

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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CABLE SPLICING—GENERAL
COAXIAL CABLE SPLICES

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1. GENERAL

1.01 This section outlines the preparation of the cable for splicing, the arrangement and method of wrapping the coaxials, and the arrangement and method of wrapping the paper-insulated pairs at coaxial cable splices.

1.02 The method of identifying conductors in coaxial cables and of joining individual .270 and .375-inch coaxials is described in other sections.

2. MATERIALS

2.01 The special materials called for in this section are listed below.

Cambric, Varnished Supplied in rolls .01-inch thick, 1-1/2 inches wide and 25 feet long. About 2 feet required per splice. For insulating the cable core from the sheath butt at splices.

Tag, Warning, C Attached to lead sleeve to indicate that the splice contains coaxials.

Tag, Coaxial, B

The tags are stamped 1, 2, 3, —8, and E-N or W-S. The tags are supplied in clips of 50 like-stamped tags. The numbered tags are used to identify coaxials in splices and the lettered tags are for use in terminal splices to indicate the direction of the coaxials.

Tape, Polyethylene, B

Supplied .007-inch thick in rolls 3 inches wide containing 100 linear feet. For insulating the conductors at splices.

**Tubing, Fibre,
Phenol**

Tubes 2-3/8 inches I.D., .0625-inch wall and 8 inches long. A tube is placed in the center of the splice to support the joints in .375-inch coaxials.

Tubing, Transflex

Available in 3-foot lengths in No. 4, No. 3/8, No. 5/16, No. 1/2 and No. 3/4 sizes. The No. 4 size is used to insulate the end of .270-inch coaxials while testing. The No. 3/8 size is for sliding over .270 coaxials where paper-insulated pairs are brought out. The No. 5/16 size is used to insulate the ends of .375-inch coaxials while testing. The No. 1/2 size is used for sliding over .375-inch coaxials where paper-insulated pairs are brought out. The No. 3/4 may be used to insulate the center unit of paper-insulated conductors in place of insulating the .375-inch coaxials with No. 1/2 tubing.

3. ASSOCIATING COAXIALS IN SPLICES

3.01 The individual coaxials in a cable are assigned a number during manufacture, on the basis of electrical measurements, and are assembled in the cable accordingly. In splicing adjacent lengths, like-numbered coaxials must be spliced together at all times.

3.02 Generally, the successive lengths of coaxial cable are so placed that the count of the coaxials is clockwise on one side of the splice and counter-clockwise on the other, thus permitting like-numbered coaxials to be joined without a cross-over in the splice. Where the cable is not so placed, however, a cross-over is necessary in joining like-numbered coaxials.

3.03 The ends of the cable are marked with scotch tape to indicate the count of the coaxials. A band of green scotch tape indicates that the count of the coaxials looking into the end of the cable is counter-clockwise. A band of yellow scotch tape indicates that the count of the coaxials looking into the end of the cable is clockwise.

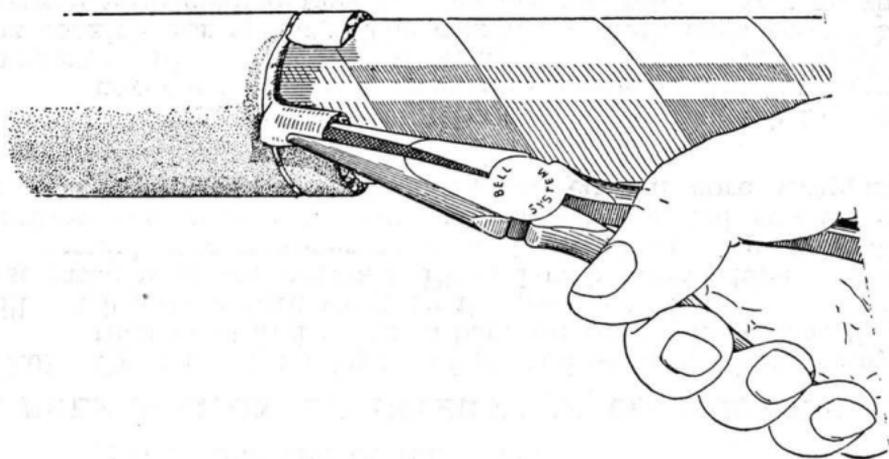
4. PREPARATION OF CABLE

4.01 The ten inches of cable adjacent to the factory seal should not be included in the splice because the coaxials may be damaged in sealing the end of the cable. The splice opening should be 22 inches.

4.02 Mark the location of the splice opening on the sheaths. Cut the ends to provide a 30-inch overlap. Remove the sheath to within 1/2 inch of the final splice opening, cutting the sheath lengthwise with a chipping knife. (A cable containing coaxials should not be cut with a hacksaw as the steel tapes may unwind; nor should the sheath be removed without splitting as the coaxials may be damaged.)

4.03 Lightly ring the sheath at the opening mark and cut the sheath longitudinally to the ring. Clean the surface adjacent to the ring and coat it with stearine.

4.04 Grasp an end of the 1/2-inch strip of sheath with a pair of long nose pliers and peel off the strip around the cable, winding it on the pliers, as shown below.



- 4.05 Protect the core at the edge of the sheath.
- 4.06 Prepare the lead sleeve in the usual manner and place it over one end of the cable.

5. PREPARATION OF INTERSTICE CONDUCTORS

5.01 Open the outer layers of paper-insulated wires, if any; then bend and tie them back on the cable so that they will not interfere with work on the paper-insulated conductors associated with the coaxials. Place 1-inch cotton tape around the coaxial core wrapper as close to the butt as practicable, working the tape well under the paper-insulated conductors previously turned back. Remove the coaxial core wrapping paper to the edge of the tape.

5.02 Wrap the cut end of each coaxial with scotch tape or cover it with a short length of 3/4-inch transflex tubing to prevent injuring the hands on the sharp ends. Then identify the coaxials for splicing. The coaxials at both ends should be marked with coaxial tags as they are identified. After all the tags have been placed, check the numbers for correctness with respect to the color code of the interstice conductors.

5.03 The method of insulating and bringing out the various groups of paper-insulated wires will depend on the make-up of the cable and the conductor segregation required. The wrappings specified are used to make sure that the same degree of insulation is maintained between the various conductor groups in the splice as that provided in the cable. Care should be taken to avoid damaging the insulation in handling the paper-insulated wires during splicing. The paper-insulated core unit is brought out between two coaxials and should be insulated from the coaxials by placing a 6-inch length of transflex tubing over the core unit on each side of the splice, if practicable; otherwise two 4 to 5-inch lengths of insulating tubing should be placed over the two coaxials between which the core unit is brought out. The tubing should be held in place by means of scotch tape.

5.04 Where there are cross-overs in the splice, the center unit should be brought out between two coaxials that are crossed. For example, if Coaxials 1 and 5 are to be spliced straight and 2 and 8, 3 and 7, and 4 and 6 are to be crossed, then the center unit should be brought out between Coaxials 2 and 3 or 7 and 8 as illustrated in the sketch in Paragraph 6.03.

5.05 Bend the interstice and core conductors back and tie them so that they will not interfere with work on the coaxials. Cut the coaxials with the cutter provided for the purpose so that the overlap is reduced to 6". This is done to prevent buckling of the coaxials at the butts.

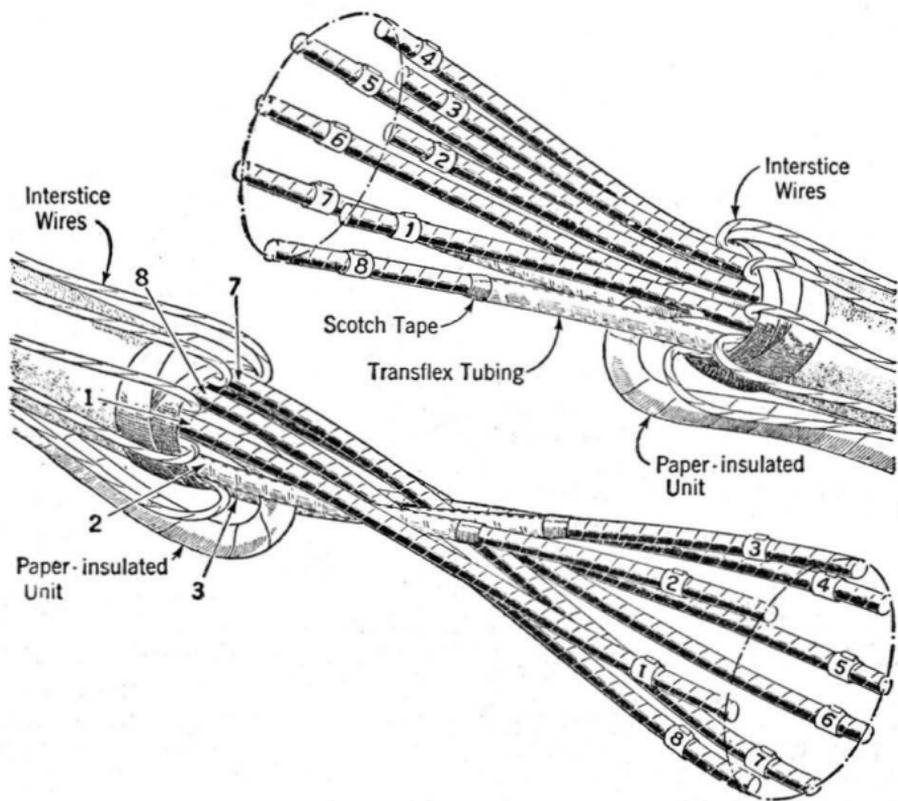
5.06 In manholes, it may be found convenient to splice a portion of the paper-insulated wires at the back of the splice before starting work on the coaxials. The number of conductors to be spliced at this time will depend on local conditions, but generally not more than $1/3$ to $1/2$ of them should be spliced. These conductors should be spliced with sufficient slack in them to permit operation of the sleeve roller on the coaxials.

6. ARRANGEMENT OF COAXIALS IN SPLICE

6.01 In splicing the coaxials, No. 1 should be spliced to No. 1, No. 2 to No. 2, etc. In this way a coaxial located between two interstice conductor groups on one side of the splice is always spliced to the same coaxial located between the corresponding interstice pairs on the other side of the splice. The core should not be twisted to bring like-numbered coaxials in alignment. They may, however, be spliced in the order that is most convenient. It is generally desirable to start splicing the coaxials at the top of the splice and on the side away from the splicer, leaving the coaxials at the bottom and in front until last. All of the coaxials on the left side of the splice should be prepared before any is connected to its mate on the right-hand side. No setup should be made in the coaxials at this time.

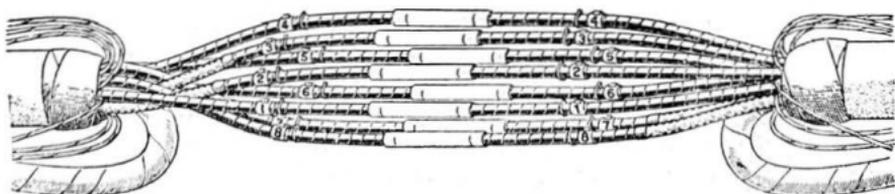
6.02 **Cross-Over of Coaxials in Splice:** Where the cable sections are so placed that the coaxials must be crossed in the splice to join like-numbered coaxials, a special setup is necessary. The coaxials should be crossed on the left-hand side of the splice.

6.03 From the cable on the left select two coaxials located opposite one another which line up best with two like-numbered coaxials on the right-hand side of the splice. For example, in the condition illustrated in the sketch on Page 6. Coaxials No. 1 and No. 5 on the left-hand side line up with Coaxials No. 1 and 5 on the right-hand side. Coaxials No. 1 and No. 5 on the left-hand side should remain straight. Next, interchange the positions of the coaxials on the left-hand side immediately adjacent to these coaxials. (In the case illustrated, Coaxials Nos. 2 and 8, Nos. 3 and 7, Nos. 4 and 6 have been interchanged to line up with the like-numbered coaxials on the right-hand side.)



6.04 The method of joining .270 and .375 coaxials is covered in other sections.

6.05 A completed splice in which the coaxials have been interchanged is shown below.

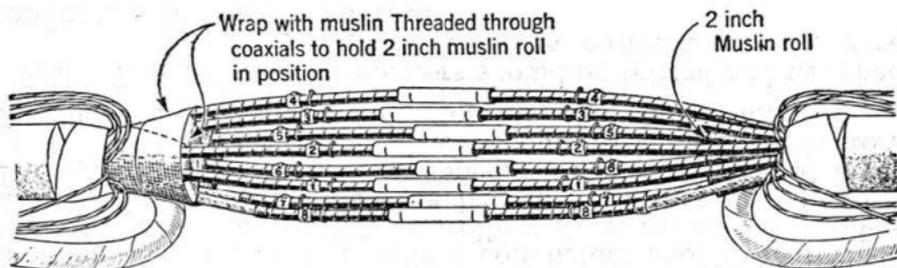


7. WRAPPING SPLICED COAXIALS

7.01 .270-Inch Coaxials:

(a) After the coaxials are spliced, make sure that the coaxial tags are in place adjacent to the No. 3 rings on each side of the splice and that like-numbered coaxials are correctly associated. The coaxials should now form a hollow cylinder having about a 2-inch inner diameter.

(b) Cut a roll of 2-inch muslin in half and insert a cut portion at each end of the cylinder formed by the coaxials and work it back toward the butt. Wrap the butt at each end with 2-inch muslin up to the edge of the inserted cut muslin roll, as illustrated below, and continue wrapping until there are two half-lapped layers over each butt, extending back sufficiently to overlap the wrapping paper on the coaxials.



(c) Place a roll of 4-inch muslin having a diameter of about 2 inches into the cylinder formed by the coaxials, centering it in the splice. This roll is placed in the splice to prevent deformation of the coaxials in wrapping.

7.02 .375-Inch Coaxials:

(a) After the coaxials are spliced, make sure that the coaxial tags are in place on each side of the splice and that like-numbered coaxials are correctly associated. The coaxials should now form a hollow cylinder having about a 2-3/4-inch inner diameter.

(b) Place a fibre tube in the cylinder formed by the coaxials, centering the tube in the splice. If a splice loading coil case is required it should be inserted in the fibre tube. The tube is placed in the splice to prevent deformation of the coaxials in wrapping. (In the event that a coaxial becomes badly deformed, it should be repaired.)

7.03 A bag of desiccant should now be placed in the splice. Wrap the coaxials with one half-lapped layer of 4-inch muslin and then with one half-lapped layer of B Polyethylene Tape. Care should be taken so as not to deform or damage the coaxials.

8. SPLICING PAPER-INSULATED CONDUCTORS

8.01 The unspliced paper-insulated wires, including the interstice and core unit of paper-insulated wires are spliced after the coaxials have been joined. To obtain the necessary slack, these conductors should be so spliced that the separation between the midpoint of the spliced wires and the wrapped coaxials is about 10 inches. The normal twist in the pairs and quads should be restored across the splice as nearly as practicable before the wires are joined.

8.02 If the paper-insulated conductors in the core unit are separated into two groups by means of wrapping paper, the two groups should be spliced and wrapped separately. First splice one group with the joints staggered to keep the splice as small as possible. The spliced conductors should be formed over the wrapped coaxials by rolling them around the splice. A bag of desiccant should be laid in with these conductors. The splice should then be wrapped with one half-lapped layer of B Polyethylene Tape. The second group of conductors should then be spliced and wrapped in a similar manner.

8.03 The interstice conductors should be spliced and wrapped with B Polyethylene Tape as outlined for the core conductors in Paragraph 8.02.

8.04 The twisted joints in the remaining pairs, if any, should be made in two banks about nine inches from each end of the splice opening. The slack should preferably be disposed of by rolling the conductors around the splice, but if this is not practicable, the conductors may be looped in the splice. In making the loops do not bend the quads sharply as this may damage the insulation. A bag of desiccant should be laid in with the conductors. The entire splice should then be covered with a half-lapped layer of B Polyethylene Tape. Then wrap the splice with a half-lapped layer of muslin.

8.05 Complete the splice in the usual manner and place the C warning tag on the sleeve as illustrated below.

