drive rings, wire loops, and toggle bridle rings are also available for use at these locations.

5.01 Drive Rings (Figure 1): Drive rings are formed steel loops having a pointed shaft suitable for hammer-driven attachment to wood or masonry surfaces. On wood surfaces, attach drive rings to beams or studding (to avoid injury below the 6-foot level use bridle rings). On masonry surfaces, use with drive anchors. Table G shows sizes of rings and anchors.

NOTE: For masonry surfaces, wire loops with wire loop fasteners are preferred.

5.02 Wire Loop (Figure 1): Wire loops are formed sections of wire used with wire loop fasteners as an intermediate support for station wires and inside wiring cables attached to masonry surfaces (to avoid injury below the 6-foot level use bridle rings). Table H shows sizes of wire loops.

NOTE: Wire loops with the wire loop fastener are preferred over drive rings in masonry surfaces because the fasteners are driven directly into the masonry surface without a predrilled hole.

TABLE E. Fasteners for Cable Clamps and Cable Clasps

SURFACE	CLAMP NO.	CLASP NO.	FASTENER	REMARKS
	COLOR			
	GALVANIZED OR BEIGE	BEIGE		
Woodwork	No. 3 and 5*	No. 17 CTS # 68-11-053-7	No. 7 x 1/2-in. PH tapping screw	
	No. 6, 8, 10	No. 17 CTS # 68-11-051-5 No. 14 CTS # 68-11-055-3	No. 7 x 1/2-in. PH tapping screw	
Plywood, Masonite	No. 3 and 5*	No. 17 CTS # 68-11-053-7	No. 7 x 1/2-in. PH tapping screw Hollow Wall Anchor 1/8 in. x 3 in. toggle bolt	Make tapping screw attachments at stud locations. Use No. 1 Hollow Wall Anchor on wall thickness 1/16 in. to 1/4 in. Use No. 2 Hollow Wall Anchor on wall thickness 1/4 in. to 3/8 in. Use No. 3 Hollow Wall Anchor on wall thickness 3/8 in. to 3/4 in.
	No. 6, 8, 10	No. 19 CTS # 68-11-051-5 No. 14 CTS # 68-11-055-3	No. 7 x 1/2-in. PH tapping screw 3/16 in. x 1 in. Plastic Anchor Hollow Wall Anchor 1/8 in. x 3 in. toggle bolt	
Plasterboard, Plaster on Wood Lath, and Plaster on Metal Lath	No. 3 and 5*	No. 17 CTS # 68-11-053-7	No. 7 x 1/2-in. PH tapping screw Hollow Wall Anchor	Make tapping screw attachments at stud locations. Use No. 1 Hollow Wall Anchor on wall thickness 1/16 in. to 1/4 in. Use No. 2 Hollow Wall Anchor on wall thickness 1/16 in. to 3/8 in. Use No. 3 Hollow Wall Anchor on wall thickness 3/8 in. to 3/4 in.
	No. 6, 8, 10	No. 19 CTS # 68-11-051-5 No. 14 CTS # 68-11-055-3	No. 8 x 1-in. PH tapping screw 3/16 x 1 in. Plastic Anchor Hollow-Wall Anchor	

* *Inside wiring clamp only.*

TABLE F. Adhesive Cable Clips

CTS NO.	LENGTH (INCHES)	WIDTH (INCHES)	INTERIOR DIAMETER (NOMINAL)	ACCOMMODATES WIRE OR CABLE DIAMETER FROM
68-11-001-4	1-1/4	3/4	3/16	11/64 to 15/64
68-11-002-2	1-1/2	3/4	1/4	15/64 to 5/16
68-11-003-1	1-3/4	1	5/16	19/64 to 13/32
68-11-004-9	2	1	3/8	25/64 to 1/2

TABLE G. Drive Rings

DIMENSIONS IN INCHES				ANCHOR SIZE (IN.)	
SIZE	D	W	L	DIA.	L
1/2	1/2	1/2	2-1/16	3/16	7/8
5/8	5/8	3/4	2-1/4	1/4	1
5/8L	5/8	3/4	2-3/4		
7/8	7/8	1-1/2	2-9/16	1/4	1
7/8L	7/8	1-1/2	3-1/16		
1-1/4	1-1/4	2-3/8	2-15/16	5/16	1-1/4
1-1/4L	1-1/4	2-3/8	3-7/16		

L sizes have extra long shafts and cannot be used with Drive Anchors.

5.03 Toggle Bridle Ring (Figure 3): This attachment, available in two sizes, 3/4 inch and 1-1/4 inch, is used to attach station wire and cable to hollow surfaces. A predrilled 3/4-inch clearance hole is required.

NOTE: For best results and a secure installation, clearance holes should be restricted to 3/4-inch diameter.

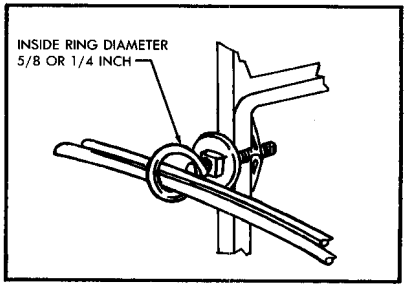


FIGURE 3. Toggle Bridle Ring

TABLE H. Wire Loop

WIRE LOOP SIZE NO.	WIDTH OF OPENING	LENGTH OF LOOP (INSIDE)	MASONRY FASTENER FOR		
			CONCRETE	MORTAR	BLOCK*
1/2	1/4-in.	3/4-in.	3	4	5
5/8	1/2-in.	1-1/8-in.			
7/8	5/8-in.	2-1/16-in.			
1-1/4	5/8-in.	2-3/4-in.			

** Cement or cinder blocks.*

6. ATTACHING TO STEEL STRUCTURES

6.01 Beam Clamp (Figure 4): The beam clamp, equipped with an A, K, or M bridle ring, is used to support wire runs on I beams, angle irons, etc., on beam thickness up to 3/4 inch.

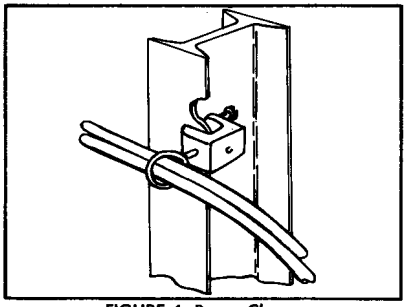


FIGURE 4. Beam Clamp

6.02 Utility Clip (Figures 5 and 6):

a. The utility clip provides a means of attaching drive rings or bridle rings to hanger wires and rods used in false-ceiling construction. It can also be used to grip the flanges of structural steel framework. See CTSP 405-705-402 for description and installation information.

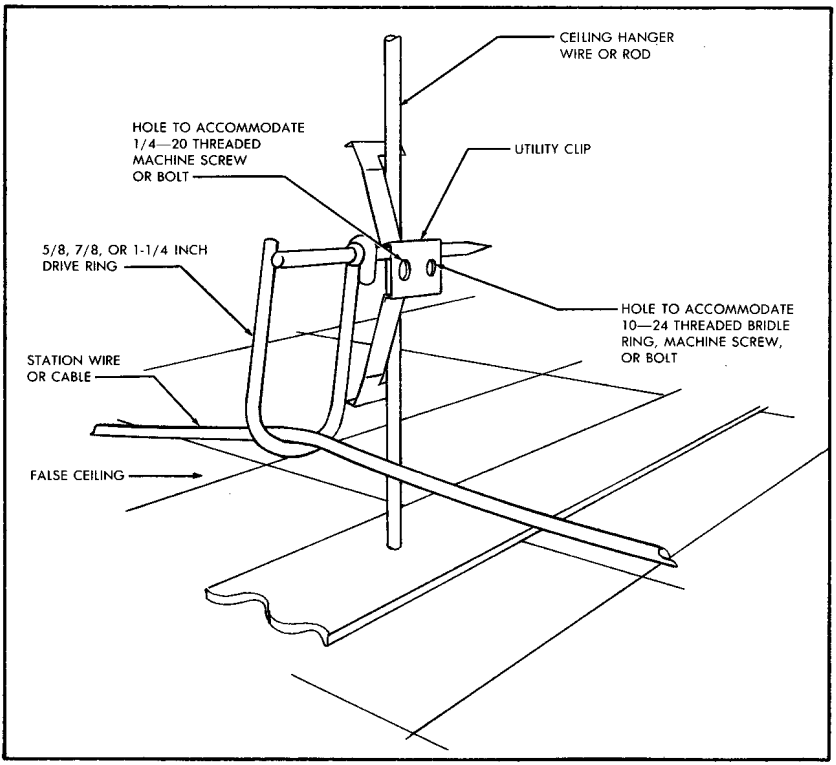


FIGURE 5. Utility Clip On Rod

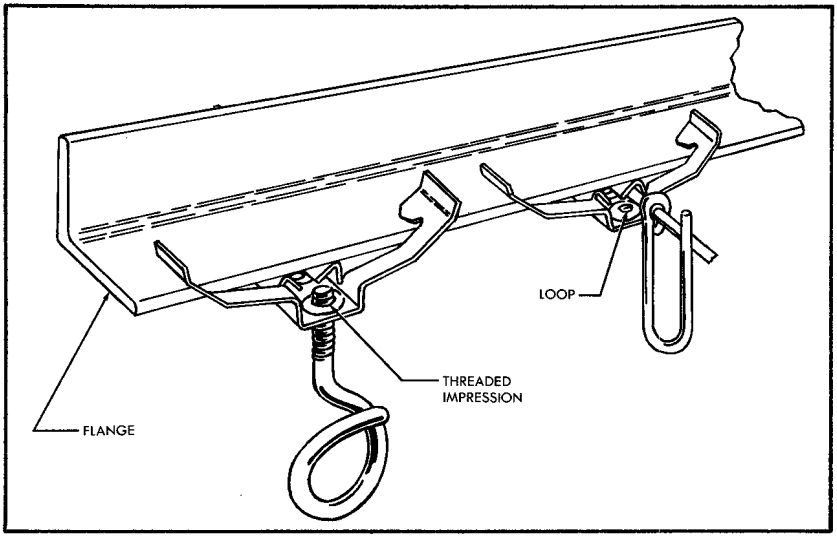


FIGURE 6. Utility Clip On Angle Iron

b. This notched spring-steel clip has two loops, each providing a fit for the drive rings. In addition, two holes are provided in the face of the clip which will accommodate either a No. 10-24 threaded bridle ring, machine screw, or bolt or a 1/4-20 threaded machine screw or bolt. The clip is intended for inside use only.

6.03 This clip may be attached to flanges from 1/8 inch to 3/8 inch, to wire from 12 through 8 gauges and to suspension rods 3/16-inch through 3/8-inch in diameter.

7. ADHESIVE CABLE TIE (FIGURE 7)

7.01 The adhesive cable tie is intended for use on various smooth flat surfaces in customer telephone installations to group wires, cords, and inside wiring cables in an orderly harness.

7.02 The tie consists of a C cable tie and a molded plastic base. It can be mounted using the self-adhesive backing, or knockouts are provided if more secure mounting is required.

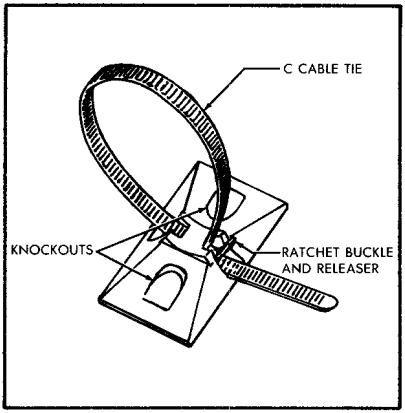


FIGURE 7. Adhesive Cable Tie

DROP AND BLOCK WIRING
TESTING AND FAULT LOCATING

1. GENERAL

1.01 In locating trouble in the drop and block wire plant, time and effort can be saved by analysis and systematic procedure by the workmen. Certain types of trouble are apparent and can be detected by a visual inspection; other types show very little external evidence of their existence and require electrical tests to locate them.

1.02 Knowledge of plant conditions throughout the territory involved greatly assists a workman in locating trouble.

1.03 Knowing the location of foreign construction operations which might interfere with the telephone plant will assist in many instances in locating the cause of trouble. Consultation with the people in charge of the construction, before they have progressed to a point where the telephone plant is endangered, will frequently prevent interference with the telephone service. When it is noted that the telephone plant will interfere with the progress of building operations or other construction work, the condition should be reported or corrected in accordance with local procedures.

1.04 In order that the workman may proceed efficiently to locate the cause of trouble, he should have the following information:

a. Telephone number.

b. Name and address of customer, given in sufficient detail.

c. Cable numbers, pair numbers, and terminals. Where terminals are not stenciled or otherwise marked, use binding post identification.

d. Number of pole on which drop or drops terminate (on other than cable lines), if available.

e. Nature of trouble as diagnosed by test or from report.

f. Whether or not station is out of service.

g. Other items of special information as:

(1) Any indications (such as the operation of protective equipment) that there may be foreign current on the line.

(2) Special effort is necessary to restore service quickly such as to hospitals, doctors' offices, etc.

(3) Trouble is such that the entire line from the terminal to the station should be inspected.

1.05 After securing the necessary information, the workman should proceed as follows:

a. If the line is not out of service, the workman should inform the customer that the line is being repaired. When party lines are involved, the work forces must monitor all working lines before opening, short circuiting, crossing, grounding, placing trouble clearing equipment or applying tone for identification.

b. When the line is out of service, the workman should began by visiting the points where trouble conditions are known to exist. If the fault is not found at these points and subsequent tests reveal that the trouble is in drop or block wire, the investigation should be continued in accordance with the methods given in paragraphs 3, 4, 5, and 6.

c. After the troubles have been cleared, the customer should be informed by the work forces that the work has been completed and that the line is back to normal.

d. Each workman should be familiar with CTSP 400-300-019, Monitoring of Working Lines.

1.06 Hand test sets can ordinarily be used on common battery circuits to make the necessary electrical tests on the line to locate faults. These sets should be used so that a trouble may be located quickly without making unnecessary tests. Proper use of the test set enables the repairman to locate many troubles without the aid of the test deskman or the operator. Tests sets used should be provided with leads ending with approved type clips equipped with test points so that contacts may be made with conductors by piercing the insulation with these points. No other method of establishing contacts with conductors through the wire insulation should be used. When making tests which depend on a click being heard in the receiver of the test set, be sure that the click is heard both upon the make and the break of the contact.

1.07 When it is necessary in locating a fault in drop or block wire to open the line at various points for the testing purposes, first select points where disconnections can readily be made such as binding posts, bridging connectors, etc. In general, no wires should be cut until tests have isolated the fault between two adjacent points. After an inspection has been made and further tests are required to locate the fault, one conductor of the wire may be cut to make the test.

1.08 Before leaving a worked on or repaired line, suitable tests should be made in accordance with local procedures to determine that the line is in good working condition.

1.09 Whenever there is any indication (such as the operation of protective equipment) of the presence of foreign current on a line, suitable precautions should be taken to prevent the possibility of electric shock.

1.10 The detailed procedures to be employed to locate the various types of faults in the drop and block wire plant are outlined in the following paragraphs.

2. GROUNDS

2.01 Two types of grounds are commonly encountered in the drop and block wire plant:

a. *Low resistance grounds*—This type of ground is usually the result of a complete breakdown of the insulation on a conductor due to deterioration or abrasion and contact with grounded objects such as guys, suspension strand, ground wires, rain spouts, conduit, etc., establishing a low resistance path to ground.

b. *High resistance grounds*—This type of ground may be caused by complete or partial breakdown of the insulation on a conductor and the establishment of a poor contact with grounded objects so that the path to ground is of high resistance, except in wet weather. It may also be caused by complete breakdown of the insulation on a conductor and contact with objects such as wood poles, trees, buildings, etc., that do not afford a low resistance path to ground. Troubles of the latter class are frequently of varying intensity, appearing usually during wet weather, and usually must be located either under wet weather conditions or by a visual inspection for the point where the insulation is faulty.

3. COMMON BATTERY CIRCUITS – LOCATING GROUNDS IN THE DROP AND BLOCK WIRE PLANT

3.01 *Low resistance grounds*–Information as to which side of the line is grounded is important. This is especially true if the cause of the fault is not found by visual inspection and tests must be made to more accurately determine its location. This information, if it is available, should be obtained when the trouble is referred for clearing. If it is not available, the side that is grounded should be determined during the tests that are necessary to isolate trouble to a drop or block wire.

3.02 The drop or block wire in which the fault is located should be found by the following test:

a. Disconnect all drop, block, or bridle wires bridged to the grounded line from the binding posts in the cable terminal, placing the wires so that they may be reconnected in their original position upon test completion. (If it is known which side of the line is grounded, it is necessary to disconnect only the wires on the grounded side of the line.)

b. Connect one clip of the test set to a suitable ground such as the metal terminal case or suspension strand and touch the other clip to the binding post on which battery normally should be found. See Figure 1. If no battery click is heard in the receiver, touch the other binding post. (If battery click is still not heard, there is other trouble on the line which must be corrected before proceeding with trouble location in the drop or block wire.)

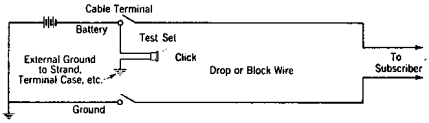


FIGURE 1. Test to Determine Battery Side of Line

3.03 When a battery click is heard, connect the clip to the binding post carrying battery and remove the other clip from the external ground. Touch this clip to the conductors of the drop wire. A battery click will be heard in the receiver when the grounded wire is touched. See Figures 2 and 3.

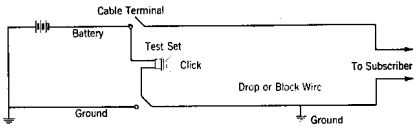


FIGURE 2. Ground Side Grounded

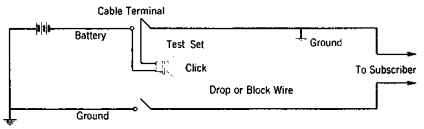


FIGURE 3. Battery Side Grounded

Note whether or not the insulation on the grounded wire carries a tracer. This knowledge will be helpful if subsequent tests at other points are necessary (unless an intervening splice has been made in a nonstandard manner and the tracer reversed). Before reconnecting the wires disconnected to make this test, be sure to test every wire separately to determine whether or not it is clear.

3.04 After the fault has been isolated to a particular drop or block wire, a careful inspection for the conditions causing the ground should be made before testing at other points to further isolate the fault. This is desirable as low resistance grounds in the drop and block wire plant are usually caused by conditions that are readily discovered by visual inspection.

3.05 If a visual inspection of the wire that is grounded does not disclose the fault, further tests are necessary to definitely locate the source of the trouble. In making these tests, if the ground is on the battery side of the line:

a. Open that side of the line.

b. Then attach one clip of the test set to the binding post or wire end on the central office side of the open.

c. Touch the end of the wire that leads away from the central office with the other clip. See Figure 4.

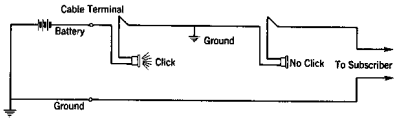


FIGURE 4. Battery Side Grounded

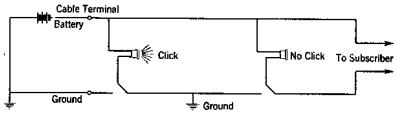


FIGURE 5. Ground Side Grounded

However, if the external ground is on the ground side of the line:

a. Open that side.

b. Establish a contact with the battery side of the line by attaching a clip of the test set to a binding post or (if the test is at a point in the wire) by piercing the insulation of the conductor carrying battery with the point of the test set clip.

c. Touch the exposed end of the wire that leads away from the central office with the other clip. See Figure 5.

The test, if on an individual line will indicate by a click in the receiver that the ground is located toward the station or by absence of a click that it is located in the direction of the central office. On a party line, the click indicates that the ground is located in the portion of the wire that is directly affected by the test and absence of the click indicates that the ground is either toward the central office or in a portion of the wire which is not affected by the test at that particular point.

3.06 In locating grounds on party line, it is desirable to start at a point where the circuits to all parties are common and are carried on a single pair of conductors. Then test the wires to each individual party until the wire that is in trouble is found.

3.07 *High resistance grounds*–Trouble of this type is frequently of varying intensity and in some instances appears only under severe moisture conditions. Often the trouble is caused by the cumulative effects of lowered insulation at several entirely different points in the drop or block wire plant; this condition is frequently found on party lines. If the resistance of the contact to ground is high, it is difficult to obtain a positive indication by testing with the hand test set under low resistance grounds. In this case, it is advisable to first determine

that the fault is not located toward the central office by disconnecting the drop or block wire at the cable terminals and having the circuit tested from the central office (when testing facilities are available). On a party line if this disconnection reduces the leak to ground but does not entirely clear the line, leave the wires disconnected until similar tests have been made where other wires are bridged to the line so that all the conditions contributing to the leak may be isolated and cleared. On party lines where the disconnection has either cleared the fault or has had no effect on the leak to ground or on individual lines, reconnect the wires immediately after the test has been concluded and the result reported. After the wire or wires which cause or contribute to the leak are determined, the fault usually may be found by making careful visual inspection. If the points of faulty insulation are not found, it is necessary to further isolate them by opening the faulty conductor at various points and having the circuit tested from the central office when testing facilities are available.

NOTE: Where leaks to ground exist at several points due to faulty insulation on different sides of the line, the trouble may be referred to the workman as a short and a ground. This possibility should be understood when starting to clear such a trouble.

4. OPENS

4.01 Opens in the drop and block wire plant are of three classes:

a. Opens—A complete open in a line is usually due to a break in one or both conductors of a drop or block wire, to a wire disconnected from a binding post or bridging connector, or to an improper or split pair connection at a cable terminal.

b. Intermittent Opens—The common causes of an open of this type are loose connections at binding posts or bridging connectors, improperly made splices, corroded wires, kinks, etc.

c. High Resistance Connections—High resistance connections are ordinarily caused by improper cleaning of wires before attaching them to binding posts or bridging connectors; also by the formation of corrosion on wires, binding posts, nuts, and washers.

Opens of the first class are easily recognized and are usually referred to the workman. High resistance connections causing only poor transmission and noise and not causing cutouts are often not identified as opens and therefore are not referred to the workman.

4.02 *Common Battery Circuits—Locating Opens in the Drop and Block Wire Plant*—To locate an open in the drop or block wire plant, isolate the fault by making successive tests at different points in the line with the hand test set. See Figure 6.

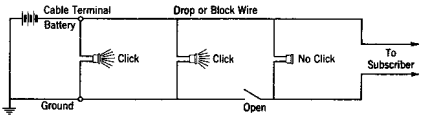


FIGURE 6. Test for Locating an Open

To make the test, bridge the test set across the line. If a battery click is heard in the receiver on the make and on the break of the contact, the open is away from the central office. If these clicks are not heard, it is situated toward the central office. When clicks are

heard on one test and the test at the next point in the line no clicks are heard, the fault is located between the points at which these two tests were made. After the fault has been isolated to one span or section, the wire in this span or section should be carefully examined, if necessary lowering the wire to do so. If the fault cannot be found, it should be eliminated by replacing the wire in that span or section. When locating an open, the test set should be bridged across the line on the *far* side of any wire support on every test. If the trouble is at a wire support, and if procedures in this practice are followed, the direction of the fault is shown. Verification of the fault at the support consists of repeating the test on the near side of the support. During the tests, wires should be shaken as described in paragraph 4.03.

4.03 *Intermittent opens*—Intermittent opens in the drop and block wire are frequently difficult to locate and generally require a close inspection. If it is not detected by the inspection, resort to tests to locate the fault. When making a test on the line, the wires toward the central office should be moved at knobs or other supporting fixtures; the wire in the span or section toward the central office should be shaken. A succession of battery clicks or a fluttering noise in the receiver indicates that the open is near to the point of movement, and it ordinarily can then be found by a careful inspection. Check all connections at binding posts, bridging connectors, etc., to be sure that they are tight.

4.04 *High Resistance Connections*—High resistance connections are generally indicated by noise and occasionally by cutouts. Connections may appear tight and in good condition on visual inspection and yet the contact afforded may be so poor that noise is introduced into the circuit. The cause of this type of trouble ordinarily can be located by bridging the test set across the line near the various connections on the side away from the source of battery and listening for noise. Moving the wires at connections or tightening screws or locknuts may clear the trouble; but, to prevent its recurrence, all wires found to be faulty should be removed at the connecting point, and thoroughly cleaned before replacing. Where the trouble is not definitely found at any connection, the wires should be removed, cleaned, and replaced at all binding posts or bridging connectors, etc. When the trouble is at the binding posts of a cable terminal and the nuts and washers are dirty and corroded, the spinning should be removed from the top of the binding post with the binding post cutter and the nuts and washers should be replaced with new ones before re-establishing the connection.

5. SHORT CIRCUITS

5.01 Short circuits in drop and block wiring are of two general classes:

a. Low Resistance Short Circuits—These are due to a complete breakdown of the insulation between the two wires and the establishment of a low resistance path from one wire to the other. Frequent causes are injury to or deterioration of insulation at supporting fixtures; abrasion at knobs, rings and at contacts with poles, trees, buildings, etc.; and injury due to interference by foreign workmen, building operations, etc.

b. High Resistance Short Circuits—These are due to the establishment of a high resistance path between the two wires, caused by either a partial breakdown of the insulation or a complete breakdown of the insulation which has resulated in only a poor or high resistance contact between the wires. The usual causes for this type of short circuit are similar to those given for the first type, differing only in that the deterioration of or injury to the insulation is less severe.

5.02 *Common Battery Circuits—Locating Short Circuits in the Drop and Block Wire Plant*—In locating a low resistance short circuit in the drop or block wire plant, first isolate the fault to a particular portion of the wire. To do this, disconnect one side of the line at various

convenient points (such as at binding posts, bridging connectors, or protectors) and connect the test set in the line. See Figure 7.

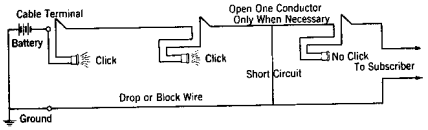


FIGURE 7. Tests to Locate Short Circuits

If a battery click is heard on the make and on the break of the connection, the short circuit is located away from the central office. If no click is heard, it is in the portion of the circuit toward the central office. When the clicks are heard at the point one test is made and are not heard at the point the next test is made, the fault is located between these two points.

5.03 After the fault has been isolated on a particular portion of the wire, make an inspection of this section, noting especially the condition of each wire support. Location of the fault is facilitated if, while making this inspection, the test set is bridged across the line near each wire support and the wire is moved at the support and in adjacent spans. If this disturbance of the wire causes the short circuit to shake out even momentarily, this will be indicated by a fluttering noise or a series of clicks in the receiver. Then, by making a careful inspection of the wire near the point it was moved, the fault can usually be found.

5.04 If the short circuit cannot be located by the inspection, it becomes necessary to further isolate it to a particular span or section by repeating at various points the test outlined in paragraph 4.02, cutting one conductor of the wire when necessary to permit testing. After the fault has been isolated to a particular section or span, make a careful inspection of the wire in that section or span, if possible with the wire lowered. If the fault is not found, cut out and replace the wire.

5.05 *High Resistance Short Circuits*–High resistance short circuits often cannot be located by the tests described for low resistance short circuits. In this event it becomes necessary to obtain assistance by having the condition of the circuit observed at the testing equipment in the central office while one side of the line is opened at various points. When a disconnection at one point causes the fault to disappear and a disconnection at an adjacent point does not, the fault is located between the two points at which these tests were made. After the fault has been isolated in this manner to a particular section or span, make a careful inspection of the wire in that section or span (if possible with the wire lowered) and then if the fault is not found, cut out and replace the wire.

6. CROSSES

6.01 Crosses in the drop and block wire plant result from the establishment of an electrical contact between one conductor of a drop or block wire and one conductor or binding post of another line. Troubles of this nature are less common than grounds, opens, or short circuits and are to a large extent limited to localities where two or more working block or drop wires are in close proximity. Common causes of crosses in drop and block wiring are:

a. Breakdown of the insulation on wires in ring runs on poles or buildings due to deterioration, abrasion on rings, or injury from external sources.

b. Breakdown of insulation on wires in close proximity in building or pole runs due to deterioration, abrasion, or other injury.

c. Improper dressing and connecting of wires at cable terminals so that wires or ends of wires touch adjacent binding posts of other lines.

6.02 When the trouble to be located is a cross, the work is greatly facilitated if certain information is obtained:

a. The line number of each of the lines that are crossed together.

b. The cable number and pair number at crossed lines.

c. Cable terminal locations–all terminals where drops terminate on either of the crossed lines.

d. Number of each pole on which drops of either line terminate (on other than cable lines), if available.

6.03 *Common Battery Circuits–Locating Crosses in the Drop and Block Wire Plant*–In isolating a cross to a portion of the plant such as to the drop or block wire plant or to a portion of a drop or block wire, make the following test: See Figure 8.

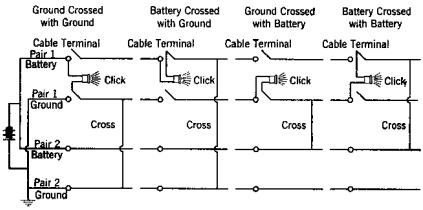


FIGURE 8. Tests to Locate Crosses

a. Disconnect all wires of one crossed line from the binding posts or bridging connectors, using care to place the wires so that they may be properly reconnected in their original position after testing.

b. Attach one clip of the test set to one of the pair of binding posts or bridging connectors from which the wires were disconnected. With the other clip, touch in turn each of the wires just disconnected.

c. If no battery click is heard on the make and break of any of the contacts, transfer the clip on the binding post or bridging connector of the same pair and repeat the test.

If clicks are heard, the wire causing the clicks when touched is crossed with another line. The cross is in the portion of the wire that is affected by the tests at this point. If no clicks are heard on either test, the cross is not located in the portion of the circuit which is affected by the tests at this point. On party lines, this test should be made at every point at which a drop or block wire is bridged to the circuit until the fault is isolated to the line

of a particular party. After it has been determined that the fault is located on the station side of a cable terminal, there is still the possibility that the inside wiring of the station is crossed with another line. Therefore, to determine that the cross is located in the drop or block wire, the above test should be repeated at the protector or connecting block at the customer's premises.

6.04 After the fault has been isolated in a drop or block wire, it usually can be found by carefully inspecting the entire length of the wire. If it cannot be found by inspection, it must be further isolated by repeating tests at suitable points, if necessary cutting a conductor to permit testing. If it is necessary to cut a conductor, repairs should be made after testing is complete.

7. HIGH RESISTANCE CROSSES

7.01 When the cross is of high resistance and the test set cannot successfully be used to locate the fault, request that the condition of the line be observed at the testing equipment in the central office while disconnections are made at various points in the circuit. The fault can be isolated in this manner to a particular portion of the drop or block wire and can then be discovered by visual inspection. In areas where testing equipment suitable for this test is not available at the central office, the operator may be called and requested to talk or ring on one of the crossed lines while the test set is bridged to a suitable disconnected portion of the other circuit. If the ring or the operator's voice is heard in the test set, the cross is in the portion of the circuits under observation and when by suitable repetition of this test the fault is isolated to a sufficiently small section of the drop or block wire, it can be found by visual inspection.

DROP WIRING

PLACING DROP WIRE POLE-TO-POLE AND POLE-TO-BUILDING SPANS

CONTENTS

1. GENERAL

1.01 This practice provides the methods for making pole-to-pole and pole-to-building runs of drop wire. Information on the placement of drive hooks and pole attachments is also provided.

1.02 This practice replaces in its entirety CTSP 475-300-409, all copies of which should be removed from the file and destroyed.

1.03 If brackets and knobs have been previously installed and are only partly filled, distribute from the vacant grooves of the knobs if the existing installation does not present a hazard or potential impairment to service.

1.04 In running drop wires, requirements must be observed which apply to clearance between telephone wires and foreign wires, foreign equipment, vertical clearances, quantity of distribution attachments, and climbing space on jointly used poles.

1.05 Drop wire should be twisted one complete turn for each ten feet of span length at the time of installation to reduce vibration and dancing.

1.06 For correct stringing sags and span limits, see CTSP 475-300-403. For measuring clearances and separations in outside plant, see CTSP 490-060-001.

1.07 Drop wire should not exceed 500 feet in total length from terminal to protector.

2. RUNS FROM TERMINAL POLES NOT REQUIRING GUARD ARMS

2.01 On terminals which do not require guard arms, distribute drop wires from hooks placed on the pole. On pole-to-building spans, use drive hooks located above the suspension strand. On spans from pole-to-pole and from pole-to-span clamps, use the drive hook located below the cable. Pass the drop wire through the drive hook only where sharp bends will not occur in the wire.

2.02 The wiring arrangements for strand mounted and pole mounted terminals are shown in Figures 1, 2, and 3.

2.03 Wiring on the pole shall be run with enough slack to prevent sharp bends at fixtures. Where drop wire passes through a drive hook, provide slack in the form of a smooth curve. For terminals requiring guard arms, refer to CTSP 475-300-406.

2.04 Attach the drop wire clamp to the drive hook by passing the bail of the clamp over the hook. The clamp shall pull against the shank of the drive hook where the direction of the drop wire span is such that the clamp will not pull around the end of the hook. Otherwise, place the clamp to pull against the hook end.

2.05 Where careful inspection determines that existing brackets and knobs are serviceable, drop wire may be distributed from vacant grooves, not exceeding the normal limit for which the knob was designed.

3. DROP WIRE RUNS ALONG THE LEAD

3.01 Use drive hooks to attach the drop wire runs to poles along the lead. Existing pole brackets may be used if they are serviceable and located as specified for drive hooks.

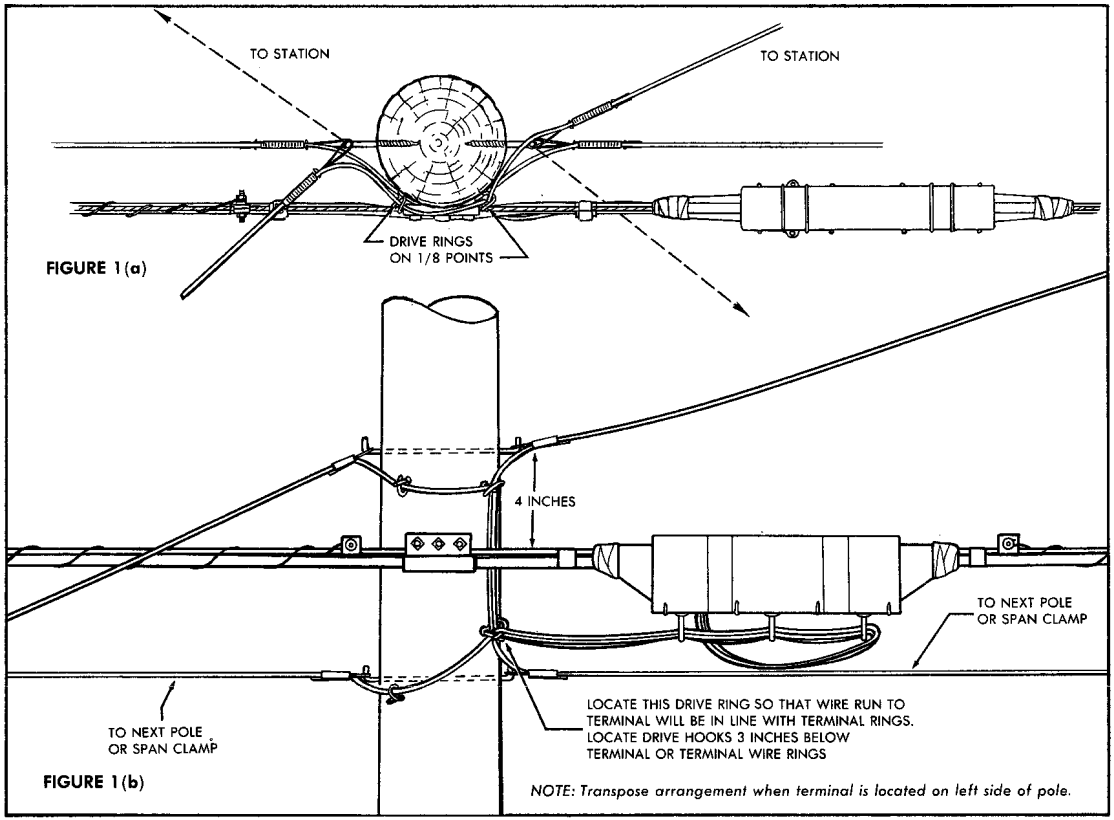


FIGURE 1. Strand Mounted Terminal

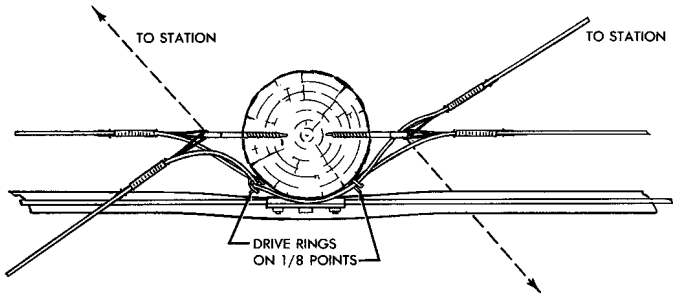


FIGURE 2(a)

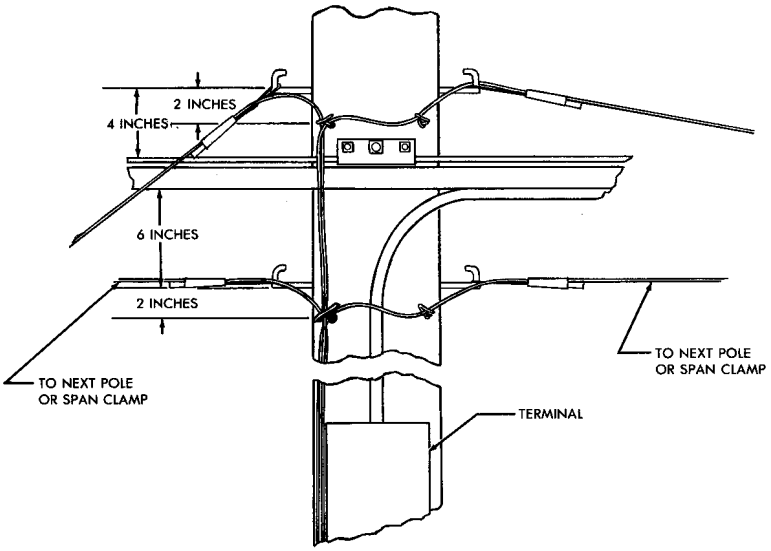


FIGURE 2(b)

FIGURE 2. Terminal Mounted on Cable Side of Pole

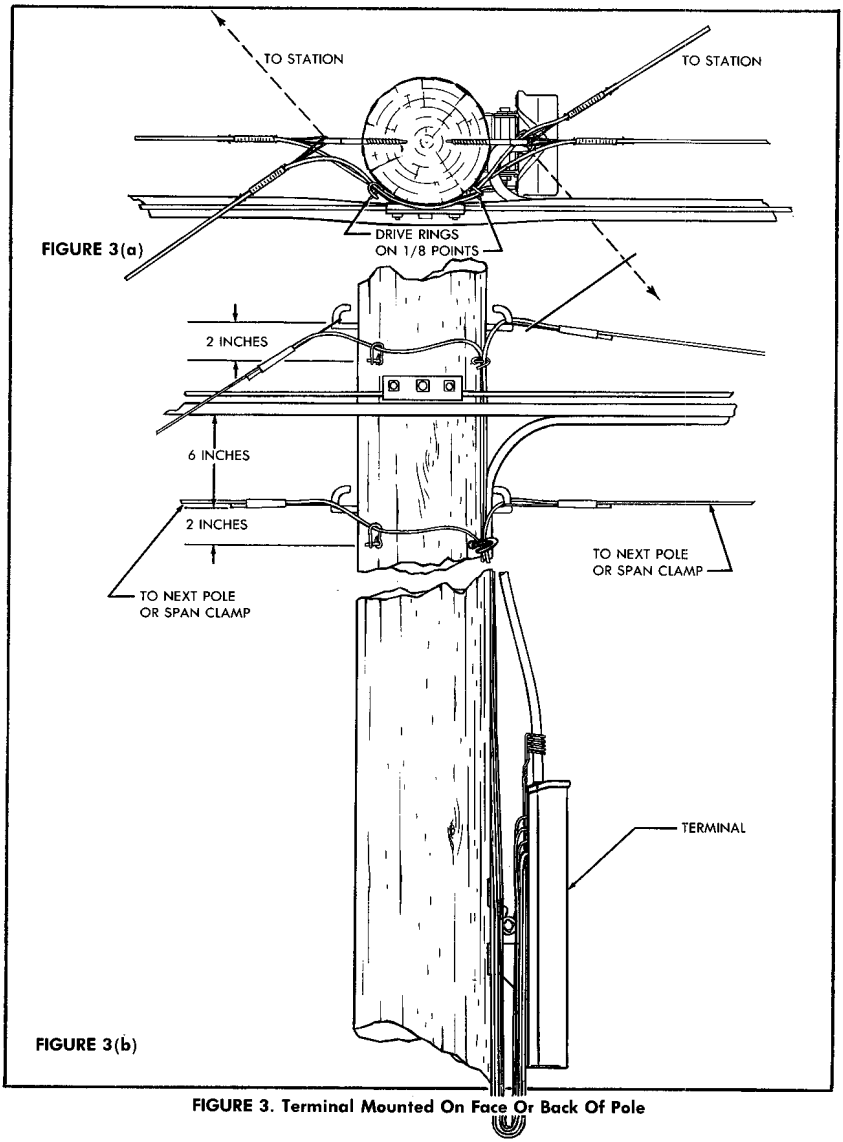


FIGURE 3. Terminal Mounted On Face Or Back Of Pole

3.02 Notify your supervisor before adding the drop wire run:

a. If an unusual amount of trouble has developed in a group of drop wires in the same run.

b. If an excess of five drops has been placed along a lead not carrying cable.

c. If when placing the first or any additional drop wire along the lead, it appears that more drops will be needed in the near future.

d. Where it is necessary to parallel cable with a total of four or more drop wire sections. (The total may consist of four or more drop wires in one pole-to-pole section, one drop wire run for four or more pole-to-pole sections, etc.)

3.03 Do not run drop wires along the lead on poles of an established open wire line run on crossarms without authorization of your supervisor.

4. DROP WIRE RUNS ALONG LEAD CARRYING CABLE

4.01 Run aerial cable drop wire below the cable as shown in Figure 4. To serve a station from wire that is strung along a lead, make a vertical run to a drive hook that is placed above the strand on the serving pole with proper clearance from power.

4.02 One or more intermediate strand pickups shall be used where required ground clearance in the span cannot be obtained with wire strung at minimum sag. See CTSP 475-300-403.

4.03 Where intermediate strand pickup fails to provide the required ground clearance, the drop wire may be placed above the suspension strand. Drive hooks are to be placed at such a height that the drop wire does not whip against the cable or strand, and that the appropriate joint use clearances are obtained.

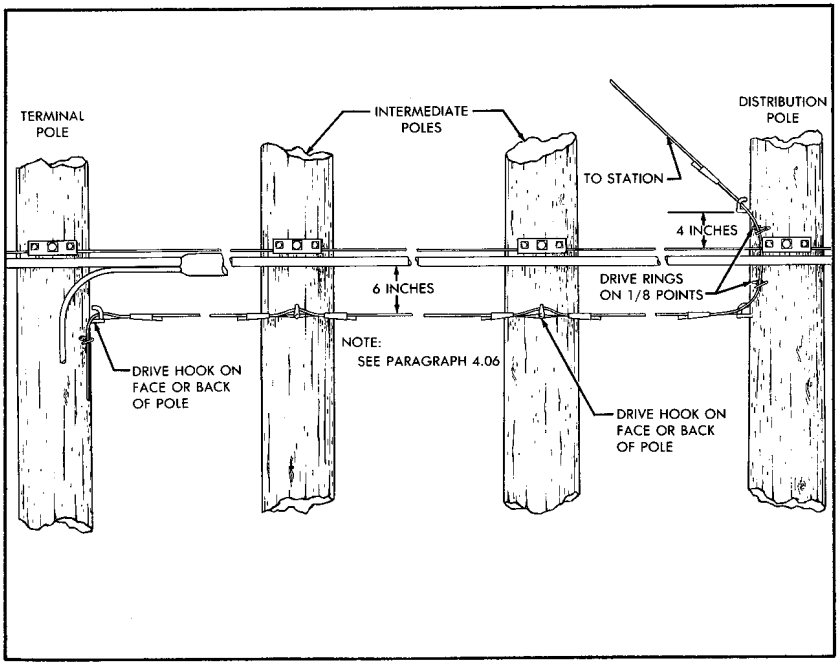


FIGURE 4. Drop Wire Run Along Lead Carrying Cable

4.04 On straight line poles or inside corner poles where the pull of the wire is away from the pole, use a single drive hook to support the drop wire. On outside corner poles where the angle will cause the drop wire to rub against the pole, use two drive hooks to support the wire.

4.05 Distribute drop wires from drive hooks at poles other than terminal poles, as shown in Figures 4 and 5.

4.06 Aerial drop wire must be 6 inches below cable or terminal. If the size of the terminal interferes, the wire shall be 3 inches below the terminal or terminal rings.

5. DROP WIRE RUNS ALONG LEAD NOT CARRYING CABLE

5.01 The procedures for placing drop wire along a lead not carrying cable and on one carrying cable are basically the same. If clearances permit, drop wire shall be placed at a height where it will not interfere with future placing of cable.

6. PARTY LINE TAP ALONG THE LEAD

6.01 A party line tap along a pole-to-pole drop wire run is to be made where several spans of drop wire would otherwise be used. Make the party line taps as illustrated in Figure 7.

7. DRIVE HOOKS

7.01 Place drive hooks on the face or back of poles, above or below the cable; maintain required clearances from the ground, foreign wires and trees. On intermediate poles, drive hooks may be placed in the sides of the poles. See Figures 4 and 6. Drive hooks shall occupy a pole area not more than 8 inches in vertical extent, nor more than 1 inch in width. No more than four hooks are to be placed in each of these areas. Refer to paragraphs 4.01 to 4.06 for the placing of initial drive hooks.

7.02 When placing more than one drive hook on the same side of the pole, stagger the hooks as shown in Figure 8: Where possible, obtain greater than the minimum vertical separation between hooks.

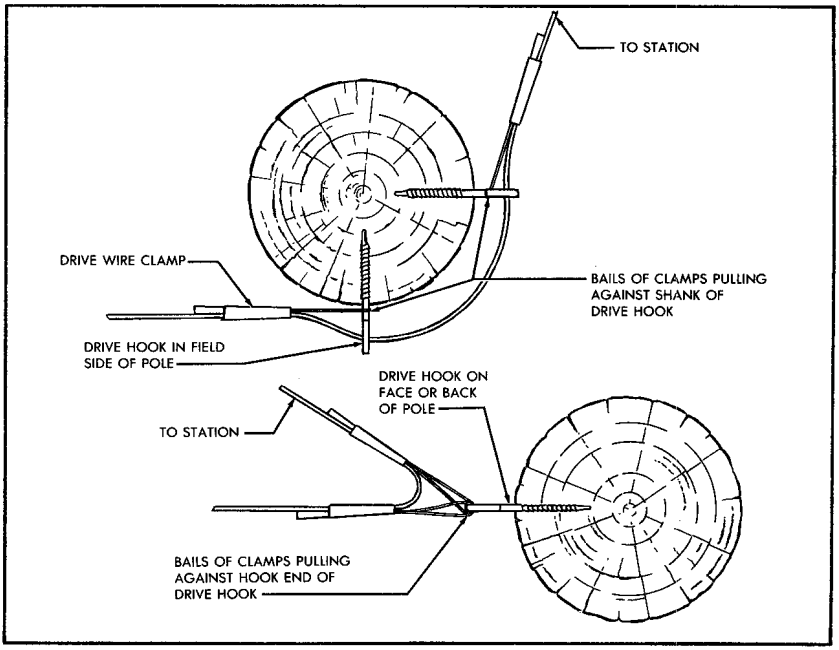


FIGURE 5. Drive Hook Distribution From Poles Without Cables

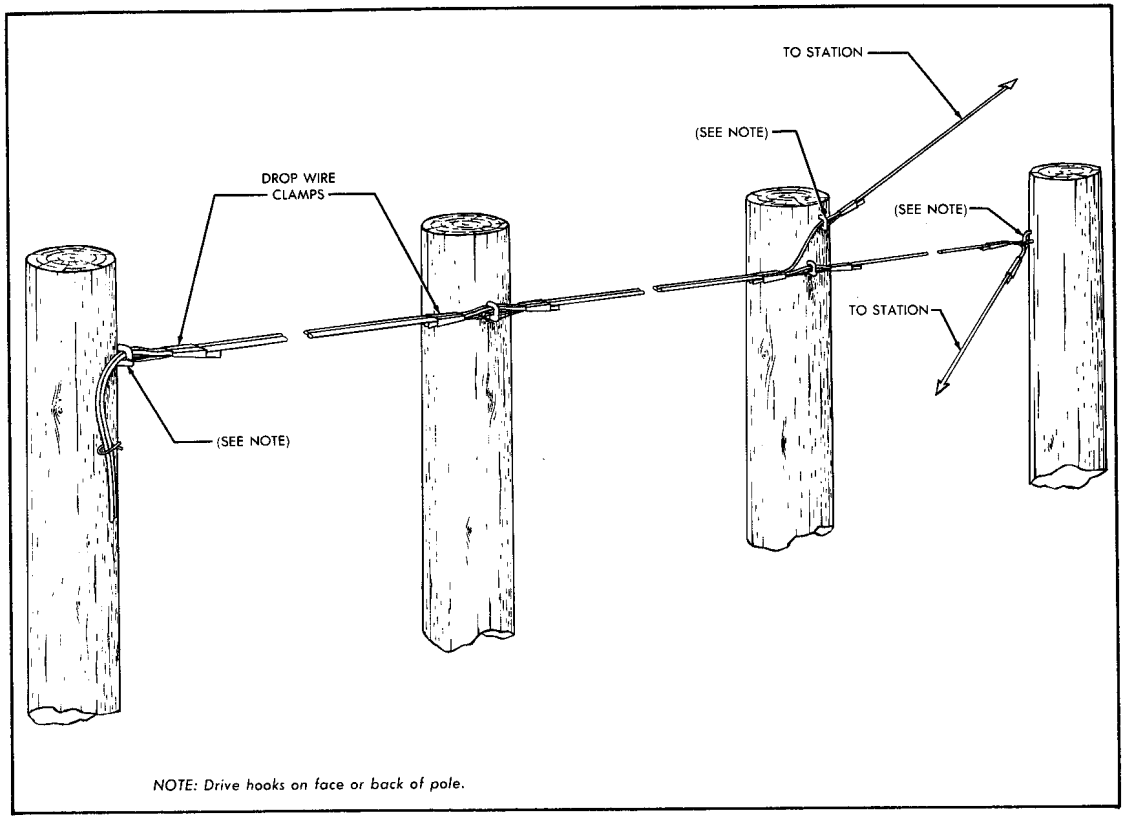


FIGURE 6. Drop Wire Run Along Lead Without Cable

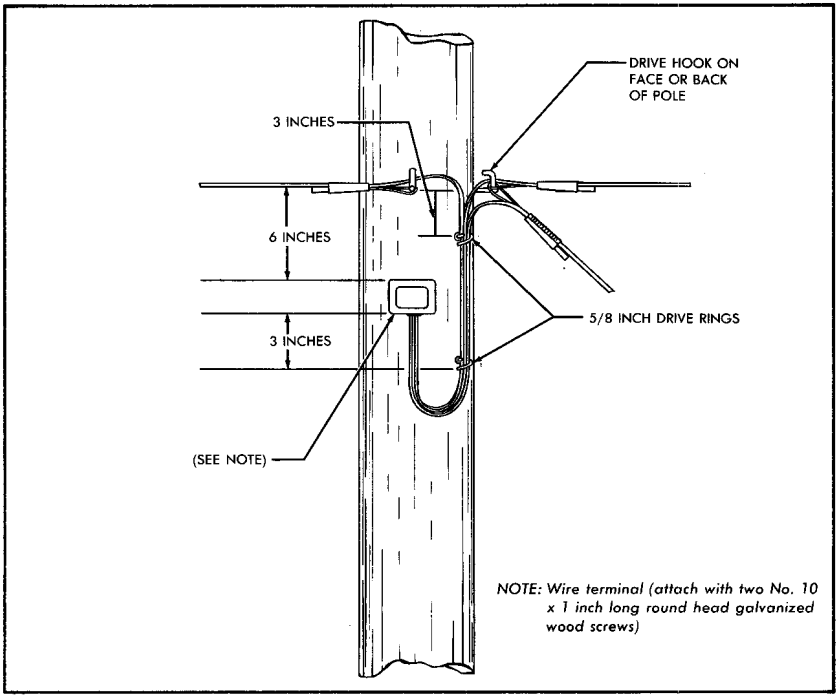


FIGURE 7. Party Line Tap Along The Lead

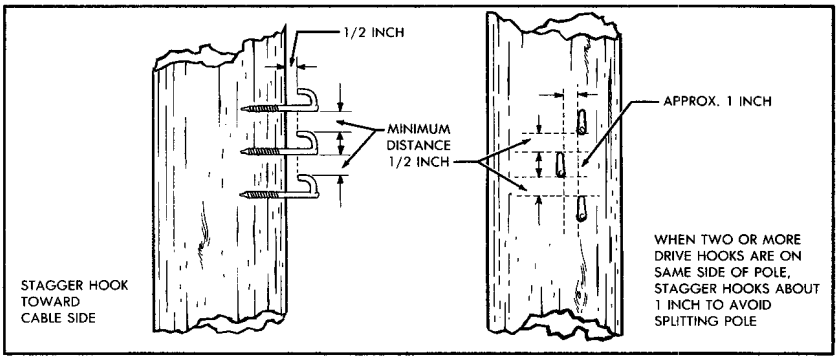


FIGURE 8. Positioning Several Drive Hooks On Same Side Of Pole

7.03 If the diameter of the pole is 5 inches or less, drill a 5/16-inch lead hole for the drive hook, about 3 inches deep. This is to protect the pole from splitting. If drive hooks are placed near the top of a pole and on both sides, a vertical separation of approximately 3 inches should be provided between drive hooks.

7.04 Table A shows the maximum number of drop wires which may be attached to one drive hook where the drop wire is dead-ended at both ends of the span.

8. RUNNING PAST TERMINALS

8.01 When a terminal assignment requires running past a cable terminal, try to obtain a reassignment to the proper terminal. Before placing more than a total of 2 spans of drop wire along a lead carrying cable, check with your supervisor.

8.02 Where a disconnected drop wire which has been run past a cable terminal is to be reconnected, obtain an assignment to the proper terminal.

9. POLE-TO-BUILDING SPANS

9.01 It is desirable to run drop wires under obstructions, such as trees or foreign wires, provided the required clearance can be obtained. Avoid running drop wire over obstructions where contact may result due to the stretching of the drop wire.

10. ATTACHING DROP WIRES TO METAL POLES

10.01 Avoid attachment to metal poles whenever possible. When it is necessary to attach to metal poles, approval shall be obtained from the supervisor. Use a sign bracket, depending on the size of the pole, and attach as shown in Figure 9. For the bracket sizes and ordering information, refer to the Continental Telephone System General Supplies Catalog under "BRACKETS, SIGNS".

TABLE A. Number of Drop Wires to be Attached to One Drive Hook

	If Number of Drop Wires Attached Pole-To-Pole or From Span Clamp is:			
	0	1	2	3
Maximum Drop Wires Crossing Street	3	2	1	0
Maximum Drop Wires Not Crossing Street	4	3	2	0
Maximum Total Drop Wires	7	6	5	3

NOTE: Combinations of drop wires crossing and not crossing street must pull as near as possible to 180 degrees to equalize the strain on the drive hook. Use separate drive hooks when strain of combinations of drop wire span tends to be in one direction.

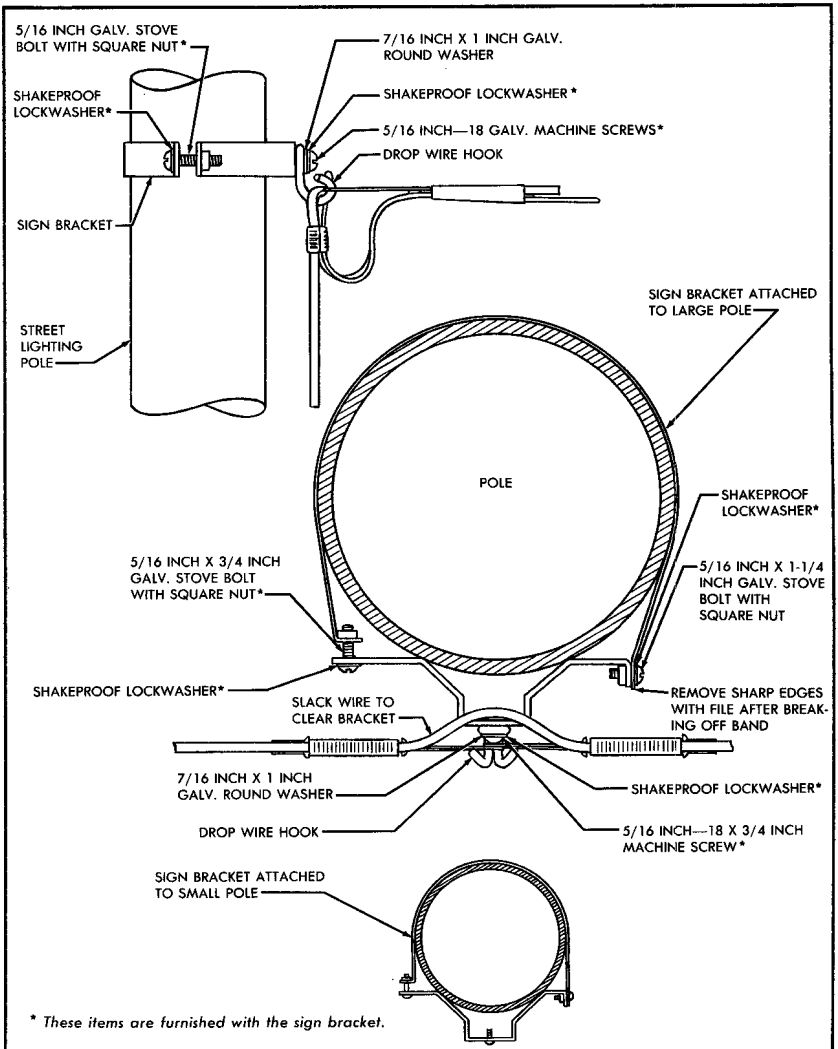


FIGURE 9. Metal Pole Attachment

DROP WIRING

PLACING DROP WIRE
POWER EXPOSURE UP TO 300 VOLTS

CONTENTS

1. GENERAL

1.01 This practice provides procedures for the one-man method of placing drop wire over and under power wires or power cables operating at 300 volts or less, or where there is no exposure to power.

1.02 This practice replaces in its entirety CTSP 475-300-400, all copies of which should be removed from the file and destroyed.

1.03 Refer to CTSP 475-301-410 for the method of placing drop wire over power wires or power cables operating at **300 volts or more.** The methods of raising or lowering drop wire, and replacing drop wire are covered in CTSP 475-301-605 and CTSP 475-301-610.

1.04 This practice covers the installation of drop wire with the use of a handline to avoid accidents when tensioning the drop wire from a position on a pole or ladder.

1.05 Drop wire shall not be placed over secondary electric service wires if other means of installing the wire are possible.

1.06 Under certain circumstances it may be desirable to attach the drop wire to the pole first and then raise it at the building. In such cases, raise the drop wire as instructed in paragraph 6.

1.07 At the time of installation, drop wire should be twisted one complete turn for every ten feet of span length to reduce vibration and dancing.

1.08 Refer to CTSP 490-060-001 for measuring clearances and separations in aerial plant and to CTSP 475-300-403 for stringing sags and span limits.

2. PRECAUTIONS

NOTE: All precautions in CTSPs 490-050-104, 490-050-105, and 490-050-106 must be taken before climbing.

2.01 If traffic, trees, or other conditions create a safety hazard for the one-man method, assistance shall be obtained before placing drop wire over streets, highways, etc.

2.02 High voltage insulating gloves shall be worn by all employees when performing any operation where the handline or the drop wire may come in contact with power wires or power cables.

2.03 The handline used for raising drop wire shall be free from metallic strands and shall be dry. However, if it is not possible to keep the handline dry due to weather conditions, a wet handline may be used for placing drop wire over secondary electric wires operating at **less than 300 volts.**

2.04 Two 3/8-inch handlines, one 50 feet and one 100 feet in length, are required for the operations in this practice. The handlines shall be served at the ends to prevent unraveling.

2.05 When it is necessary to carry a handline up a pole or ladder, use a handline carrier (CTS #74-56-031-0) or double the end of the handline back on itself for a distance of approximately 1 foot. Place this loop under the side or back of the body belt so that it will be released readily if placed under tension.

2.06 Do not work from a ladder placed against a building with the side rails crossing a wire run, or in any other position where movement of the wire, due

to loosening of the attachments, could cause an accident.

2.07 When a drop wire is to be attached to a span clamp, place the foot of an extension ladder on the field side of the suspension strand so the ladder is not in the street or highway. If there is no street or highway adjacent to the span clamp, place the ladder against the opposite side of the strand from the drop wire run to the building.

2.08 If conditions could cause the handline or the drop wire to which it is attached to become disengaged from a drive hook, crossarm, or to slide along the strand or guard arm while the work is being done, enclose the handline or drop wire with a temporary guide loop. This loop consists of a short length of wire or rope placed over the handline or drop wire, with the ends of the guide securely tied in the following manner (Figure 1):

a. Guard Arm: Tie the ends to the guard arm on each side of the handline or drop wire.

b. Drive Hook: Tie one end to the vertical portion of the drive hook and lash the other end to the pole.

c. Crossarm: Tie the ends to adjacent pins or insulators.

d. Strand: Tie the ends across 2 span clamps.

3. OVER STREET OR HIGHWAY—NOT CROSSING OVER POWER WIRES/CABLES—NO TREE INTERFERENCE

3.01 Where a drop wire to be placed over a street or highway will not cross over power wires or power cables and there is no tree interference, place the wire as follows:

CAUTION: Before proceeding with the following operations, fasten the inner end of the coil of drop wire securely to one of the springless spokes of the drop wire reel; then tighten the reel drag brake so the reel does not spin freely.

a. Install the first building attachment; secure the drop wire to this support; then complete the building run. Keep the drop wire reel on the ground near the building to avoid accidents resulting from vehicles striking the wire, or pedestrians tripping on it. See Figure 2.

b. Place a handline over the strand, guard arm, drive hook, or crossarm so that both ends reach the ground, with no excess length in that portion of the handline toward the building. If practicable, the handline may be formed into a coil at one end and thrown over the strand.

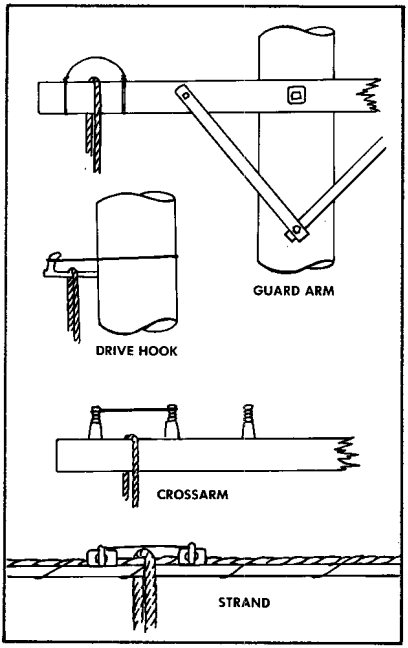


FIGURE 1. Temporary Guide Loop—Pole

After the handline has been placed, tie it to the base of the pole or the lower rungs of the ladder to avoid interference with pedestrians or vehicles. If it is necessary to climb the pole or ladder to place the handline, install any drop wire support that is needed.

c. Roll or carry the drop wire reel from the building to the building side of the street or highway. Pay out the wire along the ground with sufficient slack to ensure that the wire rests flat on the ground.

d. When no traffic is approaching, roll or carry the drop wire reel across the street or highway to the previously placed handline, paying out the wire so that it rests flat on the ground. If a metal or hard rubber-tired vehicle passes over the wire, carry the drop wire reel back to the building side of the highway and pull the wire from the highway. Inspect the wire for possible damage.

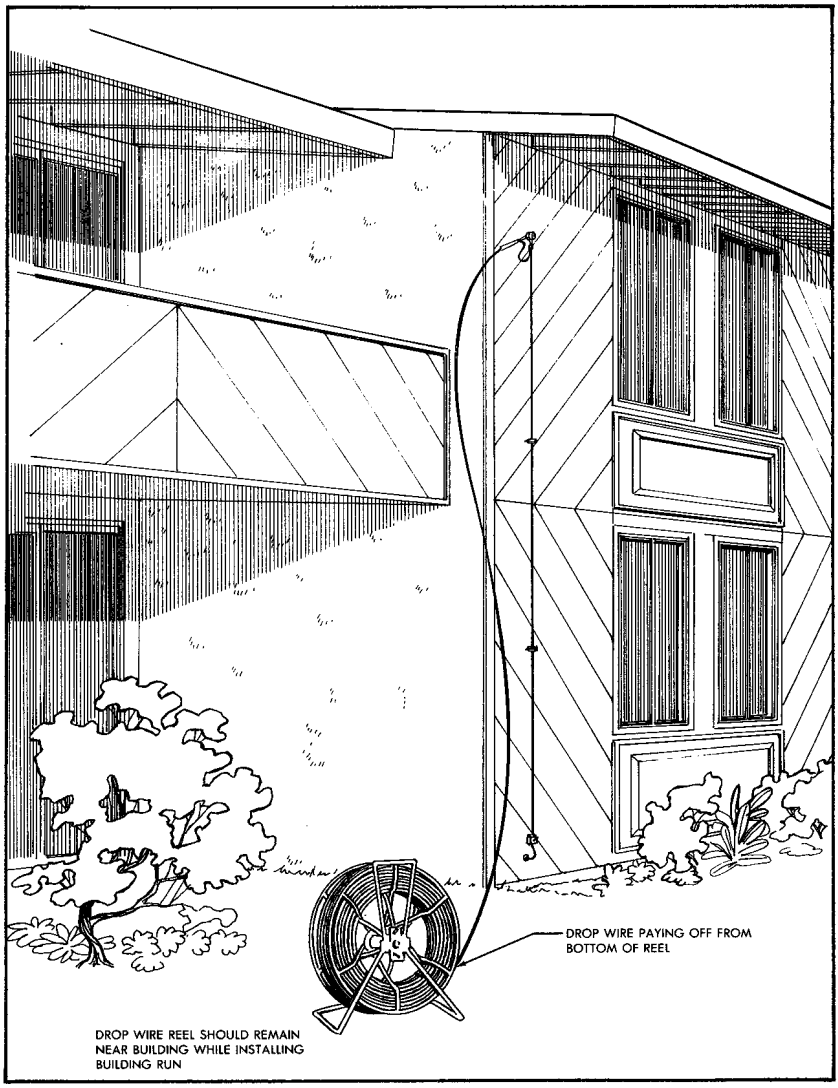


FIGURE 2. Drop Wire Attached to Building

e. Release the handline from the base of the pole or ladder, and tie a bowline knot in the end of the handline toward the building and around the drop wire at the reel. See Figure 3. Be careful not to raise the wire above the highway. Wind any excess length of drop wire on the reel.

f. Set the brake of the drop wire reel so that when the wire is raised by the handline there

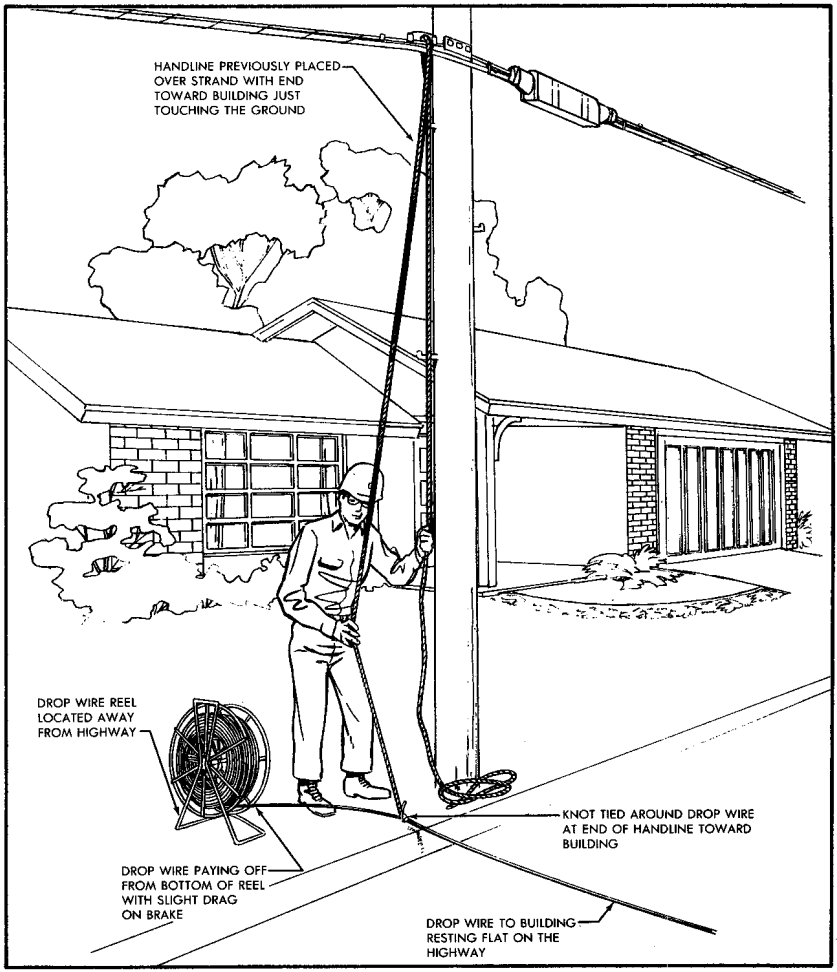


FIGURE 3. Preparing to Raise the Drop Wire

will be sufficient tension on the wire for it to be pulled up to the required height in the span over the street or highway.

g. After checking to make sure that the drop wire reel is in a stable position and that its brake is properly set, grasp the free end of the handline. When no vehicles or pedestrians are approaching, raise the drop wire as shown in Figure 4. If it is necessary to remove excess slack from the wire span as it is being raised, pull the wire at the reel end to obtain the desired slack and wind the excess length of wire on the reel.

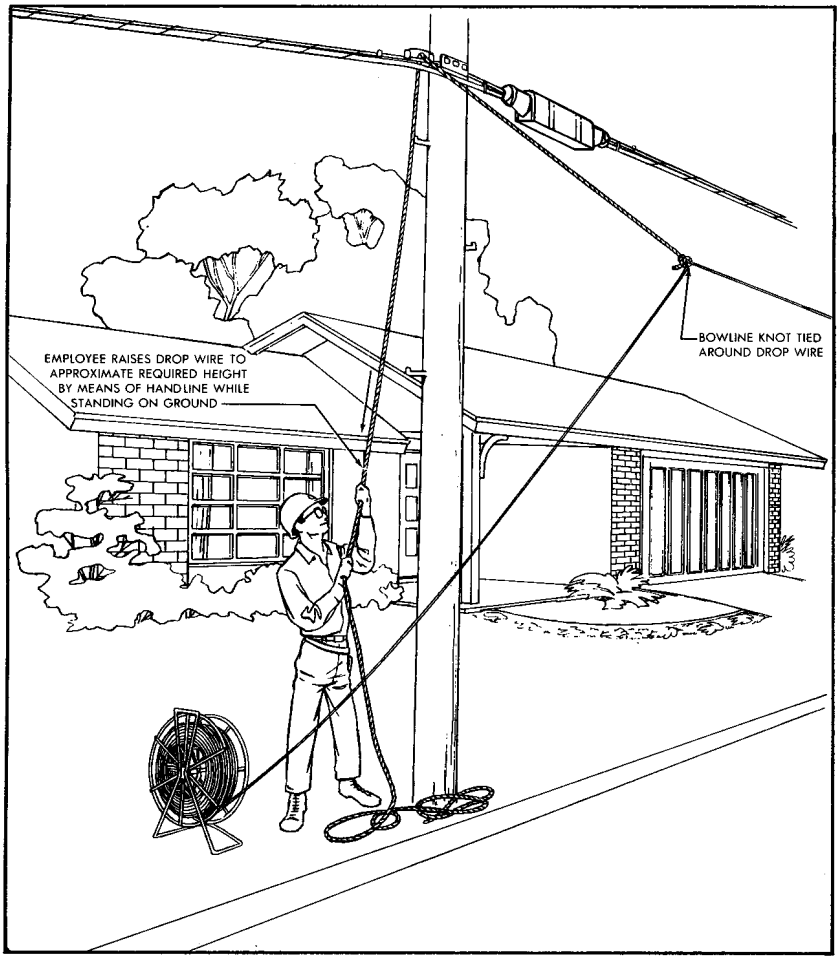


FIGURE 4. Raising the Drop Wire

h. After the drop wire has been raised to the required height, lash the handline with a clove hitch near the base of the pole or at a span clamp to the lower rungs of the ladder. See Figure 5.

i. Climb the pole or the ladder (if at a span clamp) and attach the drop wire to the pole or strand without removing the handline from the drop wire. When attaching the drop wire to a span clamp, keep in mind that the strand is

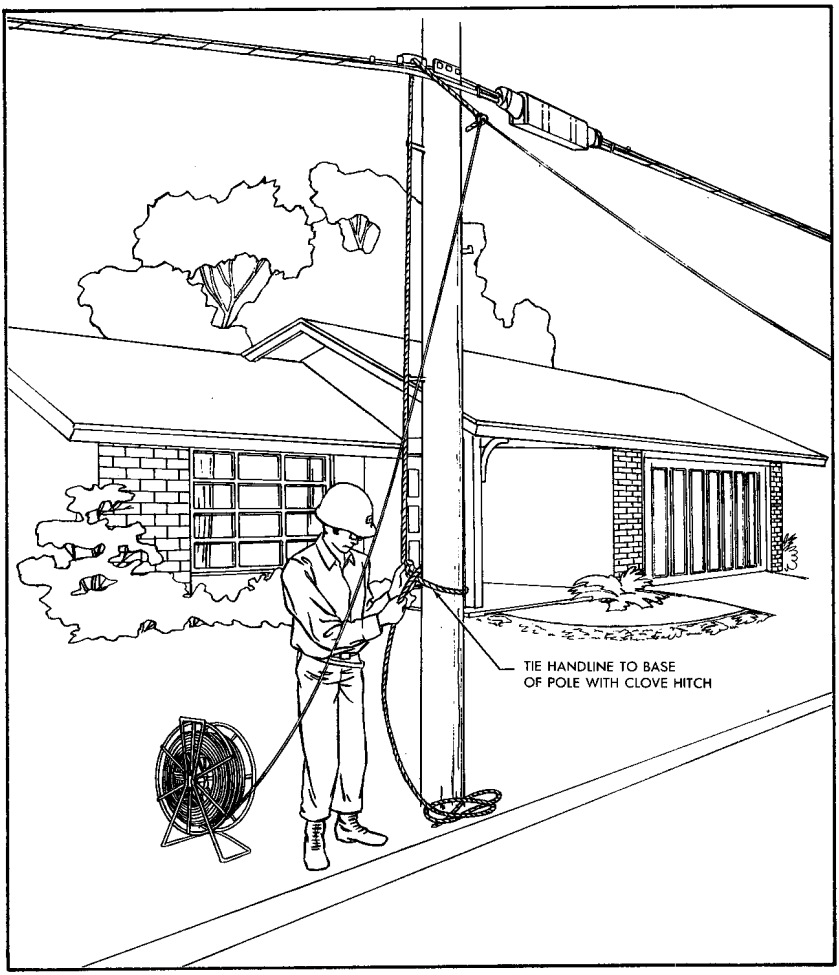


FIGURE 5. Drop Wire Raised to Approximate Height

forced out of line by the ladder resting against it. When working from the ladder, make any adjustments necessary to avoid excessive tension in the wire span to ensure proper sag and clearance after the ladder is removed.

j. Remove the handline from the drop wire. Cut the wire, leaving a sufficient length to reach the terminating point; then complete the connection.

k. Attach the handline and remaining drop wire under the body belt as instructed in paragraph 2.05, and carry them down the pole. **DO NOT DROP THEM TO THE GROUND.**

4. OVER STREET OR HIGHWAY—NOT CROSSING OVER POWER WIRES/CABLES—TREE INTERFERENCE

4.01 Placing drop wire through trees shall be avoided whenever possible. However, if trees cannot be avoided, the method in paragraph 3.01 shall be modified as follows:

CAUTION: Before proceeding with the following operations, fasten the inner end of the coil of drop wire securely to one of the springless spokes of the drop wire reel and set the brake.

a. Where a tree is located on the same side of the street or highway as the building:

(1) Place the drop wire reel on the side of the tree toward the pole line. If the tree overhangs the street, the reel shall not be placed in the street unless it is properly guarded by means of a Telephone Company truck or another object equivalent in size.

(2) Place the handline among the branches of the tree in the desired location for the drop wire, and pull the wire into position among the branches. A wire raising tool may be used to facilitate this operation.

CAUTION: The handline and drop wire shall not overhang the street unless properly guarded. If practicable, park the Telephone Company truck so that it will shield the handline and the drop wire.

(3) Attach the drop wire to the building as instructed in paragraph 3.01 a., making sure that the wire rests flat on the ground between the tree and the building.

(4) Complete the wire run to the pole or to the span clamp as instructed in paragraph 3.01 b.

b. Where a tree is located in the immediate vicinity of the pole or span clamp:

(1) When placing the handline over the strand, guard arm, drive hook, or crossarm, locate it among the branches of the tree (Figure 6) so the drop wire may be raised to the proper position. A wire raising tool may be used to facilitate this operation. After the handline has been placed, tie it to the base of the pole or the lower rungs of the ladder to avoid interference with pedestrians or vehicles.

CAUTION: The handline shall not overhang the street unless it is properly guarded. If practicable, park the Telephone Company truck so that it will shield the handline.

(2) Proceed as instructed in paragraph 3.01 or paragraphs 4.01 a., (1), (2), (4), depending on the conditions, except that the wire shall be raised at the pole or strand end of the span as follows:

(a) With the drop wire crossing the street and resting flat on the ground, remove sufficient wire from the drop wire reel to reach the terminating point and cut the wire.

(b) Tie the end of the drop wire to the handline (Figure 6) at a point in that portion of the handline toward the building which will permit access to both ends of the handline from a position on the ground during the entire raising operation.

NOTE: If the handline has been placed over a drive hook or other support on which a square knot would sag, fasten the wire to the handline as shown in Figure 7.

c. When no vehicles or pedestrians are approaching, raise the drop wire by pulling that portion of the handline on the opposite side of the strand from the building. The portion of the handline toward the building should pass through employee's hand (Figure 8) so the employee can pull the handline in either direction to work the drop wire among the branches of the tree, or to pull the wire to the ground quickly, if necessary.

d. After the drop wire has been raised to the required height, tie the handline to the base of the pole or, if at a span clamp, to the lower

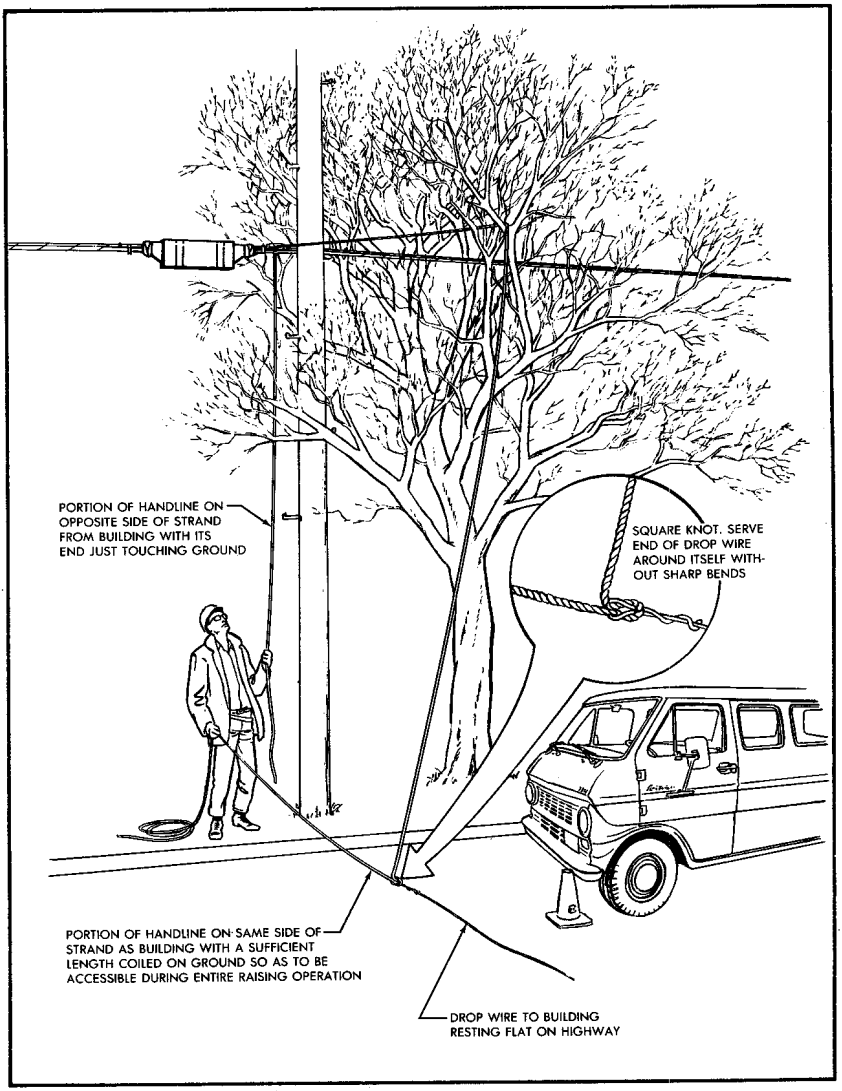


FIGURE 6. Drop Wire Tied to Handline

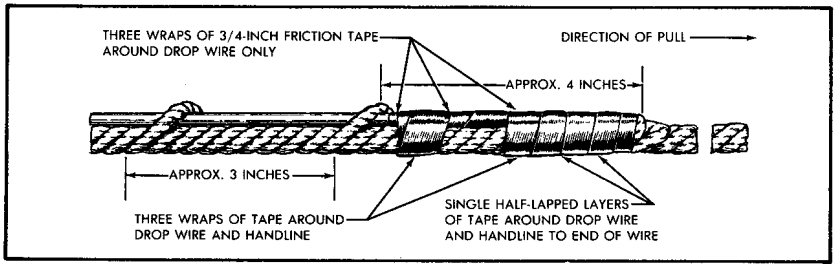


FIGURE 7. Alternate Tie to Prevent Sagging

rungs of the ladder, and proceed as instructed in paragraphs 3.01 i. and j.

5. OTHER THAN OVER STREET OR HIGHWAY—NOT CROSSING OVER POWER WIRES/CABLES

5.01 When placing a drop wire other than over a street or highway, and not crossing over power wires or cables, place the wire as follows:

CAUTION: Before proceeding with the following operations, fasten the inner end of the coil of drop wire securely to one of the springless spokes of the drop wire reel and set the brake.

a. Install the first building attachment and complete the wire run on the building, keeping the drop wire reel near the building to prevent accidents resulting from vehicles striking the wire, or pedestrians tripping on it.

NOTE: If obstructions are encountered between the building and the pole or span clamp, locate the drop wire on the pole line side of the obstructions, place the wire over or through the obstruction, and attach the wire to the building, making sure that the wire rests flat on the ground between the obstruction and the building.

b. Roll or carry the drop wire reel from the building to the pole or span clamp location, paying out the wire so that it rests flat on the ground.

c. Tie a bowline knot in one end of the handline around the drop wire at the reel. The length of the handline shall be greater than the distance from the ground to the drop wire attachment point.

d. Set the brake of the drop wire reel so that when the wire is raised by the handline there will be sufficient tension in the wire for it to be pulled to the required height in the span.

e. Loop the other end of the handline under the body belt as instructed in paragraph 2.05, and climb the pole or the ladder (if at a span clamp).

f. Place the handline over the strand, guard arm, drive hook, or crossarm from the side toward the building. Return to the ground.

g. Raise the drop wire to the required height by pulling the handline over the strand or other support, and lash the handline to the pole or strand. Climb the pole.

h. Attach the drop wire to the pole or strand without removing the handline. When attaching the drop wire to a span clamp, keep in mind that the suspension strand is forced out of line by the ladder resting against it. Make any adjustments necessary to avoid excessive tension in the wire span when working from the ladder, and to ensure proper sag and clearances after removal of the ladder.

i. Remove the handline from the drop wire. Cut the wire, leaving a sufficient length to reach the terminating point, and complete the connection.

6. OTHER THAN OVER STREET OR HIGHWAY—CROSSING OVER POWER WIRES/CABLES—POWER EXPOSURE UP TO 300 VOLTS

6.01 Place the drop wire over power wires or power cables up to 300 volts as follows:

a. Install the first building attachment; or the pole attachment if the drop wire is to be attached to a pole on the building side of the power wires or power cables.

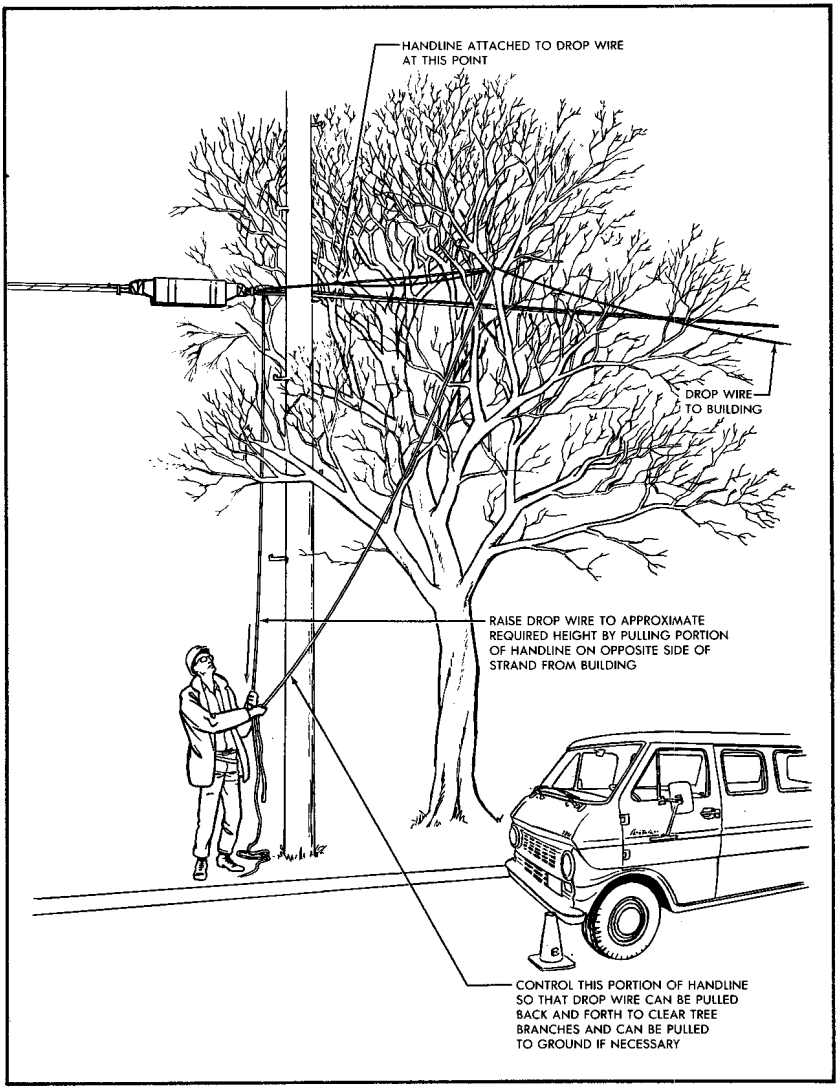


FIGURE 8. Raising Drop Wire

b. Attach a temporary guide loop to the attachment to prevent the drop wire from becoming accidentally disengaged during the placing operation. See Figures 1 and 9.

c. Place the drop wire reel, equipped with a coil of new wire, in a stable position near the foot of the ladder at the building, on the side away from the wire span.

CAUTION: Fasten the inner end of the coil of drop wire securely to one of the spokes of the drop wire reel.

d. Set the brake of the drop wire reel so that when the wire is pulled by the handline there will be sufficient tension in the wire to prevent it from sagging onto the power wires or power cables.

e. With the wire paying off from the bottom of the reel, pass the wire over the first building attachment and through the temporary guide loop until the end of the wire reaches the ground.

f. Go to the pole. Lash one end of a handline to the base of the pole. The handline shall be of a sufficient length to extend vertically from the ground to the strand or pole attachment, and horizontally at least 25 feet beyond the power wires or power cables.

g. Place the free end of the handline over the strand, guard arm, drive hook, or crossarm. If practicable, the handline may be formed into a coil at one end and thrown over the strand.

h. Standing on the ground, throw the free end of the handline over the power wires or power cables. Tie this end of the handline to the end of the drop wire by means of a square knot, serving the end of the wire around itself without sharp bends. If the handline has been placed over a drive hook or other support on which the square knot would snag, fasten the handline to the wire as shown in Figure 7.

NOTE: If a tree is involved, place the handline among the branches of the tree in the desired location for the drop wire. A wire raising tool may be used to facilitate this operation.

i. Go to the building. Reel up all slack in the handline and drop wire onto the drop wire reel, thereby raising the handline clear of the power wires or power cables. Make sure the drop wire reel is in a stable position and that its brake is properly set.

j. Return to the pole end of the handline and pull the handline and drop wire, being careful not to sag into the power wires or cable. After a sufficient length of drop wire has been pulled over the strand, guard arm, drive hook, or crossarm, the handline shall be lashed to the base of the pole.

k. Go to the building and fasten the drop wire to the first building attachment with a drop wire clamp, and then remove the temporary guide loop.

l. Climb the pole, fasten the drop wire and remove the handline.

7. OVER STREET OR HIGHWAY—CROSSING OVER POWER WIRES/CABLES—POWER EXPOSURE UP TO 750 VOLTS

7.01 Follow the procedures in CTSP 475-301-410, paragraph 2, when it is necessary to place drop wire over power wires or cables and where the drop wire crosses over a street or highway.

8. FROM BUILDING TO BUILDING

8.01 Place a drop wire between two buildings in the same manner as for a pole-to-building run, providing as much sag as practicable in the wire span. A temporary guide loop (Figure 9) should be installed on the first building attachment at which the wire span is to be raised; this will prevent accidental disengagement of the handline from the building attachment. Support the tension in the wire by lashing the handline (which was used in raising the wire) to a secure support near the base of the building, and install the second drop wire clamp on the span.

8.02 All safety precautions contained in this practice must also be observed when placing wire from building to building.

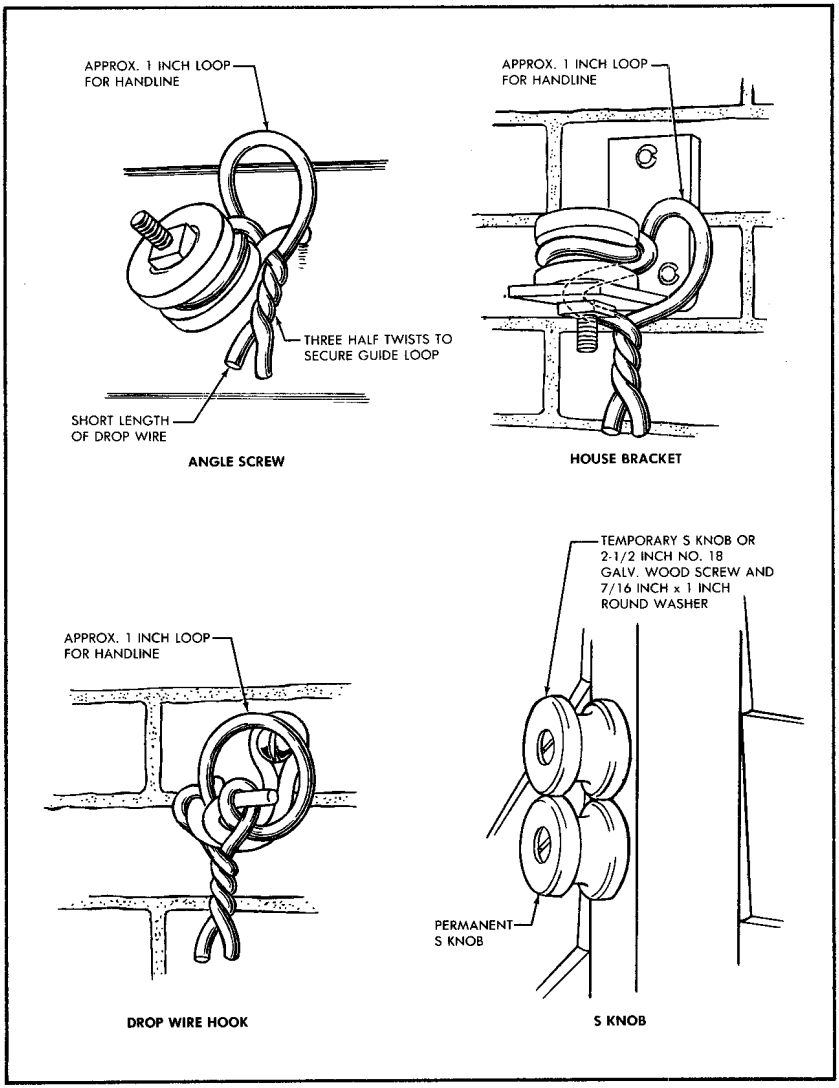


FIGURE 9. Temporary Guide Loop—Building

DROP WIRING

PLACING DROP WIRE POWER EXPOSURE UP TO 750 VOLTS

CONTENTS

1. GENERAL

1.01 This practice provides procedures for the two-man method of placing drop wire over power wires or power cables operating at 300 to 750 volts. It also provides the procedures for placing drop wire over power wire or power cables where the exposure is up to 750 volts and where a street or highway is crossed.

NOTE: Under no condition shall a drop wire be placed over power wires or power cables operating at more than 750 volts. Such cases shall be referred to your supervisor for disposition.

1.02 Drop wire shall not be placed over power cables operating up to 750 volts if other means of installing the wire are practicable.

1.03 This method provides for the drop wire to be attached first to the building and then placed over the power wires or power cables by means of a handline. During this operation, employees remain on the ground and perform the work so that the drop wire does not come in contact with the power circuits during the entire placing operation. This method is also intended to avoid the possibility of accidents caused by tensioning the wire from a ladder at the building, or vehicles striking the wire or the handline as it is being raised from the ground.

1.04 Drop wire shall not be attached to a span clamp under the conditions covered in this practice unless the span clamp is accessible from the pole.

1.05 Refer to CTSP 475-301-405 for the methods of placing a drop wire over power wires or power cables where the exposure is **300 volts or less** or where there is no exposure to power. The methods of lowering a drop wire, raising a lowered drop wire, and replacing a drop wire are covered in CTSP 475-301-605 and CTSP 475-301-610.

1.06 Drop wire should be twisted one complete turn for each ten feet of span length at the time of installation to reduce vibration and dancing.

1.07 See CTSP 490-060-001 for measuring clearances and separations in outside plant; CTSP 475-300-403 for stringing sags and span limits.

2. PRECAUTIONS

NOTE: All precautions in CTSPs 490-050-104, 490-050-105, and 490-050-106 must be taken before climbing.

2.01 Two employees shall perform the work when raising a drop wire over power wires or power cables operating at 300 to 750 volts. Obtain additional assistance before raising a drop wire over streets, highways, or elsewhere if traffic, trees, or other conditions create a safety hazard.

2.02 Insulating gloves shall be worn when placing a drop wire over power wires or power cables, and until the drop wire has been attached at both ends of the crossing span.

2.03 The handline used for raising a drop wire under the conditions described in this practice shall be free from metallic strands and shall be dry. A wet handline must not be used in the vicinity of power circuits operating at 300 volts or more.

NOTE: When it is necessary to maintain service or establish emergency service during rainstorms, a wet handline may be used over contact wires and other power circuits operating at 300 to 750 volts, PROVIDED THAT INSULATING GLOVES, RUBBER BOOTS, AND RUBBER RAINCOATS ARE WORN.

2.04 When it is necessary to carry a handline up a pole or ladder, use a handline carrier (CTS #74-56-031-0), or double the end of the handline back on itself for a distance of approximately 1 foot. Place this loop under the right or left side or back of the body belt, or in such other position that the handline will be released readily if it is placed under tension while the employee is climbing the pole or ladder.

2.05 Never release the drop wire supports from the wire span while working inside the angle formed by the wire.

2.06 Do not work from a ladder placed against a building with the side rails crossing a wire run or in any other position where movement of the wire, due to loosening of the attachments, would cause an accident.

2.07 If conditions could cause the handline, or the drop wire to which it is attached, to become

disengaged from a drive hook or crossarm, or to slide along the strand or guard arm while work is being done, the handline or drop wire shall be enclosed with a temporary guide loop. This loop shall consist of a short length of wire or rope placed over the handline or drop wire, with the ends of the guide securely tied as follows (Figure 1):

a. Guard Arm: Tie the ends to the guard arm on each side of the handline or drop wire.

b. Drive Hooks: Tie one end to the vertical portion of the drive hook and lash the other end to the pole.

c. Crossarm: Tie the ends to adjacent pins or insulators.

d. Strand: Tie the ends across 2 span clamps.

3. PLACING WIRE OVER POWER WIRES OR POWER CABLES CROSSING A STREET OR HIGHWAY

CAUTION: When it is necessary to place a drop wire over power wires or power cables, the crossing span shall be placed independently of any additional spans of wire that may be required to establish service. Place one drop at a time.

3.01 Place drop wire over power wires or power cables as follows:

a. Employee No. 1 installs the first building attachment; or the pole attachment if the drop

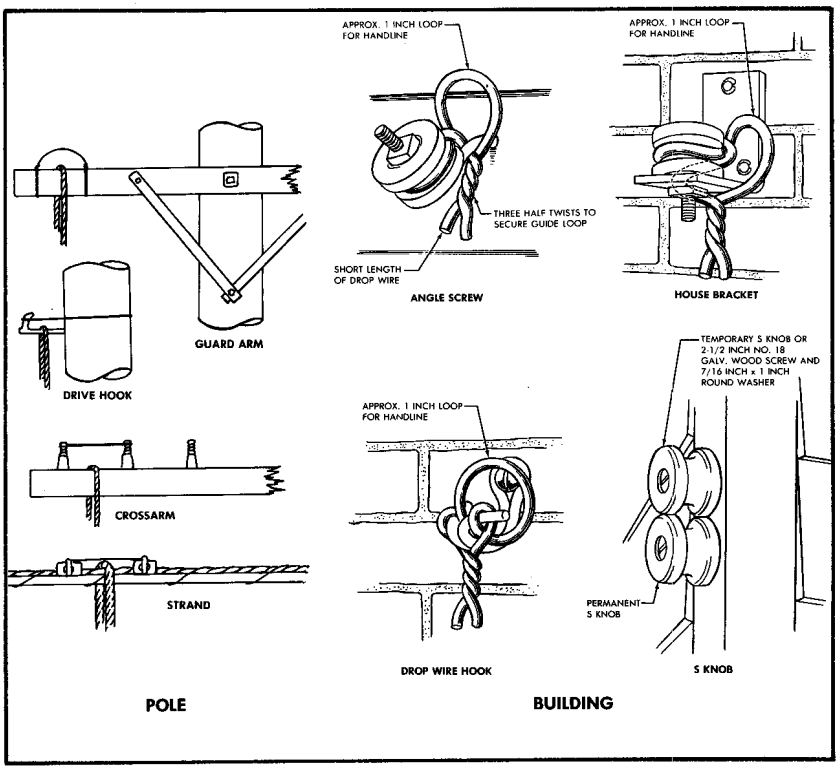


FIGURE 1. Temporary Guide Loops

wire is to be attached to a pole on the building side of the power wires or power cables.

b. Employee No. 1 attaches a temporary guide loop to the first building attachment (Figure 1) to prevent the drop wire from becoming accidentally disengaged from the building attachment during the placing operation.

NOTE: If the drop wire is to be attached to a pole between the power wires or power cables and the building, place the temporary guide loop on the pole attachment instead of at the building.

c. Employee No. 1 places the drop wire reel, equipped with a coil of new wire, in a stable position near the foot of the ladder on the side away from the wire span.

CAUTION: Fasten the inner end of the coil of drop wire securely to one of the spokes of the drop wire reel.

d. Employee No. 1 sets the brake of the drop wire reel so that when the wire is pulled by the handline there will be sufficient tension in the wire to prevent it from sagging onto the power wires or power cables.

e. With the wire paying off from the bottom of the reel, pass the wire over the first building attachment and through the temporary guide loop until the end of the wire reaches the ground.

f. Employee No. 2 lashes one end of a handline to the base of the pole. The handline shall be of a sufficient length to extend vertically from the ground to the strand or pole attachment, and horizontally at least 25 feet beyond the power wires or power cables.

g. Employee No. 1 goes into the street or highway to control traffic. (He may require the assistance of the police.)

h. Employee No. 2 places the free end of the handline over the strand, guard arm, drive hook, or crossarm. If practicable, the handline may be formed into a coil at one end and thrown over the strand.

i. Standing on the ground, **Employee No. 2** now throws the free end of the handline over the power wires or power cables. Tie this end of the handline to the end of the drop wire by means of a square knot, serving the end of the wire around itself without sharp bends. If the handline has been placed over a drive hook or other support on which the square knot would snag, fasten the handline to the wire as shown in Figure 2.

NOTE: If a tree is involved, place the handline among the branches of the tree in the desired location for the drop wire. A wire raising tool may be used to facilitate this operation.

j. Employee No. 2 reels up all slack in the handline and drop wire onto the drop wire reel, thereby raising the handline clear of the power wires or power cables. If the end of the drop wire attached to the handline would be pulled back through the temporary guide loop at the first building attachment during this operation, stop reeling up slack; make sure the drop wire reel is in a stable position and that its brake is properly set. The employee returns to the pole end of the handline, and pulls the remaining slack out of the handline and wire span so that the handline is clear of the power circuits. The handline is then retied to the pole and the employee returns to the drop wire reel.

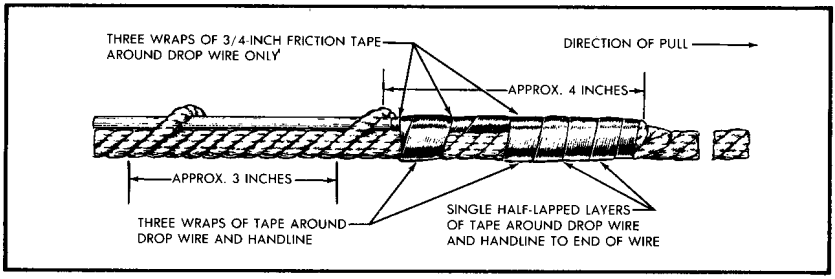


FIGURE 2. Alternate Tie to Prevent Snagging

k. **Employee No. 1** who has been in the street or highway directing traffic during operations (steps h. through j.), goes to the pole and pulls the handline, observing carefully that there is sufficient tension in the wire paying off the drop wire reel to prevent the wire from sagging onto the power circuits. **Employee No. 2** controls the action of the drop wire reel to ensure that there is adequate tension in the wire as it is pulled from the reel.

l. After **Employee No. 1** has pulled a sufficient length of drop wire over the strand, guard arm, drive hook, or crossarm for terminating or splicing purposes, the handline shall be lashed to the base of the pole.

NOTE: If the handline or drop wire catches while it is being pulled over the strand, guard arm, drive hook, or crossarm, Employee No. 2 remains at the drop wire reel and keeps the wire under sufficient tension to prevent it from sagging onto the power circuits. Employee No. 1 lashes the handline to the base of the pole and proceeds to free the handline or drop wire.

m. **Employee No. 1** crosses the highway to the building and, while **Employee No. 2** maintains tension in the wire span, **Employee No. 1** fastens the drop wire to the first building attachment with a drop wire clamp, and then removes the temporary guide loop.

NOTE: While Employee No. 1 is fastening the drop wire to the first building attachment, Employee No. 2 shall not attempt to maintain any more tension in the wire than is necessary to prevent it from sagging onto the power wires or power cables. The proper tensioning of the drop wire shall be done from the pole attachment side of the power circuits.

n. Both employees now go to the pole and, while **Employee No. 1** maintains the proper tension in the handline, **Employee No. 2** climbs the pole, fastens the drop wire, and removes the handline.

DROP WIRING

LOWERING AND REPLACING DROP WIRE POWER EXPOSURE UP TO 300 VOLTS

CONTENTS

1. GENERAL

1.01 This practice provides procedures for the one-man method of lowering a drop wire, raising a lowered drop wire, and replacing a drop wire by pulling the new wire into the span as the old wire is pulled out of the span.

1.02 The procedures in this practice apply specifically to drop wire that crosses over power wires or power cables operating at 300 volts or less, or where there is no exposure to power.

1.03 These methods provide for the drop wire to be lowered, raised or replaced by means of a handline while the employee remains on the ground where he can observe traffic, control the wire to prevent its striking persons or damaging property, and remove the wire from a street or highway quickly. An exception is made in certain cases where a wire, which does not cross a street or highway, may be dropped from a pole. The methods are also intended to avoid the possibility of accidents caused by releasing wire under tension from a building or strand attachment while working from a ladder, or as the result of vehicles striking the wire as it is being lowered to the ground.

1.04 Refer to CTSP 475-301-610 for the methods of lowering or replacing a drop wire which crosses over power wires or power cables operating at 300 volts or more. The methods of placing drop wires are covered in CTSP 475-301-405 and CTSP 475-301-410.

1.05 Drop wire should be twisted one complete turn for each ten feet of span length to avoid vibration and dancing.

1.06 See CTSP 490-060-001 for measuring clearances and separations in aerial plant; CTSP 475-300-403 for stringing sags and span limits.

2. PRECAUTIONS

NOTE: All precautions in CTSPs 490-050-104, 490-050-105, and 490-050-106 must be taken before climbing.

2.01 If traffic, trees, or other conditions create a safety hazard for one employee, obtain additional assistance before lowering a drop wire, raising a lowered drop wire, or replacing a drop wire over streets, highways, etc.

2.02 Insulating gloves shall be worn by all employees when performing all operations in which the handline or the drop wire may come in contact with power wires or power cables.

2.03 Under the conditions described in this practice, the handline used for lowering, raising, or replacing a drop wire shall be free from metallic strands and shall be dry. However, if it is impracticable to keep the handline dry due to weather conditions, a wet handline may be used for lowering, raising, or replacing a drop wire over secondary electric service wires operating at less than 300 volts.

2.04 One 50-foot and one 100-foot 3/8-inch handline will be needed for the operations in this practice. The handlines should be served at the ends to prevent unraveling.

2.05 When it is necessary to carry an extended handline up a pole or ladder, use a handline carrier (CTS #74-56-031-0), or double the end of the handline back on itself for a distance of approximately 1 foot. Place this loop under the right or

left side or back of the body belt, or in such other position that the handline will be released readily if it is placed under tension while the employee is climbing the pole or ladder.

2.06 Never release the drop wire supports from a wire span while working inside the angle formed by the wire.

2.07 Avoid working from a ladder placed against a building with the side rails crossing a wire run or in any other position where movement of the wire, due to loosening of the attachments, would cause an accident.

2.08 When a drop wire attached to a span clamp is to be lowered or replaced, place the foot of the extension ladder on the field side of the suspension strand so it is not in the street or highway. If there is no street or highway adjacent to the span clamp, place the ladder preferably against the opposite side of the strand from the drop wire run to the building.

2.09 If conditions could cause the handline, or the drop wire to which it is attached, to become disengaged from a drive hook or crossarm, or may slide along the strand or guard arm while doing the work, the handline or drop wire shall be enclosed with a temporary guide loop. This loop shall consist of a short length of wire or rope placed over the handline or drop wire, with the ends of the guide securely tied as follows (Figure 1):

a. Guard Arm: Tie the ends to the guard arm on each side of the handline or drop wire.

b. Drive Hook: Tie one end to the vertical portion of the drive hook and lash the other end to the pole.

c. Crossarm: Tie the ends to adjacent pins or insulators.

d. Strand: Tie the ends across 2 span clamps.

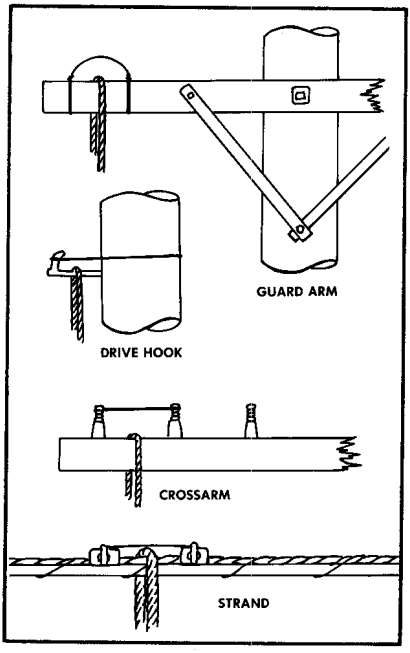


FIGURE 1. Temporary Guide Loop—Pole

3. LOWERING WIRE WHICH CROSSES A STREET OR HIGHWAY—WIRE ATTACHED TO POLE

CAUTION: The lowering of a taut drop wire span requires that special precautions be taken to ensure that the wire is lowered safely. These special precautions are covered in paragraph 6.

3.01 Handline Lowering Method: Lower the drop wire from its position on the pole (drive hook, guard arm, or crossarm) as follows:

a. Lash a handline securely to the base of the pole at a point on the handline which will leave a sufficient length on the ground so that this end will be accessible from the ground until the wire has been lowered to the street.

b. Place the other end of the handline over the strand, guard arm, drive hook, or crossarm so that this end is toward the building and reaches the ground. If practicable, the handline may be formed into a coil at one end and thrown over the strand. If the drop wire passes through a tree in the immediate vicinity of the pole attachment, place the handline so that it follows the route of the wire through the tree. A wire raising tool may be used to facilitate this operation. After the handline has been placed, tie it to the base of the pole to avoid interference with pedestrians or vehicles.

CAUTION: The handline shall not overhang the street unless it is properly guarded. If practicable, park the Telephone Company truck so that it will shield the handline.

c. Disconnect the drop wire from the terminal and remove the free end from the wiring rings on the pole.

d. Place a temporary drop wire clamp on the wire to be lowered, about one foot out in the span. Seat the clamp firmly on the wire.

e. Tie a loop of the bight of the handline to the bail of the temporary drop wire clamp so that the lashed end of the handline is sufficiently taut to remove tension from the original drop wire clamp.

f. Remove the original drop wire clamp from the wire span, leaving the wire supported by the temporary drop wire clamp and the lashed handline.

g. Return to the ground. Untie the handline from the base of the pole and, when no vehicles or pedestrians are approaching, lower the drop wire to the ground by pulling that portion of the handline toward the building. The portion of the handline on the opposite side of the strand should pass through the employee's hand, as shown in Figure 2, so that the handline can be pulled in either direction to work the drop wire among the branches of a tree, or to raise the wire quickly if necessary.

h. After the wire has been lowered to the street or highway, remove the temporary drop wire clamp from the wire, tie the handline to the base of the pole, and remove the wire from the street or highway.

4. DROPPING WIRE WHICH DOES NOT CROSS A STREET OR HIGHWAY—WIRE ATTACHED TO POLE

CAUTION: The lowering of a taut drop wire span requires that special precautions be taken to ensure that the wire is lowered safely. These special precautions are covered in paragraph 6.

4.01 A wire span may be dropped from a pole if:

a. The wire span does not cross a street or highway, or over power wires or power cables.

b. A taut wire span is not involved.

c. The wire will not be struck by a passing vehicle.

d. The wire will not fall on pedestrians or cause damage to property as a result of being dropped to the ground.

4.02 If any of the above conditions exist, the span shall be lowered by the handline method (paragraph 3).

5. LOWERING WIRE ATTACHED TO A SPAN CLAMP

CAUTION: The lowering of a taut drop wire span requires that special precautions be taken to ensure that the wire is lowered safely. These special precautions are covered in paragraph 6.

5.01 The lowering method covered in this paragraph applies to all drop wire spans attached to span clamps.

5.02 Precautions: The following precautions shall be observed when lowering a drop wire attached to a span clamp:

a. Place the extension ladder at the location of the span clamp as instructed in paragraph 2.08.

b. When climbing the extension ladder to work at a span clamp, the strand is forced out of line. The distance the strand is deflected depends on the tension in the strand, the weight of the cable, and the combined weight of the employee and ladder. Therefore, while climbing the ladder it is important to observe the effect of the strand deflection on all drop wires attached to the section of strand on which the employee is working. The principal conditions to be observed are:

(1) Where drop wire crosses a street or highway, avoid placing additional sag in a drop wire span which would create a traffic hazard, unless traffic is properly controlled.

(2) Where drop wire does not cross a street or highway, avoid placing excess tension in a drop wire span which may pull out the first building attachment, thereby causing property damage and sudden movement of the strand while the employee is climbing the ladder. See paragraph 6.04 for the method of releasing excess tension in a drop wire span.

5.03 Lower the wire from the span clamp as follows:

a. Detach the drop wire first from the pole and lower this end of the wire run to the ground. Take necessary precautions if this span crosses a street or highway.

b. Coil the drop wire and place it on the ground near the ladder to avoid accidents resulting from vehicles striking it or pedestrians tripping on it.

c. Place a handline over the strand and lower the drop wire as instructed in paragraph 3, except that the handline shall be lashed to the

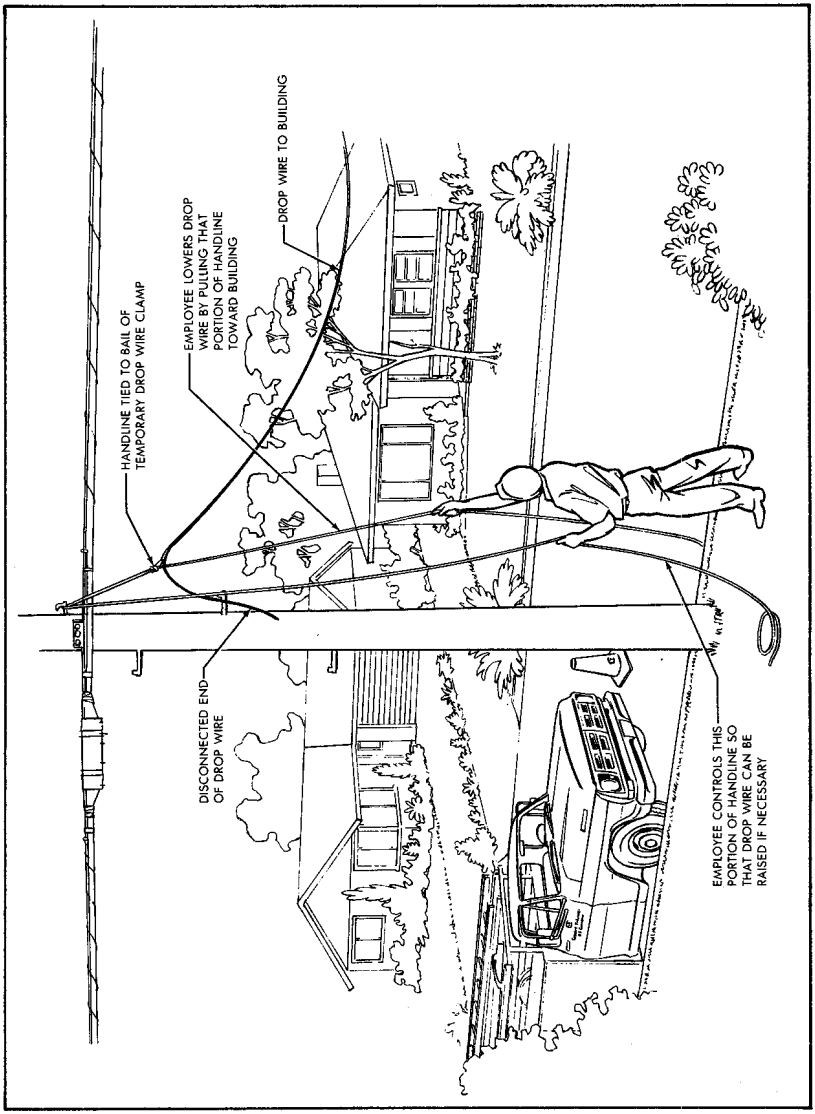


FIGURE 2. Lowering Drop Wire

lower rungs of the extension ladder if it cannot be fastened to a nearby pole or tree.

6. LOWERING TAUT WIRE

6.01 The method described in the following paragraphs covers the special precautions which shall be taken when lowering a taut drop wire span. It applies to the lowering of all taut wire spans whether or not they cross streets or highways.

6.02 Taut Span From Pole: When it is necessary to lower a taut drop wire span from a pole, proceed as follows:

a. Place a handline over the strand, guard arm, drive hook, or crossarm so that the end of the handline toward the building just reaches the ground.

b. Disconnect the drop wire from the terminal, and remove the free end from the wiring rings on the pole.

c. Place a temporary drop wire clamp on the wire to be lowered, about one foot out in the span. Seat the clamp firmly on the wire.

d. Tie a loop of the bight of the handline securely to the bail of the temporary drop wire clamp.

e. Return to the ground. Pull the long end of the handline sufficiently taut to remove tension from the original drop wire clamp, and lash the handline securely to the base of the pole. The taut wire span will be supported by the temporary drop wire clamp and the lashed handline.

CAUTION: Exercise care to avoid placing more tension in the drop wire span than is necessary to remove tension from the bail of the original drop wire clamp.

f. Climb the pole and check to ensure that the tension in the drop wire span has been removed from the bail of the original drop wire clamp.

g. Cut the bail of the original drop wire clamp with pliers.

h. Return to the ground. Untie the handline and slowly ease off the long end of the handline, thereby releasing excess tension in the taut drop wire span. When no vehicles or pedestrians are approaching, lower the wire span to the ground by pulling the short end of the handline. The long end of the handline should pass through the employee's hand. The wire can be raised quickly if necessary.

6.03 Taut Span From Span Clamp: The procedure in paragraph 5 also applies to the lowering of a taut drop wire attached to a span clamp, except that the excess tension in the drop wire span shall first be released.

6.04 Release the excess tension in the drop wire from the building end of the span as follows:

a. Remove the C knob or the D wire clip and the associated loop of drop wire from the first building attachment. Do not remove the drop wire clamp which supports the wire span.

b. Attach a temporary guide loop to the first building attachment to prevent the handline used in releasing the excess tension from becoming accidentally disengaged from the building attachment.

c. Place a temporary drop wire clamp on the wire to be lowered, about one foot out in the span. Seat the clamp firmly on the wire.

d. Place a handline over the first building attachment and through the temporary guide loop. Tie the handline securely to the bail of the temporary drop wire clamp.

e. Return to the ground. Pull the handline sufficiently taut to remove tension from the original drop wire clamp, and lash the handline to a secure support near the base of the building.

CAUTION: Take care to avoid placing more tension in the drop wire span than is necessary to remove tension from the bail of the original drop wire clamp.

f. At the first attachment, check to ensure that the tension in the drop wire span has been removed from the bail of the original drop wire clamp.

g. Cut the bail of the original drop wire clamp with pliers.

h. Return to the ground. Untie the handline and slowly ease off the handline, thereby releasing excess tension in the taut drop wire span. Retie the handline to a secure support near the base of the building.

NOTE: If the amount of slack introduced into the drop wire span is not sufficient to release the excess tension, remove the wire from one or more of the building attachments beyond the first attachment and, if necessary, cut the wire in the building run.

i. Proceed as instructed in paragraph 5 for lowering a normal wire span from a span clamp.

7. LOWERING WIRE ATTACHED TO TWO BUILDINGS

7.01 To lower a drop wire span attached to two buildings:

a. Select the end of the drop wire span at which the operations can be performed.

b. Lower the drop wire run on the building up to the first attachment from which the wire span is to be lowered. Remove the C knob or the D wire clip and the associated loop of drop wire from this attachment. Do not remove the drop wire clamp which supports the wire span.

c. Place a handline over the first building attachment so the end of the handline toward the wire span just reaches the ground. Attach a temporary guide loop to the first building attachment around the handline (Figure 3) to prevent the handline from becoming accidentally disengaged from the building attachment during the lowering operation.

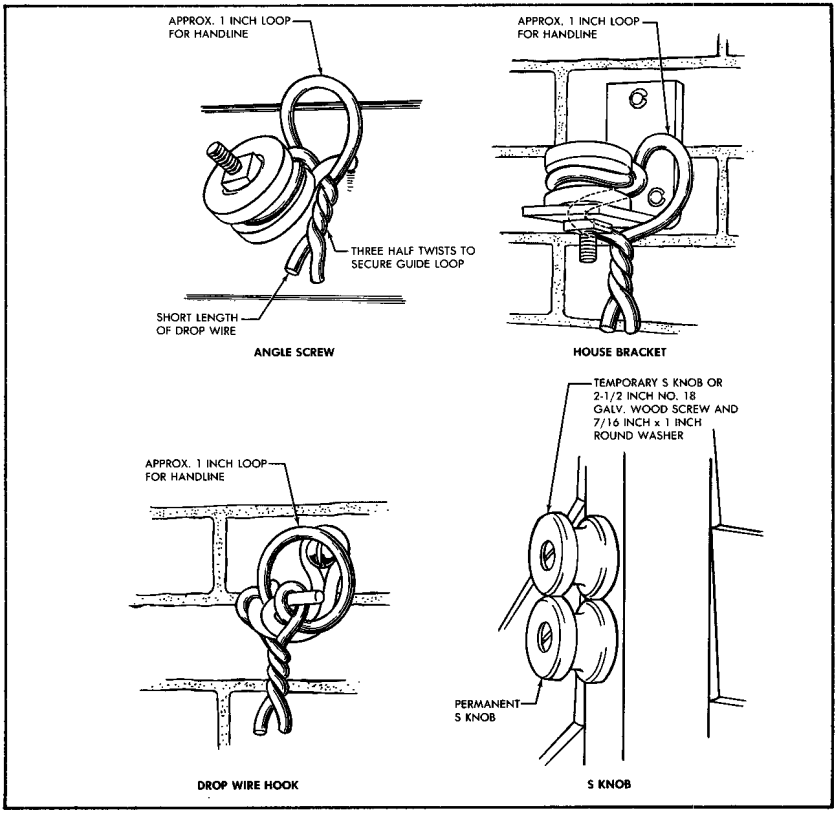


FIGURE 3. Temporary Guide Loop—Building

d. Place a temporary drop wire clamp on the wire to be lowered, about one foot out in the span. Seat the clamp firmly on the wire.

e. Tie a loop of the handline securely to the bail of the temporary drop wire clamp.

f. Return to the ground. Pull the long end of the handline sufficiently taut to remove tension from the original drop wire clamp. Lash the handline to a secure support near the base of the building. The wire span will be supported by the temporary drop wire clamp and the lashed handline.

g. Remove the original drop wire clamp from the building attachment.

h. Return to the ground. Untie the long end of the handline and lower the wire span by pulling the short end of the handline.

8. RAISING WIRE LOWERED BY HANDLINE METHOD

8.01 Where the entire original wire span is to be raised:

a. After the wire has been repaired, lay it along the ground between the building and the building side of the highway, and coil the remaining length of wire.

b. When no traffic is approaching, carry the coil across the street or highway to the previously placed handline, paying out the wire so that it rests flat on the ground. If a metal or hard rubber-tired vehicle passes over the wire, pull the wire back to the building side of the highway. Inspect the wire for possible injury and replace any portions that are damaged.

c. Tie the end of the drop wire to the handline at a point in that portion of the handline toward the building which will permit the employee to have access to both ends of the handline from the ground during the entire raising operation. See Figure 4.

NOTE: If the handline has been placed over a drive hook or other support on which the square knot would snag, fasten the wire to the handline as shown in Figure 5.

d. When no vehicles or pedestrians are approaching, raise the drop wire by pulling that portion of the handline on the opposite side of the strand from the building. The portion of the handline toward the building should pass through the employee's hand so the wire may be pulled to the ground quickly if necessary.

e. After the drop wire has been raised to the required height, tie the handline to the base of the pole or, if at a span clamp, to the lower rungs of the ladder.

f. Climb the pole or ladder (if at a span clamp), and attach the drop wire to the pole or strand without removing the handline from the drop wire. When attaching the drop wire to a span clamp, keep in mind that the strand is forced out of line by the ladder resting against it; make any adjustments necessary to avoid excessive tension in the wire span when the employee is working from the ladder, and also to ensure proper sag and clearance after removal of the ladder.

g. Remove the handline from the drop wire and complete the connection.

8.02 Where the entire original wire span or the end toward the pole or strand is to be replaced, proceed as though raising a new drop wire over a street or highway. See CTSP 475-301-405.

8.03 When raising a drop wire between two buildings, provide as much sag as practicable in the wire span, and support the tension in the wire by means of a lashed handline before placing the second drop wire clamp.

9. RAISING WIRE LOWERED BY DROPPING METHOD

9.01 Where the entire original wire span of a drop wire that was lowered by the dropping method (paragraph 4) is to be raised:

a. After the wire has been repaired, lay it along the ground between the building and the pole or span clamp location.

b. Attach one end of the handline to the bail of the drop wire clamp. The length of the handline shall be greater than the distance from the ground to the drop wire attachment point.

c. Loop the other end of the handline under the body belt or use a handline carrier as instructed in paragraph 2.05, and climb the pole or, if at a span clamp, the ladder.

d. Place the handline over the strand, guard arm, drive hook, or crossarm from the side toward the building.

e. Raise the drop wire to the required height by pulling the handline over the strand or other support; then lash the handline to the pole or strand.

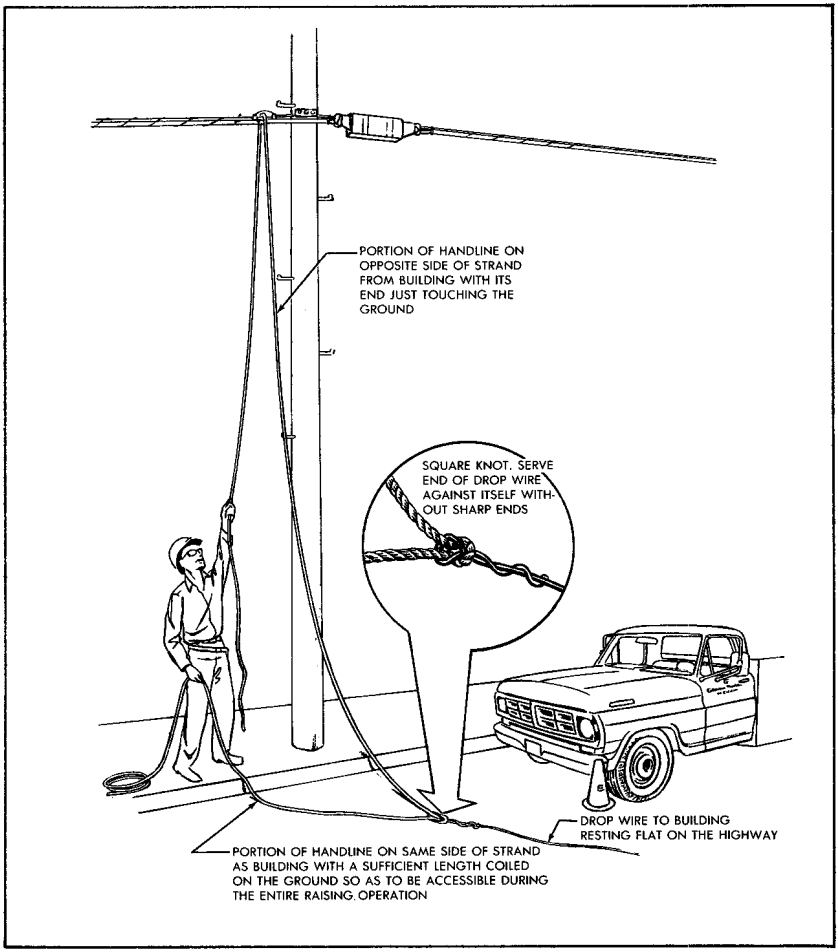


FIGURE 4. Raising the Drop Wire

f. Attach the drop wire to the pole or strand; then remove the handline. When attaching the drop wire to a span clamp, keep in mind that the strand is forced out of line by the ladder resting against it. Make any adjustments necessary to avoid excessive tension in the wire span when the employee is working from the ladder, and also to ensure proper sag and clearance after removal of the ladder.

9.02 Where the entire original wire span or the end toward the pole or strand is to be replaced, proceed

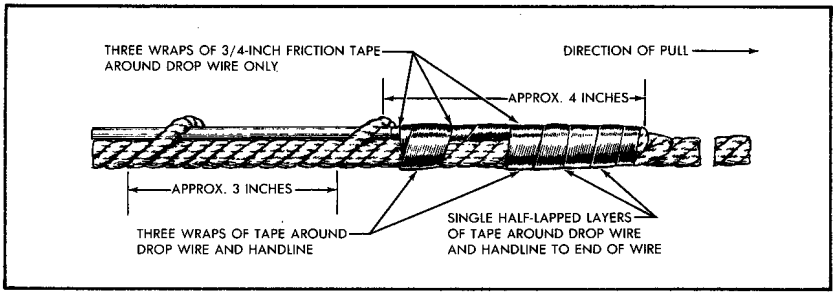


FIGURE 5. Fastening Handline to Prevent Snagging

as though raising a new drop wire at a location **OTHER** than over a street or highway. See CTSP 475-301-405.

10. REPLACING WIRE NOT LOWERED FOR INSPECTION

10.01 If it is obvious that an entire drop wire span requires replacement, and conditions indicate that it would be advantageous to pull the new wire into the span as the old wire is pulled out of the span, proceed as instructed in paragraph 10.02, provided that:

a. The existing drop wire span has at least the minimum required clearance over streets or highways, or over secondary electric service wires operating at less than 300 volts.

b. Specific approval to use this method has been obtained from the supervisor.

c. The operation of the drop wire reel can be observed from the handline location.

d. The drop wire reel can be located in a stable position so that when the tension in the wire span is transferred to the reel, it will not slide along the ground or fall over.

e. The existing drop wire span is not taut.

f. The existing wire does not cross over power wires or power cables operating at 300 volts or more.

CAUTION: If all of the above conditions are not met, the employee shall follow the standard method for lowering an existing drop wire span and raising a new drop wire span.

10.02 If conditions permit pulling the new drop wire into place as the old wire is pulled out, proceed as follows:

a. Remove the C knob or the D wire clip and the associated loop of drop wire from the first building attachment. Do not remove the drop wire clamp which suppports the wire span.

b. Attach a temporary guide loop to the first building attachment (Figure 3) to prevent the replacing drop wire from becoming accidentally disengaged from the building attachment.

c. Place the drop wire reel in a stable position near the foot of the ladder on the side away from the wire span.

CAUTION: Fasten the inner end of the coil of drop wire securely to one of the springless spokes of the drop wire reel.

d. Set the brake of the reel so that it will hold the tension in the wire span after it is transferred to the reel.

e. With the drop wire paying off from the bottom of the reel, pass the end of the wire over the first building attachment and through the temporary guide loop at this attachment.

f. Place a temporary drop wire clamp on the wire to be replaced, about one foot out in the span. Seat the clamp firmly on the wire. Tape the front end of the temporary clamp so that it will not foul on the strand, guard arm, or crossarm.

NOTE: If the drop wire is to be pulled over a drive hook or other support on which the temporary clamp would snag, securely fasten the end of the wire from the drop wire reel to the wire in the span, as shown in Figure 4.

g. Securely tie the end of the wire from the drop wire reel to the bail of the temporary drop wire clamp.

h. Reel up all slack between the drop wire reel and the temporary drop wire clamp so that tension is removed from the original drop wire clamp.

i. Go to the other end of the drop wire span and lash one end of the handline to the base of the pole or, if at a span clamp, to the lower rungs of the ladder or to a nearby pole or tree.

j. Loop the other end of the handline under the body belt or use a handline carrier as instructed in paragraph 2.05, and climb the pole or ladder.

k. Disconnect the drop wire from the terminal and remove the free end from the wiring rings on the pole.

l. Place a temporary drop wire clamp on the free end of the drop wire (not in the span) to be replaced. This arrangement eliminates the necessity of pulling the temporary drop wire clamp over the strand, guard arm, drive hook, or crossarm on which it may become fouled.

m. Tie a loop of the handline to the bail of the temporary drop wire clamp so that the lashed end of the handline is sufficiently taut to remove tension from the original drop wire clamp.

n. Remove the original drop wire clamp from the drop wire at the pole or span clamp, leaving the wire supported by means of the temporary drop wire clamp and the lashed handline.

o. Return to building; check to ensure that tension has been removed from the original drop wire clamp, and cut the wire to be replaced behind the temporary drop wire clamp with pliers.

p. Return to the pole or span clamp location; untie the handline and, while standing on the ground, pull the new wire into the span. Observe the drop wire as it feeds from the drop wire reel to make sure that the brake maintains sufficient tension to prevent the wire from sagging excessively.

q. When a sufficient length of new wire has been pulled over the strand, guard arm, drive hook, or crossarm, lash the old wire to the base of the pole, or to the lower rungs of the ladder. The wire in the crossing span shall be reasonably slack so there will not be undue tension in the span when placing the drop wire clamp at the first building attachment.

r. Fasten the new wire span to the first building attachment with a drop wire clamp, and remove the temporary guide loop.

s. Fasten the new wire span to the pole or strand attachment without removing the old wire which was used as the pulling line. When attaching the drop wire to a span clamp, keep in mind that the strand is forced out of line by the ladder resting against it; make any adjustments necessary to avoid excessive tension in the wire span when the employee is working from the ladder, and also to ensure proper sag and clearance after removal of the ladder.

t. Detach the old wire from the new wire and complete the connection.

DROP WIRING

LOWERING AND REPLACING DROP WIRE POWER EXPOSURE UP TO 750 VOLTS

CONTENTS	PARAGRAPH
GENERAL	1
PRECAUTIONS	2
LOWERING WIRE OVER POWER WIRES OR POWER CABLES	3
REPLACING WIRE OVER POWER WIRES OR POWER CABLES	4

1. GENERAL

1.01 This practice provides procedures for the two-man method of lowering and replacing drop wire over power wires or power cables operating at **300 to 750 volts.**

NOTE: If for any reason it is necessary to lower or replace a drop wire crossing over any power wires or power cables operating at more than 750 volts, refer the matter to your supervisor for specific instructions.

1.02 The methods in this practice provide for drop wire to be lowered by means of a handline while employees remain on the ground, and to perform the work so that the drop wire does not come in contact with the power wires or power cables during the entire lowering operation. These methods are also intended to avoid the possibility of accidents caused by releasing tensions from a building or strand attachment while working from a ladder, or as the result of vehicles striking the wire or the handline as it is being lowered to the ground.

1.03 Refer to CTSP 475-301-605 for the methods of lowering or replacing a drop wire over power wires or power cables operating at **300 volts** or less or where there is no exposure to power. The methods of placing drop wire are covered in CTSP 475-301-405 and CTSP 475-301-410.

1.04 Drop wire should be twisted one complete turn for each ten feet of span length to reduce vibration and dancing when replacing.

1.05 See CTSP 490-060-001 for measuring clearances and separations in aerial plant; CTSP 475-300-405 for stringing sags and span limits.

2. PRECAUTIONS

NOTE: All precautions in CTSPs 490-050-104, 490-050-105, and 490-050-106 must be taken before climbing.

2.01 Two employees shall perform the work when lowering or replacing a drop wire over power wires or power cables operating at 300 to 750 volts. Obtain additional assistance before lowering or replacing a drop wire over streets, highways, or elsewhere if traffic, trees, or other conditions create a safety hazard.

2.02 Insulating gloves shall be worn by all employees when lowering or replacing a drop wire over power wires or power cables, until the crossing span has been completely removed or replaced.

2.03 The handline used for lowering or replacing a drop wire under the conditions described in this practice shall be free from metallic strands and shall be dry. A wet handline must not be used in the vicinity of power circuits operating at 300 volts or more.

NOTE: When it is necessary to maintain service or establish emergency service during rainstorms, a wet handline may be used over power circuits operating at 300 to 750 volts PROVIDED THAT INSULATING GLOVES, RUBBER BOOTS, AND RUBBER RAINCOATS ARE WORN.

2.04 When it is necessary to carry a handline up a pole or ladder, use a handline carrier (CTS #74-56-031-0), or double the end of the handline back on itself for a distance of approximately 1 foot. Place this loop under the right or left side or back of the body belt, or in such other position that the handline will be released readily if it is placed under tension while the employee is climbing the pole or ladder.

2.05 Never release the drop wire supports from a wire span while working inside the angle formed by the wire.

2.06 Avoid working from a ladder placed against a building with the side rails crossing a wire run, or in any other position where movement of the wire, due to loosening of the attachments, could cause an accident.

2.07 When a drop wire attached to a span clamp is to be lowered or replaced, place the foot of the extension ladder on the field side of the suspension strand and not in the street or highway. If there is no street or highway adjacent to the span clamp, place

the ladder against the opposite side of the strand from the drop wire run to the building.

2.08 If conditions could cause the handline, or the drop wire to which it is attached, to become disengaged from a drive hook or crossarm, or to slide along the strand or guard arm while performing the operations, the handline or drop wire shall be enclosed with a temporary guide loop. This loop shall consist of a short length of wire or rope placed over the handline or drop wire, with the ends of the guide securely tied as follows (Figure 1):

a. Guard Arm: Tie the ends to the guard arm on each side of the handline or drop wire.

b. Drive Hook: Tie one end to the vertical portion of the drive hook and lash the other end to the pole.

c. Crossarm: Tie the ends to adjacent pins or insulators.

d. Strand: Tie the ends across 2 span clamps.

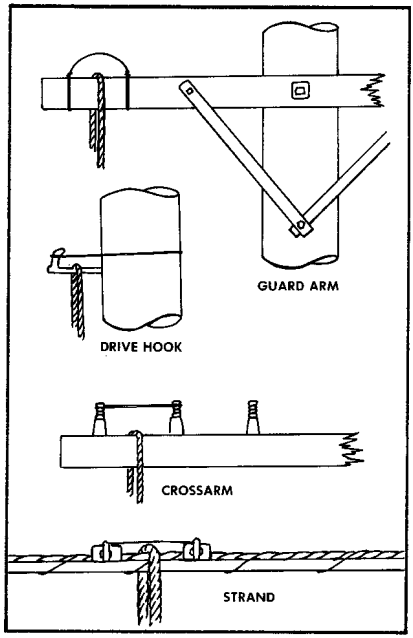


FIGURE 1. Temporary Guide Loop—Pole

3. LOWERING WIRE OVER POWER WIRES OR POWER CABLES

3.01 The procedure described below shall be followed when the drop wire span is to be permanently removed from plant, or lowered for inspection, repair, or replacement. Lower one wire span only at a time. Do not pull in new drop wire with old wire as it is pulled out.

a. Employee No. 1 loops one end of the handline under the body belt as instructed in paragraph 2.04 and climbs the pole or, if at a span clamp, the ladder. The handline shall be of a sufficient length to reach from the ground to the strand, guard arm, drive hook, or crossarm; then horizontally to about 25 feet beyond the power wires or power cables to ensure that the end of the drop wire can be pulled at least 10 feet beyond the power circuits.

CAUTION: IF A SPAN CLAMP IS INVOLVED, KEEP IN MIND THAT THE STRAND IS FORCED OUT OF LINE BY THE LADDER RESTING AGAINST IT; TAKE ANY STEPS NECESSARY TO PREVENT THE DROP WIRE FROM SAGGING ONTO THE POWER WIRES OR POWER CABLES WHILE CLIMBING AND WORKING ON THE LADDER. CARE SHOULD ALSO BE TAKEN TO ENSURE THAT THERE WILL BE ADEQUATE CLEARANCE BETWEEN THE EMPLOYEE AND POWER WIRES OR CABLES WHEN THE STRAND IS DEFLECTED BY THE WEIGHT OF THE EMPLOYEE ON THE LADDER.

b. Employee No. 1 places a temporary drop wire clamp on the wire to be lowered, about 1 foot out in the span, and seats the clamp firmly on the wire.

c. Employee No. 1 places the handline over the strand, guard arm, drive hook, or crossarm, and ties the end securely to the bail of the temporary drop wire clamp.

d. Employee No. 2, standing on the ground, grasps the free end of the handline and pulls it sufficiently taut to remove the tension from the original drop wire clamp. The handline is then lashed securely to the base of the pole or, if at a span clamp, to the lower rungs of the ladder (see Note). **Employee No. 1,** on the pole or ladder, cuts the drop wire approximately 6 inches behind the temporary drop wire clamp, leaving the drop wire span supported by means of the temporary clamp and the lashed handline.

NOTE: If a taut drop wire span is involved, Employee No. 2 on the ground grasps the free end of the handline and pulls it sufficiently taut to support the wire span, snubbing the handline if necessary. Employee No. 1 cuts the bail of the original drop wire clamp with pliers. Employee No. 2 slowly eases off the handline, thereby releasing excess tension in the taut wire span; then lashes the handline to the base of the pole or the lower rungs of the ladder.

e. Both employees go to the opposite or building end of the drop wire span.

f. Employee No. 1 cuts the drop wire in the building run at a point where the end of the wire can be reached from the ground; then frees the wire from all intermediate attachments between the cut end of the wire and first building attachment.

g. Employee No. 2 removes the C knob or the D wire clip at the first building attachment. A temporary guide loop is then placed at the first attachment around the drop wire, as shown in Figure 2, to prevent the wire from becoming accidentally disengaged from the building

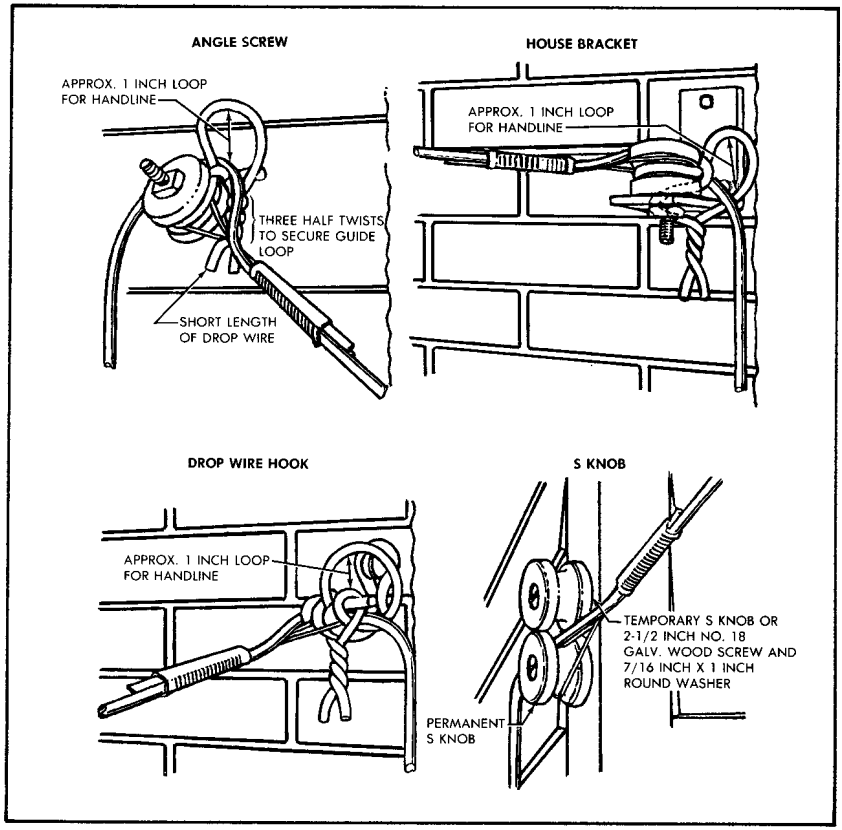


FIGURE 2. Temporary Guide Loop—Building

attachment as it is being pulled over the power circuits.

h. Employee No. 1, on the ground, holds tension in the drop wire while **Employee No. 2** removes the original drop wire clamp from the first building attachment. **Employee No. 1** continues to hold tension in the wire span to prevent it from coming in contact with the power wires or power cables.

i. Employee No. 2 returns to the other end of the wire span, unties the handline, and keeps the drop wire taut while feeding it to **Employee No. 1** who pulls it over the power circuits and coils the drop wire as it is pulled out of the span.

j. When the end of the drop wire has been pulled at least 10 feet beyond the power wires or power cables, and no traffic is approaching, **Employee No. 2** carefully releases the handline, allowing it to fall on the power circuits, and immediately goes into the street or highway to control traffic.

k. Employee No. 1 pulls the remainder of the drop wire and the handline to the building end of the span and away from the street or highway.

4. REPLACING WIRE OVER POWER WIRES OR POWER CABLES

4.01 When a drop wire crossing over power wires or power cables operating at 300 to 750 volts is lowered for inspection, repair, or replacement, it shall not be reused in the crossing span. Place new wire in the crossing span in accordance with the instructions in CTSP 475-301-410.

DROP WIRING

DROP WIRE RUNS TO BUILDINGS FASTENING AND EQUIPPING FIRST ATTACHMENTS

CONTENTS

1. GENERAL

1.01 This practice provides the rules to be followed for planning drop wire runs to buildings, and the methods of fastening and equipping first attachments. The fastener to be used on various type surfaces is also covered.

1.02 This practice replaces CTSP 475-300-401 and CTSP 475-300-415, all copies of which should be removed from the file and destroyed. For information on intermediate and last attachments of drop wire runs on buildings, see CTSP 475-302-405.

1.03 The attachments to be used in any installation depend on a number of factors, such as:

a. Loading areas.

b. Number of drops to be placed.

c. Angle at which drop approaches building.

d. Insulated or noninsulated attachments.

1.04 See CTSP 475-500-402, Station Protector Selection—Application, for information on the use of insulated or noninsulated attachments.

1.05 When galvanized attachments are fastened on buildings with aluminum siding in highly corrosive areas (industrial or marine), apply "C" rubber cement (CSS #66-52-003-7) to the siding at the point of contact.

CAUTION: It is possible for foreign voltage to be present on buildings covered with metal siding. Test siding with B voltage tester before starting any work.

2. PRECAUTIONS

NOTE: All precautions in CTSPs 490-050-104, 490-050-105, and 490-050-106 must be taken before climbing.

2.01 When planning an attachment to a customer owned clearance fixture, observe the following precautions:

a. Avoid climbing on roofs of customer premises.

b. Before making attachment, inspect fixtures, but do not make an attachment if there is any doubt as to the strength or firmness of the fixture.

c. On joint use fixtures, observe location of the power service drops to avoid body contact. **Wear insulating gloves when making attachment to the fixture.** Obtain a separation of at least 1 foot between telephone and power wires.

3. RULES

3.01 The following rules will be observed when planning drop wire runs to buildings:

a. Locate the first building attachment where the drop wire span will have the required clearance from light or power wires, other foreign wires, and metallic objects.

b. Locate the first building attachment where tree interference (including future growth of existing trees) will be avoided. It is preferable to make a longer wire run on the building if the trees can be cleared.

c. Locate the first building attachment so the drop wire span can be placed with adequate sag.

d. If possible, locate the first building attachment at the same point when two or more drop wires to a building are involved. The location of the initial and subsequent attachments should provide satisfactory wire runs in the span and on the building.

e. If possible, locate the first building attachment so the drop wire will make a direct vertical run to the last attachment, provided the drop wire in the span would have adequate clearance from trees; would not be objectionable to concerned parties if it crosses adjacent property; or would not cross portions

of vacant lots on which buildings are likely to be erected.

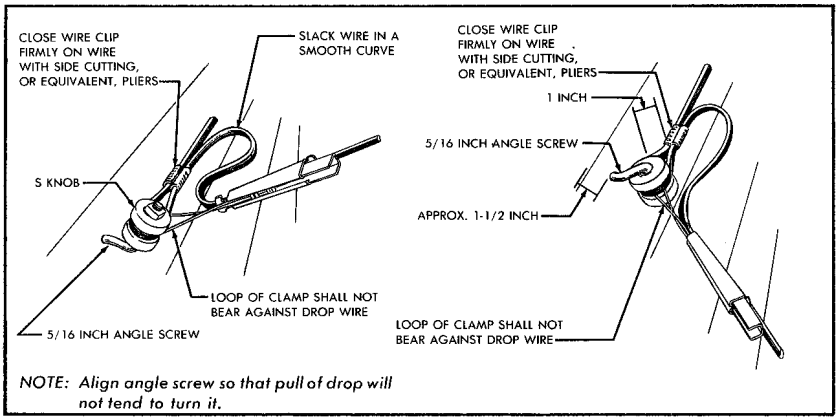
f. If possible, locate the first building attachment so ice and snow falling from the roof will not strike the drop wire. If the drop wire in the span must pass under the sloping part of a roof, make the first attachment as near the eaves as possible.

g. The first attachment should be located so the anchors will not be placed less than 10 inches to a corner or top of a wall, except in turning corners.

4. TYPICAL FIRST ATTACHMENTS TO BUILDINGS AND STEEL STRUCTURES (Figures 1 through 9)

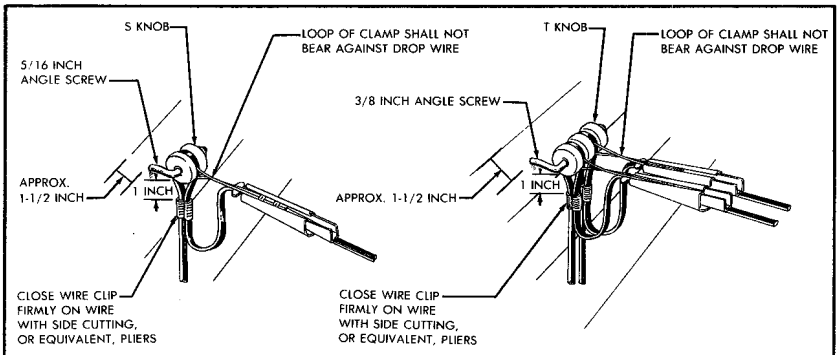
4.01 Tables A, B, C and D list anchoring devices of first attachments used on various surfaces.

4.02 Table E lists equipping information for first attachments.



NOTE: Align angle screw so that pull of drop will not tend to turn it.

FIGURE 1. First Attachment, Angle Screw (Drop Wire Run in Horizontal Direction On Building)



NOTE: Align angle screw so that pull of drop will not tend to turn it.

FIGURE 2. First Attachment, Angle Screw (Drop Wire Run in Vertical Direction On Building)

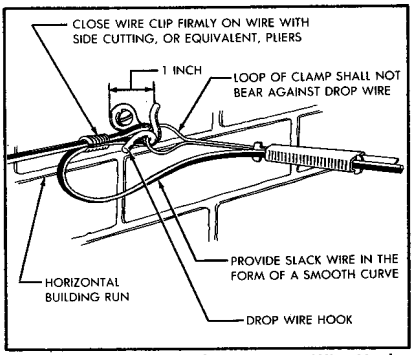


FIGURE 3. First Attachment, Drop Wire Hook

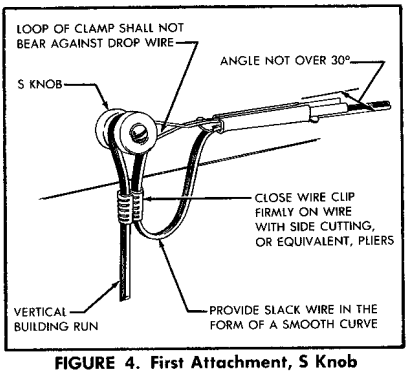


FIGURE 4. First Attachment, S Knob

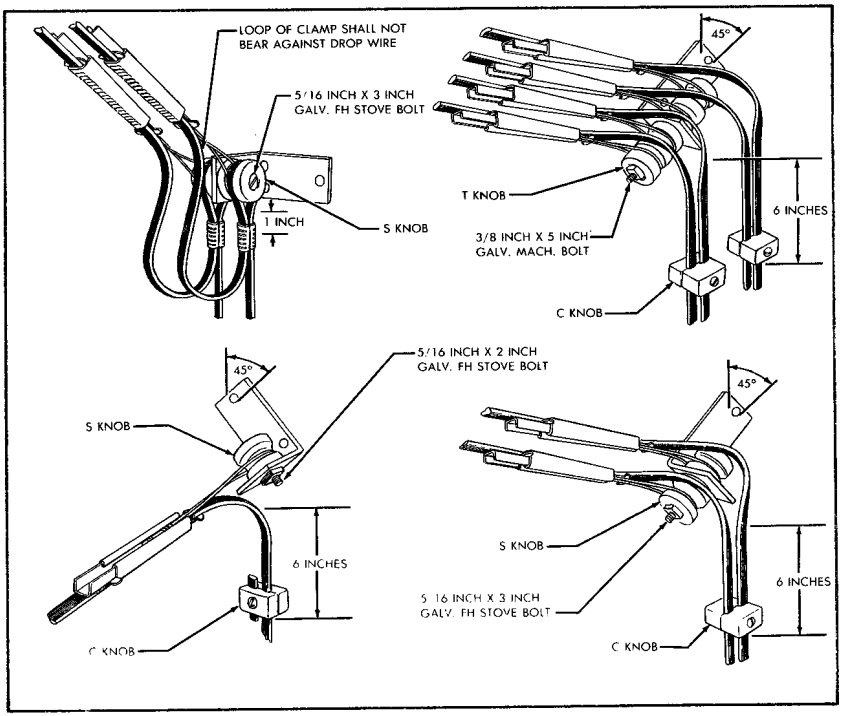


FIGURE 5. First Attachment, House Bracket (Drop Wire Run in Vertical Direction On Building)

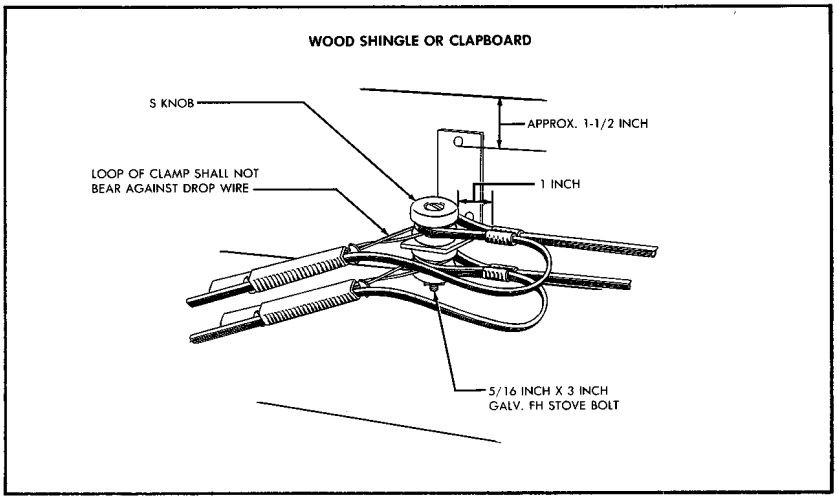


FIGURE 6. First Attachment, House Bracket (Drop Wire Run in Horizontal Direction On Building)

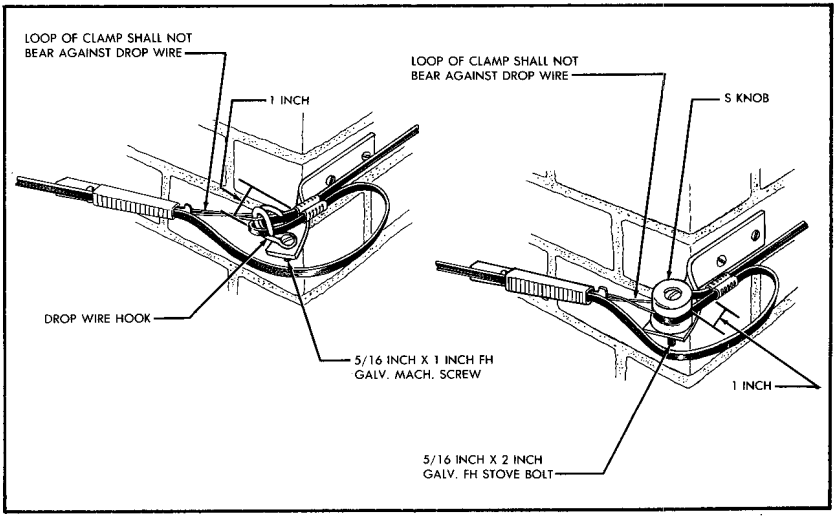
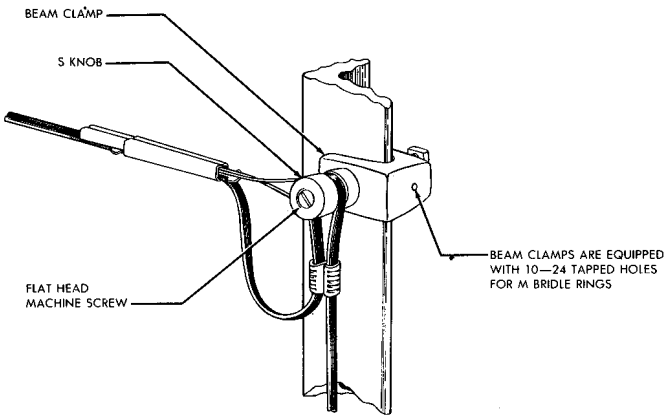
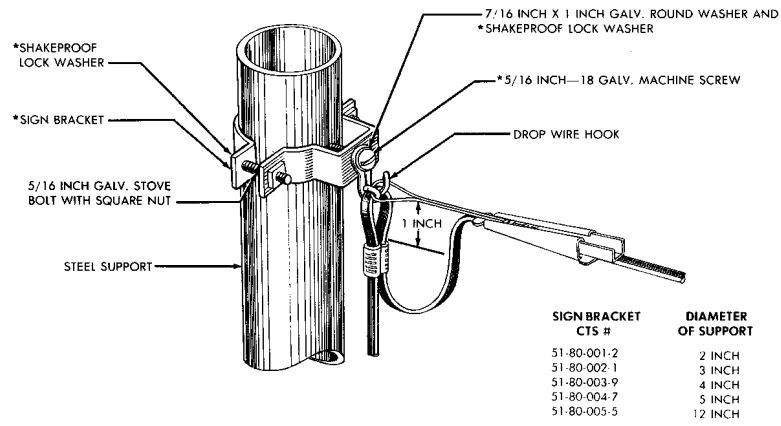


FIGURE 7. First Attachment, Corner Bracket



NOTE: Pull of drop wire must not tend to remove clamp from structure.

FIGURE 8. First Attachment, Beam Clamp



SIGN BRACKET CTS #	DIAMETER OF SUPPORT
51-80-001-2	2 INCH
51-80-002-1	3 INCH
51-80-003-9	4 INCH
51-80-004-7	5 INCH
51-80-005-5	12 INCH

**These items are furnished with sign bracket.*

FIGURE 9. First Attachment, Sign Bracket

TABLE A. Fasteners For Drop Wire Hook

WALL TYPE	FASTENERS		REMARKS
	QUANTITY	TYPE	
Wood Siding	1	2-in. No. 18 RH galvanized wood screw	Place screw in studding.
Stucco on Wood	1	2-in. No. 18 RH galvanized wood screw	Place screw in studding.
Rigid Composition Shingles	1	2-in. No. 18 RH galvanized wood screw	Drill Clearance hole to avoid splitting shingle.
Masonry or Substantial Brick Veneer*	1	5/16-in. by 1-3/4-in. drive anchor	Locate anchor in center of brick. Second drop wire hook should be located in separate brick.
Thin Wall Brick Veneer (Less Than 3-3/4 Inch Thickness)	1	6-in. No. 18 RH galvanized wood screw	Pass screw through the seam between bricks. Penetrate wood backing approximately 1 inch.
Hollow Tile	1	5/16-in. by 5-in. RH galvanized toggle bolt	Place 7/16 in. by 2-in. galvanized square washer between wall and drop wire hook.

**Do not use corner or top row of bricks.*

TABLE B. Fasteners For S and T Knobs

WALL TYPE	ATTACHMENT KNOB	FASTENERS		REMARKS	
		QUANTITY	TYPE		
Wood Siding	S	1	2-1/2 in. No. 18 FH galvanized wood screw	Place screw in studding.	
	T	1	3-1/2 in. No. 18 FH galvanized wood screw		
Stucco on Wood	S	1	3-in. No. 18 FH galvanized wood screw	Use 3-1/2 in.	If necessary to penetrate studding.
	T	1	3-1/2 in. No. 18 FH galvanized wood screw	Use 4-1/2 in.	
Rigid Composition Shingles	S	1	3-1/2 in. No. 18 FH galvanized wood screw	Drill clearance hole to avoid splitting shingle.	
	T	1	4-1/2 in. No. 18 FH galvanized wood screw		

TABLE B. Fasteners for S and T Knobs (Continued)

WALL TYPE	ATTACH-MENT KNOB	FASTENERS		REMARKS
		QUANTITY	TYPE	
Thin Wall Brick Veneer (Less Than 3-3/4 Inch Thickness)	S	1	7-in. No. 18 FH galvanized wood screw	Pass screw through the seam between bricks. Penetrate wood backing approximately 1 inch.
	T	1	7-in. No. 18 FH galvanized wood screw	
Hollow Wall	S	1	5/16 in. by 5 in. RH galvanized toggle bolt	Place flat side of S knob against bolt head.
	T	1	5/16 in. by 6 in. FH galvanized toggle bolt	

TABLE C. Fasteners For House Brackets

WALL TYPE	FASTENERS		REMARKS
	QUANTITY	TYPE	
Wood Siding	3	2-in. No. 14 RH galvanized wood screws	Place screw in studding.
Stucco on Wood	3	2-1/2 in. No. 14 RH galvanized wood screws	Place screw in studding
Rigid Composition Shingles	3	3-in. No. 14 RH galvanized wood screws	Drill clearance hole to avoid splitting shingle.
Masonry or Substantial Brick Veneer	2	5/16 in. by 1-1/4 in. B drive anchor	
Thin Wall Brick Veneer (Less Than 3-3/4 Inch Thickness)	2	6-in. No. 14 RH galvanized wood screws	Pass screw through the seam between bricks. Penetrate wood backing approximately 1 inch.
Hollow Wall	2	1/4 in. by 3 in. or 4 in. RH galvanized toggle bolt	

TABLE D. Fasteners For Corner Brackets

WALL TYPE	FASTENERS		REMARKS
	QUANTITY	TYPE	
Wood Siding	2	2-in. No. 14 RH galvanized wood screws	Place screw in studding.
Stucco on Wood	2	2-1/2 in. No. 14 RH galvanized wood screws	Place screw in studding.
Rigid Composition Shingles	2	3-In. No. 14 RH galvanized wood screws	Drill clearance hole to avoid splitting shingle.
Masonry or Substantial Brick Veneer	2	5/16 in. by 1-1/4 in. drive anchor	
Thin Wall Brick Veneer (Less Than 3-3/4 Inch Thickness)	2	6-in. No. 14 RH galvanized wood screws	Pass screw through the seam between bricks. Penetrate wood backing approximately 1 inch.
Hollow Wall	2	1/4 in. by 3 in. or 4 in. RH galvanized toggle bolt	

TABLE E. Equipping Drop Wire Attachments With S Knob, T Knob, Or Drop Wire Hook

ATTACHMENTS		EQUIPPED WITH			HARDWARE	REMARKS
		S KNOB	T KNOB	DROP WIRE HOOK		
Angle Screw	5/16 in.	1			Nut furnished	Place flat side of knob against beveled side of nut.
	3/8 in.		1			
House Bracket		1			5/16 in. by 2 in. FH galvanized stove bolt	Place flat side of first knob against house bracket.
		2*			5/16 in. by 3 in. FH galvanized stove bolt	Place flat side of second knob against beveled side of nut.
			1		3/8 in. by 3 in. galvanized stove bolt	Place flat side of first knob against bolt head.
			2*		3/8 in. by 5 in. galvanized machine bolt	Place flat side of second knob against nut.
				1	5/16 in. by 1 in. FH galvanized machine screw (obtain locally)	

TABLE E. Equipping Drop Wire Attachments With S Knob, T Knob, or Drop Wire Hook (Continued)

ATTACHMENTS		EQUIPPED WITH			HARDWARE	REMARKS
		S KNOB	T KNOB	DROP WIRE HOOK		
Corner Bracket		1			5/16 in. by 2 in. FH galvanized stove bolt	Place flat side of knob against corner bracket.
		2*			5/16 in. by 3 in. FH galvanized stove bolt	Place flat side of top knob against bolt head and place nut against flat side of lower knob.
			1		3/8 in. by 3 in. galvanized machine bolt	Place flat side of knob against bolt head.
				1	5/16 in. by 1 in. FH galvanized machine screw (obtain locally)	
Beam Clamps	D	1			5/16 in. by 2 in. FH galvanized stove bolt	Place flat side of knob against beveled side of nut.
	C		1		3/8 in. by 3 in. galvanized machine bolt	
	D			1	5/16 in. by 1 in. FH galvanized machine screw (obtain locally)	
	C					
Sign Bracket				1	5/16 in. by 3/4 in. RH galvanized machine screw	Machine screw and lock washers furnished. Obtain 7/16 in. by 1 in. galvanized round washer locally.

* *Locate one knob above and one knob below bracket.*

5. FIRST ATTACHMENTS ON LOW BUILDINGS

5.01 Paragraphs 4, 5 and 6 provide information on typical first attachments on low buildings using house fixtures provided by customers to obtain necessary ground clearance for drop wire.

5.02 Where house clearance fixtures are required but have not been provided, or where joint use of a fixture is impracticable, refer the matter to your supervisor.

5.03 Where clearance fixtures are provided but the required minimum ground clearance for drops cannot be obtained, refer the matter to your supervisor.

6. CLEARANCE FIXTURES AND METHODS OF ATTACHMENT

6.01 Figures 10 through 12 show typical clearance fixtures commonly provided by customers, and the recommended methods of making drop wire attachment. Where other types of fixtures are provided and different methods of making drop wire attachments are required, local instructions should be issued.

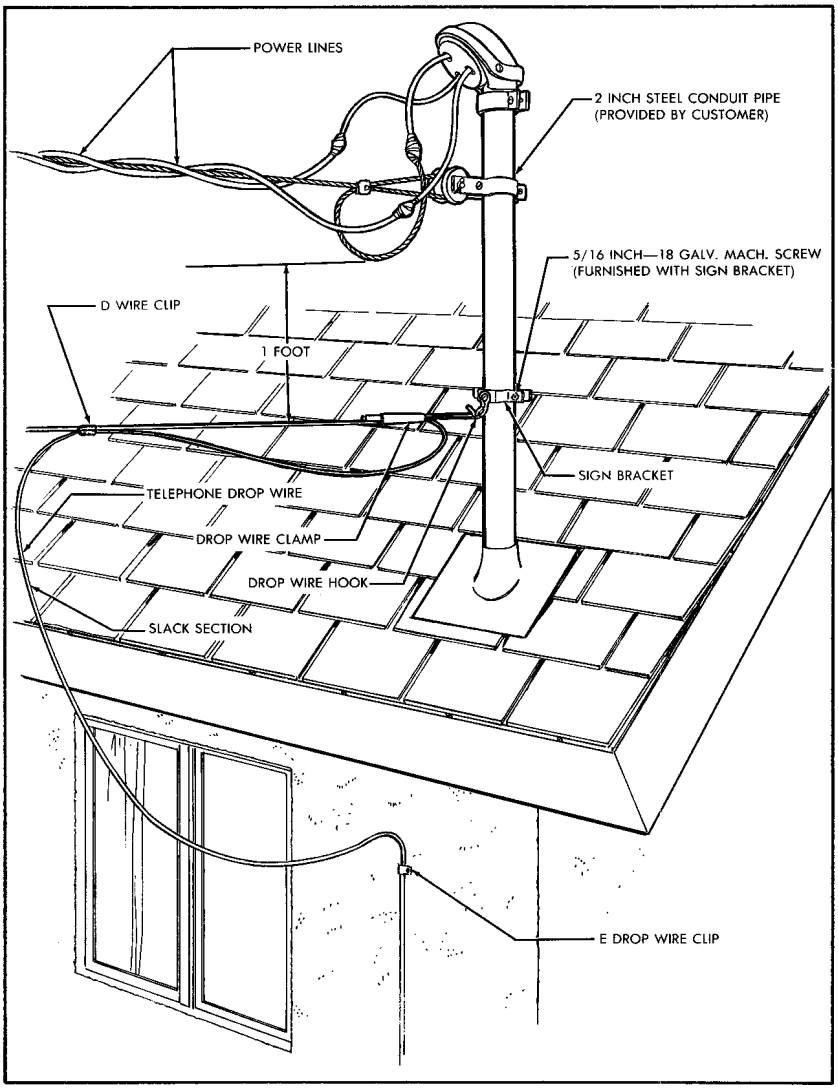


FIGURE 10. Drop Wire Attached To Power Fixture

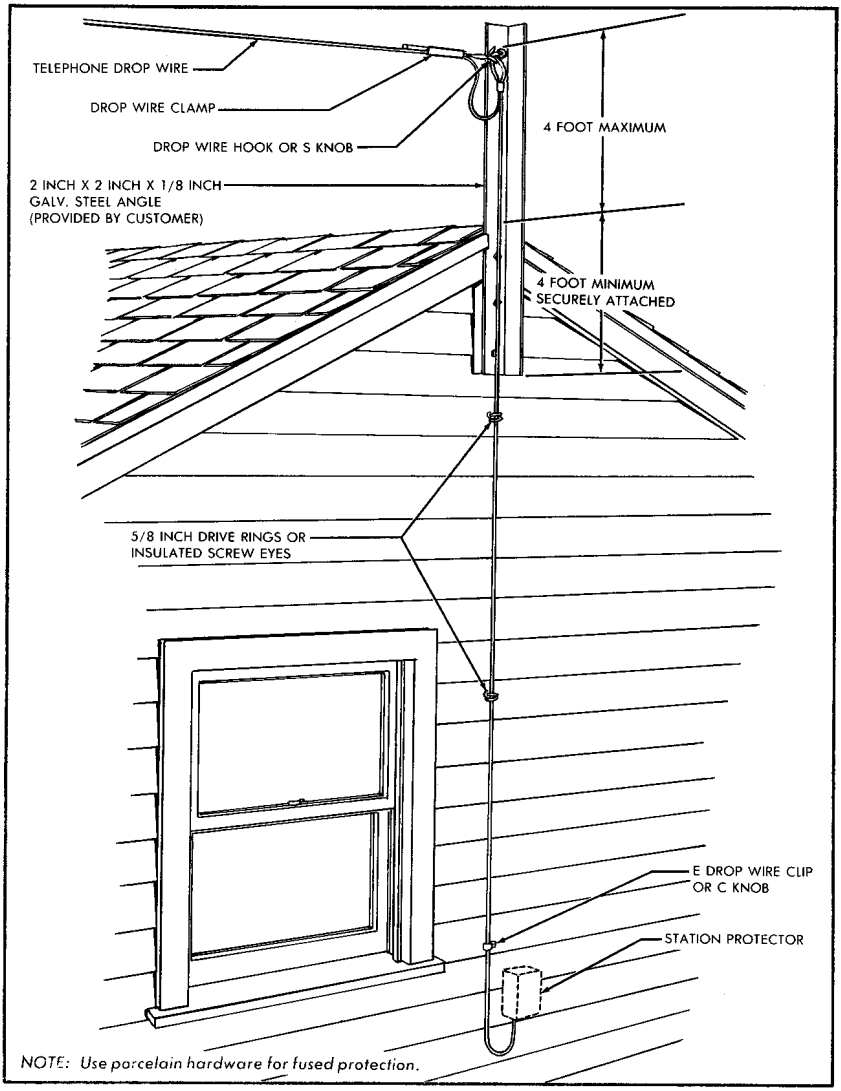


FIGURE 11. Drop Wire Attached To A 2-Inch Angle Iron

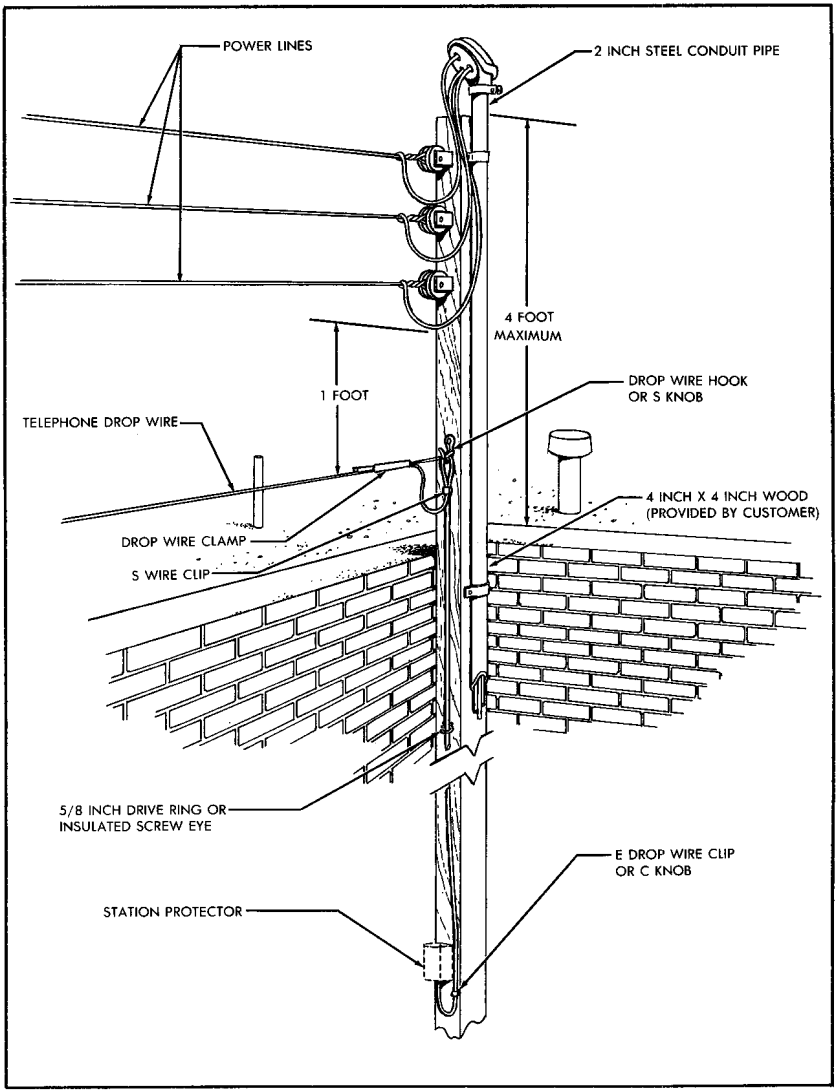


FIGURE 12. Drop Wire Attached To 1-Inch By 4-Inch Wood Beam

DROP WIRING

DROP WIRE RUNS ON AND INSIDE BUILDINGS FASTENING AND EQUIPPING INTERMEDIATE AND LAST ATTACHMENTS

CONTENTS

1. GENERAL

1.01 This practice provides information on material to be used and the rules to be followed for planning drop wire runs on buildings; the methods of fastening and equipping intermediate and last attachments; the methods of running drop wire on building walls and structures; and the methods of running drop wire inside buildings.

1.02 This practice replaces CTSP 475-300-401 and CTSP 475-300-415, all copies of which should be removed from the file and destroyed. See CTSP 475-302-401 for information on first attachments of drop wire runs.

1.03 The attachments to be used in any installation depend on a number of factors, such as:

a. Loading areas.

b. Number of drops to be placed.

c. Type of surface to be attached to.

d. Insulated or noninsulated attachments, etc.

1.04 The use of insulated or noninsulated attachments is covered in CTSP 475-500-402.

1.05 Where station protectors are required, plan the wire run so that the location of the point of entrance and the location of the station protectors conform to the methods covered in CTSP 475-500-405.

CAUTION: It is possible for foreign voltage to be present on buildings covered with metal siding. Test siding with B voltage tester before starting any work.

2. RULES

2.01 When planning drop wire runs on buildings, observe the following instructions:

a. Locate the drop wire run on the building giving consideration to permanency, accessibility, and appearance.

b. Locate runs preferably on the rear and side walls of a building.

c. Locate the run to require the minimum length of wire and as few turns as practicable. Keep runs horizontal or vertical.

d. Locate horizontal runs above the reach of the public.

e. If it would not appreciably increase the length of the run, locate vertical runs preferably in the angle formed by intersecting walls.

f. Locate the run to avoid light and power wires and so that it will encounter a minimum number of other obstructions.

g. Avoid runs on tin, sheet metal, or other materials requiring frequent repairs or renewals.

h. Avoid locating runs on walls which are likely to be added to, or on intermediate structures of a deteriorated or temporary construction. Select alternate routes.

i. Avoid vertical runs within 2 feet of a downspout where ice conditions are severe.

j. Do not make attachments to chimneys.

k. On building walls finished with stucco, rigid composition shingles, thin-wall brick veneer, and similar materials, locate attachments on wood trim if practicable and if the trim is sufficiently substantial to provide adequate support for the drop wire.

l. Maintain clearances from foreign wires. See CTSP 475-300-407.

2.02 Reuse an existing drop wire at a reinstallation wherever practicable. Inspect the wire carefully and, if necessary:

a. Tighten all loose rings and replace missing rings.

b. Replace spliced drop wire.

c. Where necessary, place mechanical protection around building projection, electrical conduits, and other obstructions.

d. If the insulation is weatherworn, replace the wire.

e. Remove strings or other foreign matter which may detract from wire run appearance.

3. SPACING OF ATTACHMENTS

3.01 Space drop wire attachments 6 feet apart or less on horizontal and vertical runs. For example, a 7-foot run would have attachments spaced 3 feet 6 inches apart.

3.02 Locate attachments so that fasteners will be placed no closer than 10 inches to the corner or top of a wall, except in turning corners.

3.03 Place additional attachments as required to keep exposed wires terminated at fused-type protectors from touching flammable surfaces.

3.04 When establishing a wire run on a building wall where cable has been placed, the wire run should parallel the cable run.

3.05 When paralleling cable is attached to building wall by cable clamps, place rings in every third cable clamp where clamps are 17 inches apart, and in every other cable clamp where clamps are 26 inches apart.

4. WIRE CARRYING CAPACITIES OF DRIVE RING, WIRE LOOPS, BRIDLE RINGS, AND INSULATED SCREW EYES

4.01 Table A shows the fastener to be used on drop wire attachments on various types of walls.

4.02 Table B shows the drop wire capacity of wire loops, drive rings, bridle rings, and insulated screw eyes.

5. INTERMEDIATE ATTACHMENTS ON BUILDINGS

5.01 Make all vertical or horizontal attachments on a straight line. For best results, fashion a plumb bob and hang from the first attachment. Use this as a guide.

TABLE A. Fasteners for Intermediate Attachments on Drop Wire

ATTACHMENT		FASTENER QTY	FASTENER TYPE		TYPE OF CONSTRUCTION		REMARKS
Wire Loops	No. 5/8 No. 1-1/4	1	Wire Loop Fastener	3/4 in. 1 in. 1-1/4 in.	Concrete Mortar Cinder Cement	Block	Fasteners for hand-type drive tools
Drive Rings	1/2 in.	1	3/16 in. x 5/8 in. Drive Anchor CTS # 68-21-001-9		Masonry or substantial brick veneer		
	5/8 in. and 7/8 in.	1	1/4 in. x 1 in. Drive Anchor CTS # 68-21-002-7				
	5/8 in. L* 7/8 in. L* 1-1/4 in. 1-1/4 in. L*	1	1/4 in. x 1 in. Drive Anchor CTS # 68-21-003-5				
C Bridle Rings	7/8 in.	1	No. 12 Plastic Anchor CTS # 68-21-034-5		Masonry or substantial brick veneer		
	1-1/4 in. 1-5/8 in.	1	No. 16 Plastic Anchor CTS # 68-21-034-5				
	3 in.						

** The L type is equipped with longer shank.*

TABLE A. Fasteners for Intermediate Attachments on Drop Wire (Continued)

ATTACHMENT	FASTENER QTY	FASTENER TYPE	TYPE OF CONSTRUCTION	REMARKS
B or M Bridle Rings	1	Utility Clip	Angle Irons, I beams, etc.	
C Knob (used only where fused protectors are required)	1	2-1/2 in. No. 10 RH galvanized wood screw	Exposed woodwork (outdoors)	Locate screw approximately 1 inch above bottom shingle or clapboard.
	1	2 in. No. 8 RH blued wood screw	Exposed woodwork (indoors)	
	1	3 in. No. 10 RH galvanized wood screw	Stucco on wood	
E Drop Wire Clamp	1	Headed Drive Pins 3/4 in.	Concrete	Fasteners for hand-type drive tools
		Headed Drive Pins 1 in.	Mortar	
		Headed Drive Pins 1-1/4 in.	Cinder Block / Cement Block	
	1	3/16 in. x 1 in. Plastic Anchor	Brick	
	1	1 in. No. 8 RH galvanized wood screw	Wood siding or shingle and metallic siding on wood	Locate screw approximately 1 inch above bottom shingle or clapboard.
	1	3/16 in. x 3 in. toggle bolt	Hollow wall	

* *The L type is equipped with longer shank.*

TABLE B. Attachment Capacity

TYPE OF RING OR INSULATED SCREW EYE	SIZE	MAXIMUM NUMBER OF WIRES	
		DROP WIRE	STATION WIRE
Drive Rings	1/2	2	3
	5/8 and 5/8 L*	6	9
	7/8 and 7/8 L*	16	22
	1-1/4 and 1-1/4 L*	30	40
Wire Loops†	No. 5/8	6	9
	No. 1-1/4	30	40
Bridle Rings	7/8	6	9
	1-1/4	16	22
	1-5/8	30	40
	3	100	140
A or M Bridle Rings	1-1/4	16	22
Insulated Screw Eyes	5/8 and L*	4	
	1 S and L*	10	

* *L represents longer shank.*
† *Install with suitable wire loop fastener.*

5.02 Drop wires extended with **fuseless protection** should be supported with the following attachments:

a. Drive rings on wood frame building.

b. Wire loops and a suitable wire loop fastener on masonry surfaces.

c. Toggle bridle rings on hollow surfaces.

d. Bridle rings as a substitute for drive rings when:

(1) Drive rings are likely to split woodwork.

(2) An intermediate support is needed for greater wire carrying capacity.

5.03 Drive rings equipped with a drive anchor, or bridle rings equipped with a plastic anchor may be used on masonry surfaces if they can be used to better advantage than wire loops.

5.04 Drop wire runs that require **fused protection** and that are to be attached to a flammable surface should be supported with porcelain hardware such as:

a. Insulated screw eyes.

b. A "C" knob may be used if not more than two wires are to be placed.

NOTE: Place drop wire in C knob so that tension is in a clockwise direction on C knob when only one drop wire is used.

5.05 Figures 1 through 8 illustrate spacing of typical wire runs using a variety of attachments.

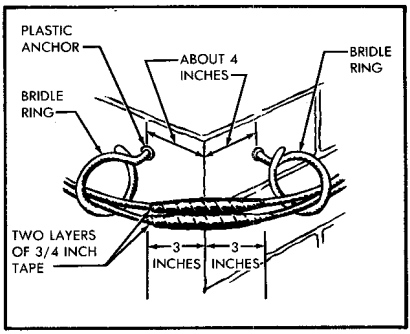


FIGURE 1. Bridle Ring

6. INTERMEDIATE ATTACHMENTS INSIDE BUILDINGS

6.01 Drop wire runs between the point of entrance and the station protector should be kept as short as practicable.

6.02 Exposed runs that require fused protection and attach to flammable surfaces should be supported with insulated attachments.

6.03 Space attachments 16 inches apart on runs between the point of entrance and the protector or connecting block. Spacing will vary at corners with type of attachment used. See Figure 5.

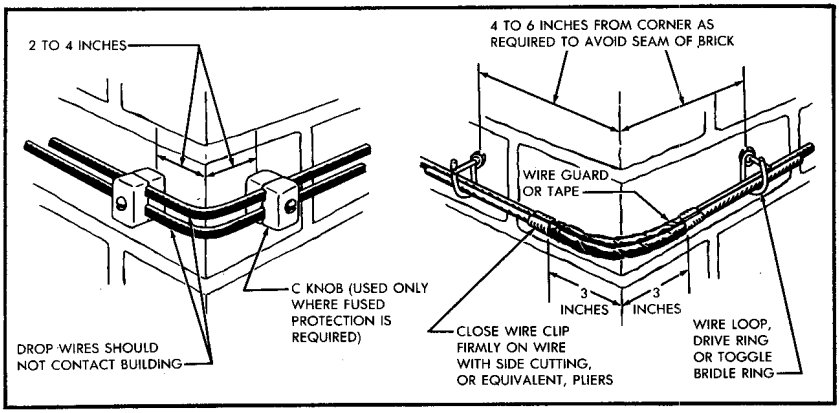


FIGURE 2. Intermediate Building Attachment at Outside Corner

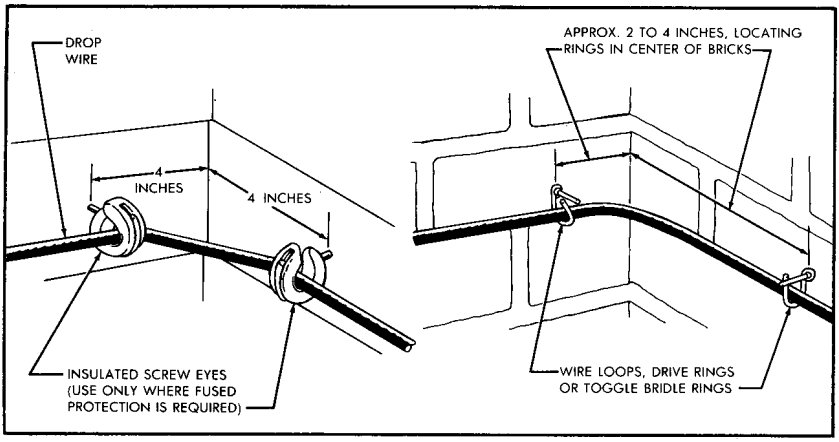


FIGURE 3. Intermediate Building Attachments at Inside Corners

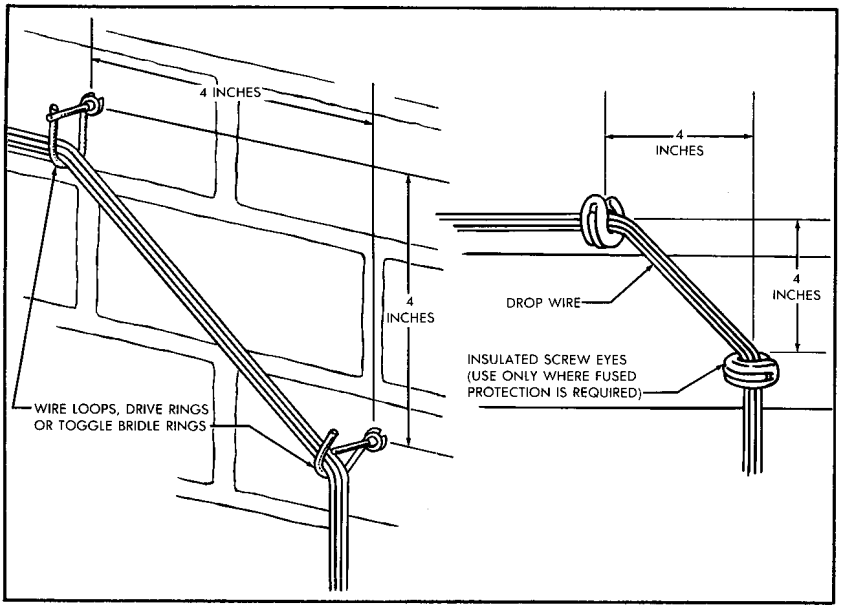


FIGURE 4. Intermediate Building Attachments to Change Direction of Wire Run

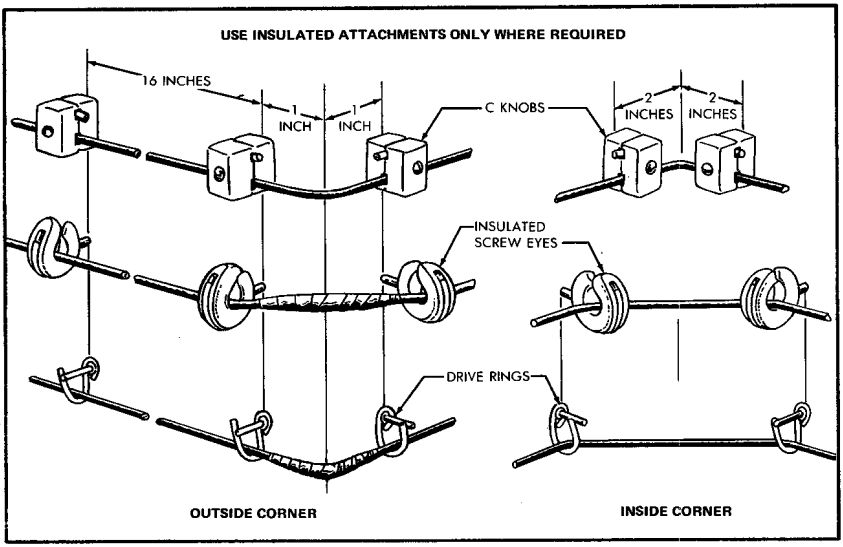


FIGURE 5. Attachments Inside of Building

6.04 Where drop wires are extended from unexposed plant, or from the station side of a fuseless protector, the method of fastening between the point of entrance and the connecting block or subscriber set is the same as for fastening station wire.

7. PARALLELING CABLE RUN

7.01 When establishing a wire run on a building wall where cable has been placed, attach the wire run as follows (Figure 6):

a. Place a drive ring or a C bridle ring in every third cable clamp where clamps are 17 inches apart.

b. Place the drive ring or C bridle ring in every other clamp where the clamps are 26 inches apart.

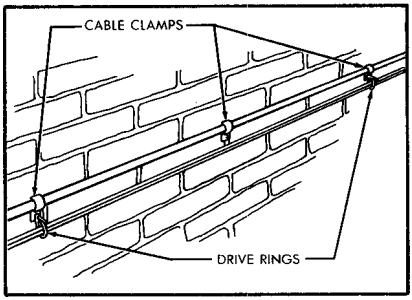


FIGURE 6. Drive Ring or Bridle Ring Run Paralleling Cable Attached with Cable Clamps

8. ATTACHING TO STEEL STRUCTURES

8.01 Manufacturing buildings, warehouses, piers, etc., require special means of attaching. Methods of attaching which have proven practicable are:

a. The utility clip (Figure 7), equipped with either a drive ring or the A or M bridle ring, is used to support wire runs on I beams, angle irons, etc., on beam thickness of 1/8 to 1/2 inch.

b. Beam clamps equipped with C or T knobs or bridle rings can be used in various applications to attach to I beams, angle irons, etc. See Figure 8.

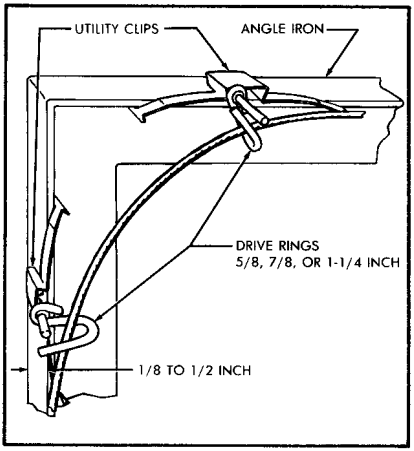


FIGURE 7. Utility Clips

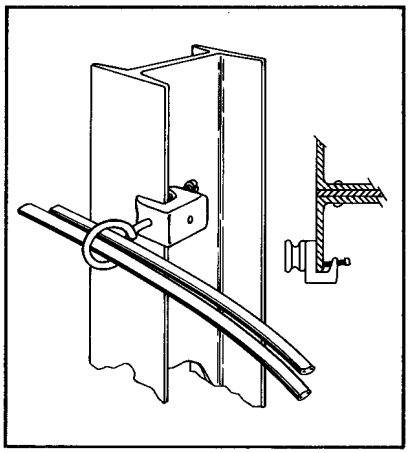


FIGURE 8. Beam Clamp and Bridle Ring

9. PARTY LINE TAPS

9.01 Party line taps should be avoided. When it is necessary to make a tap, use a wire terminal. In making a party line connection, a bridge may be made at the most accessible point in an existing wire run, provided this point is 50 feet or more away from the terminal, or if there is no space available on the binding posts for terminating the new party. If the most convenient point for bridging in the run is within 50 feet of the terminal, run the wire to the terminal, provided there is space available on the binding posts.

10. LAST ATTACHMENTS

10.01 The last attachment should be located within 18 inches of the building entrance hole.

10.02 Where fused protection is used, use a C knob or an S or T knob with a D Clip. The E drop wire clamp is used with fuseless protection.

10.03 Place drop wire in C knob so that tension is in a clockwise direction on C knob when only one drop wire is used.

10.04 See Figure 9 for typical arrangements for last attachments.

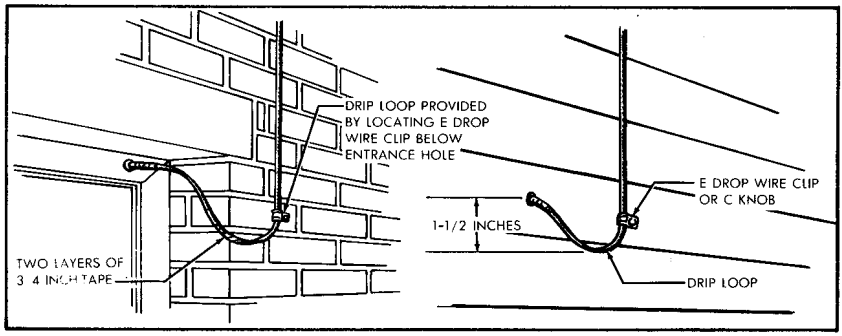


FIGURE 9. Last Attachment, Building Entrance Hole

11. BUILDING ENTRANCE HOLES FOR DROP WIRES

11.01 Use plastic tubes at building entrance holes for drop wire where fused protection is required and the wire passes through a flammable surface. Place tube as shown in Figure 10. Cut plastic tubes with a hacksaw or diagonal pliers. Do not use split tubes at entrance holes.

11.02 When drilling building entrance holes, consider the following:

a. Drill holes away from side where appearance is most important.

b. Slope holes upward from outside.

c. Use seams when drilling through masonry.

d. Take care to avoid splintering wood or cracking masonry or brick.

e. Drill clearance hole on all types of shingle siding.

11.03 Sizes of building entrance holes for wires and plastic tubes are shown in Table C.

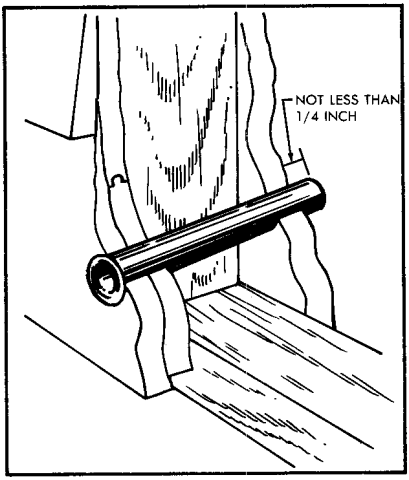


FIGURE 10. Placing Tube

TABLE C. Sizes of Building Entrance Holes for Drop Wires and Plastic Tubes

NUMBER OF DROP WIRES	1	2	3	1	2	3	4
	Plastic Tube Required			Tube Not Required			
Tube Size, Inch	3/8	1/2	5/8				
Entrance Hole Size, Inch	1/2	5/8	3/4	3/8	1/2	5/8	3/4

SELECTION OF ROUTE FOR STATION WIRE AND CABLE

CONTENTS

1. GENERAL

1.01 This practice provides recommended guidelines for routing and installing station wiring and cable.

1.02 This practice is issued to provide:

a. All telephone employees with the same information that the building industry consulting service gives to developers, architects, contractors, and building owners.

b. More detailed information and requirements pertaining to the use of false ceilings for concealing telephone plant.

c. Requirements for concealing wires and cables in walls.

d. Revised procedures to follow for advance wiring.

1.03 In addition to the conditions outlined in this practice, certain local building codes may add further restrictions to the placement of cables in buildings. If the local building codes exceed the requirements of telephone company standards the building codes will apply. If telephone company standards exceed the requirements of the local building codes, the telephone company standards will apply.

NOTE: Know the requirements of local building codes. Be sure concealed cabling satisfies fire codes.

2. UNUSUAL BUILDING ENTRANCES

2.01 Entrances at Metal Frame Windows and Doors:

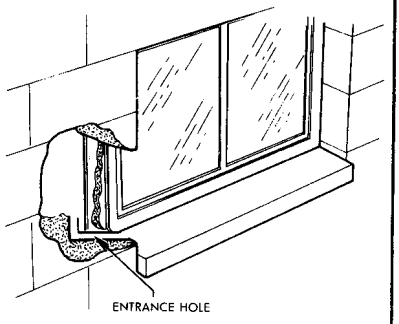
a. Do not make entrance through metal door frames.

b. When a metal window frame is set in masonry or bricks, enter as shown in Figure 1.

c. Bore hole in mortar joint as shown in Figure 2. Be sure slot is deep enough so wire is cleared when shutter or screen is operated.

NOTE: Wires or cables should ***not*** *be placed in conduits or raceways which contain electric wires not properly separated by partitions from the space provided for telephone wires or cables.*

d. Locate hole as shown in Figure 3 to avoid drilling through two shingles.



NOTE: Bore hole from both sides to pass around frame.

FIGURE 1. Entrance at Metal Window

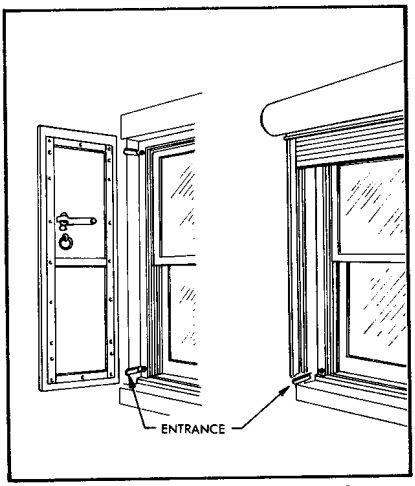


FIGURE 2. Entrance at Shutter or Fire Screen

3. GENERAL INSTALLATION REQUIREMENTS

3.01 General Notes Pertaining to Telephone Facilities Installation:

a. Seal all conduit ducts at each end between underground terminals or utility poles and the customer's premises. A weatherhead may be used if the conduit terminates above ground.

b. Inside wire runs and outlets: A telephone outlet consists of a convenience outlet or plaster ring with a telephone cover plate and a suitable wiring channel.

(1) Conduit should be used where inside wire runs have turns or go through a plastered ceiling, such as in a garage. Conduit is normally provided by customer.

(2) Pull wires may be used instead of conduit where a run is short and is vertical to an unfinished readily accessible area, such as a basement, garage, etc. Pull wires should be No. 14 single A.W.G. or the equivalent.

(3) Avoid attic runs wherever possible.

c. Interior wiring in buildings to provide telephone service to the occupants will be furnished, installed, and maintained by the telephone company.

d. Advance wiring may be provided in the following instances:

(1) In unfinished buildings, such as apartment houses, multi-unit dwellings or other living quarters.

(2) When service orders have been issued in advance, pending the availability of facilities to connect service.

3.02 Figure 4 and Table A show various points which should be considered when selecting routes for wire and cable.

3.03 Facilities to Look For:

a. Existing conduits or raceways.

b. Existing wiring or cable.

3.04 Placement of Wiring or Cable:

a. Run wire or cable horizontally or vertically in a straight line.

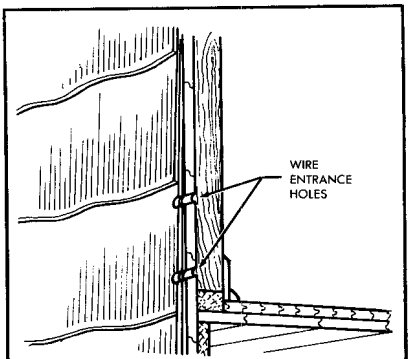
b. Use baseboards or other trim where conduit is not provided.

c. Make use of wooden surfaces in preference to others where possible.

d. Keep runs short as possible.

3.05 After location of first attachment has been determined, consider the following:

a. Locate the station wire run on the building



NOTE: Avoid drilling holes through 2 shingles.

FIGURE 3. Entrance Through Composition Shingles

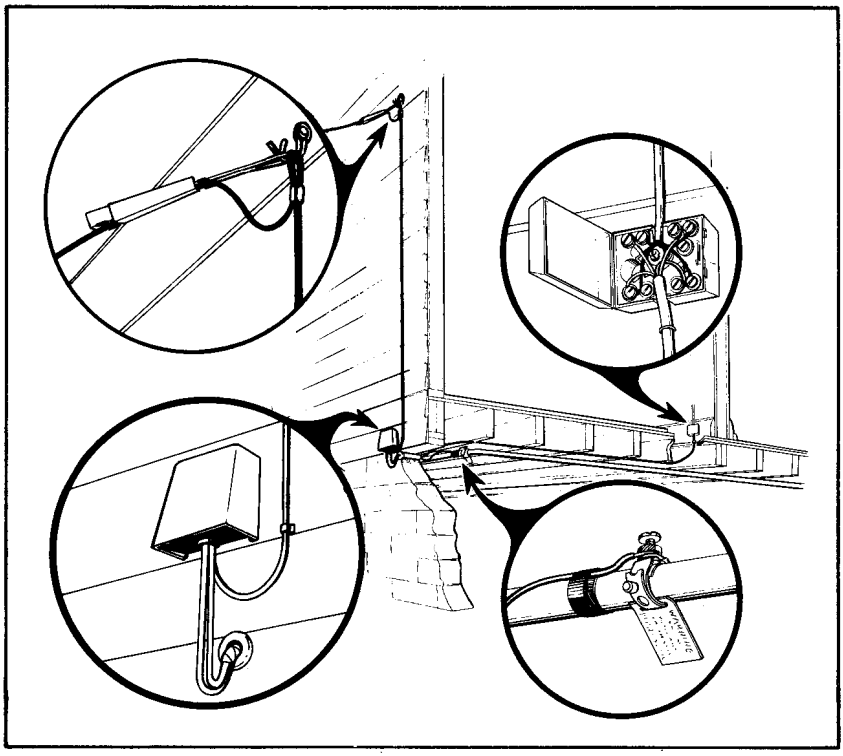


FIGURE 4. Typical Wiring Routes

with a view to permanency, and accessibility.

b. On building walls finished with stucco, rigid composition shingles, brick veneer, and similar materials, locate attachments on wood where practicable.

c. Locate preferably on the rear and side walls of a building.

d. Place horizontal run above the reach of the public.

e. Do not run wires in front of signs, doors, windows, fire escapes, awnings, etc.

f. Do not place wire runs on walls which are likely to be built against.

g. Avoid locating on intermediate structures of a deteriorated or temporary construction; select alternate route.

h. When making a wire run on a building wall near cable, proceed with one of the following methods:

(1) Use rings installed with cable clamps.

(2) Remove nails or screws that hold cable clamps and replace with drive rings.

(3) Install separate wire run paralleling cable.

TABLE A.
IF NO ENTRANCE CONDUIT

TYPE OF CONSTRUCTION	POINT OF ENTRANCE				
	WOODEN WINDOW FRAME	WOODEN DOOR FRAME	FOUNDATION SILL	OUTSIDE WALL*	METAL WINDOW FRAME
Masonry or Brick	•	•			•
Wood or Stucco on Wood (basement ceiling unplastered)	•	•	•	•	
Wood or Stucco on Wood (basement ceiling plastered)	•	•		•	

*To wire direct to set or connecting block.

3.06 Avoid the following locations when placing wire or cable:

a. Damp locations.

b. Locked storerooms, etc.

c. Temporary structures.

d. Runs that provide support for foreign objects.

e. Excessively hot locations, steam pipes, etc., run wires over rather than under pipes.

f. Locations where wires and cables will be subjected to abrasion.

3.07 In explosive atmospheres, locate and install wiring as instructed in accordance with the equipment being installed.

a. In explosive areas, all telephone lines must run through conduit and be sealed up on completion.

b. Explosive type telephone set must be used.

3.08 Requirements for Ground Wire Runs: (See CTSP's 475-500-405, 475-500-410 and 475-300-407).

a. Make runs as short as possible.

b. Locate wire where it is least likely to be disturbed.

c. Run protector ground wire exposed, except where conduit has been provided.

d. Do not place protector ground wire in ring runs.

e. Signal ground wire may be placed in ring runs.

f. When existing protector ground wire has become enclosed by a ceiling or partition, reuse if continuity can be checked and ground clamp is accessible.

g. Avoid sharp corners.

h. Do not place any coils in ground wire.

i. Use proper size.

4. MAKING USE OF WIRE DISTRIBUTION SYSTEMS

4.01 Distributing Systems in Office Buildings:

a. Office buildings are generally provided with an exchange cable terminated in a main terminal on the ground floor and distributed to each floor through a building or house cable, or the exchange cable may be distributed directly to each floor.

b. For information regarding the building conduit system, consult the plan at the main terminal or contact the building superintendent.

4.02 Distributing Systems in Apartment Houses, Hotels, and Hospitals:

a. Generally, these buildings provide a main terminal location in the basement or ground floor and a wall conduit system to each apartment or room.

b. In large buildings, there may be house cable from the main terminal to each floor with a terminal on each floor and conduits to the various apartments or rooms from the floor terminal.

5. SELECTION OF EXPOSED WIRING ROUTE

5.01 Generally, an exposed wire route should be used only where no concealing facilities are available.

5.02 Wiring in Finished Rooms and Offices:

a. Run wires along baseboards, on top of moldings, or on door or window casings, so that they will be as inconspicuous as possible. See Figures 5 and 6.

b. Where trim cannot be followed, run wires horizontally or vertically but not diagonally.

5.03 Wiring in Cellars, Factories, Storerooms:

a. Place wire and cable where they will be least likely to be broken or detached. Provide mechanical protection if necessary.

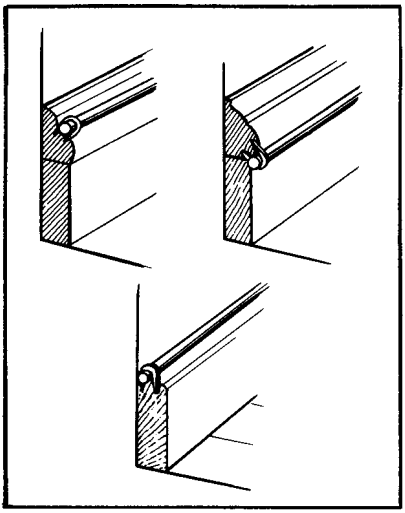


FIGURE 5. Wiring to Baseboards

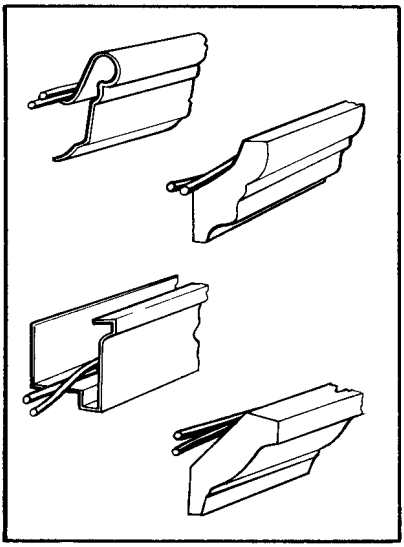


FIGURE 6. Wiring in Picture Moldings

b. Consider the shortest, most direct right-angle route unless otherwise specified.

c. Select a wire route which will be safe and accessible.

d. Follow the ceiling line rather than baseboard in heavily traveled passageways.

e. If necessary to follow chair rails, use the underside.

f. When possible, follow joists.

g. If necessary to span joists, run wiring not more than 3 inches from wall. See Figure 7.

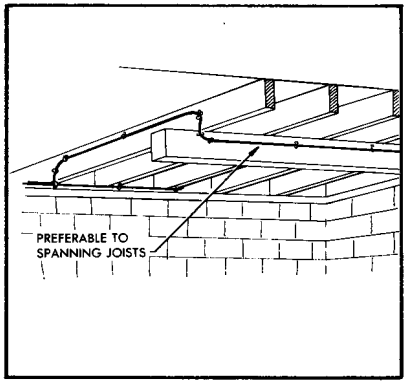


FIGURE 7. Spanning Joist

6. USING CONCEALED AND OVERFLOOR CONDUITS

6.01 Consider the following factors when using conduits:

a. Conduit should be used whenever it is provided for telephone wires and meets the prescribed specifications.

b. Check to be sure conduit does not contain electrical wires not associated with telephone equipment.

c. Consult the building people before extending wiring beyond the provided system.

d. When necessary to provide wiring through concrete floors or similar construction from floor to floor and conduit is not provided, inspect premises for pipes through floor which may be provided for such use.

7. PLACING STATION WIRE AND CABLE IN BUILDING RISER SHAFTS

7.01 Building riser shafts are usually of two types:

a. Closed riser shafts consist of a series of closets, aligned vertically one above the other, usually beginning in the basement and extending throughout the height of the building. The closets are interconnected by a cable slot or pipe sleeves through the floors.

(1) Polyethylene sheath cable may be placed if fire stops are placed in the slots or floor ducts at each floor. Fire stops should consist of a packing of asbestos or fiber glass with a thin topping of water plug cement or equivalent.

(2) If lead sheath cable or polyvinyl chloride (PVC) jacketed station wire and inside wiring cable is placed, fire stops are not required.

b. Open riser shafts usually extend from the basement to the roof of the building with no floor separations. They are similar in construction to elevator shafts.

(1) The use of polyethylene sheath cable is restricted unless it is enclosed in a noncombustible conduit.

(2) Lead sheath cable and PVC jacketed station wire and inside wiring cable may be placed with no restrictions.

NOTE: PVC jacketed wire and cable shall not be placed in ventilator or return air ducts unless in conduit.

8. USE OF AREA ABOVE SUSPENDED CEILINGS

8.01 It is not recommended to use the area above a suspended ceiling for concealing telephone plant. Avoid it whenever possible because of the following disadvantages:

a. The necessity of working on ladders over desks or other objects creates a safety hazard.

b. The employees of the tenant lose working time while the telephone employee works over their desks to install, maintain, rearrange, and remove telephone plant.

c. Expenses are incurred by the owner and the tenant when opening and closing ceilings for access by telephone employees.

d. The telephone employee loses time while waiting for the ceiling to be opened.

e. It is difficult to avoid low beams, air ducts, power conduits, etc., when placing telephone plant after the ceiling has been installed.

f. There is a possibility of damaging or soiling ceilings.

g. There is a possibility of telephone cables picking up interference from induction and causing noise in working circuits.

h. There is a possibility of having to rearrange telephone cables due to the addition or rearrangement of air conditioning ducts or other services.

i. Some fire codes prohibit using the area above suspended ceilings.

8.02 A ceiling distribution system is considered a last choice. An adequate underfloor raceway or conduit system is preferable. When it cannot be avoided, use the area above the suspended ceiling if the following conditions are agreed on by Telephone Company and builder/owner.

a. The area above a suspended ceiling is to be used only for telephone service on the same floor so that the **occupants** of one floor are not disturbed by telephone work for the **occupants** of another floor.

b. Whenever access is required, the ceiling shall be opened and closed by the building owner or customer.

c. Building entrance cables and house feeder or distribution cables require conduit.

d. Areas with solid or interlocking suspended ceilings require conduit.

e. Clear working space for placing wires and cables must be available and not blocked by vent ducts, pipes, supports, or other equipment.

f. Opening of fire walls to permit the passage of telephone wire and cable shall be completed by the building owner or the customer.

g. Telephone terminals properly sized and spaced to keep wire or cable runs to a maximum of 150 feet are required.

h. Suitable supporting structures of the type(s) outlined in paragraph 9 must be provided to support inside wires and station cables. Such supporting structures shall be placed by the building owner or customer.

i. No deviations from the preceding conditions shall be made without prior review by your local Engineering Department.

8.03 Whenever possible, avoid disturbing other tenants on the same floor where telephone service is being installed.

9. SUPPORTING STRUCTURES ABOVE FALSE CEILINGS

9.01 Make every attempt to secure the following type(s) of supporting structure(s) when placing inside wires or station cables above suspended ceilings:

a. Conduit.

b. Cable trays.

c. J-hooks.

d. Wire loops.

9.02 If none of these types of supporting structures can be obtained, inside wires or station cables can be placed directly on the main runners and/or cross runners (T-bars) of the false ceiling hardware, provided the conditions in paragraphs 9.03 through 9.05 are adhered to.

9.03 Inside wires and station cables that do not exceed a total of 500 pairs within a 4-foot section of the ceiling may be placed directly on the ceiling runners if the supporting structure(s) outlined in paragraph 9.01 cannot be obtained. Cable runs supported on the ceiling hardware should be placed as close as possible to the hangar wires.

9.04 Major runs of inside wires and station cables should be placed in the type(s) of supporting structures mentioned in paragraph 9.01 in **new buildings** or sections of existing buildings that have been **completely renovated.**

NOTE: A major run is a run that could ultimately exceed any combination of 500 total pairs.

9.05 In existing buildings, additional cables should not be added to any run supported on the ceiling runners if the combination of new and existing wires and cables will exceed 500 pairs within a 4-foot section of the ceiling. If the combination of new and existing wires and cables exceeds this limit, a route along another row of hangar wires should be selected.

a. Exercise care when working in false ceiling spaces to avoid distorting or damaging the ceiling.

b. Avoid blocking access tile in "limited access" type ceiling. Also avoid placing cables on or against any light fixtures.

10. TELEPHONE ZONES

10.01 The floor area to be served shall be divided into telephone zones consisting of not more than 400 to 600 square feet (between four adjacent columns).

a. To feed the telephone zone, the building will usually have a continuous length of 2-inch conduit in the ceiling space, properly supported to permit the pulling-in of cables. This conduit should extend from the nearest telephone terminal or apparatus closet and left open-ended at the midpoint of each telephone zone as illustrated in Figure 8.

b. For floor areas where the 2-inch conduit to the telephone zones is not available and where a number of inside wiring cables are to be placed loosely in the ceiling, adequate open-top cable supports (J-hooks) are required. These cable supports should be located on 5-foot centers and must be provided by the building owner to avoid damage to the ceilings because of cable weight.

11. USE OF WALLS OR PARTITIONS

11.01 The following conditions apply if hollow core walls or partitions are used for concealing telephone wire and cables:

a. The hollow core walls or partitions must be clear and unobstructed.

b. Opening of walls and partitions and the installation of outlet boxes are the responsibility of the building owner or customer.

c. A pull wire is required from all outlet boxes to the approved supporting structure above the suspended ceiling.

d. Use only vertical pull wire runs. If bends or horizontal runs are necessary, conduit is required.

NOTE: Fulfilling the above items shall be the responsibility of the customer.

11.02 If fire blocks, sound deadening materials, or insulation is used in the construction of walls or partitions, conduit must be run from the outlet to the approved supporting structures above the suspended ceiling.

11.03 Telephone employees shall not fish walls or partitions in commercial buildings.

11.04 Where it is planned to use walls or partitions to conceal inside wiring cables down from ceilings, a minimum of 1-1/2 inches in diameter is required to permit the connector end of the cable to pass from the top of the wall to the outlet box above floor. The following are recommended:

a. 1-1/2 inch conduit in wall or partition to outlet box. See Figure 9.

b. 1-1/2 inch square clear space between partition sections with snap-in panel or cover. See Figure 10.

c. Smaller conduit is suitable when no amphenol type of connector is on the cable.

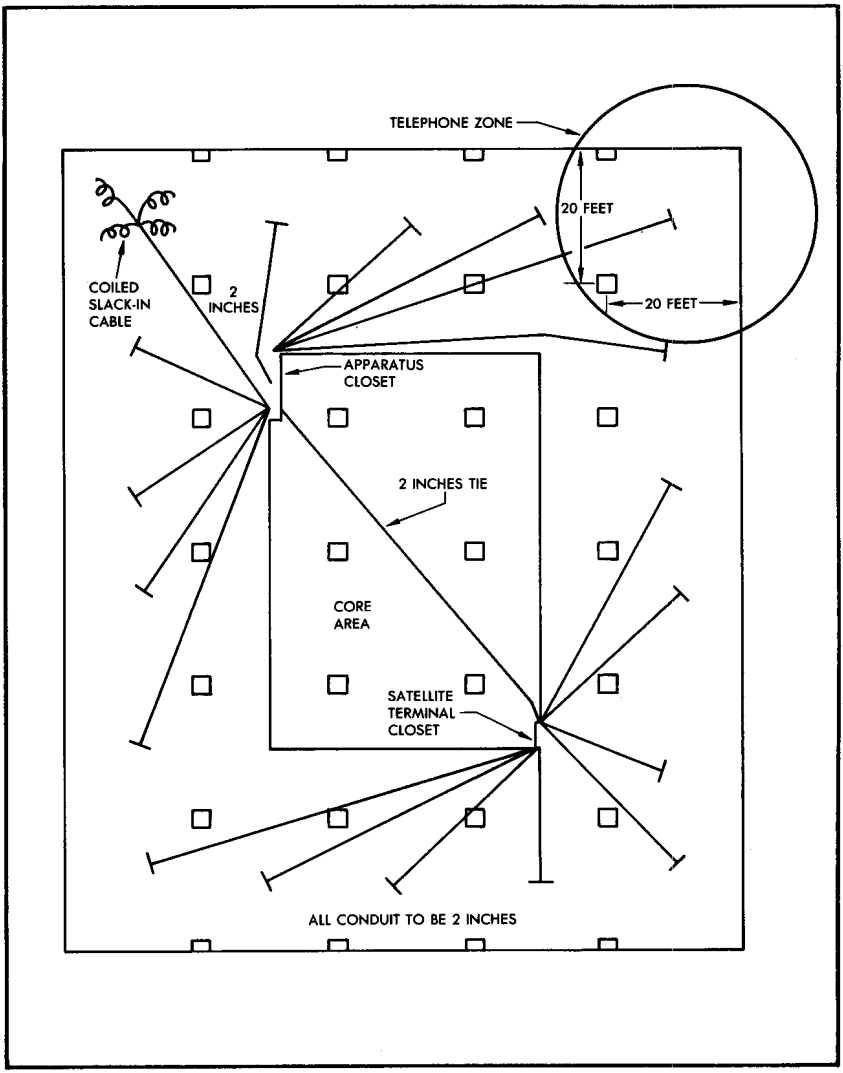


FIGURE 8. Typical Ceiling Distribution System Using Conduit to Telephone Zones

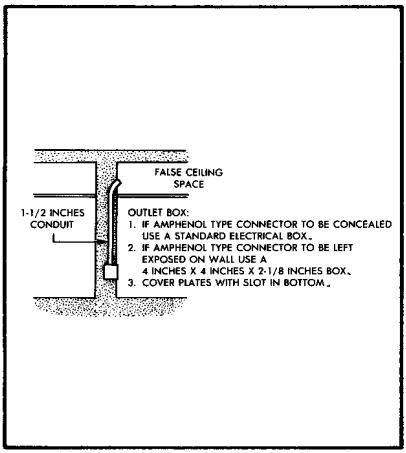


FIGURE 9. Conduit in Wall

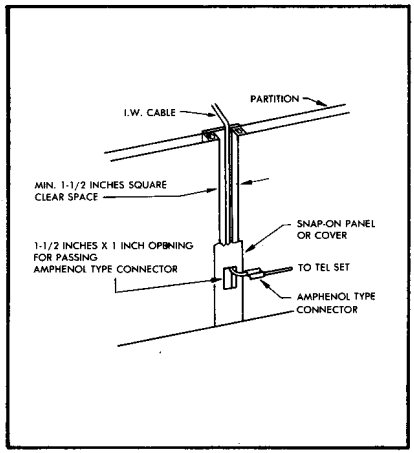


FIGURE 10. Partition Design

CONCEALING WIRE AND CABLE WITHOUT CONDUITS OR RACEWAYS

1. GENERAL

1.01 This practice outlines the procedures to follow in concealing wire and cable without conduits or raceways.

2. FISHING WIRE AND CABLE IN WALLS

2.01 Consider making runs on the outside of the building rather than fishing walls. Fish wire and cable only where appearance will not permit exposed runs, in accordance with local instructions.

a. Consider runs through closets, cupboards, etc., rather than fish.

b. Do not place plastic cable in shafts without baffles, because of fire hazards.

c. Where customer will not permit an exposed run and excessive time is required to conceal the run, consult your supervisor.

2.02 Fishing from Upper Floor to Basement:

a. When fishing from the upper floor to the basement, consider the type of construction used in the building.

b. Consider the location of obstructions.

c. Never fish between two studdings when electric light wiring is present. Presence of electric wiring is generally indicated by light switches, fixtures, or outlets.

d. In order to drill through obstructions between floors, the molding at baseboard and floor should be loosened. Consider the following procedure in loosening and replacing molding:

(1) Place a wood chisel under or in back of the molding and pry up or out gently.

(2) Then place a screw driver between molding and baseboard. See Figure 1.

(3) Pry carefully with chisel and screw driver to loosen nails which have been driven diagonally.

(4) Move tools forward as the molding is loosened and keep tools as near nail locations as possible.

(5) Loosen molding only as far as necessary to provide room for boring.

(6) Withdraw nails from molding by pulling the head through to the underside with diagonal pliers.

(7) Removing nails this way leaves the paint and putty undisturbed on the face of the molding.

(8) When replacing the molding, remove all dirt and chips from behind the molding and press the molding back into position, starting at the unloosened end.

(9) Fasten molding with thin wire finishing nails.

e. In general, no obstructions will be found in fishing brick or ballon (no obstructions between studs) frame houses. See Figure 2.

f. When fishing walls with obstructions, proceed as follows: See Figure 3.

(1) Loosen molding above baseboard on upper floor and drill hole downward through wall and plates above joist.

(2) Loosen molding at baseboard on upper floor and drill hole downward through floor and plates below joist.

(3) Loosen molding above baseboard on first floor and bore downward through wall and plates.

(4) On upper floor, pass fishing chain with twine attached through hole above baseboard, and with a piece of wire, hook chain through hole at baseboard and pass it through plates.

(5) On first floor, find fishing chain through hole above baseboard and pass it through plates.

(6) If basement has a ceiling, drill hole upward at location of chain and fish it out into basement.

(7) Tie on wire and pull it up to upper floor by use of twine.

g. When location of set, connecting block, etc., is some distance above baseboard, drill hole at location and fish from there down, proceeding as outlined in paragraph 2.02.

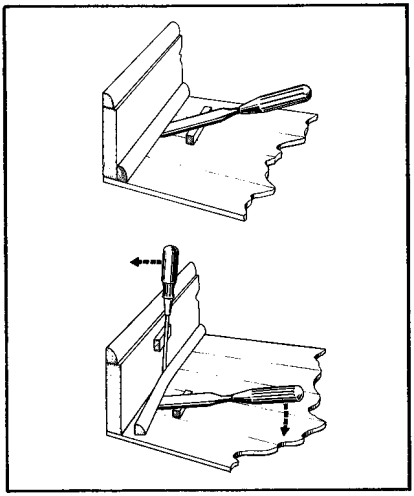


FIGURE 1. Procedure for Removing Molding

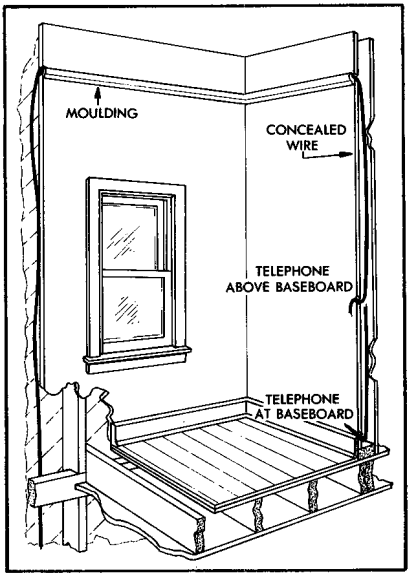


FIGURE 2. Locating on Inside Wall

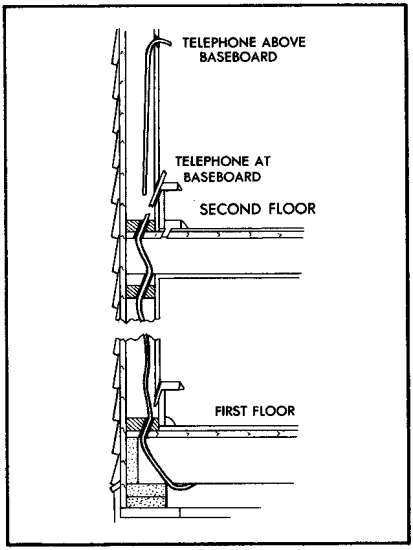


FIGURE 3. Fishing Outside Walls

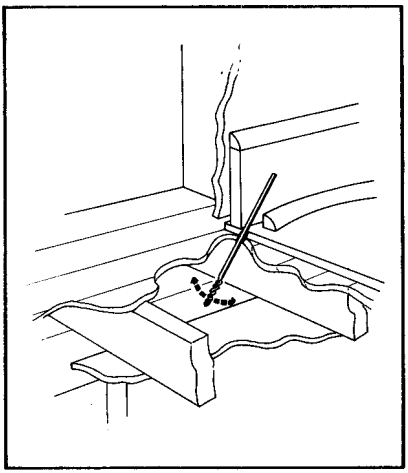


FIGURE 4. Locating Plates

(1) When drilling plates, locate them by feeling with the bit to determine proper position for drilling as shown in Figure 4.

(2) In locating the telephone connecting block, etc., on an inside wall, proceed as shown in Figure 2.

(3) Some of the obstructions which may be encountered are shown in Figure 5.

NOTE: If locations of obstructions are not known or cannot be determined readily, bore hole with search bit to locate them. Use caution when searching for obstructions. Avoid using search bit unless absolutely necessary.

2.03 Fishing Walls on the Same Floor:

a. Make runs on baseboards or around door and window frames where permissible.

b. Sound out walls or partitions by tapping lightly before attempting to fish.

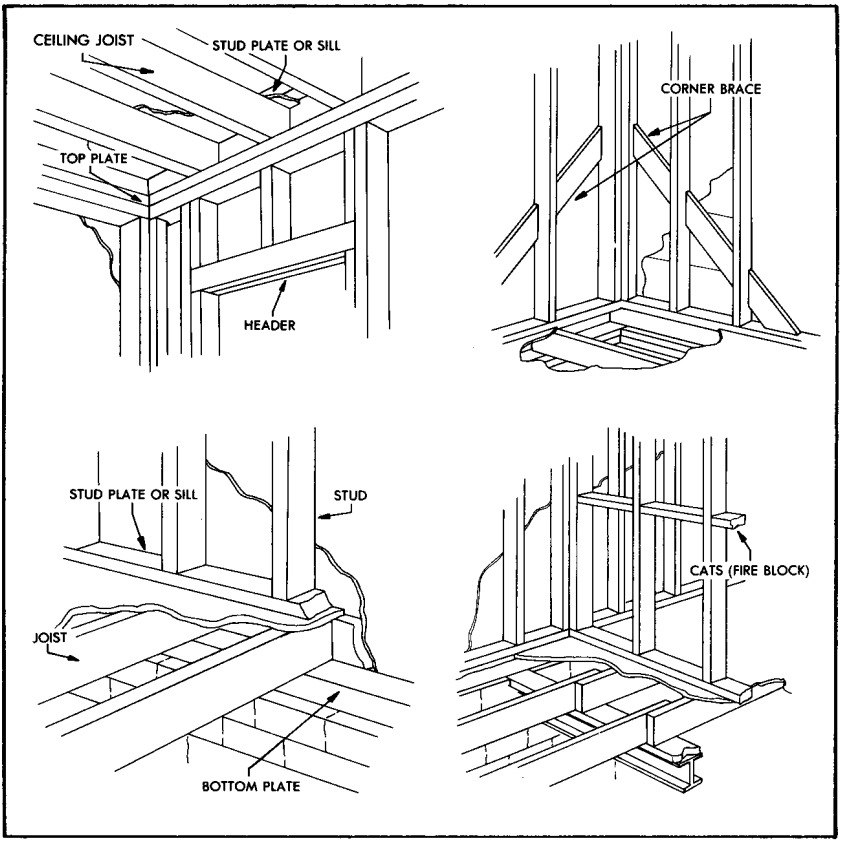


FIGURE 5. Wall Obstructions

DROP AND STATION WIRING
ATTACHMENTS ON ALUMINUM, STEEL, AND VINYL SIDING

1. GENERAL

1.01 This practice provides procedures for mounting drop wire, station protectors, station wiring and associated attachments on aluminum, steel and vinyl sided homes.

1.02 Prior to beginning any work, contact the customer and obtain permission to attach the required equipment. Be sure the customer is aware of the necessity to drill a limited number of holes to mount equipment. If permission cannot be obtained and no other means of giving the customer service is available (other than direct attachment), contact your supervisor.

2. MATERIAL

2.01 This paragraph lists the material covered in this practice. CTS numbers are listed if available.

a. E Drop Wire Clip	CTS #68-11-017-1
b. Angle Screw	CTS #68-21-105-8
c. S Knob	CTS #68-34-002-8
d. Metal Siding Clip (Horizontal)	CTS #68-21-189-9
e. Metal Siding Clip (Vertical)	CTS #68-21-190-2
f. C Porcelain Knob	CTS #68-34-001-1
g. Protector 2100 H	CTS #70-75-053-0
h. 350 Type Protector	CTS #70-75-056-4
i. Drop Wire Hook	CTS #68-21-063-9

3. SAFETY PRECAUTIONS

3.01 After customer's permission has been obtained to make required attachments, check aluminum or steel siding for foreign voltage using the B Voltage Tester (CTSP 490-050-106). Choose an inconspicuous location such as below the last panel to make this test. Be sure metal toothed disc penetrates the enamel.

3.02 If using an electrical drill, be sure that all requirements for grounding this tool are followed. Refer to CTSP 405-705-320.

4. GENERAL PRECAUTIONS

4.01 When working on aluminum or steel siding and a ladder is required, care should be taken not to dent or mar the siding. Attempt to place ladder as close as possible under a lap joint so as to avoid undue pressure on the panel.

4.02 When working on vinyl siding, every effort should be made to avoid placing a ladder against this siding. If this is not possible, follow the procedures in paragraph 4.01.

NOTE: Extreme cold weather affects vinyl siding and may cause it to crack or shatter if undue pressure is applied. If unsure as to type of siding on house, contact the customer.

4.03 When drilling holes in aluminum or steel siding for mounting protectors, knobs, clamps, etc., make a small circle on the siding using a sharp pointed tool such as the side of a screwdriver blade. Circle should not be larger than 1/4-inch in diameter. Scribe a cross within the circle. This will prevent enamel from chipping. See Figure 1.

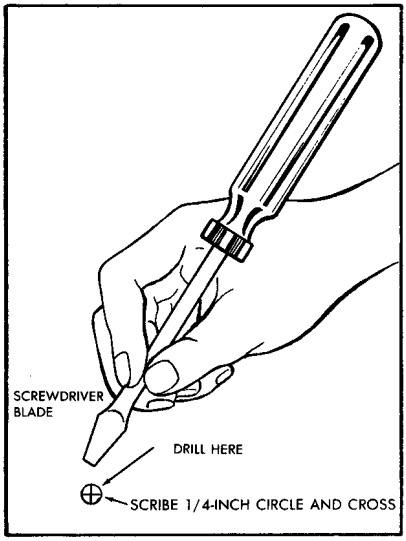


FIGURE 1.

4.04 Always use a sharp bit in a hand type push drill. Use short light strokes. **DO NOT** use a sharp tool such as an awl or ice pick. This will indent the panel, or in the case of vinyl siding, perhaps crack or shatter the panel.

4.05 When placing self-tapping screws in aluminum or steel siding, tighten screws only until they are snug. **DO NOT** exert extra pressure after screw has become snug as this will raise the aluminum or steel siding at the point of contact.

4.06 When placing attachments on vinyl siding, first determine the type of backing under the siding. (In new home construction, this is normally a composition material.) This will determine the type of fastener or attachment to use.

5. INSTALLATION OF DROP WIRE, PROTECTOR, STATION WIRE AND ATTACHMENTS

5.01 Drop Wire: After determining where drop wire will contact the house, locate a wall stud or other solid location to mount the angle screw and knob or drop wire hook. It is very important to locate a solid location, otherwise the weight of the drop may pull the attachment loose and tear the siding. Attach drop wire and drop wire clamp, and form drip loop. When fused type protection is used on flammable or conducting building walls, procelain knobs shall be used to the point of connection with the station protector.

5.02 Protector: Hold protector against siding and mark location using a pencil or marker. (Locate protector as close as possible to lap joint.) Follow procedures for drilling mounting holes as outlined in paragraphs 4.03 and 4.04. Use a spacer of nonrusting type material to get adequate clearance for cover if necessary. When using fused type protection, use the upper two mounting holes in the mounting bracket. See Figure 2.

5.03 Station Wiring: Wherever possible, use the plastic, metal siding clip (see Figure 3) for all horizontal and vertical station wire and ground wire runs. This will eliminate the need for metal clamps and screws. Vertical clips should be used at each panel lap joint. Horizontal clips should be placed at 12 to 15 inch intervals. See Figure 4. To install either the horizontal or vertical siding clip, use the following procedures:

a. To install the horizontal clip:

(1) Place the wire in the hooked portion of the clip so that the flat side will be against the siding for the Pittsburg interlock or the flat side up for the stacking type.

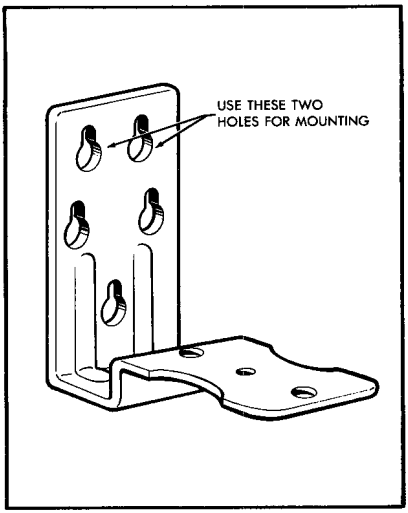


FIGURE 2. 2000 Type Protector Mounting Bracket

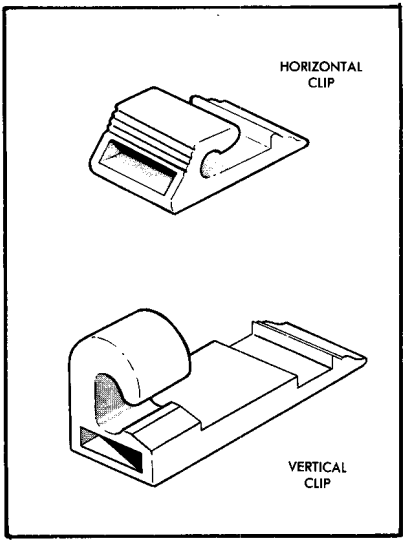


FIGURE 3.

(2) Place the tapered end of the clip (with the wire still in the clip) in the horizontal joint of the siding.

(3) Hold the clip in place with the 4-inch screwdriver by placing the blade in the notch in the bottom of the clip provided for this purpose. While holding the screwdriver with one hand, bump the end of the handle with the heel of the other hand.

NOTE: Use only enough force to properly seat the clip.

(4) Remove any slack from the wire, dress the wire against the siding, and proceed with the next clip. Place the clips 12 to 15 inches apart. See Figure 5.

b. To install the vertical clip:

(1) Place the tapered end of the clip in the horizontal joint of the siding.

(2) Hold the clip in place with the 4-inch screwdriver by placing the blade in the notch in the bottom of the clip provided for this purpose. See Figure 6.

(3) While holding the screwdriver with one hand, bump the end of the handle with the heel of the other hand.

NOTE: Use only enough force to properly seat the clip.

(4) Place the wire into the notch provided and remove any slack in the wire. Place the V clips into every horizontal joint up or down to entrance hole. See Figure 7.

c. When more than one wire is run in the same direction, place each wire in a different lap joint for horizontal runs, and place separate vertical clips for each wire.

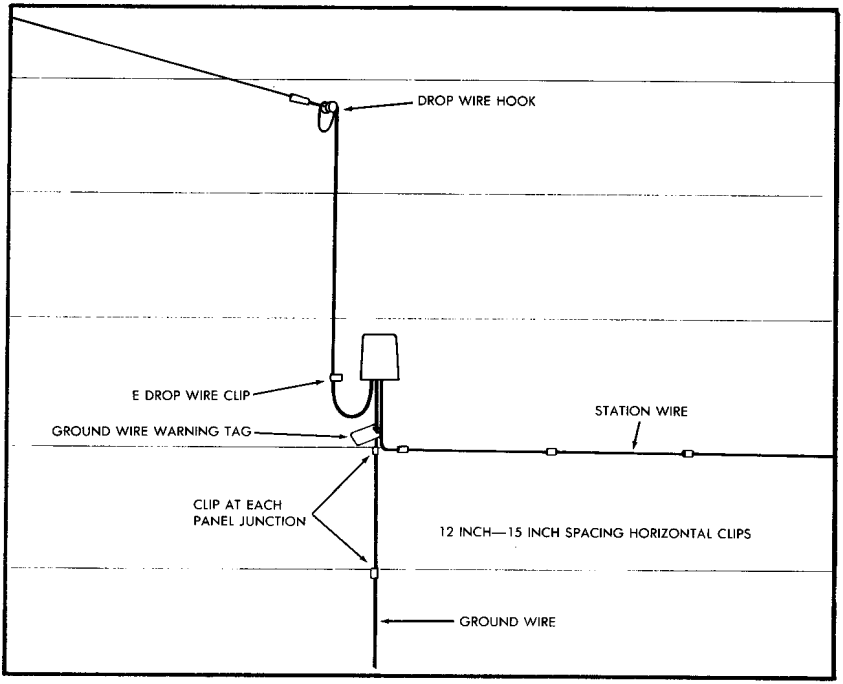


FIGURE 4. Fuseless Protection on Aluminum or Vinyl Siding

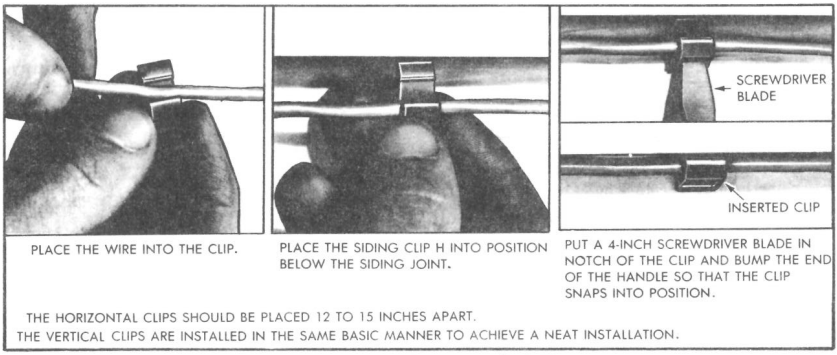


FIGURE 5. Installing Horizontal Clip

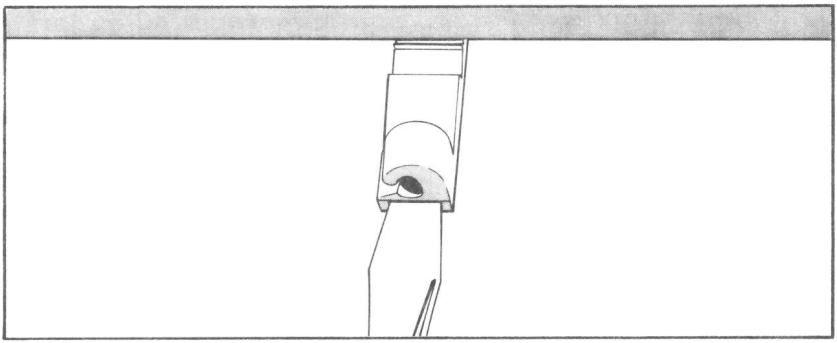


FIGURE 6. Installing the Vertical Clip

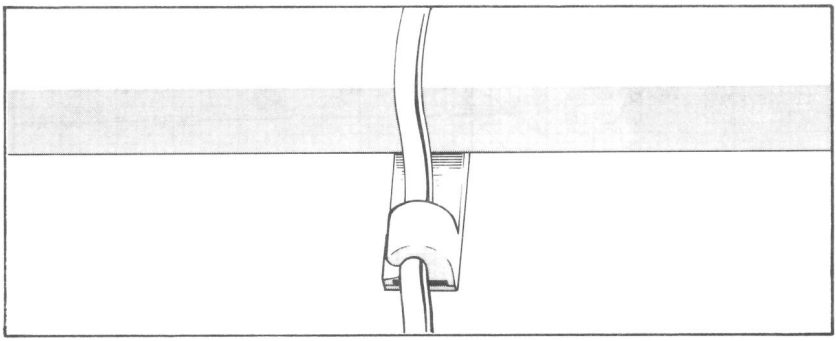


FIGURE 7. Installed Vertical Clip

PORTABLE TELEPHONE INSTALLATION

1. GENERAL

1.01 This addendum is to correct descriptive and installation information when working with portable telephones.

1.02 With red pencil or ink make the changes as shown in paragraph 2 of this addendum. Under the subject figures and in the margin of subject paragraph, write "See Addendum".

1.03 File this addendum directly in front of CTSP 475-400-401, Issue 2, 1971.

2. CHANGES

2.01 Correct Figure 1 B (left view) by crossing out "BN" and indicating that this should be "GN" (green).

2.02 Correct Figure 5 as follows:

a.. Line out words "Neoprene Gasket" and replace with "Outlet Plate".

b. Line out words "Outlet Plate" and replace with "Neoprene Jacket".

2.03 Change paragraph 3.02 a., (1) to read:

(1) Connect station wire to terminals in accordance with the color code markings shown in Figure 1 B. Position the 404B jack so that the cord of the plug is to the bottom when inserted into the jack.

PORTABLE TELEPHONE INSTALLATION

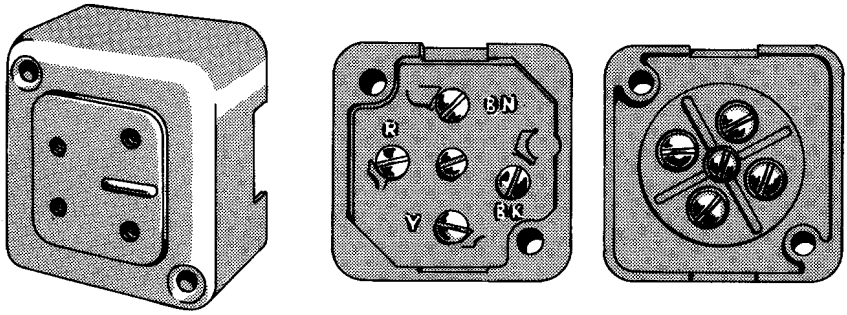
1. GENERAL

1.01 This practice provides the description of and installation procedures for plugs and jacks used with portable telephones. This practice is being reissued to update information on the 505A plug which replaces the 283B portable phone plug.

1.02 The installer should be consistent in positioning portable telephone jacks so that the customer can easily remember how to insert the plug in each jack.

2. DESCRIPTION

2.01 The various types of jacks are divided into two categories, surface mounted jacks and flush mounted jacks. The surface mounted jacks are the 404B indoor jack (see Figure 1) and the 16151 outdoor jack (see Figure 2). The flush mounted jacks are the 548A indoor jack, with various outlet plates and mounting brackets (see Figures 3 and 4), and the 16152 outdoor jack (see Figure 5).



1A. Front

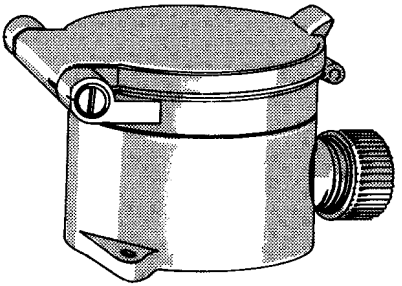
1B. Rear (Different Manufacturers)

FIGURE 1. Surface Mounted Indoor Installation (404B Jack)

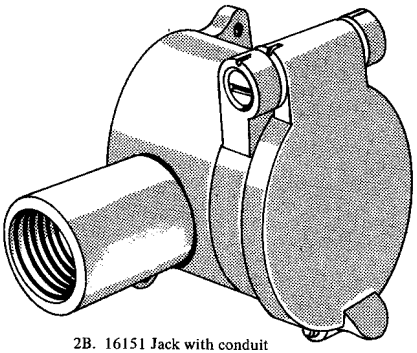
2.02 *Surface Mounted Jacks:*

a. The 404B indoor jack shown in Figure 1 is principally intended for use where exposed wire is run along the baseboard or floor. Two wood screws are supplied with the jack for mounting on a wood surface. The jack accepts a 505A plug.

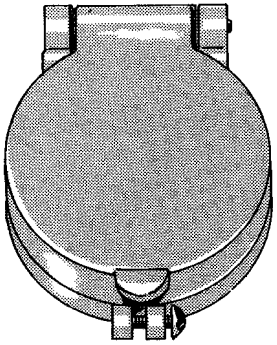
b. The 16151 outdoor jack shown in Figure 2 houses a modified 493A jack which accepts a 505A plug. This jack is designed for service at outdoor locations such as breezeways, patios and terraces where there is an exposed wire run. The jack may be installed with or without conduit.



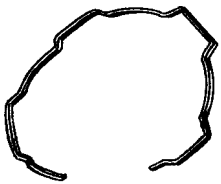
2A. 16151 Jack without conduit



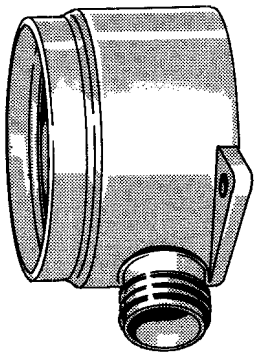
2B. 16151 Jack with conduit

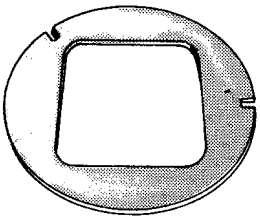


Cover Assembly

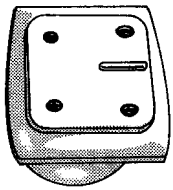


Retainer Spring

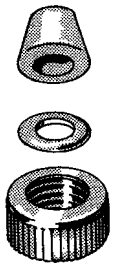




Retainer Ring



Jack Front
Modified 493A Jack



Housing

2C. Assembly of 16151 Outdoor Jack

FIGURE 2. Surface Mounted Outdoor Installation

2.03 *Flush Mounted Jacks:*

a. The 548A indoor jack may be used in conjunction with a customer installed conduit outlet box as shown in Figure 3, or for prewiring in association with a type 60A mounting ring as shown in Figure 4. The jack accepts a 505A plug.

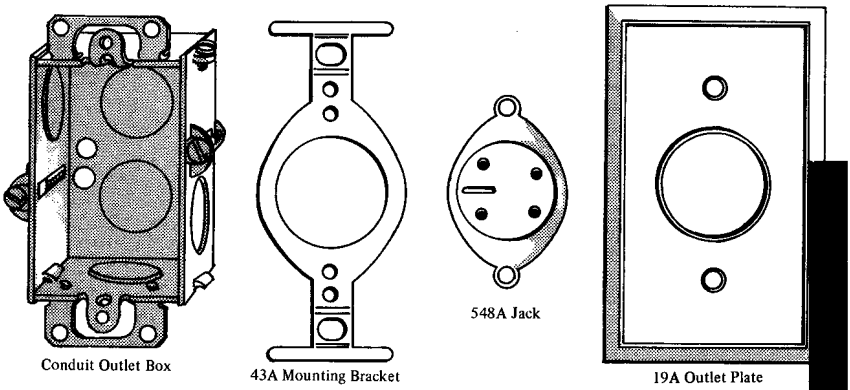


FIGURE 3. Installation Using Customer Installed Conduit Box (548A Jack)

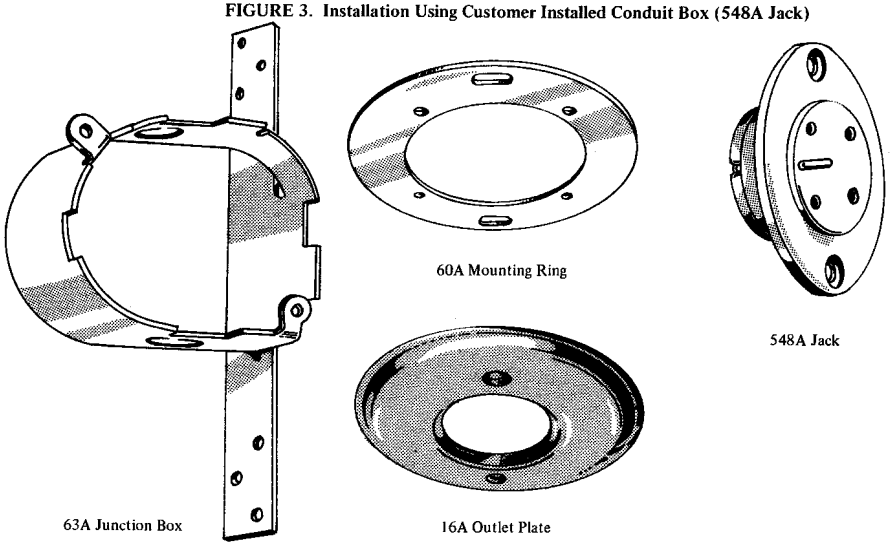
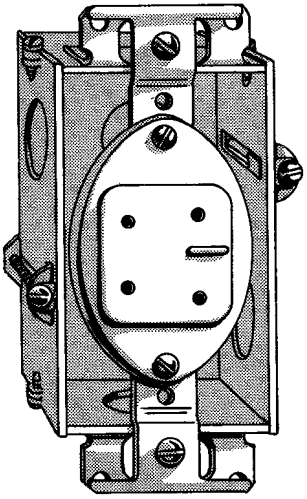
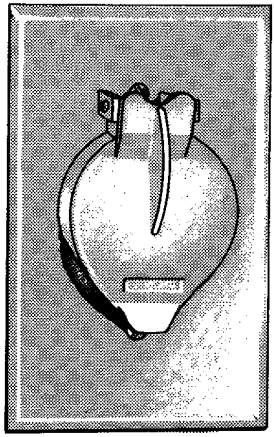


FIGURE 4. Flush Mounted Indoor Installation for Prewiring (548A Jack)

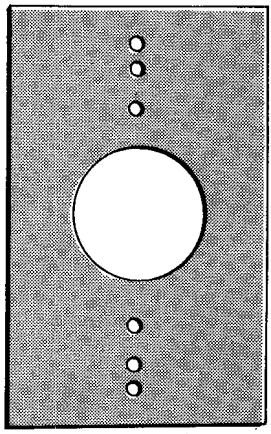
b. The 16152 outdoor jack houses a 493A jack and may be used for prewiring at outdoor locations. The conduit outlet box supplied with the assembly (see Figure 5) is used. When the outdoor jack is to be installed in conjunction with a customer installed conduit outlet box, the conduit outlet box supplied with the unit is not used. The jack accepts a 505A plug.



Conduit Outlet Box
with Portable Jack
Assembly Installed



Outlet Plate



Neoprene Gasket

FIGURE 5. Flush Mounted Outdoor Installations (16152 Jack)

2.04 *505A Plug:* The 505A plug fits 404B and 548A jacks, as well as associated 498A and 550A jack assemblies. It consists of an insulating block with four push-in spade terminals and a removable cap (see Figure 6). The 505A plug replaces the 283B plug (see Figure 7).

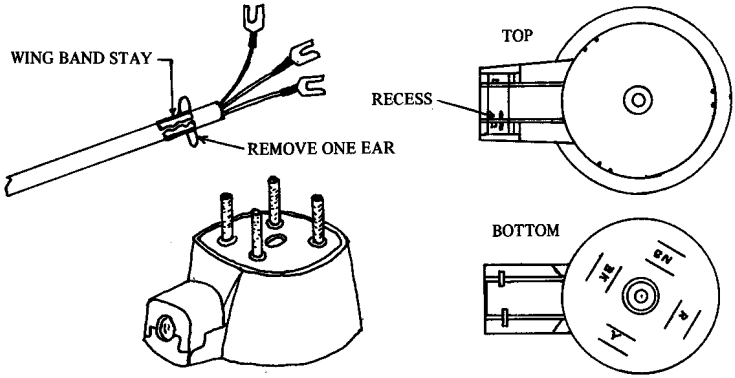


FIGURE 6. 505A Portable Phone Plug

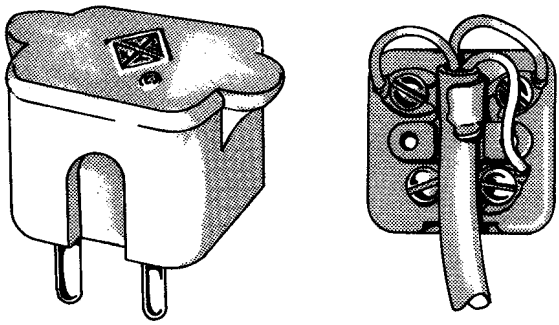


FIGURE 7. 283B Portable Phone Plug

3. INSTALLATION

3.01 The following paragraphs cover the procedures for installing the various combinations of jacks. It is assumed that conduit outlet boxes (where used) will have been installed in buildings already constructed and the installer will be responsible for prewiring installations.

3.02 *Surface Mounted Jacks:*

a. To install station wire to 404B indoor jacks (see Figure 1), proceed as follows:

(1) Connect station wire to terminals in accordance with the color code markings shown in Figure 1B. Position the 404B jack so that the cord entry hole is situated on the side.

(2) If necessary, coil excess station wire around the outside of the circular molded case.

(3) Mount the 404B indoor jack using the two 1-1/2-inch wood screws supplied with the jack.

NOTE: If the 404B indoor jack is to be mounted to a masonry wall (or any similar hard surface), use appropriate standard mounting hardware.

b. The 16151 outdoor jack may be installed with or without conduit. If installed without conduit, the wire entrance fitting should always be at the bottom, with the cover hinge of the assembly at the top, as shown in Figure 2A. The jack should be fastened to wood or masonry (or similar hard surfaces) with appropriate standard mounting hardware. To install station wire to the 16151 outdoor jack, proceed as follows:

(1) Remove the retainer spring, retainer ring and 493A jack.

(2) Loosen the gland nut.

(3) Run station wire through the gland nut friction washer, grommet and into the housing.

(4) Connect the station wire to terminals marked R, Y, G, and B on the rear of the 493A jack. If excess cord is left, it may be coiled around the outside of the circular molded case.

(5) Pull excess station wire back through the grommet while inserting the 493A jack in place.

NOTE: Arrange the 493A jack inside the housing so that the ridge on the face of the jack is at the side. This is to ensure that the cord entry hole on the 505A plug will be situated at the side when connected.

(6) Place a friction washer over the grommet and tighten the gland nut.

(7) Insert the retainer ring over the 493A jack.

(8) Insert the retainer spring.

c. The 16151 outdoor jack may be coupled directly to 1/2-inch conduit (see Figure 2B). When attached in this manner, the cover assembly (see Figure 2C) can be rotated (by loosening the cover lock screw) to position the cover hinge at the top. To connect station wire to the 493A jack, pull the station wire through the conduit and proceed as follows:

(1) Remove the gland nut, friction washer and grommet from the entry hole (these items are not necessary when connecting the 16151 jack to conduit).

(2) Remove the retainer spring, retainer ring and 493A jack.

(3) Connect the housing to conduit (using 1/2-inch conduit fitting) and secure to the mounting surface (wood, masonry, or similar hard surface) with appropriate standard mounting hardware.

(4) Bring the station wire out through the housing and connect to the 493A jack according to the color code marked on the rear of the jack.

(5) Wrap any excess cord around the outside of the circular molded case.

(6) Insert the 493A jack into the housing.

(7) Replace the retainer ring and retainer spring.

3.03 *Flush Mounted Jacks:*

a. For an installation where a conduit outlet box is used, pull the station wire through the conduit box and proceed as follows:

(1) Secure the 43A mounting bracket to the front of the conduit outlet box with the two 1-inch flathead machine screws provided.

(2) Bring the station wire out through the conduit outlet box and the 43A mounting bracket and connect to the rear of the 548A jack in accordance with the color code markings. Wrap any excess cord around the outside of the circular molded case.

(3) Insert the 548A jack into the 43A mounting bracket and secure with the two 6-32 x 5/16-inch flathead screws supplied with the 548A jack. When installed in a conduit outlet box, the face of a flush type jack should be aligned with the supporting surface and brought forward a sufficient distance so that the outlet plate will not interfere with insertion of the plug. In order to secure a flush fit, it may be necessary to remove tabs as shown in Figure 3, or to place washers between the mounting bracket and conduit outlet box.

(4) Attach the 19A outlet plate to the 43A mounting bracket with the two 6-32 x 3/8-inch ovalhead machine screws supplied with the outlet plate.

b. To install the 16152 outdoor jack in conjunction with a customer installed conduit outlet box, pull the station wire through the conduit and proceed as follows:

(1) Mount the 43A mounting bracket to the conduit outlet box with the screws provided.

(2) Bring the station wire out through the 43A mounting bracket and connect to the 493A jack in accordance with color code markings. Wrap any excess cord around the outside of the circular molded case.

(3) Mount the 493A jack to the 43A mounting bracket with the screws provided.

(4) Secure the neoprene gasket and outlet plate to the 43A mounting bracket with the screws provided.

c. Prewired outdoor installations require the use of the conduit box supplied with the 16152 outdoor jack. Prior to installing a conduit box, obtain the permission of the customer. To mount the 16152 outdoor jack, proceed as follows:

(1) Secure the conduit box supplied with the 16152 outdoor jack between suitable studs according to standard procedures.

(2) Repeat steps (1) through (4) of paragraph 3.03 b.

WIRE TERMINAL TYPE 107A2 and 101B INSTALLATION

1. GENERAL

1.01 This practice covers the description and installation of the CAC type 107A2 and 101B wire terminals which are used in making connections between drop or bridle wire and multi-pair distribution wire.

1.02 Either of the above wire terminals can be reused if in satisfactory condition.

1.03 Local instructions should cover whether the 107A2 or 101B wire terminal is to be removed when subscriber service is disconnected. Where the terminal is removed, the insulation on the support wire should be repaired by two half-lapped layers of DR tape and two half-lapped layers of D vinyl tape. The insulation of the conductors should be repaired by cutting the wire and joining the conductors with the appropriate size splice sleeve.

1.04 On all conductors except those of the 24-gauge with a single PVC jacket, remove the insulation before placing on the binding posts of the 107A2. With 24 gauge conductors having a single PVC jacket, such as C urban wire, place the wire under the lower washer and tighten the nut with the appropriate tool. Be careful not to tighten so hard as to break the wire, but be sure that the insulation has crushed enough for a good contact to be made. (See Figure 1.)

2. DESCRIPTION

2.01 The 107A2 wire terminal consists of a pair of molded phenolic terminal blocks with molded-in binding and mounting posts, and a flexible snap-on neoprene cover and two strips of sealing compound. A stainless steel channel washer on the mounting post at the back of the terminal is used to clamp over the support wire. Grooves on each side of the mounting post guide the support wire into place and keep the terminal in proper position (Figure 1).

2.02 The 101B wire terminal is constructed of durable cast aluminum and equipped with a heavy gauge aluminum sliding cover. Two bindings are mounted in a ceramic base, each binding post is equipped with five washers between two hexagonal nuts providing for up to four drop and block wires. The base is provided with a grommet for wire entrance. (See Figure 2)

3. INSTALLATION

3.01 The 107A2 wire terminal is installed by loosening clamping bolts and placing terminal over "C" rural wire with wire in the groove between blocks. Blocks are then squeezed together by tightening bolts, which makes connection to "C" rural wire and holds wire terminal in place. Strips of sealing compound are placed around "C" wire at each end of terminal block in recessed portion of the wire groove. Drop or bridle wire is inserted through the opening in the center of the terminal blocks and connected to the binding posts. The neoprene cover has lips on the inside of the bottom that fits into the grooves on the bottom of the terminal block, locking the cover in place as shown in Figure 1.

3.02 The 101B wire terminal is used to make line connections to "C" rural wire without removing insulation or for connecting bridle wire to "C" rural wire from cable or open wire; also used for connecting subscriber drop wire or line protector to "C" rural wire. (See Figure 2)

4. LOCATING ON INTERMEDIATE POLES

4.01 The first wire terminal at a pole can be installed as shown in Figures 3 through 6.

4.02 A maximum of three wire terminals can be mounted on each side of the wire bracket. The method of installation for each is similar to that in paragraph 4.01. A complete installation is shown in Figure 8, although individual terminals are added only as needed. The order of installation would depend on the direction of feed for the drop wires.

5. LOCATING ON DEAD-END POLES

5.01 Multiple line wires can have up to two wire terminals at dead-end poles as shown in Figure 9.

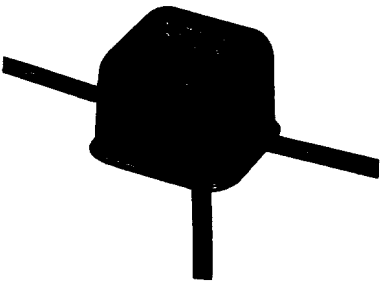
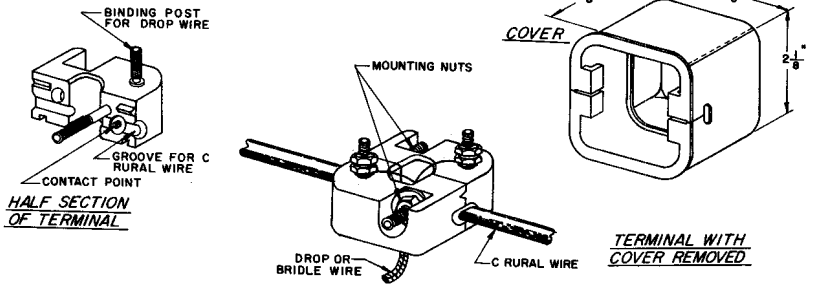


Figure 1: Type 107A2 Wire Terminal used to make line connections to "C" Rural Wire without removing insulation. For connecting bridle wire to "C" Rural Wire from cable, or open wire.

Also used for connecting subscriber drop wire or line protector to "C" Rural Wire.

Type 107A2 Wire Terminal consists of a pair of molded phenolic terminal blocks each equipped with a binding post having insulation piercing contact points. Wire Terminal provided complete with flexible neoprene cover and two strips of sealing compound.



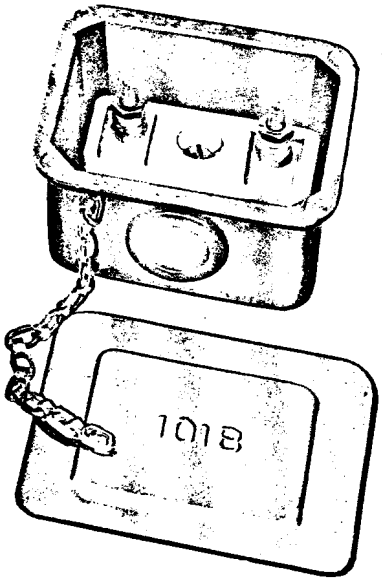


Figure 2

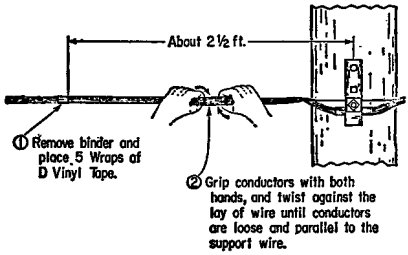


Figure 3

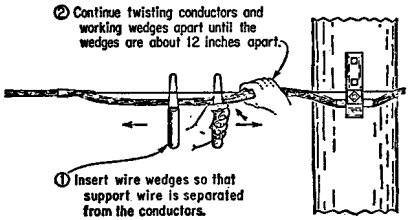


Figure 4

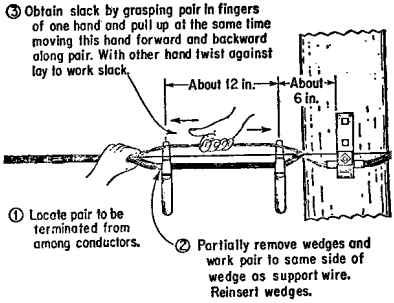


Figure 5

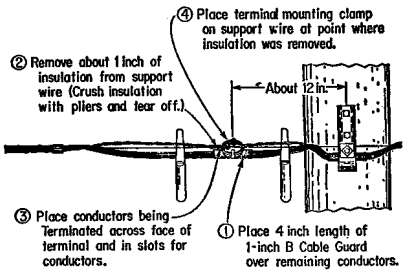


Figure 6

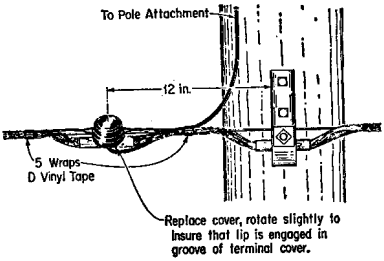


Figure 7

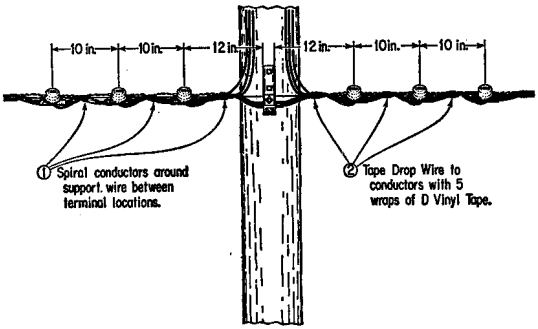


Figure 8

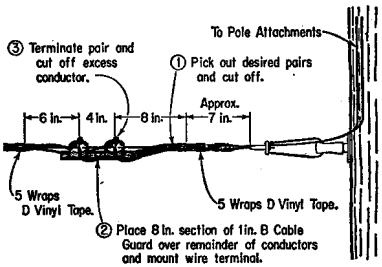


Figure 9