PART VI
OUTSIDE PLANT

POLE CLIMBING

1. GENERAL

1.01 This practice provides basic instructions for ascending and descending a pole using the **3 points of contact method.**

1.02 One of the more hazardous jobs confronting the telephone man is climbing and working on poles. This practice provides safety precautions that must be observed before, during, and after pole climbing.

2. CLIMBING EQUIPMENT

2.01 To ensure personal safety when pole climbing, it is important that proper clothing is worn and proper equipment is used. To determine proper clothing, consideration should be given to the nature of the job, the environment, and weather conditions.

2.02 Pole climbing equipment consists of a body belt, a safety strap, and a pair of climbers. This equipment allows a craftsman to climb, stand, or change position on a pole when no other means of support is available; it also allows the free use of both hands while in any position on the pole.

2.03 Body Belt:

a. The body belt consists of a cushion section, a belt section with tongue and buckle ends, a tool saddle, and D-rings which are attached solidly to the cushion; or on shifting D-ring belts, attached solidly to a D-ring saddle. On the body belt, provision is usually made for a holster to carry one or more tools, in addition to the tools which are carried in the tool loops. Tool loops should be of proper size to prevent the tools from slipping through the loops and falling. There should be no tool loops for 2 inches on either side of the center in the back of the body belt. Older type belts may have tool loops within 2 inches of the center of the back; **DO NOT USE THESE LOOPS.**

b. Refer to CTSP 405-601-303 and CTSP 405-601-601 for safety precautions, use and care of body belts.

c. As a general rule, the body belt is marked in "D" sizes. The "D" size is the distance between the heels of the D-rings when the belt is laid flat. See Figure 1. To obtain the correct "D" size, measure from the prominent part of the right hip bone to the prominent part of the left hip bone across the back, and add 2 inches. See Figure 2. The waist size is determined by measuring the distance between the center of the buckle roller and the middle hole on the tongue end. See Figure 3. To obtain the correct waist size, measure the distance around the body at the point where the belt will be worn. This measurement should be made outside any clothing normally worn while climbing the pole. See Figure 4. The body belt should fit snugly, but not too tightly. The end of the strap should always be passed through the keeper when the belt is being worn.

d. Manufacturers have standardized on the relationship between the "D" size and the waist size. When the waist and "D" size do not coincide with the standard sizes, the belt should be ordered by the "D" size as the waist size is adjustable.

e. Pliers shall be carried in the pocket of the tool holster farthest from the D-ring to minimize the possibility of engaging the snap of the safety strap on the plier handles instead of in the D-ring.

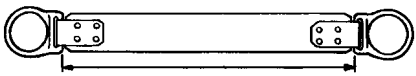


FIGURE 1. Distance Between Heels of D-Rings

FIGURE 2. Measuring for "D" Size

FIGURE 3. Distance Between Center of Buckle Roller and Middle Hole

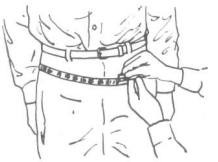


FIGURE 4. Measuring for Waist Size

2.04 Safety Strap:

a. The safety strap is used for support while working on poles, towers, or platforms. Snap hooks are provided on each end for attachment to the D-rings in the body belt.

b. When poles are being climbed under normal conditions, both snaps should be engaged in the same D-ring for safety. The snap on the double end should have the keeper facing outward; the other snap should face inward. See Figure 5.

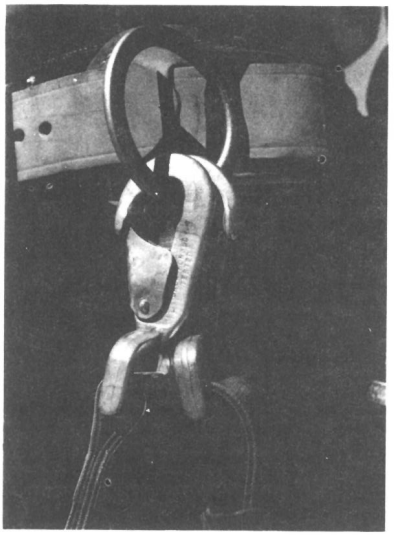


FIGURE 5.

c. When in use, one snap hook should be securely engaged in each D-ring; never both snaps in the same D-ring. The craftsman should look to be sure that snaps are properly engaged. **NEVER DEPEND ON SOUND OR FEEL FOR SECURITY.**

d. Safety straps are adjustable for length by means of a buckle in the strap to suit the craftsman and the size of the pole. When in use, the side of the strap to which the buckle is attached should be next to the pole, with the buckle tongue outward. See Figure 6.

e. The length of the safety strap should be adjusted so that the craftsman can comfortably reach his work. See Figure 7. The craftsman who uses a safety strap of the correct length can perform his work with a minimum of effort. He will be able to maintain good body balance and control of his work operations.

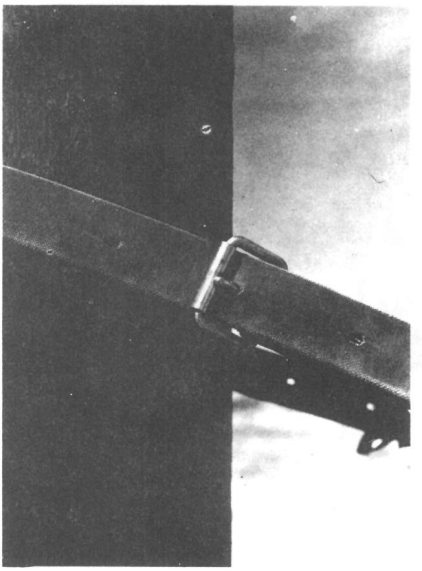


FIGURE 6.

FIGURE 7.

f. Refer to CTSP 405-601-303 and CTSP 405-601-601 for safety precautions, inspection, and maintenance of safety straps.

2.05 **Climbers:**

a. Climbers are used for ascending, descending, and maintaining the working position on poles when no other means of support is available. The condition, length, and shape of the gaffs of the climbers are of the utmost importance. The gaffs support the workman as he climbs, descends, and does his work.

b. Defective gaffs are dangerous. Inspection and maintenance procedures are covered in CTSP 405-601-310.

c. Climbers are made in adjustable or fixed lengths, from 14 to 21 inches by ½-inch increments. Gaff mountings are either permanent or replaceable. Proper fit requires a leg iron to reach about ½ inch below the prominence of the knee joint. Refer to CTSP 405-601-310 for correct fitting procedures.

d. Foot and leg straps are used to secure climbers to the craftsman's legs. These straps should be drawn up to a snug fit, but not so tight as to be uncomfortable. High-top shoes with heavy soles and heels should be worn for climbing. See Figure 8.

FIGURE 8.

e. The buckle on the foot strap should lie just outside the shoe lacing. Pads and straps are attached to the upper end of the leg irons. All leg and foot strap ends should be snugged down in their keepers after buckling; the strap ends should point to the rear and outside.

f. Before the leg straps are fastened, pull up the pant legs so that they bag at the knees and do not bind. Fold the pant legs snugly against the calf, toward the outside, as shown in Figure 9. This prevents the pant legs from tripping the workman while climbing.

FIGURE 9.

3. CLIMBING PRECAUTIONS

3.01 Before ascending a pole, inspect it carefully for unsafe conditions such as rake, rotted places, nails, tacks, cracks, knots, foreign attachments, pole steps, ice, etc. Remove rocks and other objects from the ground at the base of the pole.

3.02 Unauthorized attachments such as signs, radio aerials, clotheslines, etc., should be reported to the supervisor, according to local procedures.

3.03 Whenever possible, a slippery pole or one partly coated with snow or ice should be ascended with the gaffs in the slippery side and the hands held on the less slippery side.

3.04 Do not hold onto pins, crossarm braces and other hardware in ascending, descending, or changing position on a pole.

3.05 Always ascend and descend on the high side of a leaning, raked or bent pole.

3.06 Each employee should be sure that he is in good physical condition before climbing poles and should refrain from climbing poles when he feels it is not safe for him to climb and work aloft.

3.07 Arms and hands should be properly protected when climbing.

3.08 Estimate the length of the safety strap required at the working level and adjust the safety strap at the base of the pole before ascending. See Figure 10.

FIGURE 10.

3.09 Inspect the pole during ascent and descent to avoid placing gaffs in cracks, knots, holes, etc., which might cause a fall.

3.10 When ascending the pole, keep the arms and body relaxed, with the hips, shoulders, and knees a comfortable distance away from the pole.

3.11 Length of steps should be natural for each individual craftsman. Climb with the legs, using the hands and arms for balance only. Direct the gaffs toward the center (or heart) of the pole in a natural manner. The size of the pole and the length of the craftsman's legs between the hips and knees will determine the amount of gaff separation on the pole.

3.12 The effective leg stroke is that angle or stroke that will cause the gaff to cut into the pole wood without side thrust of any sort. An effective stroke results when the knee is thrown comfortably away from the pole (without straining the hip), the gaff is aimed at the target (the imaginary line down the center of the pole), and the leg force and travel are made to parallel the climber shank until proper penetration is accomplished. Kicking or slapping the gaffs against the pole should be avoided. The hands and feet should work in coordination with the weight being shifted gradually and easily from one foot to the other.

3.13 When ascending, removal of the gaffs is made easier by using a twisting action of the ankle (outward) and a slight prying action of the inside of the footwear against the pole.

3.14 Always use the body belt and safety strap when working aloft on a pole. Never place the safety strap around the top of the pole above the top crossarm or in any other place where it can accidentally slip off. If it is necessary to place the safety strap high on a bare pole, place a long through bolt in the top gain hole to keep the safety strap from slipping off the pole.

3.15 When descending, each leg is relaxed and straightened before being lowered. When the relaxed and straightened leg is "lined up" with the center of the pole and the body weight has been shifted above the gaff, drop the gaff into the pole. When descending, the leg is not stroked; it is merely lowered into position with the body weight behind it. Keep hips shoulders, and knees away from the pole. **Do not take long steps when descending.**

3.16 When descending, the climber gaffs should break out naturally with the outward and lowering movement of the knee. Removal of the climber gaff from the pole when the last step to the ground is taken is accomplished by a slight twisting and prying action, as in ascending.

3.17 Wear climbers only when necessary for climbing or working on poles.

3.18 Do not stand at the base of a pole while a man is ascending, descending, or working aloft.

3.19 If a second man is to ascend the pole, he should wait until the first man has placed his safety strap in his working position. When descending a pole, one man should remain in his working position with his safety strap in use until the other man has reached the ground and is safely out of the way.

4. ASCENDING A POLE—3 POINTS OF CONTACT METHOD

4.01 It is important for the lineman to have good control of all his motions while aloft. This may be accomplished by using **3 points of contact** with the pole at all times. That is, both hands and one foot, one hand and both feet; or, in working position, both feet and the safety strap should always be in contact with the pole. The object of the 3 points of contact concept is to form and maintain a "tripodlike" contact with the pole. This stance or position will resist side forces, such as wind. With the tripod effect, leverage is always available to maintain proper balance.

4.02 In ascending, the right hand leads the left foot, and the left hand leads the right foot. The right hand must be raised on the pole before the step up is made with the left foot, and vice versa with the left hand and the right foot. This will provide a balanced climbing position.

4.03 The following is the correct sequence for a craftsman taking the first step onto a pole with his right foot:

a. Take a standing position with both feet close to the base of the pole. Place both hands on the pole. See Figure 11.

FIGURE 11.

b. Raise the right hand up the pole a distance about equal to the height of the first step that will be taken up the pole. See Figure 12. This first step should be short, about 6 to 8 inches from the ground.

c. The right foot is raised, and the gaff stroked into the pole. No body weight is placed on the right gaff at this time. See Figure 13.

FIGURE 12.

FIGURE 13.

d. The left hand is then raised up the pole a distance about equal to the natural step up the pole for the individual craftsman. The left hand controls the body side swing as the weight is lifted onto the right foot.

e. Raise the body weight to the right climber. Lift the left foot up the pole a distance equal to the normal ascending step. Stroke the left gaff in the pole; the body weight is still on the right foot. See Figure 14.

f. The right hand is then raised up the pole. The distance the hand is raised will be about equal to the natural step up the pole for the individual workman. Lift the body weight to the left gaff. The right foot is removed from the pole, raised up and stroked into the pole. See Figure 15.

FIGURE 14.

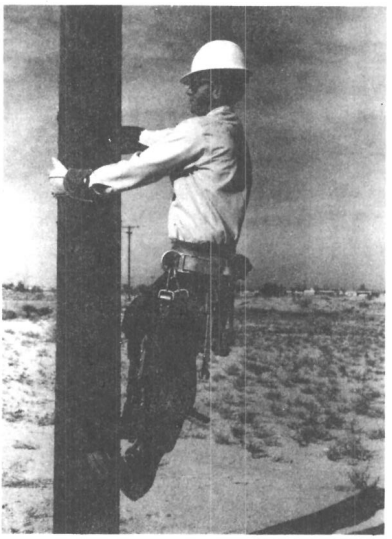


FIGURE 15.

g. With the body weight still on the left foot, the left hand is then raised up the pole. See Figure 16.

h. The body weight is raised to the right foot. The leverage to raise the body is obtained from the left hand; the side sway is controlled by the right hand. The left gaff is raised up and stroked into the pole. See Figure 17.

FIGURE 16.

FIGURE 17.

i. The sequence continues; the right hand is raised up the pole. The body weight is then raised to the left foot and the right foot is raised and stroked. The left hand is raised up the pole and the body weight is raised to the right foot.

5. DESCENDING A POLE—3 POINTS OF CONTACT METHOD

5.01 For the climber's safety, it is important that the **3 points of contact** method is used when descending a pole. When descending, the hand must be lowered on the pole before the downward step is taken; otherwise, the natural position cannot be maintained. Figures 18 through 21 show the leg, body, and arm sequence.

a. In Figure 18, the safety strap has been removed from the pole and is being stored in the left D-ring of the body belt. The feet are positioned with the left foot low; the right hand is high, holding securely to the pole.

FIGURE 18.

b. The left hand is then placed in the high position. Next, the right hand is lowered and the right foot is moved downward. See Figure 19.

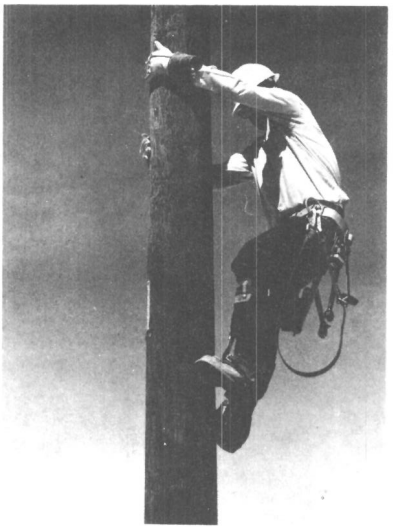


FIGURE 19.

c. The left hand is then lowered a distance equal to the next downward step. In Figure 20, the next step with the left foot has just been made.

d. For the next step (shown in Figure 21), the right hand is lowered and then the right foot descends.

FIGURE 20.

FIGURE 21.

5.02 The length of the downward step is controlled by keeping both hands on the pole while the descending step is being made. With both hands on the pole during the downward step, the craftsman is able to control his body swing. The hand and foot sequence described above gives the craftsman the greatest leverage; he can control his motions with little effort and more assurance.

6. STEPPING AWAY FROM A POLE

6.01 Stepping away from a pole incorrectly can result in severe gaff wounds, as well as injuries such as broken arms and wrists, bruised hips, shoulders, and backs; other injuries may also occur when a man loses his balance and falls. Figures 22 through 27 show the safe method of stepping away from a pole.

a. Observe the ground for safe stepping space before the first foot is placed on the ground. Three points of contact with the pole are maintained during this operation. The step to the ground should be made from 6 to 8 inches up the pole. Step from the pole with one foot. See Figure 22.

FIGURE 22.

b. Move the other foot from the pole to the ground, keeping both hands on the pole for balance and control. See Figure 23.

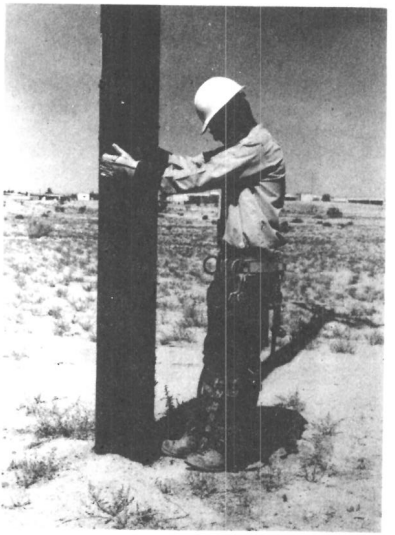


FIGURE 23.

c. The craftsman stepping away from the pole to his left, will drop his left arm and turn his head in the direction of the step so that he can observe the ground for safe stepping space. The right hand is kept on the pole. See Figure 24.

d. When both feet are on the ground, the left foot is moved a natural step away from the pole. The body balance is controlled by keeping the right hand on the pole. See Figure 25.

FIGURE 24.

FIGURE 25.

e. When the left foot has been moved, the body weight is transferred to it and the right foot carefully moved to a natural standing position with relation to the left foot. The right hand is kept on the pole for control during this step. See Figure 26.

f. When the move with the right foot has been safely made, remove the right hand from the pole. See Figure 27.

FIGURE 26.

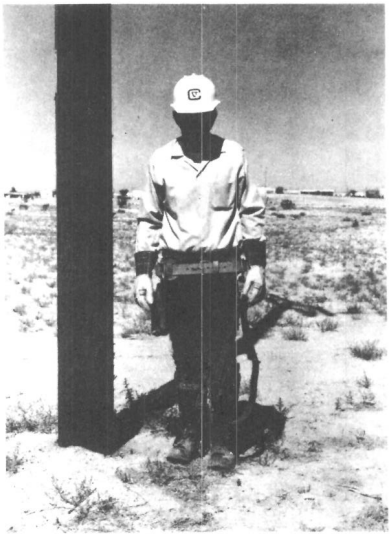


FIGURE 27.

g. Remove the climbers and replace the gaff guards on the gaffs. See Figure 28.

FIGURE 28.

NOTE: If the first step away from the pole is made to the right, the same sequence is followed except the right hand is dropped instead of the left.

6.02 The above method of stepping away from poles while wearing climbers works equally well when stepping away from stepped poles when climbers are not worn.

7. GOING AROUND A POLE

7.01 It is important that all craftsmen use the correct method of going around a pole. Figures 29 through 32 show the correct method to be used when going around a pole to the **left.**

NOTE: This method is reversed when going around a pole to the **right.**

a. The left (or lead) foot is removed from the pole and moved around to the left. It is set in the pole from 2 to 4 inches higher than the right foot (or following climber). The leg action is an ascending or stroking action toward the center or "heart" of the pole. Keep both hands on the pole while performing this operation. Figure 29 shows the position of the feet at the start of the movement to the left.

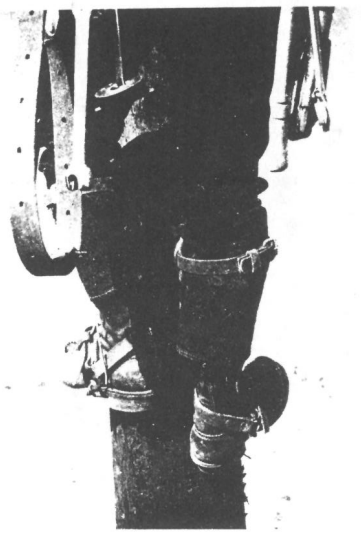


FIGURE 29.

b. Figure 30 shows the position of the feet after the lead (left) foot has been moved around and stroked into the pole. The following (right) foot has not been moved. The body weight is supported by the right foot.

c. The body weight is raised to the left (high) climber. The right (lower) gaff is removed from the pole and moved around to the left. The gaff of the right (lower) climber is lowered into the pole with the same leg and body action used in descending a pole. That is, the leg is kept straight, the gaff aimed at the "heart" of the pole, and the body weight lowered to the gaff. The lower gaff is not stroked. Figure 31 shows the position of the feet just after the body weight has been transferred to the lower (following) gaff.

FIGURE 30.

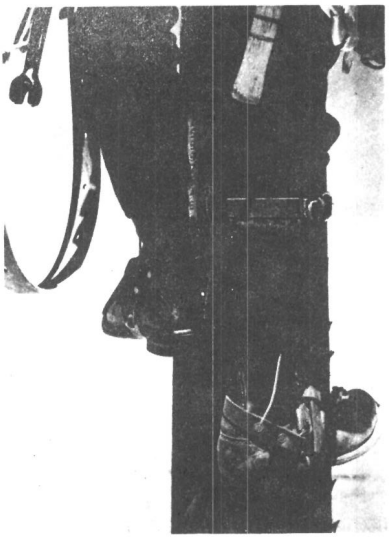


FIGURE 31.

d. The hands are shifted around the pole. The left gaff is removed and moved around the pole for the next step. Figure 32 shows the start of the second step with the lead (left) foot.

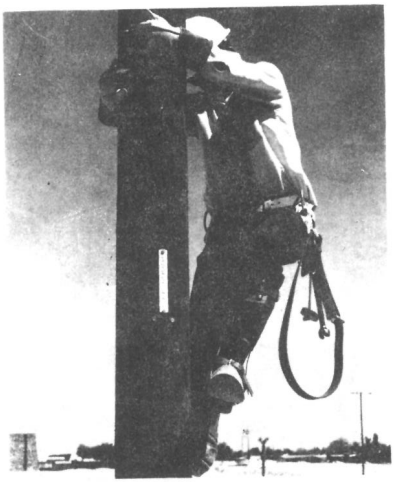


FIGURE 32.

7.02 The craftsman's body structure, wind conditions, whether the operation involves going from the high to the low (or the low to the high) side of the pole all have a bearing on the vertical separation of the gaffs. The distance that the gaffs are moved horizontally as each step is made is determined by the size of the pole, size of the craftsman's boots, wind conditions, etc. The step should be that which is most natural for the individual.

7.03 When using a safety strap for going around the pole, keep both hands on the safety strap and proceed as instructed in paragraphs 7.01 and 7.02, maneuver the safety strap with the hips.

7.04 The use of the safety strap is recommended for going around the pole. However, when circumstances require the removal of the safety strap due to obstacles such as down guys, cable extension arm braces, crossarm braces, etc., remove the safety strap and proceed as instructed in paragraphs 7.01 and 7.02.

8. WALKING WITHOUT CLIMBERS

8.01 Craftsmen shall remove their climbers when walking between poles, from a truck to a pole, etc., and at all other times except when actually climbing poles. The gaff guards shall always be on the gaffs when the climbers are being carried or stored.

8.02 The cutting edges of the gaffs will be dulled if the climbers are worn while walking. **DULL GAFFS ARE DANGEROUS TOOLS.**

8.03 Severe gaff wounds may be experienced if climbers are worn while walking. The safety strap should be placed over the shoulder while walking, particularly if walking on rough ground, through brush, on slopes, etc.

9. USE OF SAFETY STRAP

9.01 Putting Safety Strap Around Pole: The following sequence is for a craftsman who carries his safety strap on the left D-ring. The gaffs should be set in the pole with the right gaff higher than the left. This makes it easier to bring the right hip up to the pole and provides good "side sway" control.

a. The top safety strap snap is disengaged from the D-ring by depressing the keeper with the index finger of the left hand. The thumb backs up the snap hook as shown in Figure 33.

FIGURE 33.

b. The snap hook is removed from the D-ring. The body weight is supported with the right hand and both climbers while the snap is being disengaged. See Figure 34.

c. Pass the snap hook back of the pole toward the right hand. The snap is carried around the pole in the same position in the hand as when it was removed from the D-ring. The opening in the snap hook will be away from the pole. See Figure 35.

FIGURE 34.

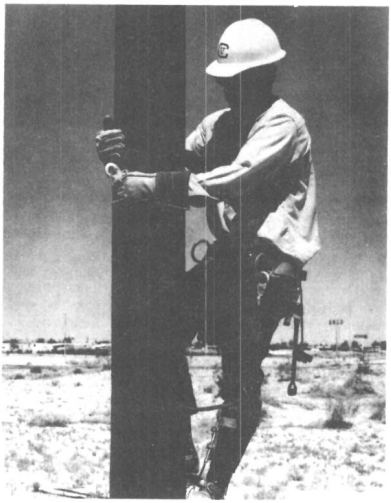


FIGURE 35.

d. The body weight is transferred from the right hand to the left hand. Do not transfer the safety strap snap to the right hand until the body weight has been shifted safely. See Figure 36.

e. The snap is taken by the fingers of the right hand and carried around the pole to the right D-ring. See Figure 37.

FIGURE 36.

FIGURE 37.

f. The safety strap should be kept at working height by letting it slide through the fingers of the left hand as the safety strap is passed around the pole to be engaged in the right D-ring.

g. The heel of the hand backs up the D-ring and prevents it from moving as the fingers apply pressure to the back of the snap. This hand action makes it easy for the craftsman to engage the snap. See Figure 38.

FIGURE 38.

NOTE: In the above figure, the glove has been removed so the heel of the hand and finger action may be shown more clearly. However, gloves should not be removed during actual climbing.

h. The opening in the snap should always be outward from the body. **LOOK, SEE, KNOW** that the snap is properly engaged in the D-ring. Most craftsmen will bring the right hip closer to the pole during this operation. This makes it easier to attach the snap to the D-ring.

i. Place the right hand on the safety strap between the pole and the right D-ring. Gradually lean back on the safety strap. Keep the left hand around the pole and the right hand on the safety strap as an added precaution until the body weight is safely supported by the safety strap and body belt. The safety strap should always be flat against the pole, with no twists in it. See Figure 39.

FIGURE 39.

j. The position of the safety strap on the pole may be readjusted once it is ensured that the snap is properly engaged.

k. The length of the safety strap can be readjusted at the working level after the craftsman has safely belted in. See Figure 40.

FIGURE 40.

l. When in working position, the openings of the snap hooks must be away from the body.

NOTE: Employees who carry the safety strap on the right side of the body belt will reverse the above procedures.

m. To move up or down on a pole with the safety strap in use, hold the pole with one hand as tension is released on the strap and move the strap up or down with the other hand.

9.02 Removing Safety Strap from Around Pole:

a. First, the craftsman should position his gaffs so that the right gaff is higher than the left. Support the body weight with the left hand. Move the right hip toward the pole to secure slack in the safety strap. Place the right hand in position on the snap. The right elbow is up from the D-ring and away from the body. See Figure 41.

FIGURE 41.

b. Depress the keeper with the thumb. Twist the snap around as shown in Figure 42 and remove it from the D-ring.

FIGURE 42.

c. The snap is passed around the pole to the fingers of the left hand, while the body weight is still supported by the left hand and arm.

d. The body weight is transferred to the right hand before the left hand (carrying the snap) is removed from the pole.

e. The snap is returned to the carrying D-ring. It is engaged on top of the keyed snap with the opening of the snap toward the body. A downward-forward motion is used to engage the snap. See Figure 43.

FIGURE 43.

NOTE: Employees who carry the safety strap on the right side will reverse the above procedures.

SAFETY PRECAUTIONS OBSERVATIONS AND VOLTAGE TESTS TO BE MADE AT JOINT USE POLES

CONTENTS

1. GENERAL

1.01 This practice provides information pertaining to observation and tests to made at joint use poles to protect Company personnel from electrical shock.

1.02 This practice is reissued to replace in its entirety CTSP 490-050-106, Safety Precautions—Voltage Tests To Be Made Before Climbing Joint Use Poles. **Remove from the file and destroy all copies of CTSP 490-050-106, Issue 1, 1968.**

1.03 For information pertaining to the description, testing, care and storage of the B Voltage Tester, refer to CTSP 405-503-350.

2. SAFETY PRECAUTIONS

2.01 When performing tests with the B Voltage Tester:

a. Wear proper head protection (safety cap).

b. Wear safety glasses.

c. Wear insulating gloves consisting of:

(1) Cloth glove liner (optional).

(2) High voltage insulating (synthetic rubber) gloves.

(3) Leather protector gloves.

2.02 When it is necessary to ascend a pole to perform tests with the B Voltage Tester, observe the climbing precautions provided in CTSP 490-025-110.

2.03 Insulating gloves are not to be used when ascending or descending the pole. Lineman's leather gloves are to be used when climbing. When voltage tests are required aloft, ascend the pole and maintain a distance of 60 inches from voltage potential. Remove the lineman's leather gloves, put on insulating gloves, and proceed with tests using the B Voltage Tester.

3. OBSERVATIONS

3.01 Examine the pole for potential hazards such as a ground wire, metallic conduit or street light fixtures. Also observe the pole for potential hazards such as improper clearances from power conductors or equipment, dangling wire, etc.

3.02 If a ground wire is present, make a voltage test as instructed in paragraph 4. Voltage tests are not required when the following conditions exist:

a. The power ground wire is bonded to a telephone cable strand.

b. The power ground wire is covered with a wood molding, or equivalent, up through the telephone space.

c. The ground wire is insulated and insulation is in good condition.

3.03 If a power conduit is present, make a voltage test as instructed in paragraph 4.

3.04 If a light fixture is present, make a voltage test as instructed in paragraph 5 only if the pole is supporting telephone cable, urban wire, rural wire, an isolated section of cable, or a bare ground wire.

3.05 Voltage tests are not required when the following conditions exist:

a. The light fixture is located in power space.

b. It is clearly visible that the light fixture is bonded to the telephone cable strand and is located **above** telephone attachments.

c. When the light fixture is located below telephone cable, it must be clearly visible that the light fixture is bonded to the telephone cable strand and the wiring through and below the telephone space is 40 inches out from the surface of the pole or is inaccessible.

4. VOLTAGE TESTS AT THE BASE OF THE POLE

4.01 When a voltage test is required from observations in paragraph 3.02 or 3.03, it shall be made as follows **before climbing or working on the pole:**

a. Attach the insulated clip of the B Voltage Tester (Figure 1) to one of the following:

(1) A telephone anchor rod or guy. (Do not attach to an anchor rod or guy that is bonded to the power ground wire.)

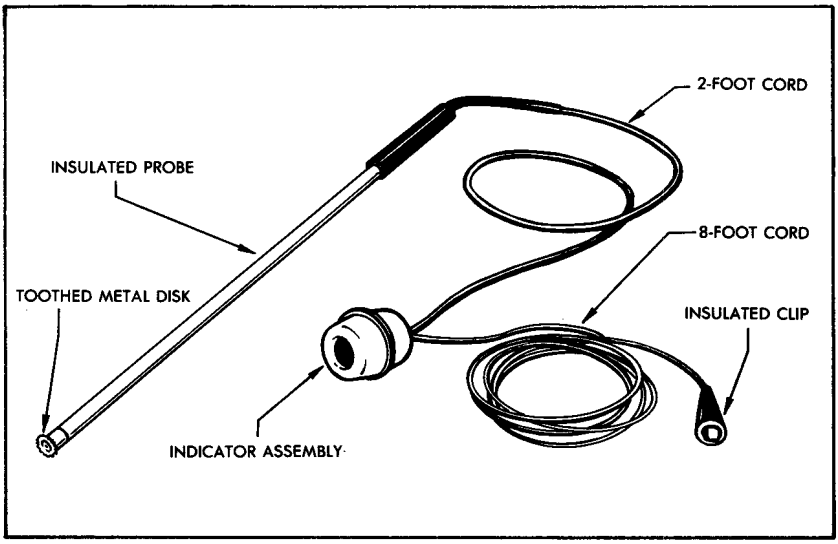


FIGURE 1. B Voltage Tester

(2) A fire hydrant, a projection on a manhole cover, or a metallic curb box.

(3) A 5-inch screwdriver blade pushed into the earth about 5 feet from the pole (Figure 2).

(4) A substantial metal object such as a piece of lead sleeving, a metal crossarm brace, or a half-pound bar of D seam solder, etc., and lay the object on the ground or pavement about 5 feet from the pole.

b. Standing about 3 feet from the pole, grasp the insulated probe in one hand and the indicator assembly in the other. Touch the toothed metal disk on the end of the probe to the ground wire, metal conduit, and pole being tested, and look into the open end of the indicator assembly.

c. If the indicator glows, the ground wire, metal conduit or pole is energized. Immediately remove the probe from contact with the ground wire, metal conduit or pole. **Do not climb or contact pole if the indicator glows. Notify your supervisor.**

d. If the ground wire is broken at ground level, test the upper portion.

e. If the lower 8 feet or so of the ground wire is protected with a wood molding, test above the molding.

4.02 If the voltage tester does not glow in performing the above test, the pole may be climbed as instructed in CTSP 490-025-110.

CAUTION: Care should be taken to avoid contacting the ground wire on metal conduit and telephone strand, cable or guys at the same time as a small voltage (of less than 60 volts) may be present. This caution is recommended to avoid possible surprise shocks.

4.03 If a shock is experienced as a result of an accidental contact between the ground wire or metal conduit and telephone strand, cable, guy or other grounded object, **notify your supervisor.**

5. VOLTAGE TESTS AND PRECAUTIONS ON THE POLE

NOTE: Attach B Voltage Tester bag containing test equipment and the bag containing insulating gloves to body belt.

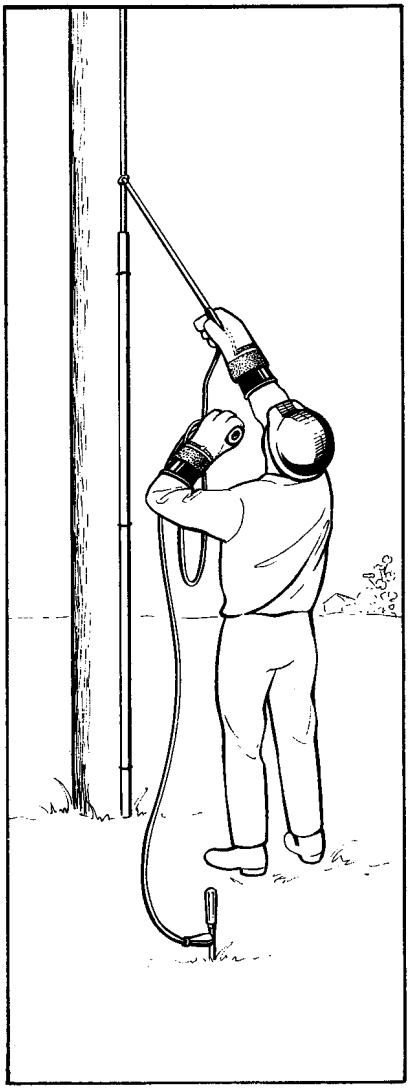


FIGURE 2.

5.01 Climb pole (as instructed in CTSP 490-025-110) to location approximately 60 inches from the potential hazard. Put on insulating gloves and proceed with test as instructed below.

CAUTION: Take care to avoid contacting hardware or wiring that could be energized.

5.02 When a voltage test is required for a light fixture as mentioned in paragraph 3.04, use the following procedure:

a. Attach the insulated clip of the voltage tester to the cable suspension strand support bracket or urban or rural wire or bare vertical power ground wire. Touch the toothed metal disk to the street light fixture and promptly look into the open end of the indicator assembly.

b. If the indicator does not glow, contact the fixture with the probe again to be sure that good contact has been made. If the indicator still does not glow, make a temporary bond as described in paragraph 5.03.

5.03 The B Temporary Bond is a 5-foot length of stranded copper, rubber covered cord with battery clips at each end. To use the B Temporary Bond, proceed as follows:

a. Make a temporary bond by attaching the small clip of the B Temporary Bond (Figure 3) to the cable suspension strand or the bare power vertical ground wire so as not to be in the way of work operations. **Do this first.** Then attach the larger clip of the bond wire to the street light fixture. **Do not bond** to the support bracket of urban or rural wire or the suspension strand of isolated cable.

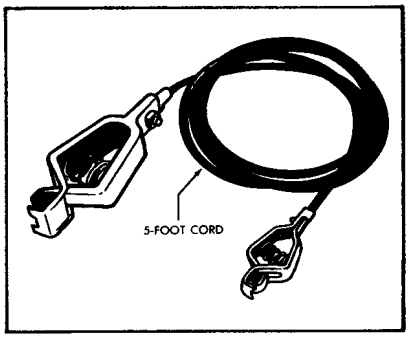


FIGURE 3. B Temporary Bond

b. Insulating gloves may be removed **only after** the temporary bond is in place, and then only if other protection requirements permit. Leave the B Temporary Bond in place until all work operations have been completed. Should the bond start smoking during the work operation, descend immediately without touching the fixture or its wiring. **Notify your supervisor.**

5.04 The B Voltage Tester is extremely sensitive and operates with very small currents. Street light fixtures may cause the indicator to glow even though they are energized only by leakage across damp cobwebs or induction between the fixture and its wiring.

5.05 For the condition mentioned in paragraph 5.04, the B Shunting Capacitor (Figure 4) is used to determine if the voltage present is excessive. To use the B Shunting Capacitor, proceed as follows:

a. Attach the clip of the B Voltage Tester and the clip of the B Shunting Capacitor to the cable suspension strand or to the bare power vertical ground wire.

b. Attach the small clip of the B Temporary Bond to the metal terminal of the B Shunting Capacitor and the larger clip to the metal cap behind the disk of the insulated probe.

CAUTION: Maintain at least 1 foot of separation between the B Voltage Tester and the B Temporary Bond and B Shunting Capacitor.

c. Touch the toothed metal disk to the street light fixture and promptly look into the open end of the indicator assembly (Figure 5).

CAUTION: Avoid bodily contact with temporary bond or capacitor during test.

d. If indicator glows, the fixture is energized. Immediately remove the probe from contact with the fixture, replace testing equipment in the carrying case, descend the pole and **notify your supervisor. Avoid contact with the fixture or its wiring.**

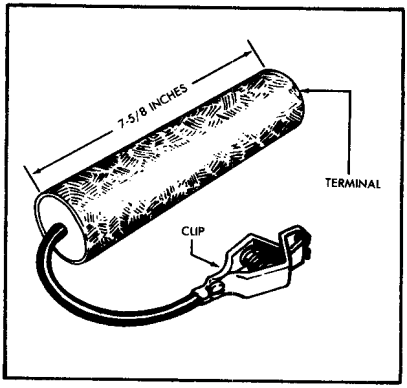


FIGURE 4. B Shunting Capacitator

e. If the indicator does not glow, contact the fixture with the probe again to be sure that good contact has been made. If the indicator still does not flow, proceed as instructed in paragraph 5.03.

5.06 When work operations are completed on a pole, remove the B Temporary Bond as follows:

a. Put on insulating gloves.

b. Remove the clip attached to street light fixture. **Remove this clip first.**

c. Remove the other clip.

CAUTION: If a spark is noticed when removing the bond, descend the pole immediately and notify your supervisor.

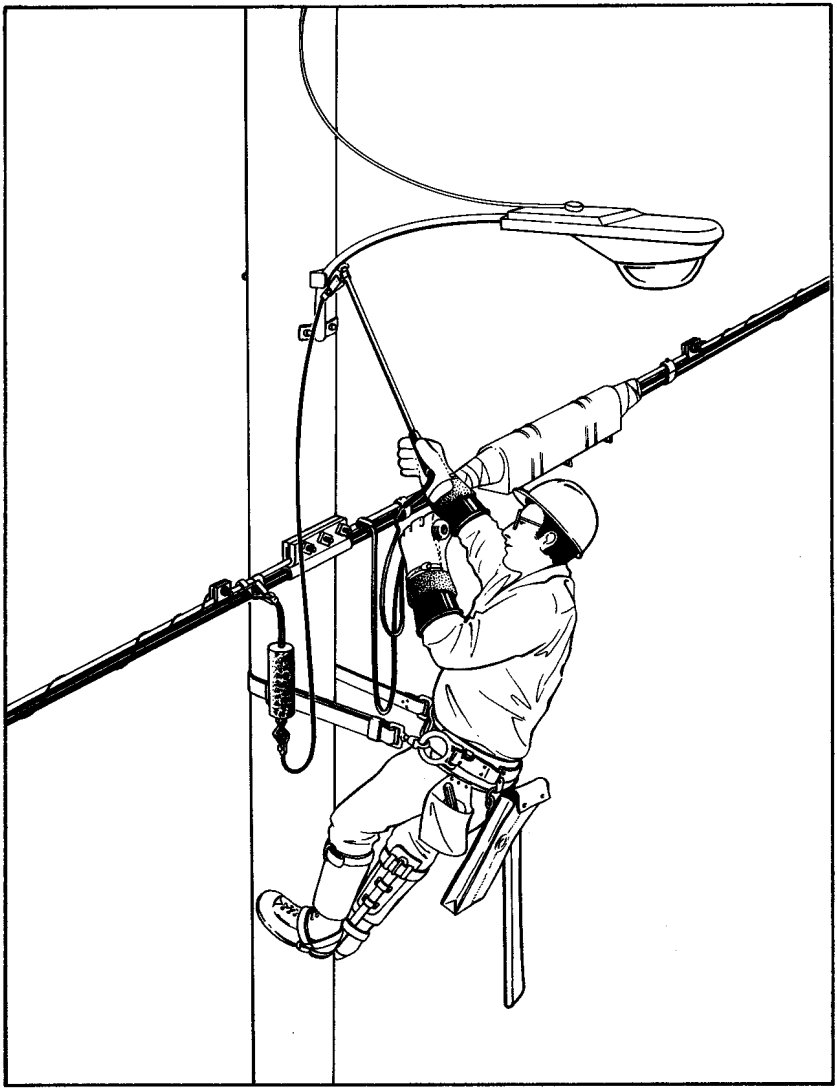


FIGURE 5.

– N O T E S –

CLEARANCES AND SEPARATIONS

MEASURING CLEARANCES AND SEPARATIONS AERIAL PLANT

CONTENTS	PARAGRAPH
GENERAL	1
SAFETY PRECAUTIONS	2
TOOLS	3
CLEARANCES AND SEPARATIONS CARD (FORM 49001-P)	4

1. GENERAL

1.01 This practice describes the methods and tools to be used in measuring clearances and separations for aerial plant and includes the safety precautions that must be observed. This practice is reissued to update information and introduce the pocket-sized card showing the minimum clearances and separations for joint use aerial plant. See Exhibits I and II. **Remove from the file and destroy all copies of CTSP 490-060-001, Issue 1, 1970.**

1.02 Refer to the appropriate practice in the 490-06X Plant Series and the 570-150 Engineering Series of practices for information on clearances and separations.

1.03 The clearances and separations recommended by the National Electrical Safety Code (Sixth Edition) should be used as the governing principle in all planning or inspection of aerial plant. These recommendations are the allowable minimum when no other values are specified on detail plans or work orders.

1.04 The clearances and separations specified by the NESC are those which will exist under ideal weather and wind conditions (60° F. with no wind). Refer to the appropriate practice in the CTS 490-200, 490-250, 490-355 and 490-360 series for any adjustment to the sag values contained in the NESC tables. (Unless otherwise specified, the NESC tables refer to the voltages between supply wires.)

1.05 The rearrangement of existing plant to meet the minimum clearances specified in the NESC tables is not always necessary. When a clearance problem is encountered, the supervisor should be consulted to determine the corrective action to be taken in accordance with local ordinances and procedures.

NOTE: In locations where state or municipal requirements are more stringent, locally prepared instructions shall be provided.

2. SAFETY PRECAUTIONS

2.01 It is essential that special precautions and safety practices are followed when working aloft or near any structure or equipment used for the distribution of electricity.

2.02 Plan and perform work in the vicinity of power facilities on the basis that any metallic part of the power structure is alive with dangerous voltage. In addition to recognized power systems, this also includes:

a. Power service drops to buildings.

b. Street lighting circuits.

c. Down guys, span guys, street lamp fixtures, and any other wires or hardware not normally energized.

d. Unprotected power company neutral grounds attached to poles.

2.03 When selecting the proper locations for telephone plant attachments, the following precautions shall be observed:

a. All methods or tools used for measuring separations shall be such that craftsmen are not exposed to foreign potentials.

b. When supply circuits of less than 750 volts are present, the actual separations can be measured only along a nonmetallic surface with a standard rule. **Rubber gloves shall be worn while making measurements.**

c. If more than 750 volts are present, the clearance must be estimated where gains or bolt holes are below the supply circuits; the distance can then be measured using the gain as a reference point.

d. Generally, when supply circuits are not in place at the time the telephone attachments are to be installed, the location of future power facilities and hardware will be noted on the Job Order. If they are not, the location should be obtained from the telephone company field engineer. Separation measurements may be taken with the Perkins PM 950-25 FI measuring pole, rules or linen tapes (see paragraph 3).

2.04 When work involves any boom equipment, the craftsman must thoroughly check all overhead

clearances. If there is a doubt about the height of any wire, actual measurements must be made to determine clearances. Field engineers shall consider clearances when planning jobs and place appropriate warning notes on the prints to inform the construction forces of potential hazards.

2.05 If power facilities prevent the safe performance of work, the work shall not be commenced until arrangements have been made for the necessary safeguards.

2.06 No telephone company employee shall touch or allow equipment or material to come in contact with power conductors or associated hardware of any voltage.

2.07 No work will be performed by a telephone company employee, or with company equipment at a radial clearance of less than 36 inches from any power conductors or associated hardware which are classed as primaries (above 750 volts).

NOTE: An exception to the above is a pole being erected, removed or straightened, which may be less than the 36-inch radial clearance provided it is covered with insulating pole guards on all surfaces of potential contact. During the performance of this work, all employees in contact with the pole or equipment shall wear protective rubber gloves. Refer to CTSP 400-100-100.

2.08 The use of steel measuring tapes aloft on poles, fixtures or in any other place where there is a possibility of contact with an energized wire is prohibited. Linen tapes with metallic reinforcing strands, or tapes dampened by rain, shall not be used to measure power clearances.

3. TOOLS

3.01 Depending on the plant involved, the tools used to measure clearances are divided into three groups:

a. Contact Tools: These include Perkins PM 950-25 FI measuring poles, clearance lines, linen tapes, and ropes which touch plant to be measured. They are used to measure the height of telephone line wires, cables, guys, and drop wires only when hazardous potentials are not present.

b. Proximity Tools: Perkins PM 950-25 FI measuring poles, tree pruner handles, pike poles and bamboo rods are used as reference markers when raised adjacent to the line. Due to the possibility of contact by teetering, their use is limited to measuring the height and vertical clearance of telephone line wires, cables, guys, and drop wires only when hazardous potentials are not present.

c. Optical Tools: These are tools equipped with lenses and include range finders (CTSP 405-600-305), height meters, etc. They are used to compute the height and vertical clearance of **all** telephone and supply wires and cables.

4. CLEARANCE AND SEPARATION CARD (FORM 49001-P)

4.01 Form 49001-P is a 3-1/2-inch x 6-inch plastic laminated card showing minimum clearances between power fixtures and telephone facilities carried on the same pole. Exhibit I shows the front of the card and Exhibit II shows the back.

4.02 System operating telephone companies who use the National Electrical Safety Code to meet local minimum requirements should obtain and issue the card to:

a. Line crew personnel.

b. Cable splicers.

c. Installer/Repairmen.

d. Plant Management personnel who supervise construction or maintenance of aerial plant.

e. Outside Plant Engineers.

4.03 Ordering Information: Form 49001-P is available in packages of 25 each. Order through local Purchasing channels specifying CSS No. 95-49-001-9.

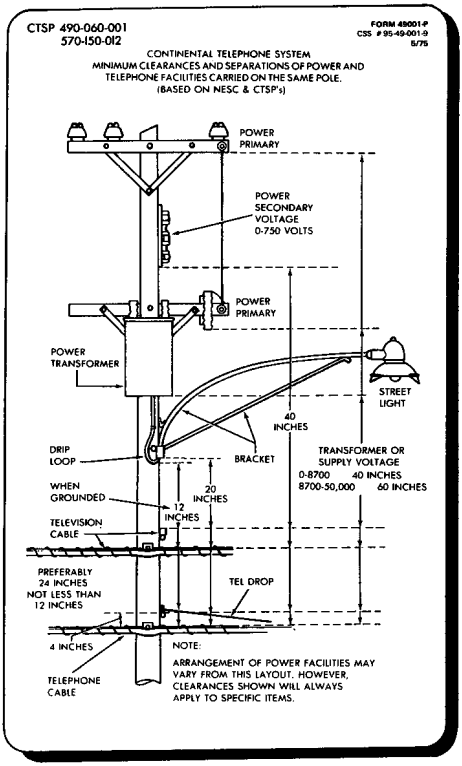


EXHIBIT I. Front of Clearances and Separations Card

MINIMUM CLEARANCE ABOVE GROUND FOR TELEPHONE OR CATV FACILITIES

ITEM	URBAN FEET	RURAL FEET
Where cables, guys, line or drop wires run along and within the limits of:		
(a) public highways, streets and roads	18	14
(b) public alleys	15	–
(c) ways accessible to pedestrians only	8	8
Where cables, guys, line or drop wires cross over private property or ground:		
(a) accessible to pedestrians only	8	8
(b) accessible to people on horses or loaded farm vehicles	–	+16
Where cables, guys, line or drop wires cross over:		
(a) public highways, streets and roads	18	18
(b) public alleys	+15	+15
(c) driveways in general unless height of loaded vehicles or equipment using drive requires extra clearance	+15	+15
(d) driveways–residential garages	10	10
(e) ways accessible to pedestrians only	8	8
(f) obstacles (billboards, roofs)	2	2
(g) flat roofs which may be used by tenants or workmen	8	8
(h) railroads–cable	25	25
(i) railroads–wire	27	27
(j) waterways (rivers, canals, etc.), provide clearance specified by proper authorities and on work plans		

+ secure additional clearance on new construction when warranted at specific locations.

MINIMUM CLEARANCES IN FEET AT CROSSINGS OF WIRES AND CABLES CARRIED ON DIFFERENT SUPPORTS

TYPE OF CROSSING WIRES AND CABLES	TELEPHONE OPEN WIRES, CABLES MESSENGER, DROPS AND GUYS	
	Crossing Under	Crossing Over
Open supply wires 0-750 volts and supply cables having effectively ground sheath or messenger–all voltages		NOT CTC PROCEDURE
(a) line wires	4	
(b) service wires	2	4
Open supply, line or service wires		
(a) 750-8700 volts	*6	NOT CTC
(b) 8700-50000 volts	6	PROCEDURE
Foreign guys, span wires, lightning protection wires	2	2
Foreign communication wires, cables and fire alarm wires	2	2
Trolley contact conductors		
(a) 750 volts or less	–	4
(b) 750-8700 volts	–	6

*Clearance for (a) may be reduced to 4 feet if crossing is more than 6 feet from communication pole

NOTE: The above clearances apply where the crossing span length of the upper conductor or wire does not exceed 175 feet for greater span lengths, increase clearances in accordance with NESC and CTS

MINIMUM HORIZONTAL CLEARANCE OF POLES FROM OTHER OBJECTS

OBJECT	MINIMUM CLEARANCE
Fire hydrants	Not less than 3 feet – 4 feet recommended
Curbs	6 inches measured to street side of curb
Railroad tracks	12 feet measured to nearest rail

EXHIBIT II. Back of Clearances and Separations Card

OPEN WIRE

NUMBERING OF PIN POSITIONS

1. GENERAL

1.01 This practice contains illustrations showing preferred numbering for various types of crossarms.

2. PIN POSITIONS

2.01 Pin positions are numbered from left to right; with your back to the central office, or facing ascending pole numbers.

2.02 The following illustrations shall be followed unless other numbering plans are established for certain lines.

Figure 1. 2-Pin Crossarm

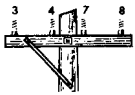


Figure 2. 4-Pin Crossarm

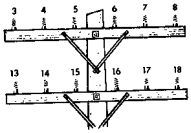


Figure 3. 6-Pin Crossarm

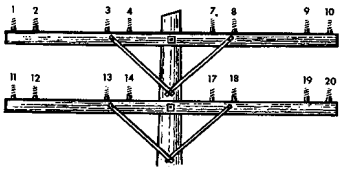


Figure 4. 8-Pin Crossarm (Carrier Design)

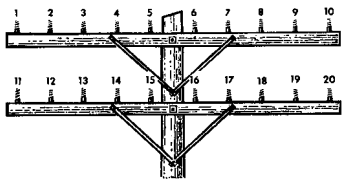


Figure 5. 10-Pin Crossarm

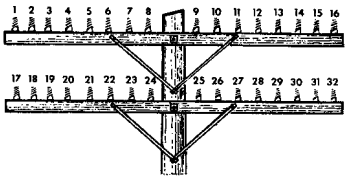


Figure 6. 16-Pin Crossarm

OPEN WIRE

POSITIONS OF WIRES ON CROSSARMS AND WOOD BRACKETS

1. GENERAL

1.01 This practice covers the assignment of wire positions on crossarms and wood brackets.

1.02 Detail work plans will generally be furnished to the construction forces before any work operations are begun. These plans will show the types of circuits to be placed, the designated wire positions, the type and points of transpositions, and the kind and size of wire to use. If such plans are not available, consult your supervisor.

2. WIRE POSITIONS ON CROSSARMS

2.01 Pin positions on a crossarm are numbered from left to right, with your back to the central office, or facing the ascending pole numbers, or in the direction determined for that line.

2.02 When tying or retying wires at straight line poles, attach them to insulators as shown in the following illustrations. In the case of type B crossarms, wire positions are the same as those illustrated except the pole pair wires are placed on the pole side of the insulators.

2.03 Figure 1 shows placement where wire is not point transposed.

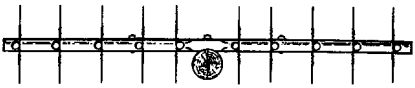


Figure 1. Type "A" Crossarm: Wires Not Transposed.

2.04 Figure 2 shows placement at corners.

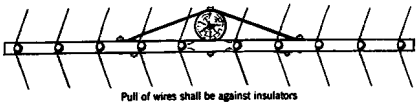


Figure 2. Type "A" Crossarm: Wire Placement at Corner.

3. WIRE POSITIONS ON WOOD BRACKETS

3.01 On bracket lines, place the wires on the side of the insulators toward the pole. If insulators are on the outside of a corner, tie the wires so they will pull against the insulators (Figure 3).

3.02 At some corners it may be necessary to place two wooden pole brackets so the line will clear the pole. When this is done, place the wires as shown in Figure 4.

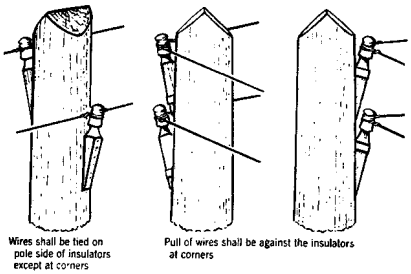


Figure 3. Placement of Wires on Bracket-Mounted Insulators.

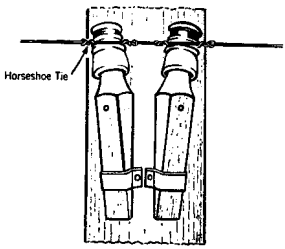


Figure 4. Placement of Wires on Adjacent Insulators.

OPEN WIRE

BRIDLING–OPEN WIRE LINES DESCRIPTION AND INSTALLATION

1. GENERAL

1.01 This practice provides methods of bridling open wire lines at the junction of open wire and cable, buckarm poles, protective equipment, and at the junction of open wire side lead terminations. This practice also covers methods of making bridle wire connections in both corrosive and non-corrosive areas.

2. DESCRIPTION

2.01 Three types of wire are available for bridling purposes:

a. No. 14 gauge twisted pair with rubber insulated, neoprene jacketed, hard drawn copper conductors.

b. No. 20 gauge twisted pair (red) 40% conductivity, rubber insulated, neoprene jacketed, copper steel conductors.

c. No. 18 two-conductor, (black), rubber insulated, neoprene jacketed, twisted, solid annealed copper conductors.

3. USE

3.01 Use No. 14 gauge wire at the following locations:

a. All bridling of toll circuits.

b. Bridling from exchange open wires to protected cable terminals.

c. Bridling from exchange open wires to external protectors such as 222 type arrestors (extend from external protectors to unprotected cable terminals with 18 gauge, as in paragraph 3.02 a.).

d. Bridling associated with battery feeders when specified.

e. Between poles at side-lead terminations.

3.02 Use No. 18 bridle wire (black) at the following locations:

a. Bridling of exchange circuits from unprotected cable terminals to external protectors (extend from protectors to exchange open wires with 14 gauge, as in paragraph 3.01 c.).

b. Bridling open wire exchange circuits at buckarm poles.

3.03 Use No. 20 gauge 40% conductivity bridle wire (red) between exchange open wire and one-pair-wire terminals.

3.04 All bridling wires should be free of splices.

4. ILLUSTRATIONS

4.01 The following illustrations (Figures 1 through 6) show the recommended positions of bridle wires on poles and crossarms.

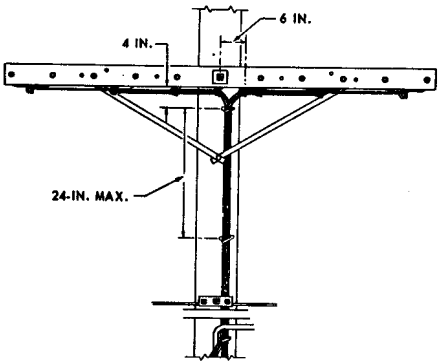


FIGURE 1. Bridle Wires at Dead-end Poles, Pole-mounted Terminals.

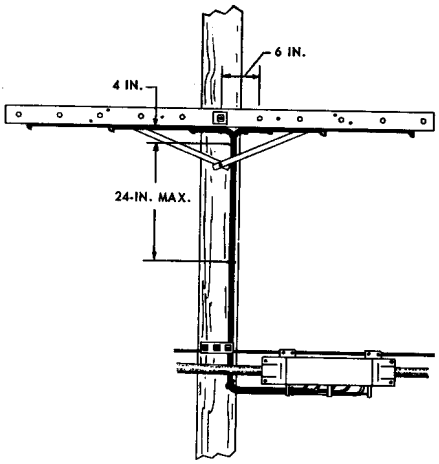


FIGURE 2. Bridle Wires at Dead-end Poles, Strand-mounted Terminals.

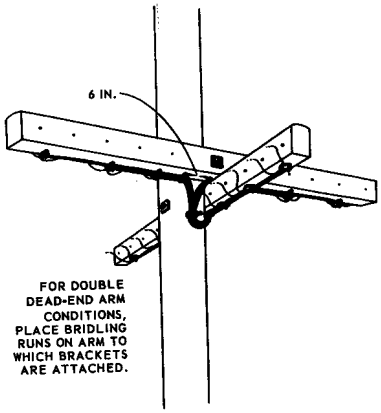


FIGURE 3. Bridle Wires at Buckarm Poles.

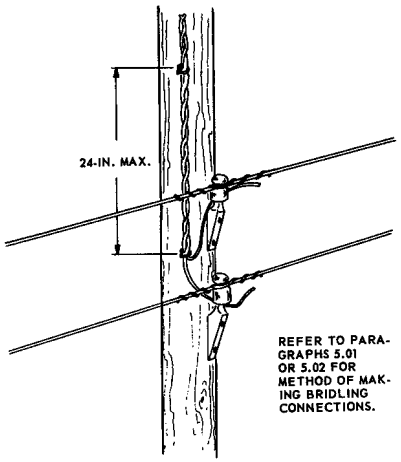


FIGURE 4. Bridle Wires at Wooden Pole Brackets.

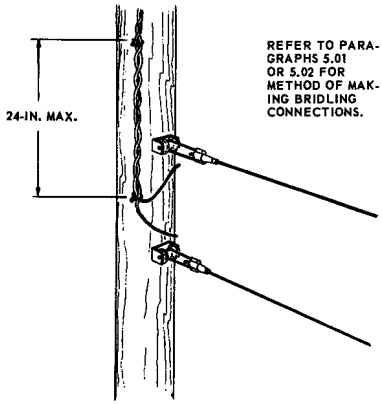


FIGURE 5. Bridle Wires at Bracket Dead-ends.

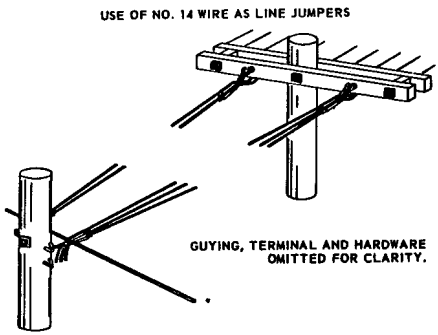


FIGURE 6. Bridle Wires at Side-Lead Terminations.

5. CONNECTIONS TO LINE WIRE

5.01 *Non-Corrosive Areas:* All connections between open wire and bridling wire in non-corrosive areas should be made with split sleeves of varying sizes depending on the type and gauge of wire of the main facility. Figures 7, 8 and 9 illustrate the split sleeve and some of its uses.

FIGURE 7. Split Sleeve.

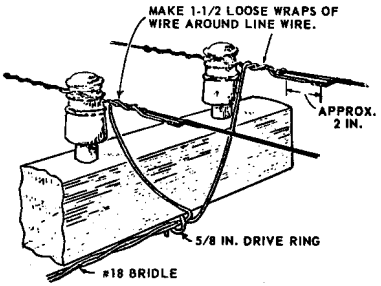


FIGURE 8. Placing Split Sleeve at an Intermediate Pole.

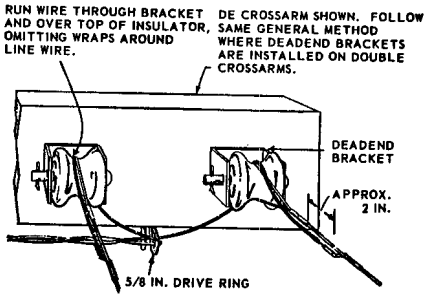


FIGURE 9. Placing Split Sleeve at a Dead Pole.

5.02 *Corrosive Areas:* All connections between open wire and bridling wire in corrosive areas should be made with bridging connectors of the appropriate size, depending on the type and gauge of the main facility. Figures 10, 11 and 12 illustrate the bridging connector and some of its uses.

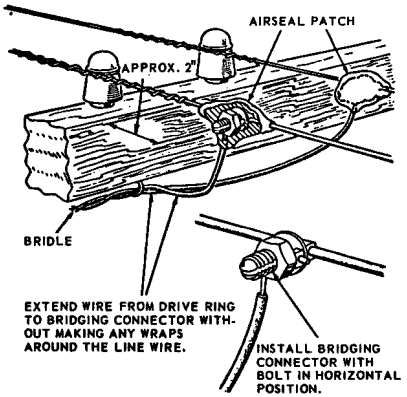


FIGURE 10. Installation of a Bridging Connector.

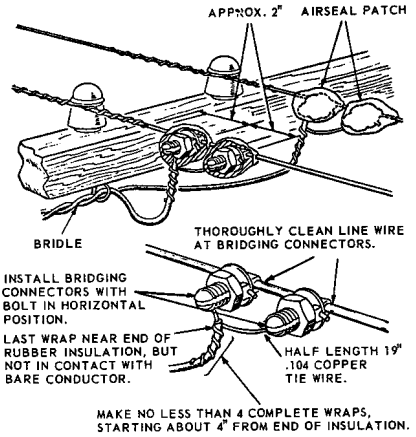


FIGURE 11. Bridle Wire Connection in a Highly Corrosive Area.

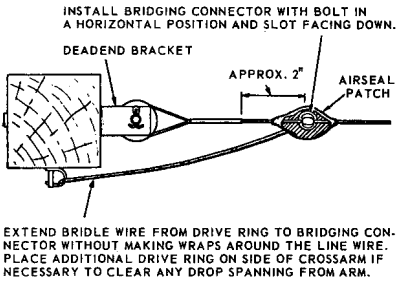


FIGURE 12. Bridle Wire Connection at Dead-ends.

6. PLACING SPLIT SLEEVES AT BRIDLING POINTS

6.01 Run the bridle wire on the pole or crossarms to provide sufficient wire to reach beyond the deadend or insulator tie as shown in Figures 13 and 14.

FIGURE 13. Placing Split Sleeve at the Dead-end.

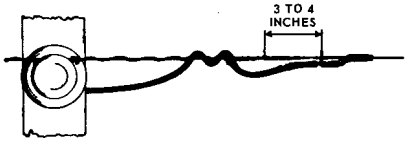


FIGURE 14. Placing Split Sleeve at the Insulator.

6.02 Install the bridging sleeve as follows:

a. Remove 2 inches of insulation from the bridle wire. Clean the copper conductor thoroughly with abrasive cloth.

b. Insert the cleaned wire in the sleeve so the end of the insulation is 3/4 inch from the end of the sleeve. See Figure 15.

c. Make at least five presses with the 31-DC Nicopress tool, starting at the inner end and working toward the outer end with adjacent presses overlapping slightly. When making the last press, the side of the presser jaws should extend slightly beyond the end of the sleeve. No attempt should be made to remove the fin by pressing a second time.

d. Wrap the bridle wire around the line wire one and one-half turns. See Figure 14. Clean the line wire thoroughly with abrasive cloth. Place the split sleeve on the line wire and close the split end of the sleeve down on the line wire throughout its length by pressing with the side cutting pliers. See Figure 16.

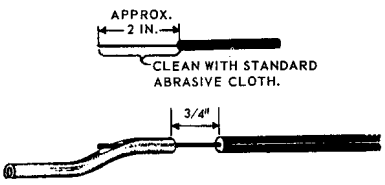


FIGURE 15. Placing Bridle Wire in the Sleeve.

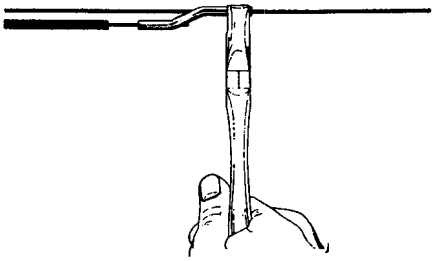


FIGURE 16. Closing Split Sleeve on Line Wire.

e. Make a minimum of eight presses with the 31-DC Nicopress tool, starting at the inner end of the split portion and working towards the outer end with adjacent presses overlapping slightly so as to result in a complete closure of the seam. When making the last press, the side of the presser jaws should extend slightly beyond the end of the sleeve. The pressing tool should be so positioned on the split sleeve that the seam will coincide with one of the fins formed in the pressing operation. This is necessary to insure a complete closure of the seam. No attempt should be made to remove the fin by pressing a second time. A completed sleeve is shown in Figure 17.

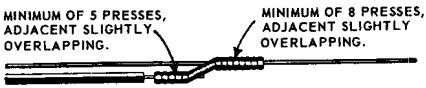


FIGURE 17. Completed Split Sleeve.

7. BRIDLE RINGS AND DRIVE RINGS

7.01 The type of bridle or drive ring used for bridle runs on poles or crossarms depends on the number and type of bridle wire used. Table A lists the type of ring to use.

TABLE A. Bridle or Drive Ring

Size of Wire	Number of Pairs		
	5/8-Inch Drive Ring	1-1/4 " C Bridle or Drive Ring	1-5/8 " A Bridle Ring
14GA. Twisted	3	6	12
18GA. Twisted	6	12	26

8. DISCONNECTING AND RECONNECTING BRIDLING-WIRE SPLIT SLEEVES

8.01 In disconnecting a bridging sleeve connection, cut the bridle wire as close to the split sleeve as possible. When making a reconnection, place the new bridging (split) sleeve adjacent (either side) to the previous attachment.

OPEN WIRE

OPEN WIRE LINES REPAIRING

1. GENERAL

1.01 This practice provides the basic methods in making repairs to open wire lines.

1.02 In doing open wire repair work the following general rules should be used as a guide:

a. Repair all items shown on prior inspection reports, as well as such items that may be observed during the course of other construction work that would cause service interruption, or be a potential hazard to workmen or the public.

b. There may be cases where existing plant does not conform to the latest standards. It is not ususally economical or necessary to change such plant unless service or safety is involved.

c. Temporary repairs should be avoided if at all possible.

d. Any dangerous plant conditions which cannot be corrected shall be reported through the lines of organization.

2. METHODS OF REPAIR

2.01 *Open Wire:*

a. Use new wire of the same size and type to repair breaks or other defects in open wire. Cut out any existing sleeves that are within 25 feet of the new splice to be made.

b. Kinks, bruises, flaws or other faults in bare open wire should be cut out and spliced with wire of the same kind and size.

c. Sag the repaired wire to the same sag as the existing wire.

d. In repairing open wire exchange circuits, caution should be exercised to maintain service. Test each circuit for busy and install appropriate jumper facility before opening. Do not allow wires to become shorted, grounded or crossed with another pair.

e. Where toll or special circuits are involved, call the appropriate testboard or supervisor for a circuit release before work is performed. It may be necessary to reroute such circuits, or to provide temporary parallel or twisted pair wire around the area being repaired or rearranged. When all work has been completed the testboard or supervisor should be advised, and an O.K. test obtained.

f. Before descending a pole on which work has been done, or leaving a job that has in any way disturbed the wires, see that all wires are clear and in proper condition.

2.02 *Ties and Insulators:*

a. Replace broken and missing ties with new ties of the proper size and type as specified in the appropriate CTS practice. Replace loose ties when line wire has pulled out of insulator groove. When removing or replacing ties, use care not to injure the line wire.

b. Replace broken or missing insulators in accordance with the appropriate CTS practice. Insulators that have pulled off pins shall be securely re-installed. If the threads are stripped or worn the pins shall be replaced.

3. CLEARANCES AND SEPARATIONS

3.01 When repairs or changes are made in open wire, the clearances specified in the appropriate CTS practice shall be maintained.

3.02 When slack is pulled or wire attachments are raised on poles, and especially when joint use is involved, the separations as shown in the appropriate CTS practice must be maintained.

3.03 When clearance from electric wires or structures requires correction, the telephone plant should be changed, or the power company requested to rearrange their plant. When the telephone plant is to be changed to provide the required clearances, the method outlined in the practices covering the particular type of plant involved should be followed.

4. SCRAP AND DEBRIS

4.01 All foreign material such as scrap wire, metallic objects, kite strings, or debris of any kind hanging on the wires should be removed. This material can some times be removed by shaking or whipping the wires. However, do not use pliers or tools to vibrate wires, as they may damage the wire. A handline placed over the wire, with both ends held securely, and made to slide along the wire, may dislodge the object, or bring it to a point that it can be removed.

4.02 Any scrap wire, metallic material, and debris removed from wires together with that found under or in the vicinity of the line should be gathered up and properly disposed of.

5. TREE INTERFERENCE

5.01 Where tree wardens, city foresters, or other authorities have control of trees, secure permission from the proper authorities as well as the consent of the property owner before work is started. Trees should be removed if permission to do so can be obtained. When this is impracticable or undesirable, remove sufficient growth to obtain adequate clearance from the wires. The amount of clearance required in any specific case depends on kind of tree, rate of growth, frequency of trimming, etc. Cutting to obtain clearance of a foot or so around wires is generally inadequate as the tree will grow back into the line within a short time. In cases where permission to trim for adequate clearance cannot be obtained it is usually desirable to trim as much as the tree wardens or property owners will allow. In these cases and also in cases where the owner will not allow trimming of any nature the matter should be referred to the supervisor.

5.02 All timber, brush, and debris cut or pruned should be removed from the premises and disposed of as covered by local instructions.

5.03 Where it is not possible to remove or trim trees, extension arms may sometimes be used to provide adequate clearance; or pins may be respaced to change location of wires through trees. However, the proper spacing of wires must be maintained where carrier circuits are involved.

5.04 The use of tree wire (or insulated wire) as a means of maintaining line insulation is not desirable due to the short life of the wire insulation. When tree wire is the only answer to the problem it should be placed as outlined in the appropriate CTS practice.

6. CONNECTIONS

6.01 Defective sleeves should be removed, and the wire spliced with standard sleeves.

6.02 All handmade joints or other types of unauthorized sleeves should be cut out and the wire respliced in a standard manner.

6.03 Where there is not sufficient slack in the wire to place new sleeves, cut in a short piece of wire of the same kind and size.

6.04 All loose connections at bridging points, binding posts, terminals, etc., shall be remade, after first thoroughly cleaning wire and contact surface, and remaking the connection properly. Defective test or bridging connectors, including bridging sleeves, should be replaced.

OPEN WIRE

INSPECTION

1. GENERAL

1.01 The open wire portion of the outside plant requires a careful and continuous preventive maintenance program. The fundamental principles involved in open wire construction, the scattered location of the plant, the general use of bare wire, the constant exposure to weather, and to interference by construction activities, electric light and power circuits, trees, vehicles, etc., make it a vulnerable part of the plant from the viewpoint of service interruption. Improper sag, scrap wire and fireign material on wires, tree interference, defective ties and insulators are some of the common causes of trouble in the open wire plant.

1.02 In order to detect and correct faulty conditions or remove potential sources of interference before service interruptions occur and to economically keep the open wire plant in a satisfactory service condition at all times, preventive maintenance work must be carefully planned and consistently carried out.

1.03 To accomplish this, a complete inspection of all open wire and associated plant should be carried out on a periodic basis, and the necessary repairs and adjustments made. (See CTSP on Open Wire Repairs). The inspection should include such items as power hazards, insufficient clearances at highways, driveways, sidewalks, over railroads or street railways, etc., or from guys or other obstructions, free interference, broken or loose ties, broken, missing or floating insulators, faulty connections and other similar sources of interruptions to service or hazards to employees or the public.

1.04 The frequency of inspection will in general depend upon the quality of work performed by telephone workmen, the cooperation of power and other wire using companies in properly constructing their plant, and the relations established with highway and building engineers and contractors for obtaining advance information concerning major projects affecting telephone plant. Usually inspections of exchange open wire carried out at intervals of about one year will be adequate. For toll circuits, inspections at more frequent intervals will generally be required. Local conditions are in all cases important factors in determining the required frequency of inspections. For either exchange or toll open wire, consideration should be given to the importance of the service carried on the lines, the character of the circuits, the age of the lines, prevalence and kind of tree growth, activities of power and other wire using companies, the amount of trouble, the general condition of the plant and fumes, smoke or moisture conditions, etc.

1.05 Extensive damage to plant by floods, forest fires, severe wind or sleet storms will sometimes require special inspection work, or have a direct bearing on the scheduling of regular inspections.

1.06 In general it is felt that a sufficiently accurate determination of the conditions can be made by observations from the ground. It seems desirable, however, that poles be climbed in order to secure closer observations of conditions on:

a. Terminal poles.
b. Reverse (buck) arm poles.
c. Test poles.
d. Side lead termination poles.
e. Poles at open wire loading points.
f. Railroad and river crossing poles.
g. Dead end and suspension poles or fixtures in long span construction.

1.07 Poles should also be climbed for making inspections when the observed conditions from the ground indicate that this procedure is warranted.

1.08 On certain classes of lines and for particular inspections local instructions may require that the inspector climb all poles.

1.09 In carrying out the inspection work for open wire plant, good judgment must be excerised on the part of the inspector in determining the conditions that are to be corrected. It should generally be the intent to carry out only that repair work necessary to insure uninterrupted and satisfactory service from the plant and the elimination of hazards to employees or the public. Minor deviations from standard practices, old standards of construction and obsolete materials should not be changed except where they present a hazard or may be expected to cause trouble.

1.10 Unauthorized attachments on poles should be noted and reported as it is desirable to have them removed if objectionable, or a suitable agreement for joint use executed if they are not objectionable.

1.11 Idle wire and associated plant shall be treated in the same manner as working plant in connection with the inspection work. Dead wire or other idle plant for which there is no further use should be reported for removal. When plant as described above and plant that is temporarily idle present hazards to employees, the public or to service, arrangements should be made to eliminate the hazards promptly.

1.12 Note building or other foreign construction operations that might interfere with telephone service or which might result in hazards to telephone employees. Consultation with those in charge of the operations, before they have progressed to a point where the telephone plant is endangered, will frequently prevent any interference with the telephone service. When it is noted that the telephone plant will interfere with the progress of building or other construction work, the conditions should be corrected or reported in accordance with local instructions.

1.13 In some cases it may be desirable to combine the open wire inspection work with inspections of drop wires, poles or cable. If combination inspections are to be made, detailed instructions concerning the various types of plant will be furnished the inspector.

1.14 The principal items which should be considered for the inspection of the open wire and associated plant are outlined in the following parts of this section.

2. CLEARANCES

2.01 Check all wires for conformity to local clearance regulations and for all clearances specified in the practices on clearances.

2.02 Check clearances of wires over or under railways and railroads to be sure that they conform to all requirements of practices on clearances for aerial plant and the instructions covering railroad crossings.

2.03 Check all wires for clearances from electric light, power, trolley feeders, contact wires, transformers, etc., including the supporting structures for plant of this nature to make sure that trouble from direct crosses, or "power arc follow up" will not occur and so that hazards to employees, or the public, will be eliminated. Note attachments of telephone plant to poles supporting high tension circuits or of high tension circuits to poles supporting telephone plant and report all such cases in accordance with local instructions. When it is not known whether power circuits are high or low tension, secure this information in accordance with local practices or as instructed by the supervisor.

2.04 Observe wires for proper separation from foreign communication circuits, signal circuits or other similar plant.

2.05 Observe clearances where wires cross or parallel suspension strand or guys, including guys from electric light, power, foreign telephone, telegraph or other pole lines.

2.06 Observe locations where action should be taken to eliminate fire hazards caused by close proximity of the line to inflammable materials or buildings.

3. SAG

3.01 Note that sag in wire is uniform, adequate and that no abnormal amount of slack is present in a sufficient degree to constitute a hazard to employees or the public or to cause interference with service. Where sag, obviously excessive, insufficient or non-uniform exists, guys, including crossarm guys, and anchors should be inspected for adequacy and defects.

4. SCRAP OR DEBRIS

4.01 Observe for pieces of scrap wire, metallic material or other debris hanging on wires. In some cases it will be found advisable to give attention to inspecting right of way, both sides of highways and vicinities immediately adjacent to open wire leads for the purpose of removing pieces of line wire, ties, cable rings, fence and bailing wire, metallic objects, etc., which might be picked up and thrown on the wires.

5. TREE INTERFERENCE

5.01 Inspect wire clearances through trees, hedges, etc., to see that there is adequate separation from limbs, branches or foliage. Clearances should be such that interference will not occur because of sleet, snow, rain and wind storms, or because of the growth which will occur before the next inspection period. Note that tree guards and attachments are in good condition and are used on insulated wire where required.

5.02 Note any dead limbs or dead trees which might fall into the line.

5.03 Where pruning has been done or where trees have been cut down, note that branches and brush have been disposed of properly.

5.04 When instructed locally to do so, inspect for brush and young tree growth under lines which are likely to cause future interference.

6. WIRE

6.01 Observe wires for badly rusted or corroded conditions and for kinks, cuts, nicks, tie burns, etc., all of which are common causes of trouble. In sections where it is not known that the condition of the wire is satisfactory or in lines in the vicinity of smelters, foundries, chemical plants, mills, railroad crossings, switch yards, etc., it is advisable to make a spot inspection by climbing a number of poles at suitably selected locations to definitely determine whether deterioration exists. If the results of such an inspection indicate that the wire is badly deteriorated, it is advisable to make further climbing inspections to determine the extent of the defective wire and the amount of replacement required.

6.02 Observe twisted pair, parallel or other insulated wire in long spans, ring runs and through trees, etc., including temporary twisted pair and emergency cable, for defective insulation, faulty ties and attachments, loose connections, etc.

6.03 Inspect (by climbing pole) open wire dead ends at terminal poles, reverse (buck) arm corners, test points, side lead terminations, railroad and river crossings, bridle wire insulators, etc., to see that they are properly made and secure. Note that wire jumpers, bridle cables and bridle wires are properly placed and terminated, that no loose connections exist and that bridle rings or similar attachments are used where required. Observe bridle wires and bridle cables for abraded insulation, kinks, loose or uninsulated splices, etc.

6.04 Observe that proper size of wire is used in spans crossing over railroads and in adjacent spans. Note that connections are in good condition and that line wire joints are not located in crossing span. See instructions covering railroad crossings.

6.05 Report locations where the placing of exchange cable or cable terminals will eliminate excessive wire. Report also the locations where it appears economical to replace defective drop wire in line spans with cable, or with crossarms and bare wire. Note locations where dead wire is in hazardous condition and should be removed.

6.06 At severe changes in grade, observe for excessive strain on attachments, wires and ties. See that wires are on the proper side of insulators with respect to the pull on corner poles.

7. CONNECTIONS

7.01 Hand made and other unauthorized or obsolete types of splices, joints or connections in line wire or between line and bridle wire, etc., should be observed and reported for replacement with standard sleeve splices or for correction.

7.02 Check all connections at or adjacent to poles climbed for other inspection purposes, to make sure that they are in good condition and properly made, for example, bridle wire and line wire connections at side lead terminations.

7.03 Inspect connections at cable terminals, binding posts, bridging and test connectors, etc., to be sure that they are tight and in good condition. Observe that test connectors on toll circuits are of the proper type and used only where authorized.

7.04 Line wire joints, at or adjacent to poles climbed for other inspection purposes, should be checked to see that they are properly made and free from excessive corrosion or other defects. High resistance connections and splices, generally caused by corrosion or rust (particularly in iron wire) are common sources of trouble and are difficult to locate. In areas where this trouble is prevalent, it may be desirable to make suitable tests to detect those conditions.

8. TIES

8.01 Observe line for missing, broken or loose ties. Note that ties appear in satisfactory condition, are properly placed and are of the correct size and type.

9. INSULATORS

9.01 Inspect line for missing, broken, floating and obviously loose insulators. Note also that the insulators are of the correct type.

9.02 Note that bridle wire insulators are used where required and that they are in good condition and properly installed.

9.03 Observe that interconnecting insulator wires and straps are in good condition and have been placed where required on open wire carrier circuits.

9.04 Note that the interconnecting straps clear the underside of insulator petticoats.

10. TRANSPOSITIONS

10.01 When specified locally, check transpositions for accuracy of layout and for correctness of type.

11. PROTECTIVE EQUIPMENT

11.01 Note that protector mounting is properly and securely attached to the pole. See that cover is not broken and that the hinge type covers close properly.

11.02 Inspect protector mountings for broken ground wires, defective or corroded protector springs, missing or defective protector blocks and for moisture or dust inside the mounting. Note that ground and bridle wires connecting protective equipment are properly installed and that all connections and protector blocks are in good condition.

11.03 Note that protector blocks are properly placed on open wires entering cables as required by the instructions covering cable protection and in accordance with local instructions with respect to the areas in which protector blocks should be provided on exchange open wires of less than one-half mile in length.

11.04 When any of the open wires or drops entering a particular terminal are equipped with protector blocks, as specified in the instructions covering cable protection, note that all open wires or drops entering the terminal are so equipped.

11.05 Note that the ground plate of protector mounting is properly connected to suspension strand or to sheath of underground or buried cable in accordance with the appropriate practices.

12. LOADING COILS

12.01 Note that loading coil cases and supports used in connection with open wire loading are in good condition and securely attached.

12.02 Inspect exposed wires for defective insulation and loose connections. Note that wires are placed properly and securely fastened.

13. LONG SPAN CONSTRUCTION

13.01 In addition to the inspection items outlined in the preceding paragraphs, special features involved in catenary and non-catenary long span construction shall be inspected as follows, unless otherwise instructed by the supervisor.

13.02 Inspect special steel crossarms and angle iron braces at dead end and suspension fixtures to see that they are securely attached.

13.03 Observe all steel work for excessive rust and see that galvanizing or protective paint is in good condition.

13.04 Inspect arms and braces for warping or buckling and for any other apparent defects that are likely to weaken the structure.

13.05 Inspect head guys, riding and suspension strand at dead ends to be sure that clamps are in good condition and securely attached.

13.06 Note that wire dead ending clamps are tight and that wire loop and splice are in good condition.

13.07 See that suspension insulator eye-bolt is in good condition and that end of bolt is upset to prevent it from becoming loose.

13.08 Note that suspension insulator is not broken, that wire hanger and wood block are in good condition and span wire is securely held.

13.09 When crossarms or suspension strand hangers are badly out of alignment, observe suspension strand for non-uniform sag and inspect hangers for loose clamps.

BURIED PLANT

BURIED SERVICE WIRE TERMINATIONS WITH AERIAL PLANT

1. GENERAL

1.01 This practice provides procedures for terminating buried service wires at junctions with aerial plant such as aerial cable, multiple wire, C rural wire or open wire.

2. JUNCTION WITH AERIAL CABLE

2.01 At the cable terminal or closure where buried service wire feeds from aerial cable and where the length of the buried service wire is:

a. 500 feet or less–Do not bond the armor wire or the aluminum tape to the strand or terminal housing. This will protect the subscriber's location from possible fire caused by excessive power fault, should the circuit come in sustained contact with power lines of any voltage.

b. More than 500 feet–Use direct buried wire and bond the armor wire to the strand or terminal housing. When the length of buried wire is greater than 500 feet, the resistance of the armor wire because of its length, limits the fault current to safe values. The buried service wire is not to be used for distances of more than 500 feet.

2.02 Carbon block protection is not required between the cable conductors and the buried service wire conductors unless severe lightning exposure exists. See paragraph 2.08.

2.03 Buried service wire can be brought up a pole and terminated directly in a pole or strand mounted cable terminal or cable closure if the cable conductor is 24 or 26 gauge. Where fuseless protectors are used at the station and the cable conductor is 22 gauge or 19 gauge and exposed to power contact, a fusible link is required between the cable pair and the service wire. The 24 gauge conductors in a cable stub or the connecting block of a 49 type cable terminal are satisfactory fusible links. At the groundline, the wire should be protected with an 8 foot length of No. 0 U cable guard. A typical installation terminating in a 49 type cable terminal is shown in Figure 1.

2.04 Where the direct buried wire is 500 feet or less in length, grounding of the armor wire or bronze tape at the cable terminal is omitted. Cut off the armor wire or bronze tape and wrap with two turns of vinyl tape to protect against sharp edges. See Figure 2.

2.05 Where the direct buried wire is over 500 feet in length and the armor wire of the wire is to be grounded to the cable terminal, terminate the armor wire in a grounding harness connector as shown in Figure 3.

2.06 Inside a cable terminal, the conductors of direct buried wire or buried service wire should be terminated on the binding post in the usual manner. The cable stub of the pole or wall mounted terminal provides the fusible link. In the case of a 50 type cable terminal, the 24 gauge conductors of the connecting block serve as the fusible links between the cable conductors and the buried plant conductors.

2.07 Where the length of the buried service wire is over 500 feet, grounding of the armor shield to the terminal housing with a grounding harness connector is required. In a Cook cable terminal, fasten the spade clip connector under a convenient nut or screw in the base assembly.

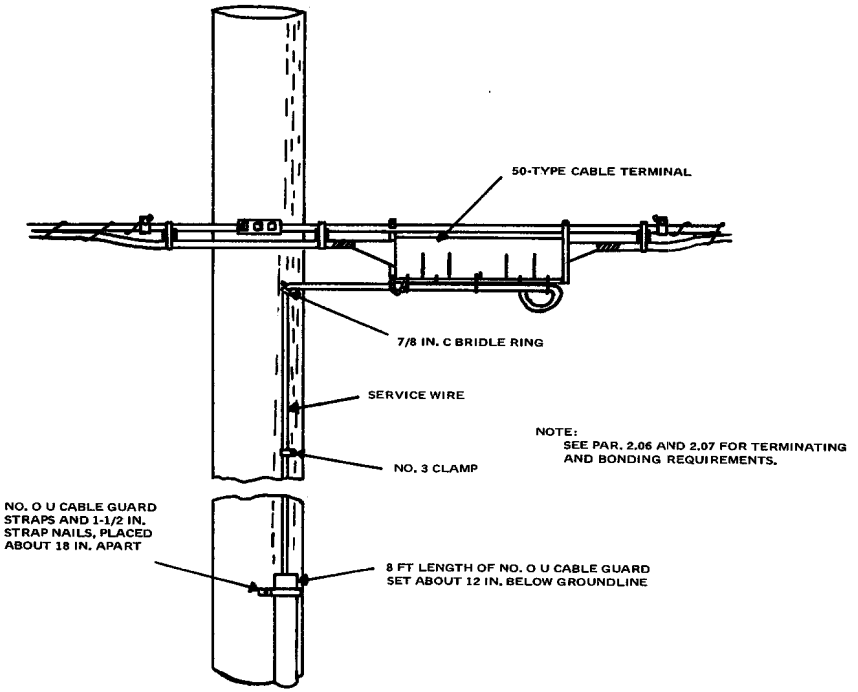


FIGURE 1. Buried Plant Run up a Pole

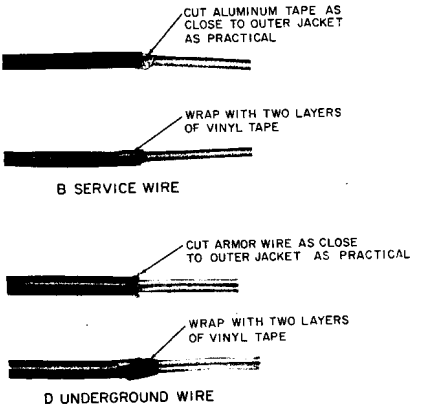


FIGURE 2. Removal of Aluminum Tape or Armor Wire

Remove approximately 5" of the outer jacket from the end of the buried wire, and unspiral the bronze or copper shield to this point. Leaving approximately ¾" of the shield, trim as shown. Remove approximately 2" of the inner jacket from the wire end and bare the conductors as shown.

Place the Termi-foil on the shield tab and squeeze in place with the fingers.

Using Superior Compression Tool GHT-1, crimp the Termi-foil connector to the shield.

Bend the shield tab back into place and wrap with two half-lapped layers of vinyl tape. Place #14 AWG tinned ground wire (connected to ground rod; water systems; etc.) in the butt-splice connector and crimp into place.

FIGURE 3. Bronze Shield or Direct Buried Wire Terminated in a Grounding Harness

2.08 In heavy lightning areas where the subscriber's station is severely exposed to lightning, it may be desirable to furnish additional lightning protection to buried service wires which are 500 feet or less in length. Under these conditions, detailed plans or other special instructions authorize bonding the armor shield or bronze tape at the aerial cable terminal. Such installations require the use of a type 123 or 128 protector (equipped with 2B1E protector units) and connection of the armor shield or bronze tape to the ground post of the protector. A connection is also required between the protector ground post and the cable strand. For the latter purpose, block wire is required as a fusible link to prevent the common wire or bronze tape from overheating. A typical installation is shown in Figure 4.

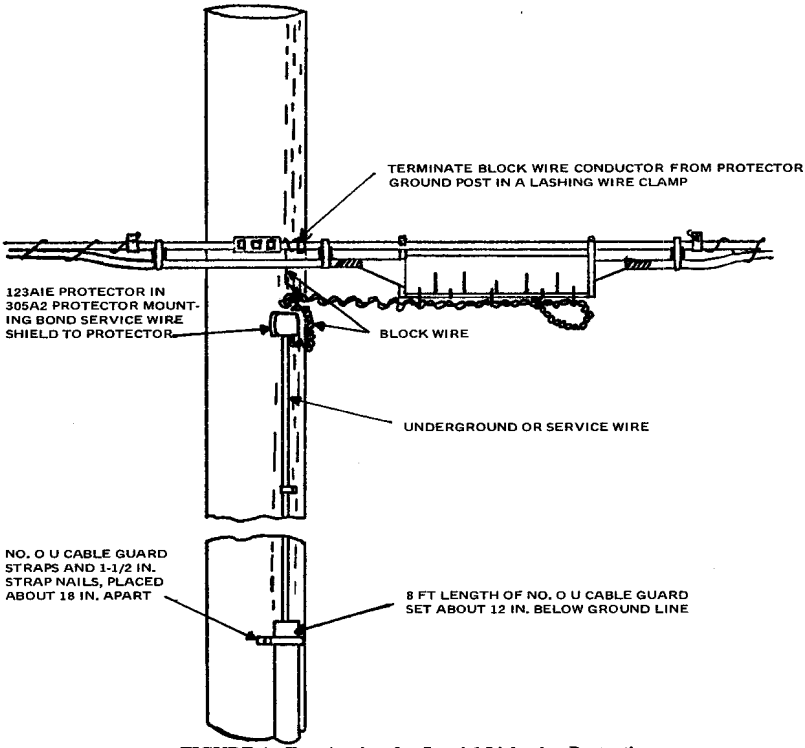


FIGURE 4. Termination for Special Lightning Protection

3. JUNCTION WITH MULTIPLE WIRE

3.01 Where multiple wire is exposed to power contact and a fuseless protector is used at the station, buried service wire should not be used with or fed from multiple wire, because of the relatively small size and low fusing level of the conductors or buried service wire. A satisfactory fusible link is not available for use between multiple wire conductors and buried service wire conductors.

3.02 Direct buried wire can be used with or fed from multiple wire where the multiple wire is exposed to power contact and fuseless station protection is used. Direct buried wire should be brought up a pole and terminated in a pole mounted wire terminal. At the groundline, the wire should be covered with an 8 foot length of No. 0 U cable guard. Cut off the armor wire as shown in Figure 2. Connect the conductors of the direct buried wire to the conductors of the multiple wire with block wire. Figure 5 shows a typical example of direct buried wire being connected to a strand mounted wire terminal.

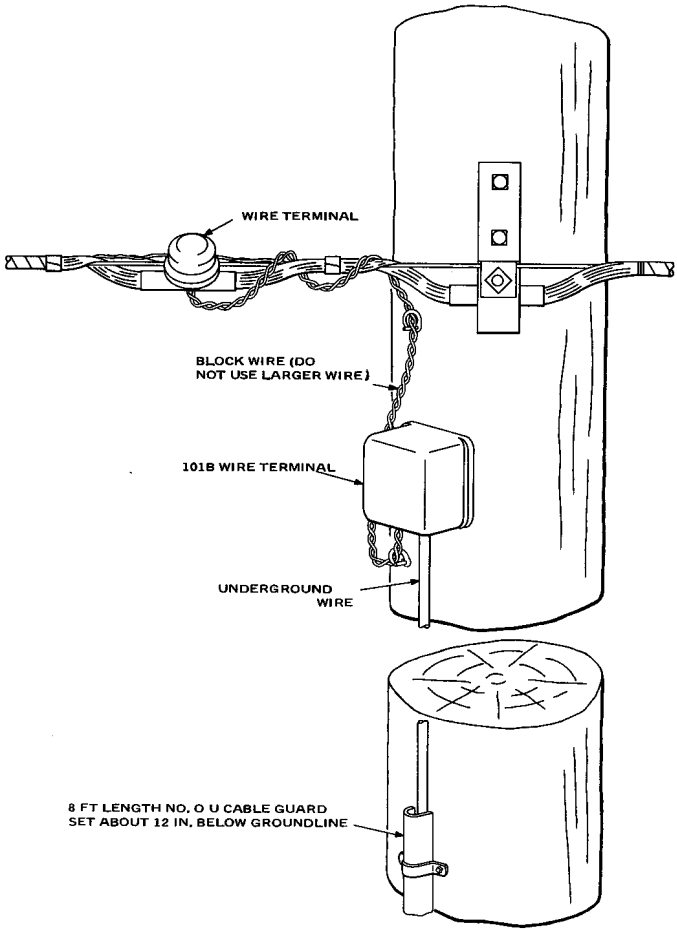


FIGURE 5. Underground Wire Terminated to Multiple Wire

3.03 The block wire serving as a fusible link between the direct buried wire conductors and the multiple wire conductors can be terminated in a pole mounted wire terminal.

4. JUNCTION WITH C RURAL WIRE

4.01 Do not connect buried service wire to C rural wire because of the small size of service wire conductors.

4.02 At the junction with C rural wire, direct buried wire can be brought up a pole and terminated in a pole mounted wire terminal. At the groundline, the direct buried wire should be covered with an 8 foot length of No. 0 U cable guard. The armor wire should be cut off as shown in Figure 2. Block wire should be used to bridle between the pole mounted wire terminal and the strand mounted wire terminal on the C rural wire. A typical installation is shown in Figure 6.

5. JUNCTION WITH OPEN WIRE

5.01 Buried service wire should not be used with or fed from open wire because of the relatively small size and low fusing level of service wire conductors.

5.02 At the junction with open wire, direct buried wire can be brought up a pole and terminated in a pole mounted wire terminal. At the groundline, the wire should be covered with an 8 foot length of No. 0 U cable guard. The armor wire should be cut off as shown in Figure 2. Block wire must be used between the protector and the open wire. A typical installation is shown in Figure 7.

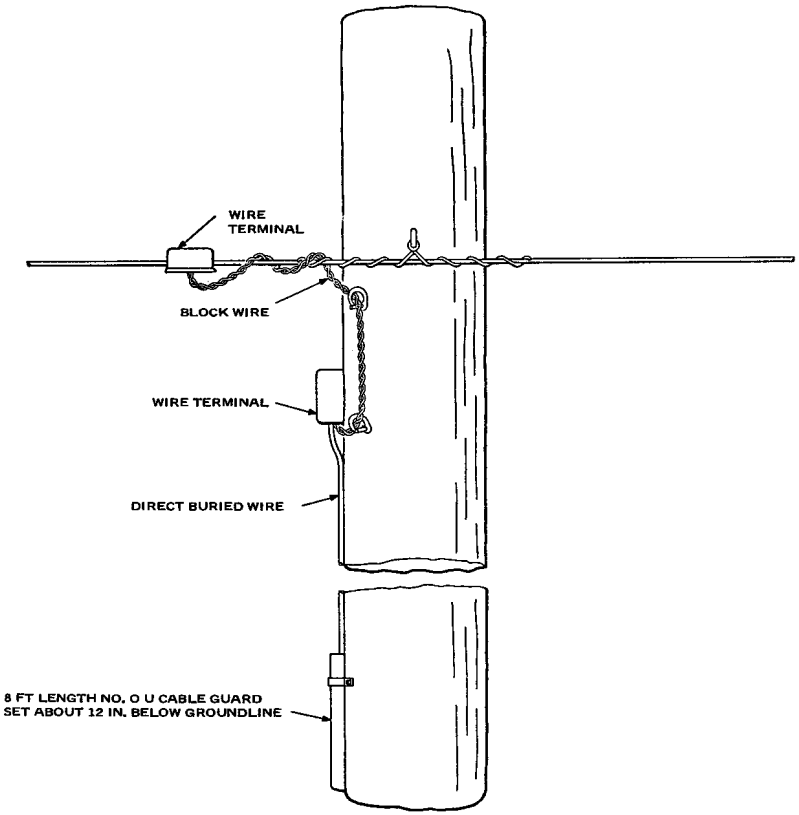


FIGURE 6. Termination of Underground Wire and Rural Wire

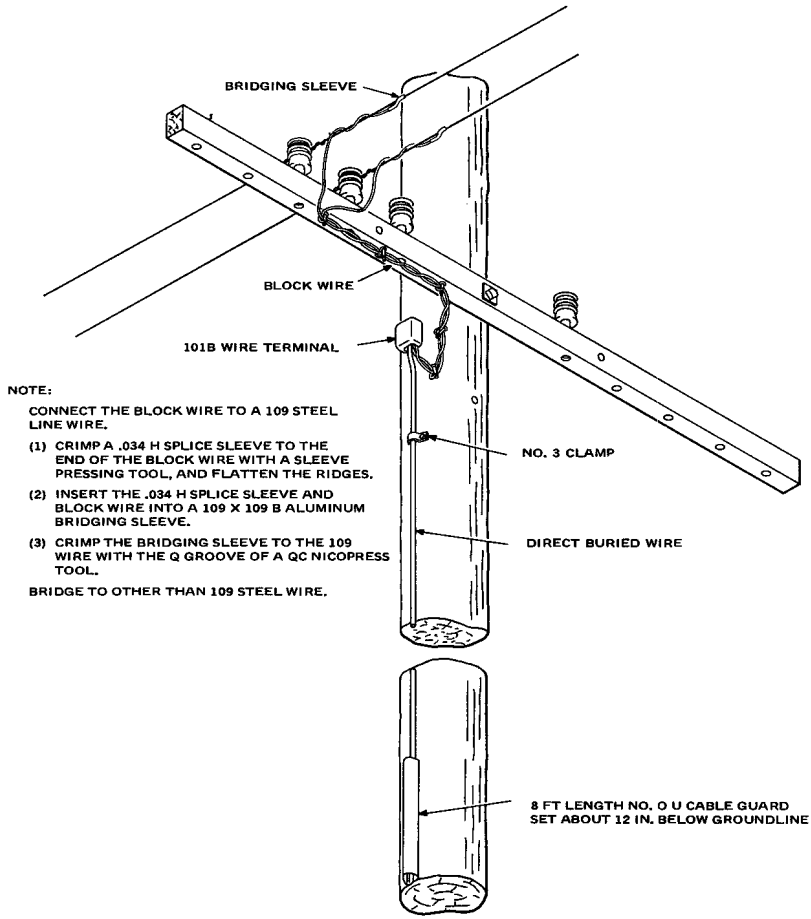


FIGURE 7. Termination of Underground Wire and Open Wire

BURIED PLANT

BURIED WIRE TERMINATIONS AT JUNCTIONS WITH BURIED PLANT

1. GENERAL

1.01 This practice provides procedures for terminating buried service wire and underground wire at junctions with other types of buried plant and at customer locations.

2. GROUNDING AND PROTECTION

2.01 The armor of direct buried wire must *always* be grounded at the customer's protector when the protector is fed from buried plant. The grounding is needed at customer locations to protect against lightning damage and to minimize shock or fire hazards caused by sustained power contact. The armored shield of the buried service wire should always be bonded to the terminal housing at the junction with buried cable.

2.02 At the older buried wire installations where a shield wire was used, the shield wire can be terminated in the same manner as recommended for bronze tape or armor wire. See CTSP 490-800-300.

2.03 Those stations which use fuseless protectors, and which are served from buried distribution cable of 19 or 22 gauge and are exposed to possible contact with power of over 300 volts (such as in random separation construction) require a fusible link in the circuit between the exposed cable and the station. This fusible link can be provided at junctions of buried cable and buried service wire by terminating the buried service wire at the terminal block with 24 gauge leads installed in a buried cable pedestal. The 24 gauge wire leads which are connected to the cable pair provide the fusible link. The terminal blocks can be used with F-1, F-2, F-3 and F-4 cable closures.

2.04 Buried service wires can be identified at terminations by means of tabs made from B glass tape. Cut about 5 inches of glass tape and wrap it around the wire, pressing the sticky side against itself to make the tag. It can be readily marked with pencil or pen to show the customer or to identify the route of the buried wire as shown in Figure 1.

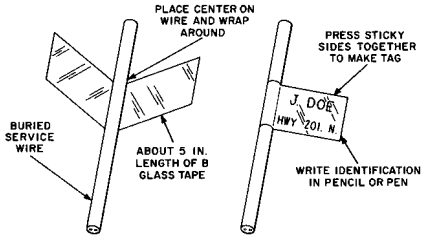


FIGURE 1. Identifying Tags

3. DISPOSITION OF UNTERMINATED PAIRS

3.01 Buried wire not in use may include new installations when some time may elapse before the buried wire is placed in service or where existing service is being disconnected. To avoid differences in potential between conductors and armor wire or bronze tape, buried wire which is not in use should be protected as follows:

a. New installations where the wire is not being terminated on a station protector at the time of placing:

(1) At the station end, twist the bare conductors and armor wires together and wrap with vinyl tape. (Make a water tight wrap if the service wire end is buried.)

(2) At the end toward the central office, bridge armor wires and connectors to a common ground post or if not available, follow the instructions in paragraph 3.01 a. (1).

b. Service disconnections where the wire has been terminated and existing service is being disconnected:

(1) At the station end, leave all terminations as they are; but where the station protector is being removed, twist the armor wires and bare conductors together and wrap with vinyl tape.

(2) At the end toward the central office when the wire terminates on a protector, leave the terminations as they are. Refer to paragraph 3.01 a. (2). (Dedicated plant only.)

4. JUNCTIONS WITH BURIED CABLE

4.01 To terminate buried service wire pull slack from the wire and mark the outer jacket about 6 inches above the ground line cover. Prepare the end as shown in Figure 2.

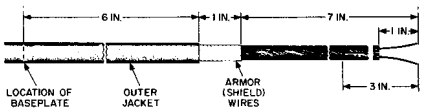


FIGURE 2. Preparation of Buried Service Wire for B Cable Closure

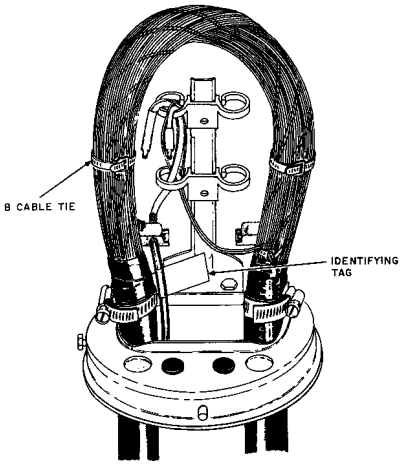
4.02 Attach the grounding harness connector and fasten securely with a compression tool.

4.03 Push any slack in the buried wire down into the terminal post. Arrange the identifying tags so that they are easily read.

4.04 Run the buried service wire through the plastic clamps (where applicable) and bend them down over the top clamps. Run the cable pair through the same route as the buried service wire. Bend the cable pair over the top plastic clamp and cut off wires about 1-1/2 inches below the bend. (See Figure 3 showing a typical installation). Connect the cable pair to the wire by using the appropriate size Scotchlok type wire connectors.

4.05 Where the binding posts on a connecting block installed for loading are not all used for loading, they should be used for any terminations required. Insert the armor wire into the grounding harness connector and terminate the conductors of the buried wire on the binding posts of the blocks in the usual manner.

4.06 To join buried wire directly to a cable conductor in a cable closure, prepare the wire as shown in Figure 4.



NOTE:
WHEN BURIED WIRE IS EXPOSED AND A FUSELESS PROTECTOR IS USED AT THE SUBSCRIBERS STATION AND IF CABLE IS 19- OR 22-GAUGE, PLACE A TERMINAL BLOCK AND TERMINATE THE BURIED SERVICE WIRE.

FIGURE 3. Buried Service Wire in B Cable Closure

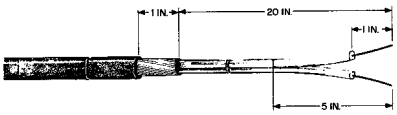


FIGURE 4. Preparation of Direct Buried Wire for Termination in a Cable Closure

4.07 Attach the armor shield of the buried wire to the grounding harness connector and fasten securely. Run the buried wire and the cable pair to be connected through the nylon cable clamp and bend down over it. Connect to the cable pair by using the appropriate size Scotchlok type connectors. See Figure 5.

4.08 The termination of buried service wire in an F-4 type pedestal mounting is illustrated in Figure 6.

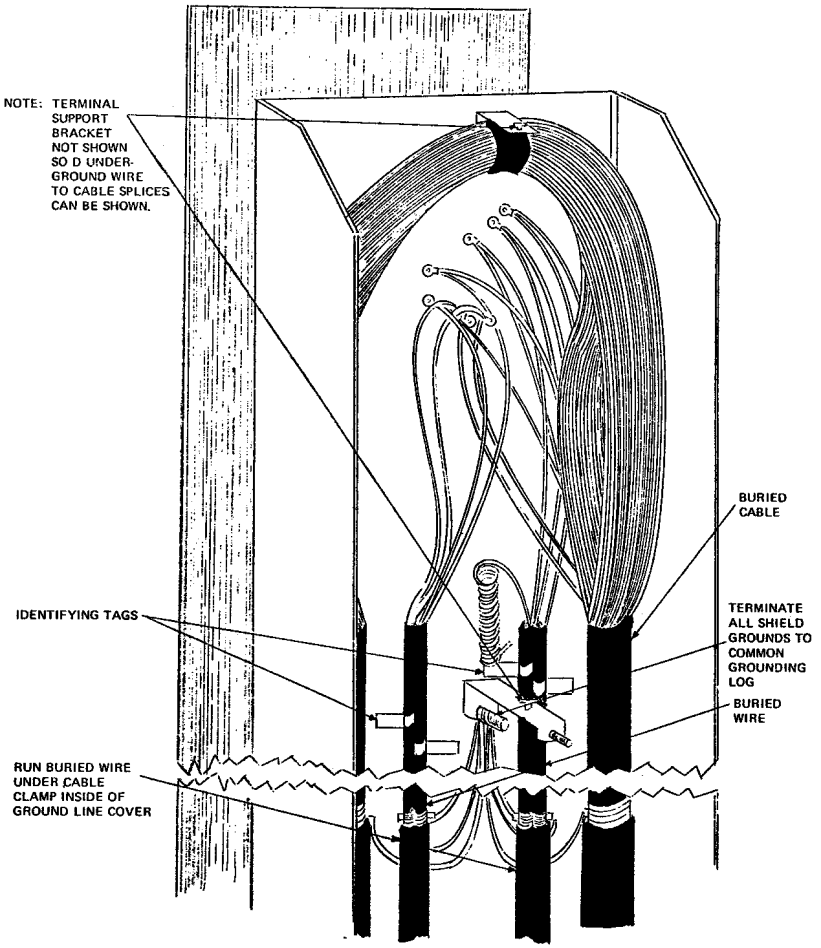


FIGURE 5. D Underground Wire in an F-3 Type Pedestal Mounting

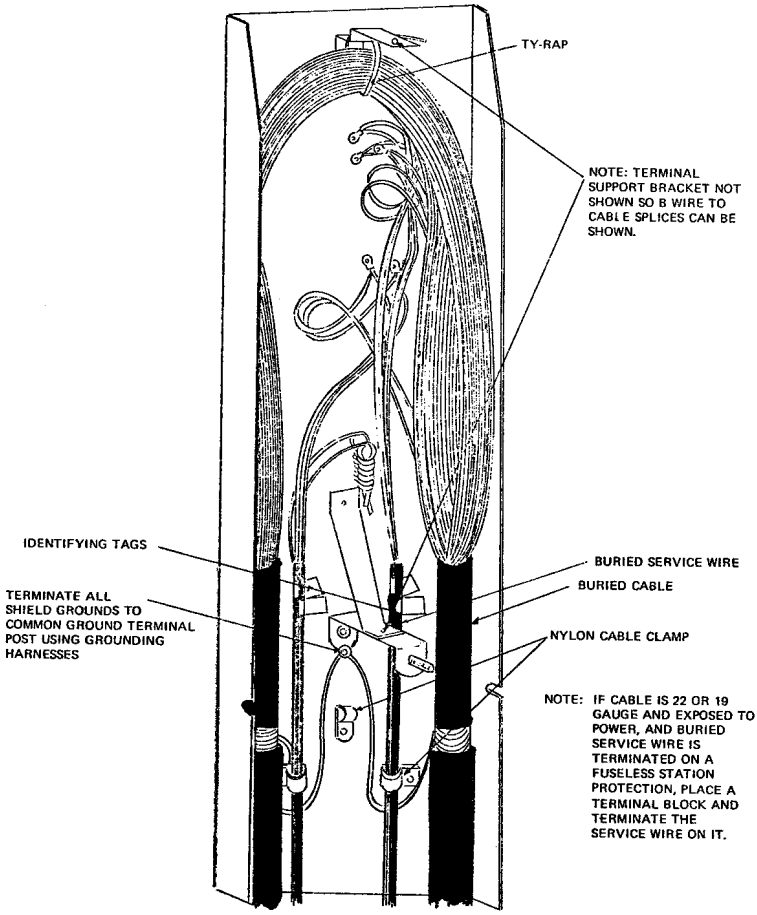


FIGURE 6. B Service Wire Terminated in an F-4 Pedestal Mounting

5. JUNCTIONS WITH BURIED WIRE

5.01 At junctions of buried wire with buried wire, place an F-3 or F-4 buried wire terminal as described in CTSP 490-500-432. Bridge the branch buried wire in the terminal as required. Each wire can be identified with a suitable designation by placing a tag made from glass tape as covered in paragraph 2.04. The armor wire or bronze tape of buried wire should always be connected to the ground post of each terminal.

6. TERMINATIONS AT CUSTOMER LOCATION

6.01 A grounding harness is used to bond the bronze tape of buried service wire to a protector ground post of the station protector. (Do not attempt to bond armor tape in any other manner.) The grounding harness has a spade clip which can be placed under the washer of the protector ground post without removing the nut. See CTSP 490-800-300.

6.02 Mount the station protector on the wall and mark the location of the grounding harness connector on the service wire. Cut off the wire about 5 inches beyond this point. Remove the outer jacket and proceed as follows:

a. Remove the bronze shield as shown in Figure 7.

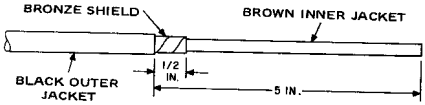


FIGURE 7. Strip Outer Jacket and Bronze Tape

b. Remove the inner jacket up to the bronze tape. Position the grounding harness on the wire as shown in Figure 8, and fasten securely with a compression tool.

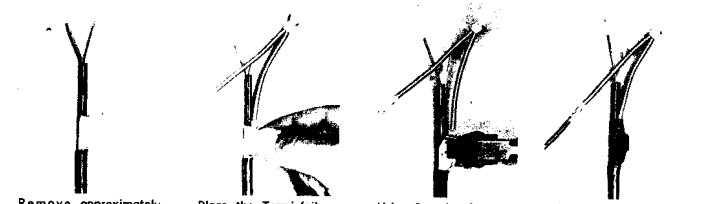


FIGURE 8.

c. Terminate buried service wire on a protector as illustrated in Figure 9. Place the spade clip of the connector under the flat washer with the clip between the flat washer and brass washer. Tighten the nut securely. Install a cover over the protector.

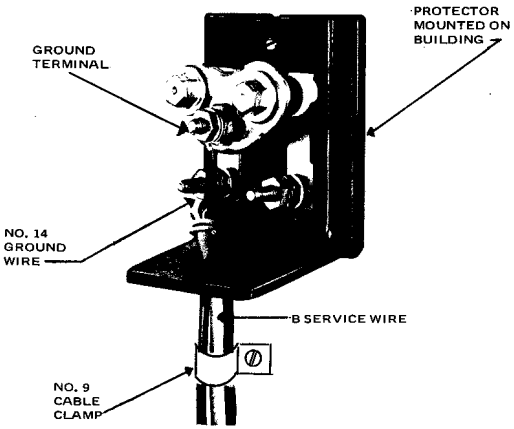


FIGURE 9. Buried Service Wire on Protector

d. Where a protector is not required, a buried service wire can be terminated on a connecting block on a backboard as shown in Figure 10.

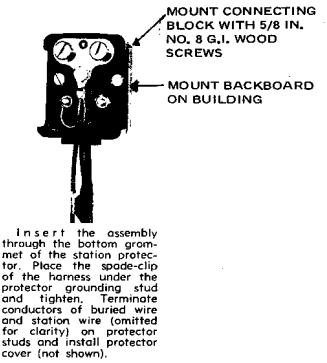


FIGURE 10. Buried Service Wire on Connecting Block

e. Buried Service wire can be terminated in a protector by preparing the end as shown in Figure 11. The spade clip connector can be placed on the ground post in a manner similar to placing the grounding harness connector (on buried service wire) on the ground post as described in paragraph 6.02 c.

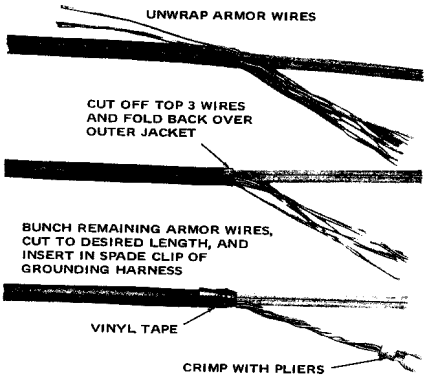


FIGURE 11. Preparation of Buried Service Wire for Termination on a Protected Terminal

BURIED PLANT

BURIED WIRE DESCRIPTION

1. GENERAL

1.01 This addendum is issued to correct the CTSP number referenced in paragraph 2.06.

1.02 With red pen or pencil, make the change noted in paragraph 2 of this addendum.

2. CHANGE

2.01 Paragraph 2.06 of CTSP 490-500-432 should read:

> **2.06** The recommended depths for placing B service wire are specified in CTSP 490-500-421.

BURIED PLANT

BURIED WIRE DESCRIPTION

1. GENERAL

1.01 This practice provides a description of the service wires used in buried distribution plant.

2. BURIED SERVICE WIRE (QUAD BURIED DISTRIBUTION SERVICE WIRE)

2.01 B service wire is a 2-pair wire intended for use as buried drop connections to subscribers' premises. This wire can be buried directly in the ground without added mechanical protection.

2.02 B service wire, illustrated in Figure 1, consists of four 19 AWG solid copper conductors, individually insulated with high density, colored polyethylene.

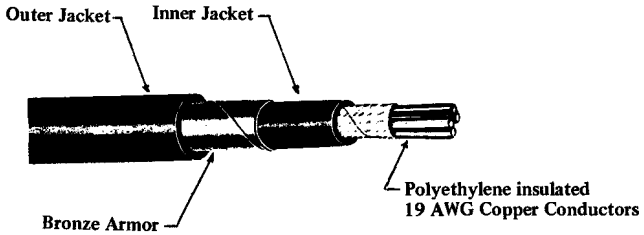


FIGURE 1

2.03 The conductors are stranded to form a star quad. The inner jacket is composed of high molecular, black polyethylene covered by spirally applied bronze tape armor.

2.04 The outer jacket is composed of high density polyethylene and is black in color. The mutual capacitance of the B service wire is .083 μ per mile. The resistance of B service wire is 92Ω per loop mile.

2.05 B service wire is available on reels containing lengths totaling 5,000 feet and 10,000 feet.

2.06 The recommended depths for placing B service wire are specified in CTSP 490-500-426.

3. D UNDERGROUND WIRE (PAIRED BURIED DISTRIBUTION SERVICE WIRE)

3.01 D underground wire, illustrated in Figure 2, is a 1-pair wire and is for use in buried distribution of telephone circuits. This wire can be buried directly in the ground without added mechanical protection.

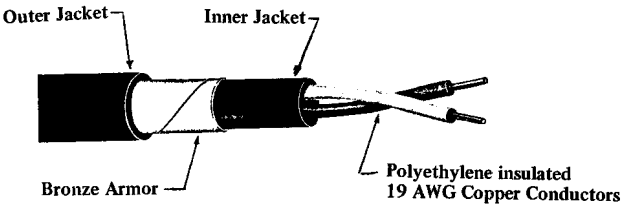


FIGURE 2

3.02 D underground wire consists of two parallel 19 AWG solid copper conductors individually insulated with high density, colored (Blue-white) polyethylene.

3.03 The conductors are twisted and covered with an inner jacket of high molecular, black polyethylene. The inner jacket is covered with spirally applied bronze tape armor.

3.04 The outer jacket is composed of high density polyethylene and is black in color. The mutual capacitance of the D underground wire is .083μ per mile. The resistance of D underground wire is 92Ω per loop mile.

3.05 D underground wire is available on reels containing lengths totaling 5,000 feet and 10,000 feet.

BURIED PLANT

PROTECTION OF BURIED SERVICE WIRE FROM GROUND LEVEL TO PROTECTOR

CONTENTS	PARAGRAPH
GENERAL	1
TOOLS AND MATERIALS	2
PROCEDURES	3

1. GENERAL

1.01 This practice provides procedures for protecting aluminum shielded buried service wire on buildings before it enters the protector or building. See Figure 1.

1.02 This practice is being reissued to clarify the application and the type of materials required. **All copies of CTSP 490-500-436, Issue 1, 1972, should be removed from the file and destroyed.**

1.03 Service wire protection can be used in conjunction with a fuseless or fused protector or where no protector is required.

2. TOOLS AND MATERIALS

2.01 All or part of the following tools and materials will be required:

a. Tools:

(1) Masonry drill or push drill.

(2) Screwdriver.

(3) Hacksaw.

b. Materials:

(1) Five foot plastic house and building riser with offset, CTS #20-79-002-3, see Figure 2.

(2) Screws or toggle bolts.

(3) Fuseless or fused protector.

3. PROCEDURES

3.01 When a protector is used on the exterior of the building, proceed as follows:

a. Install the protector.

b. Determine the length of the plastic riser required. The length should be the distance between the protector and the ground level plus 7 inches.

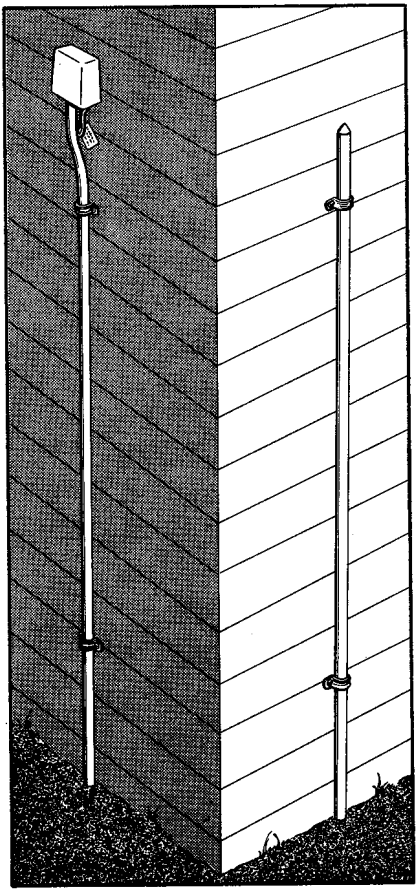


FIGURE 1. House and Building Riser Typical Installations

c. Cut off the straight end of the plastic riser with a hacksaw if necessary.

d. Dig down 7 inches into the ground where the wire emerges.

e. Drill holes where the clamps are to be installed, approximately one foot below the protector and one foot above ground level. Both clamps should be used.

f. Slip the plastic riser over the service wire and other wires if any. The offset must be on top.

g. Squeeze the top end of the riser and slip it along with the wires into the protector bottom after removing and discarding the rubber grommet if any. See Figure 3. On some protectors that have a soft rubber base, it might be necessary to enlarge the opening sufficiently to allow the end of the riser to slip into the protector. Approximately 3/4 of one inch of the riser should protrude into the protector.

h. Secure the riser to the building with the plastic clamps. Backfill hole.

i. Terminate the wires, then pass any wire that must leave the protector and the riser through the slotted opening at the top of the riser. Provide a drip loop before entering the building. Attach a ground wire warning tag to the ground wire at this location. See Figure 4.

3.02 When more than one protector is served from buried service wires, all the wires can be brought up inside one riser then exit out the slot in the top of the riser to the other protectors. A maximum of 3 wires, any combination, are to be placed in a riser.

3.03 When a protector is not required or it is to be installed indoors proceed as follows:

a. Determine the length of the plastic riser required. The length should be the distance between the protector and the ground level plus 6 inches.

b. Cut off the offset end of the plastic riser with a hacksaw if necessary.

c. Dig down 7 inches into the ground where the wire emerges.

d. Drill holes where clamps are to be installed, approximately one foot below the protector and one foot above ground level. Both clamps should be used.

e. Slip the plastic riser over the service wire and other wires if any. The straight end must be on top.

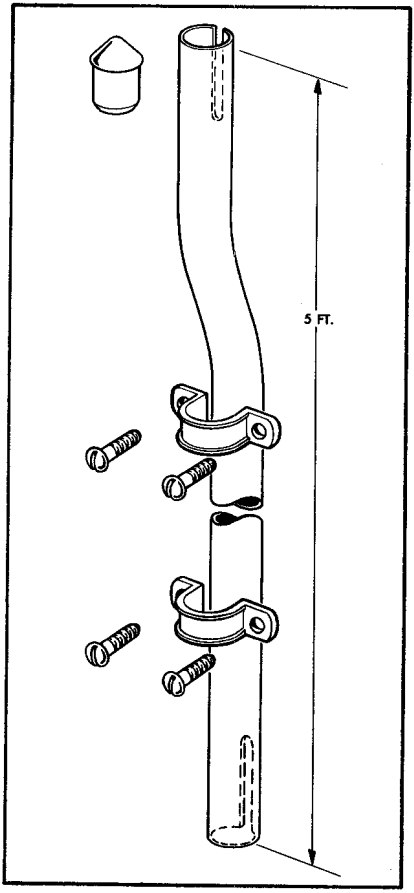


FIGURE 2. Plastic House and Building Riser with Clamps and Plug

f. Pass wires out of slot in the top of the riser, tape and pass directly into the building. Be sure entrance hole is drilled sloping in an upward direction going into building.

g. Insert plug into top of riser and secure riser to the building with clamps. Backfill hole. See Figure 5.

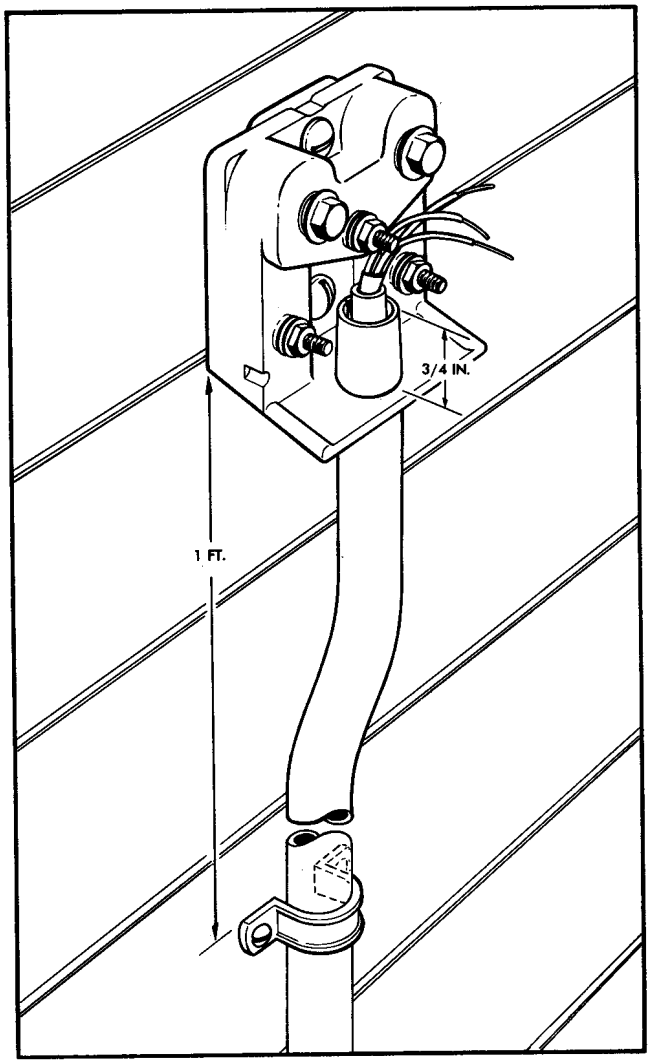


FIGURE 3. Plastic Riser Entering into Protector
(Drawing 1 of 2)

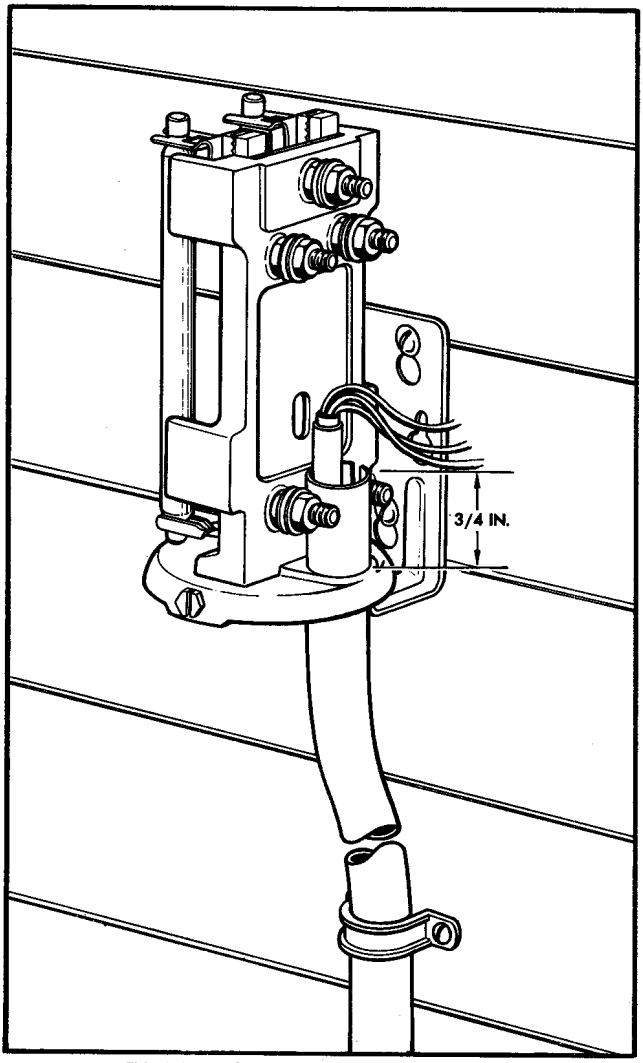


FIGURE 3. Plastic Riser Entering into Protector
(Drawing 2 of 2)

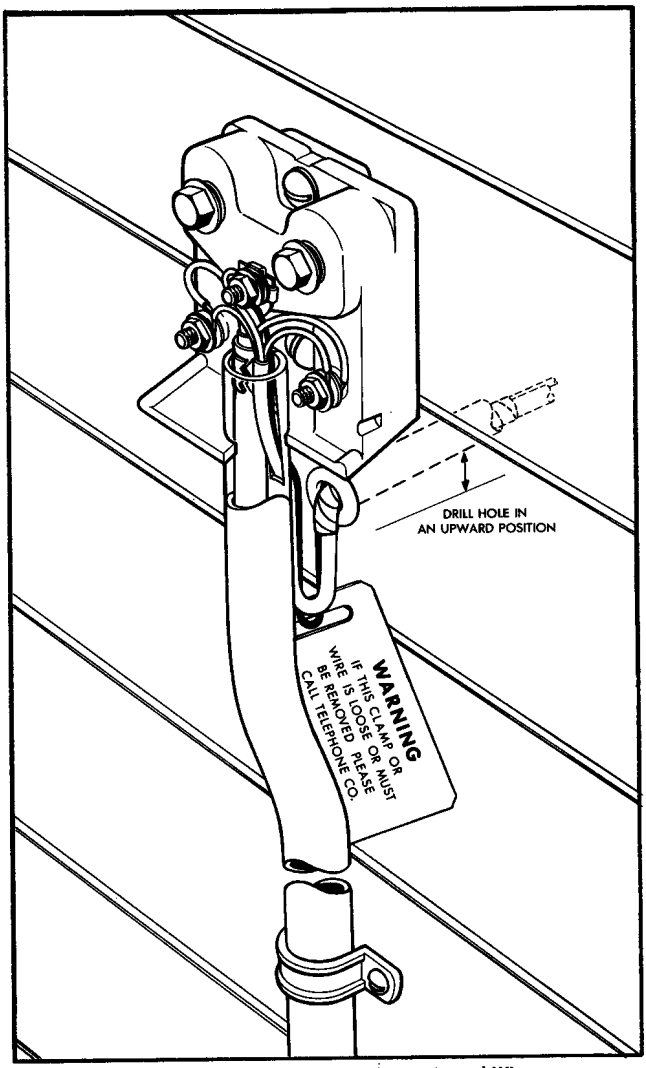


FIGURE 4. Protector and Riser with Terminated Wires (Drawing 1 of 2)

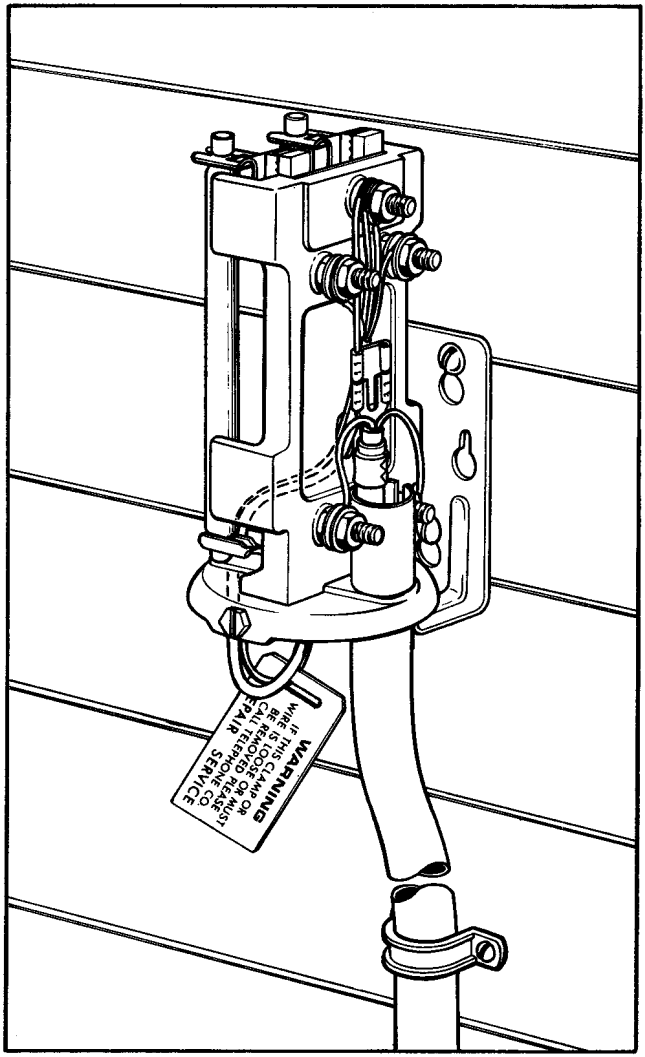


FIGURE 4. Protector and Riser with Terminated Wires (Drawing 2 of 2)

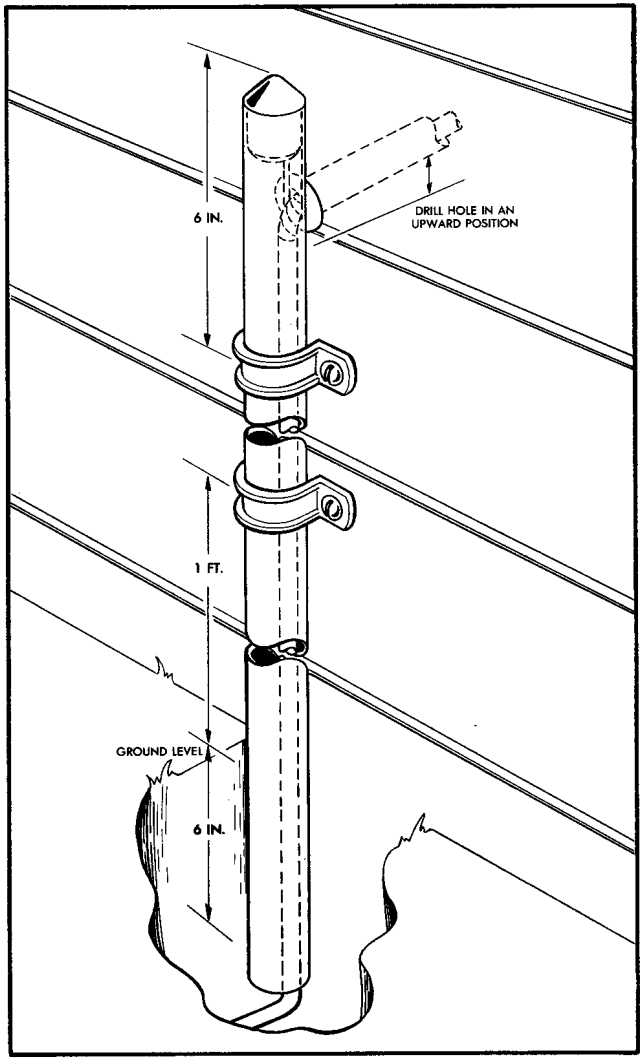


**FIGURE 5. House and Building Riser
No Exterior Protector**

700–TYPE CONNECTORS
DESCRIPTION, INSTALLATION, AND MARKING

1. GENERAL

1.01 This practice covers the description, installation, and marking of the Reliable Electric Company 700-type connector. These connectors are used in terminating outside plant cables on existing central office main distributing frames where there is a shortage of vertical frame space.

1.02 The 700-type connector will provide up to 600-pair termination on an 11' 6" vertical. Verticals should be on 8" centers. The 700-type connectors should not be mounted on frames having verticals on 6-1/2" centers.

1.03 The 700-type connectors provide features for voltage protection, current protection, testing, identification of special circuits, and disconnecting the cable pairs.

2. DESCRIPTION

2.01 The basic component of the Reliable Electric 700 connector is the 10" long 50-pair unit of molded plastic with attached fanning strips. Two 50-pair connectors are secured as a single unit by two continuous grounding-mounting bars on an aluminum supporting bar to make up the 100-pair unit. See Figure 1. They are equipped with a 101-pair stub and 100 protector units.

2.02 The connector has a factory-connected color coded stub cable consisting of tinned-copper PVC insulated conductors, mylar tape core wrapper, corrugated aluminum shield under the outer PVC sheath and factory installed gas plug near the terminated end of the stub cable.

2.03 The stub cables are available in both 22- and 24-gauge conductor sizes. The standard length of the cable is 20'. Additional lengths may be obtained in increments of 1' up to a maximum length of 100'. The stub cable is mounted for downward extension from the frame unless otherwise specified when ordered.

2.04 The color of the outer jacket of the 24-gauge cable is beige and the 22-gauge cable is slate gray.

2.05 The stub cables contain an extra pair (red-white) which is folded and tied to the cable form.

2.06 The Reliable Electric No. 1104 Protector Unit (Figure 2) with four carbon blocks and heat coils is used on circuits requiring both voltage and sneak current protection. When the six metallic pins and one plastic polarizing pin of this protector are inserted in the connector unit (Figure 3), they provide the following contact for one cable pair:

a. Tip and ring to outside plant conductor (long pins).

b. Tip and ring to central office equipment (short pins).

c. Ground (long center pin between two long pins).

d. Alarm (long center pin between two short pins).

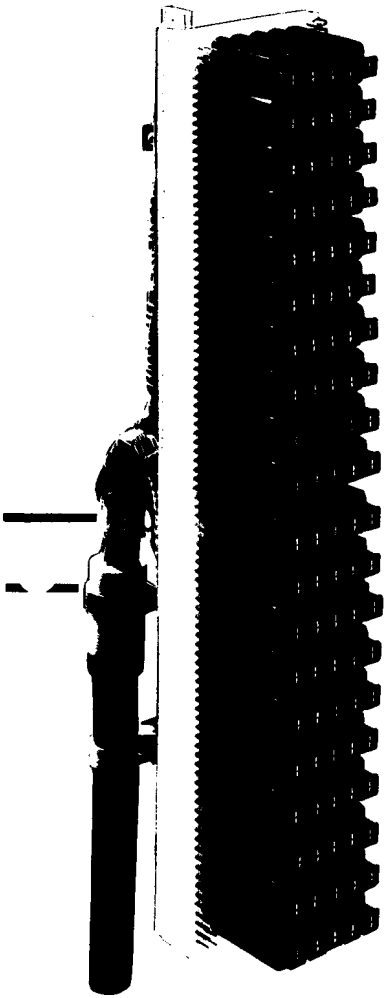


FIGURE 1. 100-Pair Connector With Stub

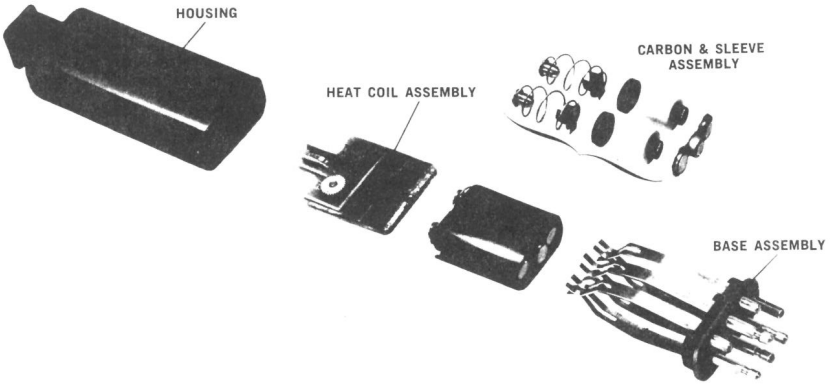


FIGURE 2. 1104 Protector Unit

2.07 The Reliable Electric No. 1100 protector unit (Figure 4) with four carbon blocks for voltage protection is used on circuits where sneak current protection is not required. When the five metallic pins and one plastic polarizing pin of this protector are inserted in the connector unit, they provide the following contact for one cable pair:

a. Tip and ring to outside plant conductor (long pins).

b. Tip and ring to central office equipment (short pins).

c. Ground (long center pin between two long pins).

2.08 The Reliable Electric No. 1101 protector unit (dummy) may be used when no protection is required. When breakdown tests are being conducted, see Table A, Note 4.

2.09 The type of protection required will be indicated in the detail plans.

2.10 When the protector units are fully inserted into the connector, the outside plant and central office equipment is connected and protection is provided. For protection purposes, ground is provided for the heat coils and carbon blocks through the grounding pin of the protector unit. Two vertically oriented copper bars are recessed at the rear of the connector panel assembly. These serve the dual function of connector ground and connector mounting to the frame supporting bar. These bars are grounded by the mounting screws securing the connector to the protector frame.

2.11 When the protector unit is pulled out to the detent position (Figure 5), the central office equipment is disconnected to isolate outside pairs for testing purposes or service denial. In this position, protection is still provided on the outside cable pair.

2.12 The protector units used on the Reliable Electric 700-type connector for circuit identification are listed in Table A.

2.13 The protector units are installed on the connector in 20 horizontal rows with 5 protector units in each row.

2.14 The molded plastic panel of the Reliable Electric 700-type connector is equipped with 100 groups of six pin-grip type terminals and one polarizing jack. Four of these terminals provide contact for tip and ring connections. One terminal provides a ground connection and one provides an alarm connection.

2.15 Electro-tin plated line terminals project through the connector panel to the front for convenient test points. To protect workmen against high voltage during a breakdown test, a Reliable Electric No. 1105 RGT terminal guard should be placed over the wire wrap terminals on the front of the connector.

2.16 Codes for the basic Reliable Electric 700-type connectors and protector units are listed in Table B.

3. PRECAUTIONS

3.01 Store the Reliable Electric 700-type connector in a dry location. Do not leave these units on loading docks or outside where they may be exposed to the weather.

3.02 When unpacking the connector, open the carton on the side marked "OPEN FROM THIS SIDE".

3.03 Do not bend the cable stub in a radius of less than 5".

3.04 Do not bend the cable stub in a 5" radius more than twice at the same general location.

3.05 Do not remove the packing material from the connector until it is ready for installation on the protector frame.

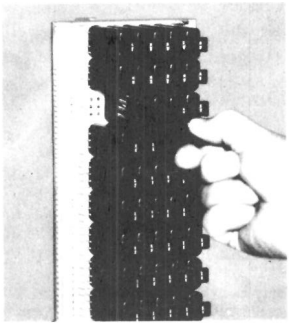


FIGURE 3. Installing Protector Units Into Connector Block

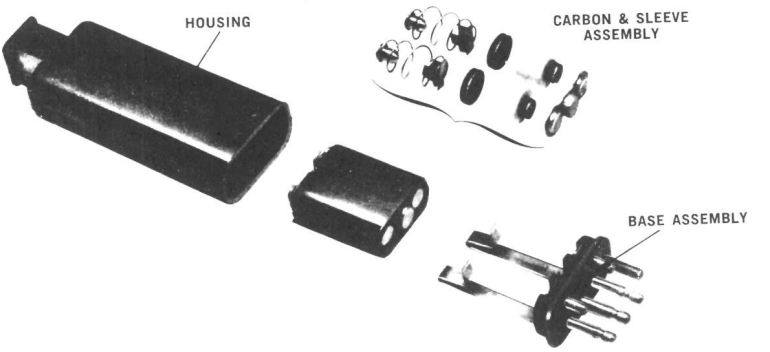


FIGURE 4. 100 Protector Unit

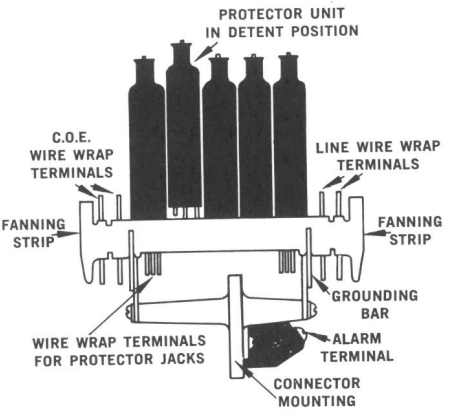


FIGURE 5.

TABLE A – PROTECTOR UNIT COLOR CODE CIRCUIT IDENTIFICATION

Code	Cap Color	Protector Blocks (2 Each)	Circuit Identification
1100 B	Black	P-6082 and P-5841	Standard Circuit
1101 GY	Gray	None (dummy) (Note 1)	Standard Circuit
1104 B	Black	P-6082 and P-5841 (Note 2)	Standard Circuit
1100 R	Red	P-6082 and P-5841	Special Circuit
1101 R	Red	None (dummy) (Note 1)	Special Circuit
1104 R	Red	P-6082 and P-5841 (Note 2)	Special Circuit
1100 Y	Yellow	P-6082 and P-5841	PBX Battery
1101 Y	Yellow	None (dummy) (Note 1)	PBX Battery
1104 Y	Yellow	P-6082 and P-5841 (Note 2)	PBX Battery
1100 Gn	Green	P-6082 and P-5841	Denied Circuit
1101 Gn	Green	None (dummy) (Note 1)	Denied Circuit
1104 Gn	Green	P-6082 and P-5841 (Note 2)	Denied Circuit
1102 Gn	Green	P-6082 and P-5841 (Note 3)	Denied Circuit
1105 R	Red	None (dummy) (Note 4)	Breakdown Test

Note 1: Connects field side thru to C.O. equipment without protection

Note 2: Equipped with P-13984 resettable heat coils P-6082 carbon blocks and P-5841 insulator-carbon blocks

Note 3: Protector module without central office pins

Note 4: Protector stenciled "Breakdown Test Do Not Disturb"

TABLE B – CONNECTOR CODES

Code	Stub * Cable Size	Protector Unit Code	Type Protection
700A1A-100	24-gauge, 101-pair	1100	500 Volts
700A1C-100	24-gauge, 101-pair	1104	500 Volts & Sneak Current
700A1D-100	24-gauge, 101-pair	1101	None (dummy)
700B1A-100	22-gauge, 101-pair	1100	500 Volts
700B1C-100	22-gauge, 101-pair	1104	500 Volts & Sneak Current
700B1D-100	22-gauge, 101-pair	1101	None (dummy)
700C1A-100	None	1100	500 Volts
700C1C-100	None	1104	500 Volts & Sneak Current
700C1D-100	None	1101	None (dummy)

* (1) Indicate length of stub if over 20 feet.

(2) Specify on order if cable is to be mounted for upward extension from frame.

4. INSTALLATION OF RELIABLE ELECTRIC 700–TYPE CONNECTORS

4.01 To modify the verticals of a protector frame for installing the 700-type connector, the Reliable Electric Company will provide an adapter bar drilled and tapped ready for mounting with the necessary mounting screws; the adapter must be ordered separately as follows: (QUANTITY), ADAPTER, RELIABLE, SCB.

4.02 To install the adapter on the vertical, proceed as follows:

NOTE: The adapters are placed on the RIGHT hand side of the verticals as determined by the workman facing the verticals.

a. Remove the headboard brackets at the top of the frame.

b. Align the unthreaded holes in the adapter with the mounting holes in the frame vertical. Starting with the bottom hole, use the 12-24 screws furnished and bolt the adapter to the vertical. Place the adapter bar with the 7-1/8" offset at the top of the vertical.

c. Raise the headboard by reattaching the headboard bracket to the top of the adapter bar using the existing 12-14 screws. If no adapter bar is located at the end of a headboard section, a Reliable SCB, MDF DESIGNATION STRIP, ADAPTER can be bolted to the top of the frame at the point where the copper ground bar is attached. Attach the headboard bracket using the existing 12-14 screws.

4.03 In locations where there is a cable vault, install the 700 type connectors on the adapter as follows:

a. Mark the cable number and pair count of each stub on a linen tag or glass tape and attach to the stub cable before it is placed into the cable vault or splice location. If this in not done, regular cable identification procedures will be required to identify each connector before splicing.

b. Remove the connector from the shipping carton. Route the stub cable into the cable vault. Remove any cable twist that may be present. Install the 12-24 screws (furnished with the connector) in the threaded holes on the left-hand side of the adapters. Starting at the bottom, hook the ear-shaped mounting brackets on the connector over the screws in the adapter (Figure 6). Place all of the connectors on the vertical. Tighten the screws before starting the next vertical. Dress the stub cable.

4.04 Position and secure the stub cables laterally across the transverse arms with waxed cotton twine or 12-type distributing rings.

4.05 A bond wire is extended from the stub cable shield to the mounting bracket. When the connector is bolted to the frame, electrical continuity is provided between the shield of the stub cable and ground to reduce electrical noises in the cable.

4.06 In locations where there is no cable vault, the connectors are mounted in the same manner as described in paragraphs 4.03 and 4.04, except that the stubs are taken to the top of the frame and are then taken on cable racks to the splice locations.

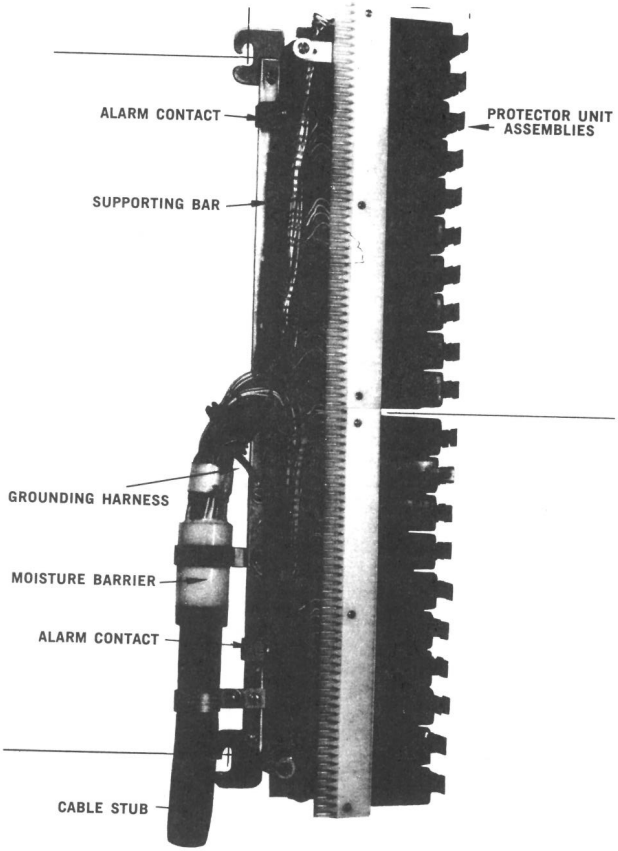


FIGURE 6. Stub and Mounting Bracket Arrangement

5. TESTING PROTECTOR UNITS

5.01 The primary purpose of this test is to remove carbon dust which may have accumulated in the .0035" gap between the protector blocks and to detect defective protector units. This test should be performed prior to splicing the stub cables to the entrance cables.

5.02 Connect the following components as shown in Figure 7 to perform the protector unit test:

a. A 7-1/2 watt, 120 volt frosted light bulb.

b. Two 90-volt KS-7890 dry batteries.

c. A light bulb socket.

d. A test probe (411A tool).

e. Cross-connecting wire.

5.03 Touch the test probe to each tip and ring on the cross-connecting terminals. The test probe should remain in contact for one second or longer. If a carbon condition exists, the light bulb will illuminate. The flow of the current should burn out the carbon and the lamp will then be extinguished. If the lamp remains illuminated, remove the protector unit and replace with a new protector unit. Test the new protector unit.

NOTE: Do not attempt to repair a defective protector unit. Return defective units for repair in accordance with local instructions.

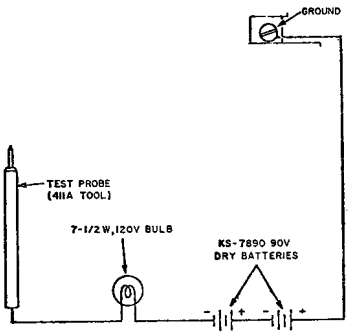


FIGURE 7. Circuit For Testing Protector Unit

6. MARKING

6.01 Factory-stenciled numbers on the face of the connector will identify protector modules associated with each cable pair.

6.02 Cable numbers are marked on 700-type connectors with adhesive backed number plates E-5293–G cable designation card (red numerals on aluminum background). Cable numbers should be placed below the first numbered pair of each 100 pair connector. If colored circuit designation plates are required on the space specified for the cable number, place the number on the next available space below that point.

6.03 Sensitive circuits are designated and protected by using blank adhesive number plates stamped with the required color designation.

7. TEST CORDS

7.01 A four conductor two-way test cord, Reliable Electric Model No. 1130A (12' in length) or No. 1130B (18' in length) is available for testing individual cable pairs or the associated central office equipment. The connector-end plug is inserted into the individual connector

jack position (protector removed) of the line under test. The connector-end plug consists of the housing and base plug of a protector unit. Twin plugs on the opposite end of the cord (5/8" centers) are provided as required for connecting into test trunk jacks.

7.02 Reliable Electric test cord Model No. 1131A (12' in length) or No. 1131B (18' in length) equipped with the necessary plugs is available for making Varley loop tests to locate grounded or crossed cable pairs.

GROUNDING HARNESSES
DESCRIPTION

1. GENERAL

1.01 This practice provides information on the various Type GH Grounding Harnesses and the GHT-1 Grounding Harness Compression Tool. This practice is reissued to delete reference to the Type GH-4 grounding harness, to add the Type GH-8 grounding harness and ordering information for the grounding harnesses and compression tool.

1.02 Type GH grounding harnesses are used for grounding and interconnecting shields of plastic insulated, plastic jacketed wires and cables.

2. ORDERING INFORMATION

2.01 Use the following catalog numbers when ordering grounding harnesses and/or the compression tool through local purchasing channels:

a. Type GH-1 Grounding Harness: CTS #90-51-001-0.

b. Type GH-2 Grounding Harness: CTS #90-51-002-0.

c. Type GH-3 Grounding Harness: CTS #90-51-003-8.

d. Type GH-7 Grounding Harness: CTS #90-51-007-1.

e. Type GH-8 Grounding Harness: CTS #90-51-006-2.

f. Type GHT-1 Grounding Harness Compression Tool: CTS #74-88-471-9.

3. GROUNDING HARNESSES

3.01 Type GH-1: Used for grounding the shields of direct buried cables at pedestal and pole mounted terminals. Consists of a tinned, Termi-foil connector crimped to one end of a No. 14 AWG solid tinned copper conductor insulated with green PVC. The overall length is 16-1/2 inches. The stripped end of the conductor is placed to the grounding connector provided in the terminal. See Figure 1.

3.02 Type GH-2: Used for interconnecting the shields of cables that have encapsulated or taped splices. Consists of two tinned Termi-foil connectors crimped to a No. 14 AWG tinned strand copper conductor insulated with green PVC. The overall length is 20 inches. See Figure 2.

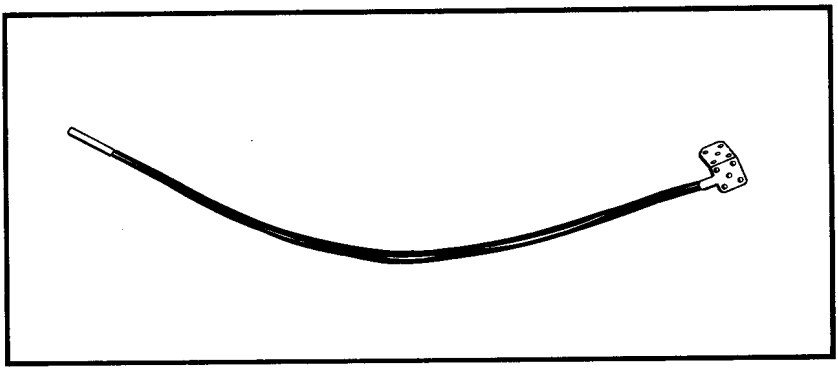


FIGURE 1. Type GH-1 Grounding Harness

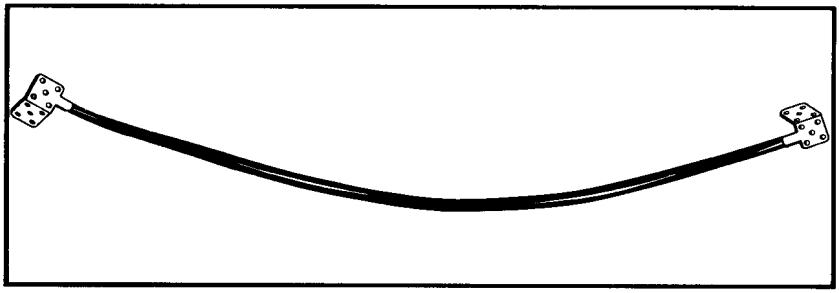


FIGURE 2. Type GH-2 Grounding Harness

3.03 Type GH-3: Used for interconnecting and grounding the shields of aerial cables where ready access type enclosures are used. Consists of two tinned Termi-foil connectors and a tinned spade clip, all crimped to a No. 14 AWG tinned stranded copper conductor insulated with green PVC. The spade clip is attached to the terminal frame by means of a terminal frame bolt. The spade clip to one Termi-foil is 7-1/2 inches long; the spade clip to the other Termi-foil is 21 inches long. See Figure 3.

3.04 Type GH-7: Used for interconnecting the shield of buried service wire to the grounding connector at station protectors. Consists of a tinned Termi-foil connector crimped to one end of a No. 14 AWG solid tinned copper conductor insulated with green PVC. The spade end of the harness wire and the ground wire (connected to ground rod, water system, etc.) are connected directly to the station protector lug. The overall length of the grounding harness is 3 inches. See Figure 4.

3.05 Type GH-8: Used for interconnecting the shields of APFSP cables in buried splices. Consists of four tinned Termi-foil connectors crimped to No. 14 AWG tinned stranded copper conductors insulated with green PVC. The overall length is 6 inches. See Figure 5.

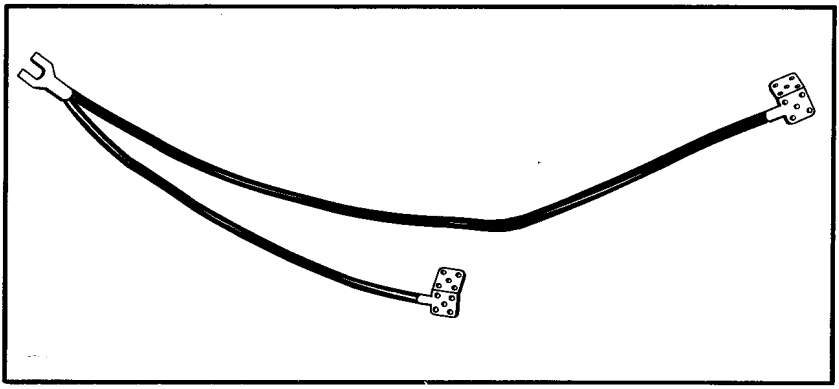


FIGURE 3. Type GH-3 Grounding Harness

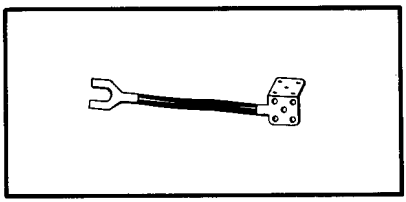


FIGURE 4. Type GH-7 Grounding Harness

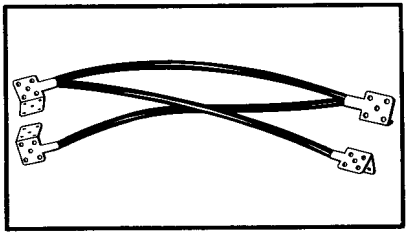


FIGURE 5. Type GH-8 Grounding Harness

4. COMPRESSION TOOL

4.01 The Type GHT-1 grounding harness compression tool is used to connect the grounding harness to the shield. The tool is equipped with a special ratchet and will not release until the proper compression pressure is reached at the connection. See Figure 6.

NOTE: The use of pliers or similar tools in place of the compression tool is not recommended.

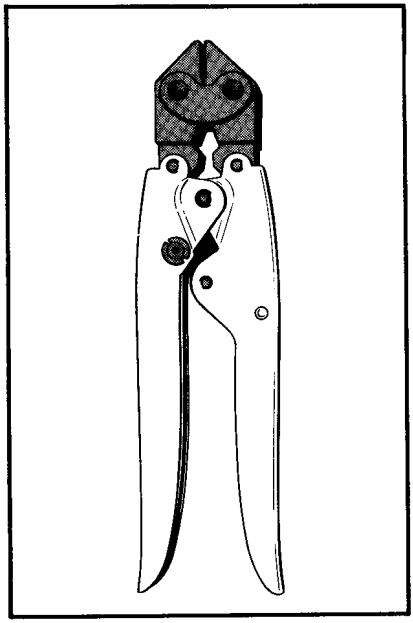


FIGURE 6. Type GHT-1 Compression Tool

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