

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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COILS AND CASES
REPAIR OF LOADING COIL CASES

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1. GENERAL

1.01 This section replaces Section G74.450. It covers the procedures to be followed in repairing loading coil cases when trouble has developed in the stub, body, wiring or coils of the case.

1.02 No lead sleeve or welded steel case shall be opened in the field to make repairs. Such cases should be returned in accordance with local routine for repair or replacement.

1.03 Before undertaking any work on a case in a cable maintained under pressure which requires soldering or wiping, make sure that the pressure in the cable at the case has been released.

2. REPAIR OF CASES NOT IN SERVICE

2.01 **Sheath Repairs:** If inspection or pressure tests disclose a crack in the sheath and insulation resistance tests indicate that no moisture has entered the stub, the defect should be repaired by soldering or wiping a joint over it.

2.02 Where moisture has entered the core through an opening and the trouble can be cleared by removing a small section of sheath, the repair should be made by drying the conductors with desiccant or by boiling, repairing the insulation, wrapping the core with muslin or cotton tape and placing a short length of lead sleeving (approximately 1/4 inch larger in diameter than the core) over the repair.

3. PIECING OUT STUB

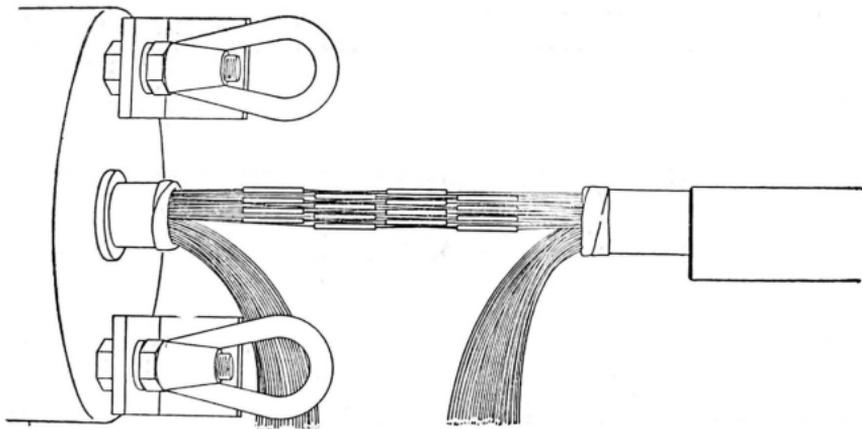
3.01 It is sometimes practicable to reuse a case with a short stub without piecing out by clamping the case to the wall of the manhole near the splice or by placing the case on a pillar made of bricks or concrete blocks and strapping the case to the manhole wall.

3.02 Where this is impracticable, the method of piecing out will depend on the condition under which the case will be used.

(a) If a lead sleeve installed just above the top of the case will not interfere with bending the stub in position, the repair should be made by splicing a length of cable to the stub.

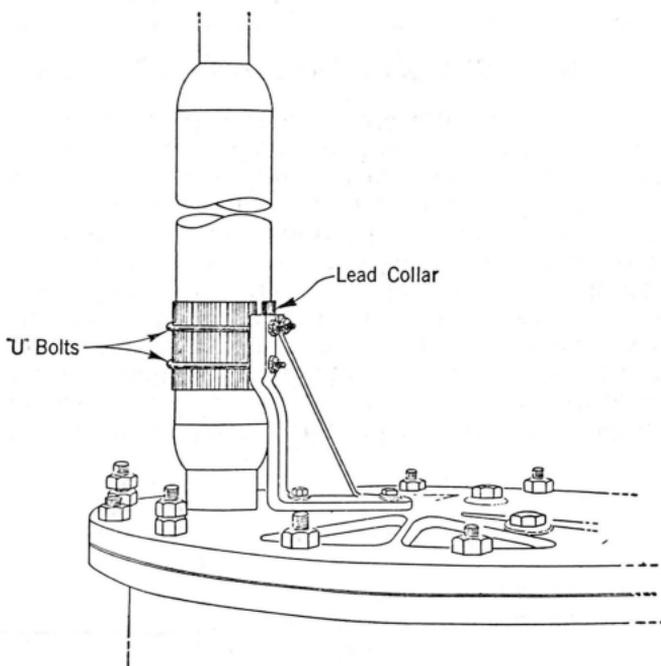
(b) If this lead sleeve will interfere with setting up of the stub, the repair should be made by piecing out the conductors and covering the core with lead sleeving or sheath.

3.03 **Lengthening Stub with Cable:** If obtainable, the cable used should be of the same type as the original stub; otherwise cable of equivalent design should be used. Placing the case on its side will simplify splicing and wiping. All conductor joints in the stubs of the toll and program loading coil cases shall be soldered. In order that a small diameter lead sleeve can be used to cover the splice, the wire joints should be made in four rows. The figure below illustrates a cable being spliced to the stub of a loading coil case.

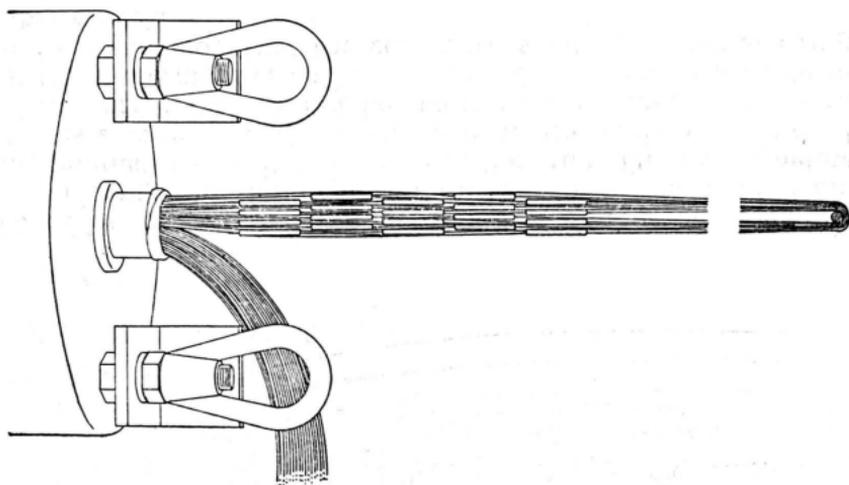


3.04 After the wires have been spliced, it is preferable to boil the conductors with a mixture of paraffin and splicing oil in order that the conductors can be drawn down tightly thereby permitting the use of a smaller diameter lead sleeve than if the splice were dried with desiccant. The splice should be completed in the usual manner.

3.05 If the case was equipped with a stub cable bracket, it should be replaced. The sleeve should be attached to the bracket by means of "U" bolts made of 1/2-inch mild steel. A piece of lead sheath should be placed around the sleeve under the clamp to avoid damaging the sleeve. The bolts should be painted with asphalt paint. The method of clamping the sleeve to the bracket is illustrated below.



3.06 **Piecing Out the Conductors:** The conductors used for piecing out should be obtained from a length of cable having conductors similar to those in the stub. The figure below illustrates a case with the conductors in the stub being pieced out. The wire joints should be made in a number of rows in about the same manner as in making a duct splice in a cable in order to permit covering the core with small diameter sleeving or cable sheath.



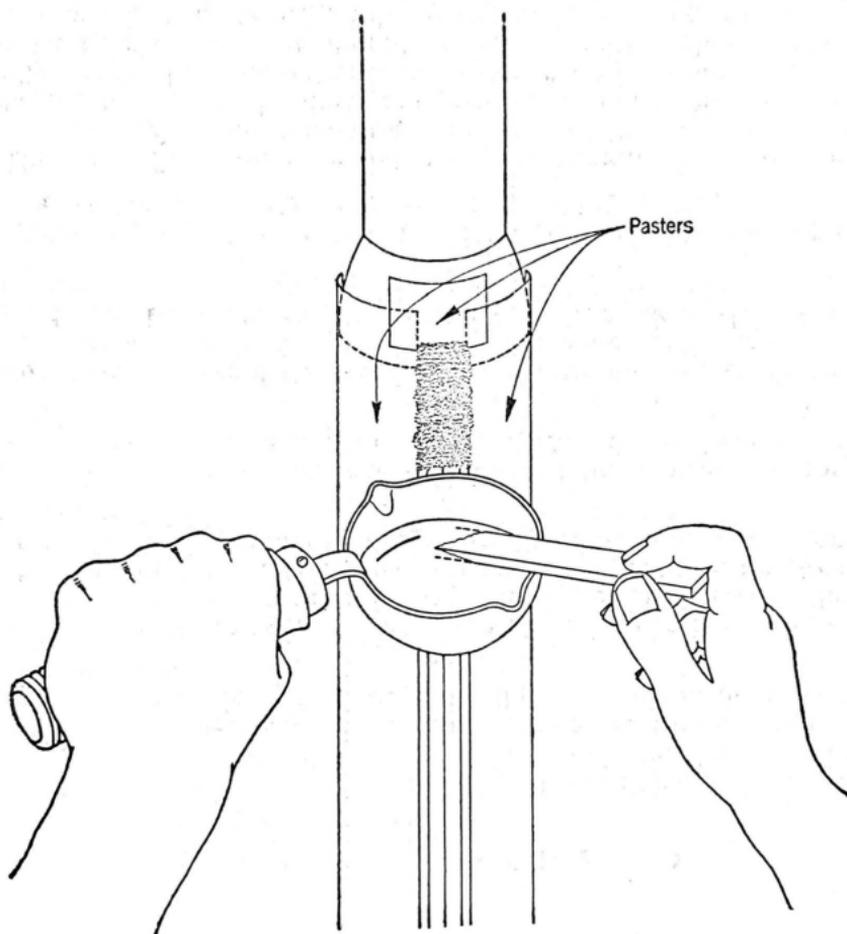
3.07 After the wires have been spliced, the core should be boiled with paraffin and splicing oil to facilitate pulling the core down as much as practicable. Begin wrapping the core at the case and work toward the free end so that slack will not accumulate in the core which would tend to increase the diameter of the core. Lead sleeving or cable sheath which will just slide over the conductors should be used to cover the core. The end of the sleeving or sheath should be flared to facilitate sliding it over the core. Twisting the sheath as it is being placed will also facilitate sliding. A joint, of course, should be wiped at the junction. If the case was equipped with a stub cable bracket, it should be replaced as described in Paragraph 3.05.

4. REPAIRING STUBS OF CASES IN SERVICE

4.01 If there is an opening in the sheath and insulation resistance tests indicate that no moisture has entered the stub, the opening in an aerial or buried case should be closed by soldering with a torch, and in an underground case, by means of a wiped joint. A circular wiping cloth should be used to make the wipe if the opening is in a vertical section of cable.

4.02 If moisture has entered the core and the removal of a short section of sheath will permit clearing the trouble, the repair should be made by drying the insulation with desiccant or by boiling, repairing the insulation, if required, wrapping the core with muslin or cotton tape and covering the splice with a length of lead sleeving (approximately 1/4 inch larger in diameter than the core). In aerial or buried cable the joints can be soldered with a torch. In the underground, the joints should be wiped. If the sleeve is on a vertical section of cable, complete the repair as follows:

- (1) Prepare the sleeve in the usual manner and place it over the splice. Tack the seam at a few places with a soldering copper and wipe the joints using a vertical wiping cloth.
- (2) Place cable pasters on the sleeve, as shown in the figure, and apply stearine to the sleeve at the seam.



- (3) The seam should be tinned its entire length by splashing solder on the seam, beginning at the top of the sleeve.
- (4) After tinning, the seam can be built up to the desired thickness by splashing additional hot solder over the entire tinned surface. The point at which solder is splashed should be changed frequently to avoid flowing of the accumulated solder.

4.03 If considerable sheath was removed in clearing the trouble and it is impracticable to resheath the core, it will, of course, be necessary to replace the case. Pending replacement of the case, the core should be protected by enclosing it in a CR tape covering. If the cable is maintained under pressure, the tape covering should be reinforced with muslin.

4.04 If the moisture has affected the loading coils, the case should be replaced. The matter should be referred to the plant engineer who will advise as to the type of coils and case to be used.

5. REPAIR OF DEFECTS IN THE BODY OF A WELDED STEEL CASE

5.01 **Aerial and Buried Cases:** If a leak develops in the walls, bottom or top of an aerial case, repair can be made by welding. The supervisor will determine whether this method of repair will be made and arrange for the work to be done by a reputable welder.

5.02 In performing the work, care should be taken to avoid extensive heating of the case, especially those filled with compound, as heating may create sufficient internal pressure to force the compound through the defect and interfere with the welding.

5.03 Upon completion, the case should be painted, as covered in the section on "Painting Metal and Wood Surfaces."

5.04 **Underground Cases:** Because of the hazard, an underground welded steel case having a defect in the body should not be repaired by welding. Such a case should be replaced.

6. REPAIR OF PROTECTIVE COVERING ON UNDERGROUND OR BURIED WELDED STEEL CASE

6.01 The finish on a welded steel case should be repaired by applying undercoating (an asphalt paint containing asbestos fibres) to the damaged portion. Undercoating is generally supplied in one gallon cans and can be obtained at automobile supply stores. It should be applied with either a putty knife or a brush. Before applying the undercoating, make sure that the surface to be repaired is free of dirt and moisture. It dries to the touch in about 4 hours.

7. REFINISH OF AERIAL CASE FOR USE IN UNDERGROUND PLANT

7.01 Where an aerial case is to be installed in a manhole, the bottom of the case should be equipped with a sheet steel pan (22-gauge metal will be satisfactory). Before placing the case in the pan, spread undercoating in the pan to a depth of about 1/4 inch. Then paint the sides and top of the case with undercoating as covered in Part 6.

7.02 An aerial case to be buried in the ground need not be equipped with a bottom pan. After the surfaces have been prepared, paint the sides, bottom and top with the undercoating.

7.03 The stub of the case should be wrapped with one-half lapped layer of CR tape or its equivalent to protect it against corrosion.

8. CLEARING TROUBLE DUE TO DEFECTIVE COILS

8.01 The cost of removing and returning a loading coil case to the factory for repair is considerable. Therefore, if the trouble is due to a defective coil or wiring in the case and relatively few coils are involved, replacement of the defective coils should generally be made by means of a splice type loading coil case or an auxiliary loading coil case containing sufficient coils, except defective carrier loading coils, where it is advisable to replace the case. However, before any coils are replaced, the matter should be referred to the plant engineer who will advise as to the type of coils and case to employ.

9. DISCONNECTING DEFECTIVE LOADING COILS

9.01 When an auxiliary or replacing loading coil case is not available at the time the trouble develops, and the circuit can be operated with omitted loading coils, the faulty coil or coils should be disconnected from the main cable conductors until they can be replaced. Under these circumstances, the installation of the auxiliary or replacing case can be facilitated by looping the main cable conductors through an auxiliary stub. If the reloading is to be made by means of a splice case, the wires can be spliced through. All conductors from which loading has been removed should be marked so that they can be identified readily when the circuits are reloaded. The leads to defective coils should be marked at the end of the stub so that they can be identified later.

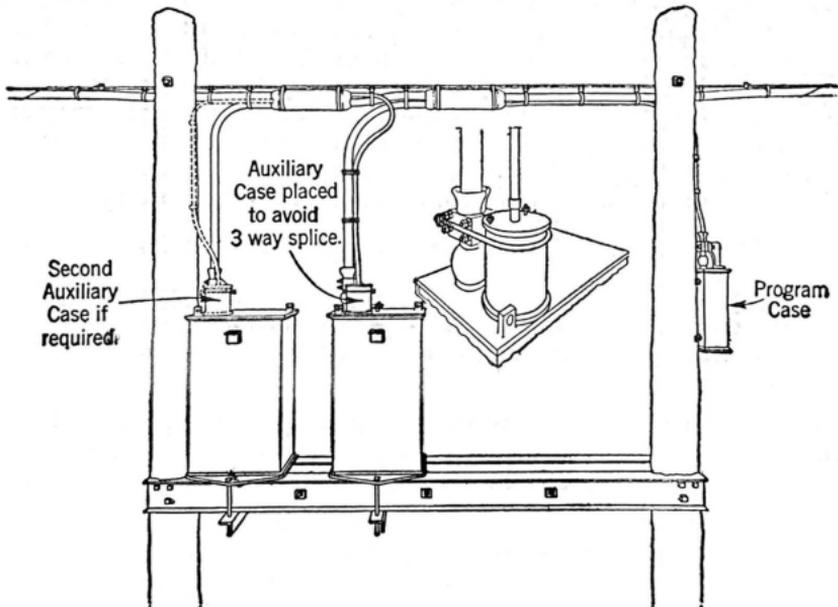
10. SPLICING REPLACEMENT OR AUXILIARY CASES

10.01 Before splicing the loading coil stub, make sure that the case is gas-tight. Then test the conductors for opens, grounds, crosses and short circuits. When making the defective pair test in cases containing quadded circuits, the quads should be checked to ensure that the color code is correct. Do not disturb the binding strings on the quads any more than necessary in testing. Then splice the coils to the tagged pairs in the splice or at the end of the auxiliary stub.

11. TYPICAL SPLICING ARRANGEMENTS

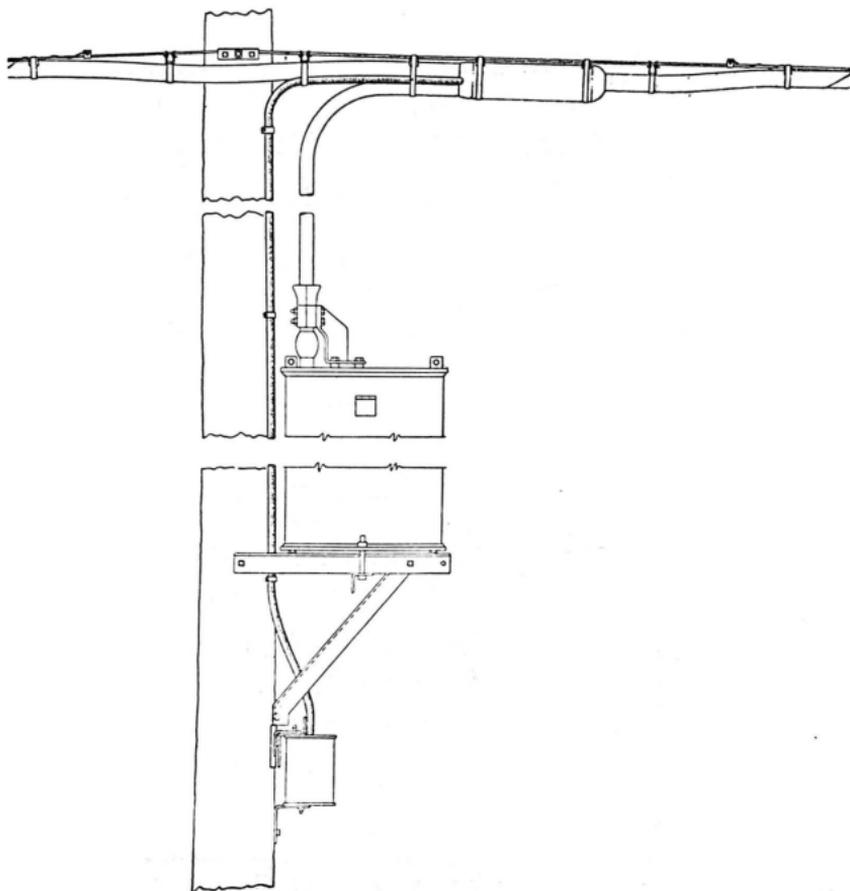
11.01 The illustrations in the following paragraphs show the conditions generally encountered in placing and splicing auxiliary cases. Where an unusual condition exists, it may be necessary to devise some other method of installing the case. Under these circumstances the supervisor should be consulted.

11.02 **Aerial Cases:** The following figure illustrates the arrangement on auxiliary cases at an H loading fixture.

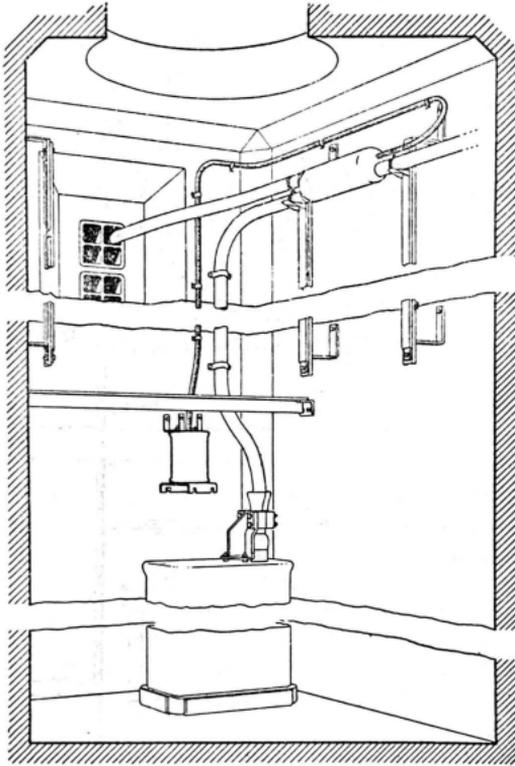


11.03 The "U" bolt and strap used to hold the auxiliary case to the stub bracket of the large case should be obtained locally.

11.04 The arrangement of an auxiliary case at a single pole loading fixture is shown in the following sketch. Where the stub is short the auxiliary unit may be installed on the large case.



11.05 **Underground Cables:** The auxiliary case should be placed in such a position that it will not interfere with subsequent loading that may be done in the manhole. The figure below serves to illustrate the installation of an auxiliary case in a manhole.



Note: -
Only one cable shown for clearness