AERIAL CABLE REPAIR METHODS

REPAIRING SHEATH DEFECTS AND MINOR CORE DAMAGE

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1. GENERAL

1.01 This section covers the methods of repairing sheath defects in plastic or lead sheathed cables where conductor damage has not occurred and also covers methods for opening and closing plastic or lead sheathed cables where minor core damage has occurred. The repair methods described in this section cannot be used if a length of the cable sheath has been removed.

1.02 This section is issued to consolidate the information previously covered in Sections 627-395-305, 627-395-311, 627-395-315, and 627-395-325 which are hereby canceled.

1.03 Lead sheathed cable that has a number of sheath defects concentrated in a limited area but has no core damage may be repaired with heat shrinkable tubing as described in Section 627-395-330.

1.04 The description and operation of acetylene torches is covered in Section 081-330-105.

2. REPAIRING SHEATH DEFECTS

LEAD SHEATHED CABLE

2.01 Repair small defects in the lead sheath as follows:

(1) Use a carding brush to clean an area on the sheath that includes the defect and extends at least 3/4-inch around the defect.

(2) Use an H file to remove sheath at the point of the defect to a depth of one-half of the sheath thickness. Slope the file cut gradually to the outer edge of the defect.

(3) Apply a coating of stearine to the cleaned area.

(4) Ignite the acetylene torch, adjust the flame, and apply heat with a brushing motion to the cleaned area. Be careful to avoid concentrating the heat in one spot. Do not allow the blue tip of the flame to contact the sheath.

(5) Hold solder in contact with the sheath and heat with a brushing motion of the flame until the solder flows and adheres to the sheath. Tin the sheath in the cleaned area by gently heating around the adhered solder. After the cleaned area has been tinned, build up the repair with solder until the center of the repair is about 1/32- to 1/16-inch above the level of the good sheath, depending on the size of the cable, and tapers to the level of the good sheath at the outer edges of the repair. Excess solder should be removed with a small wiping cloth—not with a file. After excess solder has been removed apply heat to the repair to allow the solder to flow slightly and fill any pores that may have developed.

PLASTIC SHEATHED CABLES

2.02 Minor repairs to plastic-sheathed cables of 1-inch or larger diameter may be made with an E Pressure Flange (Fig. 1) if there is no conductor damage. Plastic-sheathed cables of 1.6-inch or smaller diameter with sheath damage but no conductor damage may be repaired with a 13A or 14A splice case as covered in Section 633-470-100. The E Pressure Flange is described in Section 637-235-201.

2.03 The method of sheath repair using the E Pressure Flange is limited to minor damage such as cuts, cracks, holes made in connection with pressure tests, etc. Where the sheath must be opened to expose the core for conductor repair use the method described in Part 3. Where a length of the sheath must be removed when repairing core damage, use a lead sleeve or splice case as appropriate to complete the repair. Use the following method to repair minor sheath defects with an E Pressure Flange.

(1) In the area of the defect, scuff the sheath with a carding brush. Scuff an area slightly larger than will be covered by the saddle of the E Pressure Flange. Be sure to scuff only at right angles to the length of the cable.

(2) Use pliers to remove the plastic ferrule from the saddle. Discard the ferrule.

(3) Remove the release paper from the saddle and place the saddle over the prepared area of the sheath. Apply two turns of D Vinyl Tape to hold the flange in place as shown in Fig. 2.

(4) Place two sealing clamps loosely around the cable on each side of the saddle. Place the steel strip over the flange and form the strip snugly around the cable and saddle. Use shears to cut off one end of the strip so the end is directly under the cable and parallel to it. Cut off the other end of the strip so the ends overlap about one inch. Cut the corners off of the strip and smooth all cut edges with a file. Figure 3 illustrates the partially completed installation.

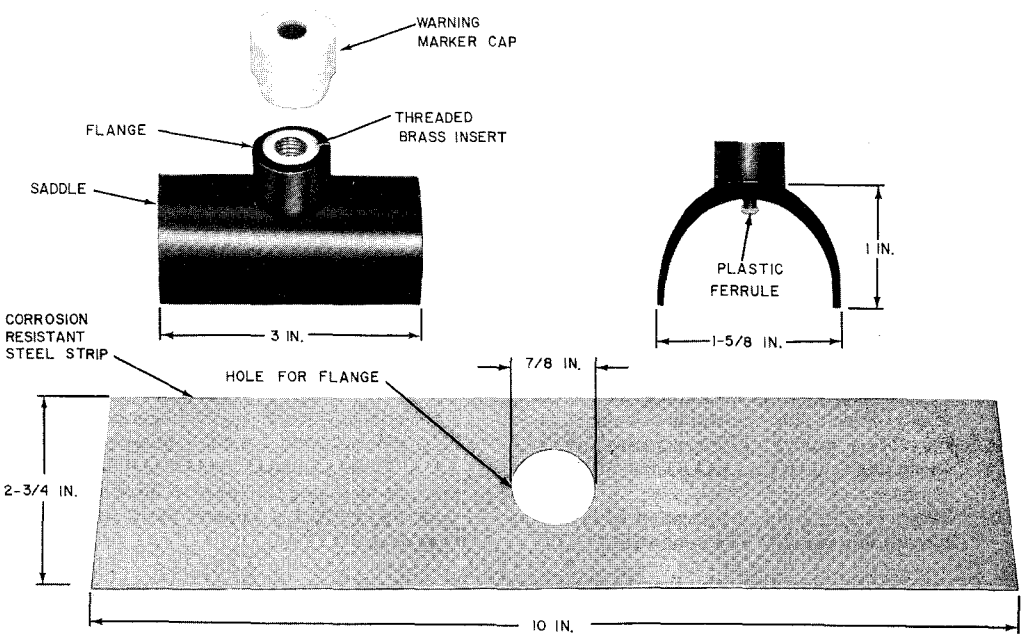

Fig. 1—E Pressure Flange

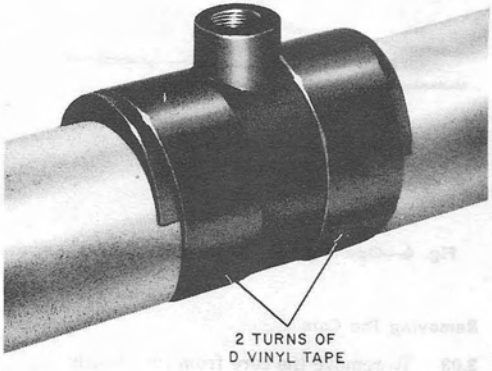

Fig. 2—Saddle Taped To Cable

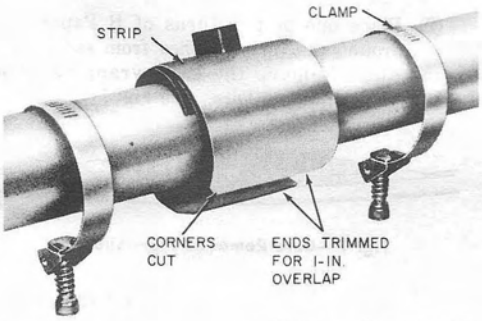

Fig. 3—Strip Formed Around Saddle and Cable

(5) Position the sealing clamps on the steel strip with the heads of the clamps at the bottom of the cable and tighten the clamps. Place the warning marker cap over the flange, apply pipe compound to the threads of a C Pressure Flange Plug and thread the plug into the flange. Tighten the plug with a 7/16-inch wrench. The completed installation is shown in Fig. 4.

(6) If the cable is pressurized, test for leaks with E Pressure Testing Solution.

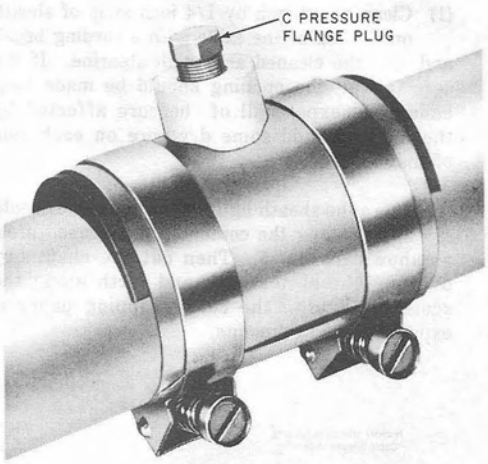

Fig. 4—E Pressure Flange Installed

3. REPAIRING MINOR CORE DAMAGE—SLIT SHEATH METHOD

LEAD SHEATHED CABLE

3.01 The slit sheath method of repairing lead sheathed cable basically consists of slitting the sheath, removing the core, repairing the conductors, replacing the core, and restoring the sheath by soldering the slit with an acetylene torch. This method is generally applicable only where the cable diameter is 1-1/2 inches or less. If the repairs to the conductors should increase the overall size of the core enough to prevent the sheath from being properly restored, a length of the sheath must be removed and the cable closed with a sleeve rather than by the slit sheath method.

Slitting The Sheath

3.02 Provide sufficient working space by removing cable rings, supports, etc, or by clamping the lashing wire on each side of the proposed work area and turning back the lashing wire between the clamps. Slit the sheath using the following method:

(1) Clean an 18 inch by 1/4 inch strip of sheath on the top of the cable with a carding brush and coat the cleaned area with stearine. If the core is wet, the opening should be made long enough to expose all of he core affected by the moisture and some dry core on each side of the moisture.

(2) Score the sheath lightly with the cable sheath slitter along the center of the cleaned area, as shown in Fig. 5. Then cut the sheath by drawing the slitter back and forth along the score mark until the core wrapping paper is exposed at several points.

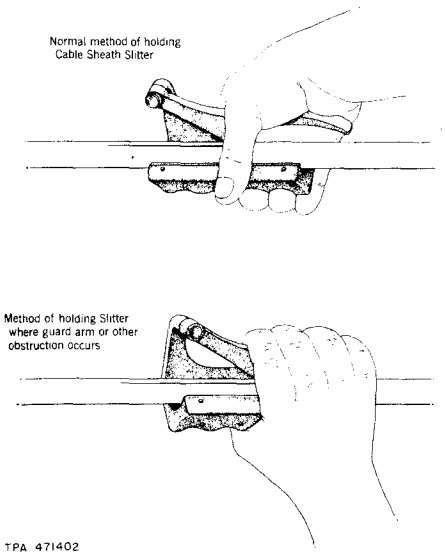

Fig. 5—Slitting The Sheath of Lead Sheathed Cable

(3) Starting at the center of the cut, pry the edges of the sheath apart with a pair of cable openers, as illustrated in Fig. 6, until the core can be removed. Care should be exercised to avoid denting or kinking the edges of the sheath.

(4) Remove the burrs from the inner edges of the slit and coat the edges with stearine.

Fig. 6—Opening The Sheath With Cable Openers

Removing The Core

3.03 To remove the core from the sheath:

(1) Install the slack puller on the strand at a point where it will not interfere with the repair operations. Pull slack in the cable until the core rises out of the sheath.

(2) Place one or two turns of B Paper Tape around the core 3 inches from each end of the slit. Remove the core wrapping paper between the tape collars. See Fig. 7.

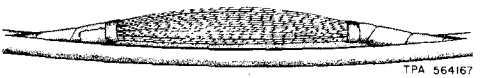

Fig. 7—Core Removed From Sheath

Repairing The Conductors

3.04 If the conductors are wet, dry them with desiccant. Care should be exercised in applying the desiccant as the abrasive action of the material may damage wet insulation. The desiccant should be applied as follows: Cut a piece of muslin slightly shorter than the length of the exposed core, and several inches wider than the circumference of the cable. Wrap the muslin around the core so that the opening in the muslin is at the top of the cable. Then tie the ends of the muslin around the core to form an envelope.

3.05 The quantity of desiccant to be used will depend on the size of the cable, length of the opening, and the quantity of moisture in the cable. Do not use any more desiccant than can be distributed among the conductors. The desiccant that falls to the bottom of the muslin or is piled

on top of the wires does not aid in drying the insulation.

3.06 Sprinkle the desiccant among the conductors distributing it as thoroughly as possible. Distribution of the desiccant will be facilitated by separating the conductors with the fingers and gently working the granules into all spaces. Desiccant which falls to the bottom should be picked up with the fingers and replaced among the conductors. It will ordinarily require about five minutes for thoroughly distributed desicca... to lose its effectiveness in very wet cable.

3.07 Continue these operations until all conductors are dry to the touch. Then add another application of desiccant and wrap the opening with muslin. After about 15 minutes, call the testboard and request an insulation test to determine whether the conductors are serviceable. If they are, remove the muslin and envelope and shake out all excess desiccant. If the test shows the conductors are not serviceable, remove the muslin, shake out the desiccant and replace with fresh desiccant. After 10 to 15 minutes, call for another test. When clear, remove the bandage and envelope.

3.08 Damaged insulation should be repaired with B Paper Tape, as shown in Fig. 8. Burned or otherwise defective conductors should be pieced out and the joints insulated in the same manner.

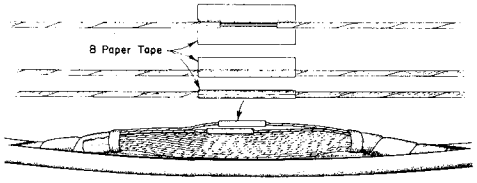

Fig. 8—Repairing Damaged Insulation

3.09 After conductor repairs have been made, as much of the desiccant should be removed as practicable. Then wrap the core with 1-inch black bias-cut varnished cambric tape, overlapping the cambric 1/3 its width. Wrap the core as tightly as practicable, to obtain a small core diameter. The cambric tape should overlap the undisturbed core at each end. Secure the tape at each end with one or two turns of B Paper Tape. See Fig. 9.

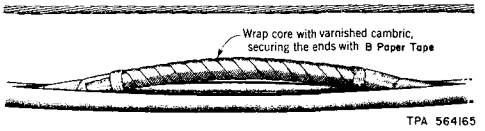

Fig. 9—Core Ready to be Replaced in Sheath

Replacing The Core

3.10 To replace the core in the sheath:

(1) Inspect the inside of the sheath. Remove any dents or inside burrs.

(2) If the sheath has a hole in it, place a piece of cleaned lead serving tape over the hole inside the sheath before the core is replaced. B Paper Tape may be used to hold the serving tape in place.

(3) Remove the slack puller. Place the core in the sheath and partially close the sheath with the hands and the cable pliers, working from the ends toward the middle. See Fig. 10.

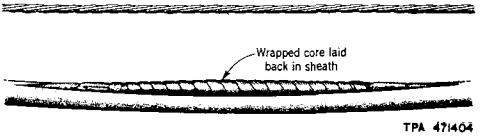

Fig. 10—Core Replaced in Sheath and Sheath Partly Closed

(4) Cut a piece of lead serving tape approximately 1/4 inch longer than the sheath opening and between 1/4 and 1 inch wide, depending upon the diameter of the cable. Taper the ends of the tape to facilitate inserting them under the sheath at the ends of the cut. Form the tape lengthwise over the strand to the approximate shape of the core. Clean the outer surface of the tape with a carding brush and coat with stearine.

(5) Place the lead tape in the opening, working the ends under the sheath. Close the sheath over the tape with the cable pliers, working the pliers around the cable to restore it, as

much as practicable, to its original shape as illustrated in Fig. 11.

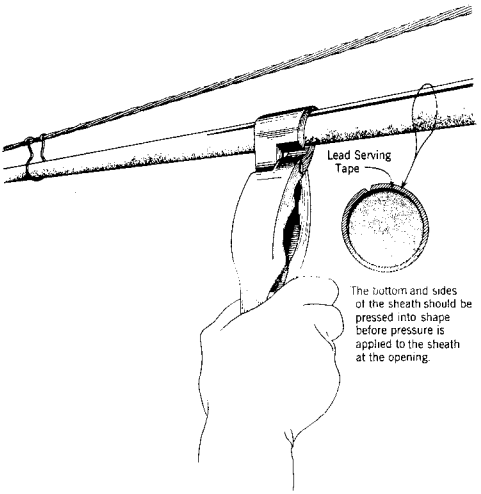

Fig. 11—Closing the Sheath With Cable Pliers

Soldering The Slit

3.11 To solder the slit:

(1) Solder the opening with stearine core solder using the acetylene torch. Defects in the sheath should be repaired after the slit has been soldered.

(2) In the case of fatigued sheath, file the defective sheath to about 1/2 the original thickness. Clean the area around the repair with a carding brush and coat the area with stearine. Solder with stearine core solder building up the solder patch about 1/2 the thickness of the sheath and tapering off toward the edges.

(3) Where a hole in the sheath is covered with lead serving tape, clean the tape and area around the hole with a carding brush and then solder with stearine core solder using the acetylene torch.

(4) Restore the cable to its original position under the strand and replace the cable rings or lashing wire.

PLASTIC SHEATHED CABLE

3.12 The slit sheath method of repairing plastic sheathed cable basically consists of slitting the sheath, removing the core, repairing the conductors, replacing the core, and restoring the sheath by permanently taping the opening. This method of repair may be used to make repairs with the cable pressurized. If the repairs to the conductors should increase the overall size of the core enough to prevent the sheath from being properly restored, a length of the sheath must be removed and the cable closed with a lead sleeve or splice case rather than by the slit sheath method.

Slitting The Sheath

3.13 Provide sufficient working space by removing supports, lashing wire, etc, on each side of the proposed work area. Slit the sheath using the following method.

(1) Position a chipping knife in line with the cable as shown in Fig. 12. Tap the knife lightly with the hammer and carefully cut through the plastic sheath and metallic shield along the top of the cable.

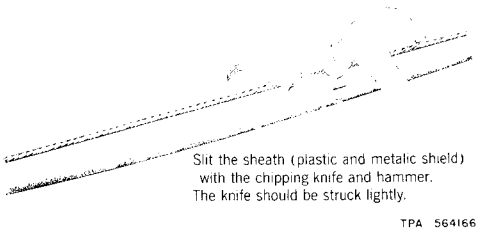

Fig. 12—Slitting the Sheath of Plastic Sheathed Cable

(2) Spread the edges of the slit apart to permit removal of the core and remove any sharp or jagged edges of the metallic shield.

Removing The Core

3.14 To remove the core from the sheath:

(1) Install the slack puller on the strand at a point where it will not interfere with repair operations and obtain enough slack to permit

the core to be removed from the sheath as shown in Fig. 13.

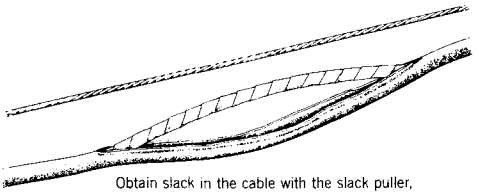

Fig. 13—Core of Cable Removed (Plastic Sheath)

(2) Place one or two turns of B Paper Tape around the core 3 inches from each end of the slit. Remove the core wrap between the tape collars.

Repairing The Conductors

3.15 Dry the insulation as necessary and repair damaged insulation with vinyl tape. Burned or otherwise defective conductors should be pieced out and the joints insulated with vinyl tape.

3.16 After conductor repairs have been made, wrap the core with varnished cambric tape, overlapping the tape 1/3 its width. Wrap the core as tightly as practicable to obtain a small core diameter. The cambric tape should overlap the undisturbed core at each end. Secure the cambric tape at each end with one or two turns of B Paper Tape.

Replacing The Core

3.17 Inspect the inside of the sheath and remove any inside dents or burrs. Push the core back into the sheath, remove the slack puller (if used), and close the sheath as much as possible, working from the ends of the opening to the middle.

Taping The Opening

3.18 To permanently tape the opening:

(1) Scuff the entire sheath for the length of the opening plus about two inches beyond the ends of the opening. Scuff at right angles to the length of the cable as shown in Fig. 14.

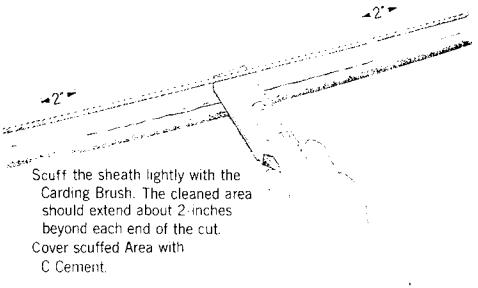

Fig. 14—Scuffing the Sheath

Never scuff the sheath longitudinally as this will score the sheath and allow air to escape.

(2) Apply C Cement over the scuffed area. Allow the cement to set for about five minutes or until it becomes tacky.

(3) Start at one end and cover the cemented area and about 1/2 inch beyond on each end with two half-lapped layers of 2-inch DR Tape.

(4) Place two half-lapped layers of 2-inch B Aluminum Tape over the DR Tape, and about 1/2 inch beyond each end of the DR Tape. Smooth down the aluminum tape with a hammer handle.

(5) Start at the center of the taped area and cover the aluminum tape and about 1/2 inch beyond each end of the aluminum tape with two half-lapped layers of 2-inch black friction tape.

(6) Start at the one end and apply two half-lapped layers of 1-inch vinyl tape, under light tension, over the friction tape and about 1/2 inch on each side.

(7) Place a collar of vinyl tape over the final wrapping of vinyl tape about 1-1/2 inches in from each end. Each collar should consist of five turns of 1-inch vinyl tape. The first four turns of the tape should be applied under

tension and the fifth (final) layer without tension. See Fig. 15.

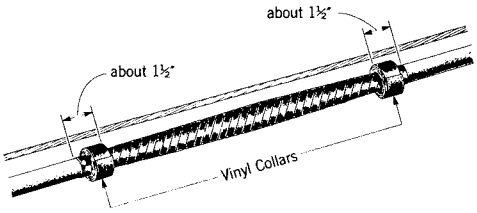

Fig. 15—Vinyl Collars in Place

Supporting The Taped Opening

3.19 On cable lashed to the strand, place a lashed cable support on the cable 1 inch beyond each end of the tape wrapping. Support the wrapping at one or more places, depending on its length with lashed cable supports. The distance between supports should be uniform and should not exceed 20 inches. Place two turns of lead serving tape under each lashed cable support located on the wrapping.

3.20 On cable supported in rings, place a cable ring on the cable about 1 inch beyond each end of the tape wrapping. Support the wrapping at one or more places with aerial cable supports, depending on the length of the opening. The distance between supports should be uniform and should not exceed 20 inches. Place two layers of lead serving tape under each of the supports located on the wrapping to prevent cutting.