BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

SECTION G71.705
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SUBMARINE CABLE SPLICING

GENERAL

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1. GENERAL

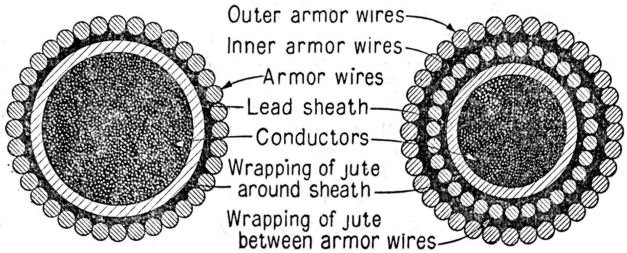
1.01 The instructions contained in this section cover the general features of splicing submarine cable. The detailed procedure for splicing the armor wires are covered in separate sections, each of which covers a specific method of splicing the armor.

1.02 The splicing of the conductors and lead sheath of submarine cable should be done in a manner similar to that followed in splicing the more common types of lead covered cable.

2. TYPES OF SUBMARINE CABLES

2.01 The most generally used submarine cables for telephone work are paper insulated lead covered cables protected by jute wrappings and either one or two layers of galvanized steel wires wound spirally around the cable. If the cable is protected by only one layer of armor wires it is known as a single-armored cable. Cables protected by two layers of armor wires are called double-armored cables. On double-armored cables the two layers of armor wires are wound on the cable in opposite directions. The make-up of single and double-armored submarine cables is illustrated in the following figure. Either of these cables may have an outer jute covering over the armor wires.

CROSS-SECTION OF SUBMARINE CABLES



2.02 The conductors of non-quadded submarine cables may be either single or double paper insulated. Those of quadded submarine cable are double paper insulated.

2.03 The color codes used in the case of submarine cables are the same as those employed in other lead covered cables described in the instructions for cable splicing.

2.04 Non-quadded submarine cables have twice as many extra pairs as the corresponding land type cables.

3. SPLICING INSTRUCTIONS

3.01 Instructions for doing the work will be furnished at the time the work is done. Splices in submarine cables will be straight splices and thus splicing diagrams should be required only for quadded cables in which case the information necessary for maintaining correct segregation of groups should be provided.

3.02 The work should never be done in a temporary manner. As the splice is to be placed under water, every precaution should be taken to do the work as perfectly as possible.

3.03 The lead sleeve used should be of large enough diameter to slip over the lead sheath of the cable, but the inside diameter of the sleeve should not be more than 1/4 inch larger than the outside diameter of the lead sheath. If one cable is of slightly larger diameter than the other, the lead sleeve should be of such size as to just slip over the lead sheath of the smaller cable. In this case it will be necessary to flare out the end of the lead sleeve which goes over the larger cable. If the lead

sleeve will be used to cover a splice in a cable containing a large number of pairs, it is desirable to use a longer sleeve rather than to increase its diameter. Slip the sleeve over one of the cable ends so that it will not interfere with splicing the wires. Avoid using a split lead sleeve whenever practicable.

3.04 The ends of the cable should be set up on wooden horses or other supports, so that the distance between the butts of the sheaths will be 3 inches less than the length of the lead sleeve which will be used to cover the splice. The cables should be lashed to supports so that the cable will be held firmly in a straight line.

3.05 In order to avoid weakening the sheath when preparing the cable for wiping the joints it is essential that only a sufficient amount of metal be removed with the shave hook to provide a clean, bright surface. The pitch and discoloration from the jute should be removed from the sheath with a cloth dampened with kerosene, afterwards drying the sheath with a clean cloth. The sheath should then be shaved very lightly and carefully with the shave hook.

3.06 The following special details should be observed in splicing the conductors. In other respects, the practices outlined in the cable splicing practices will apply.

(a) In boiling out the splice, care should be taken to ensure that the paraffin is not used at a temperature above 375° to 390° F., as the insulation might otherwise be weakened.

(b) Make the splice with as many rows of cotton sleeves as practicable. Leave a 2-inch space between the end row of sleeves and the butt of the cable sheath. Do not allow the rows of sleeves to overlap. Keep all wires taut as excessive slack will make it impossible to place the lead sleeve over the splice. Splice the center conductors of the cable first and work toward the outside layers so as to maintain a symmetrical layup.

(c) Distribute the wire joints equally along the entire splice so that when completed, it will have a uniform diameter.

(d) Tinned-copper sleeves may be used for making joints in 16-gauge conductors when necessary for forming the splice properly.

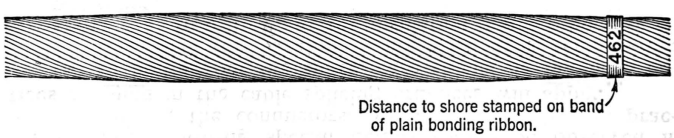
3.07 Where a splice is made on the deck of a boat and one or both sections of the cable have been laid, the cable should be securely lashed to the deck at several points in order to prevent the motion of the boat from interfering with the wiping of the joints.

3.08 The wiped joints should be as small as practicable and the solder work of splices should be pressure tested.

3.09 It is desirable to work continuously on the splice, after the lead sheath has been removed, until the lead sleeve has been wiped in place. If a splice in a submarine cable is left uncompleted overnight, every precaution should be taken to ensure that no moisture will enter the splice.

4. MARKING SPLICE POINTS

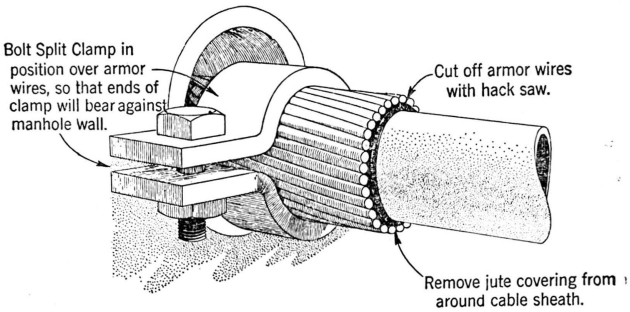
4.01 When a splice is made in a long submarine cable, and it is considered probable that the cable may have to be picked up by grappling in the future, it is advisable to make the splice show its distance from shore. In such cases place a piece of plain bonding ribbon on one side of the splice, and stencil on the bonding ribbon the distance of the splice from shore, as shown in the following figure. The bonding ribbon should be placed on the side of the splice toward the shore from which the measurement is taken. Lap the ends of the bonding ribbon and solder them together.

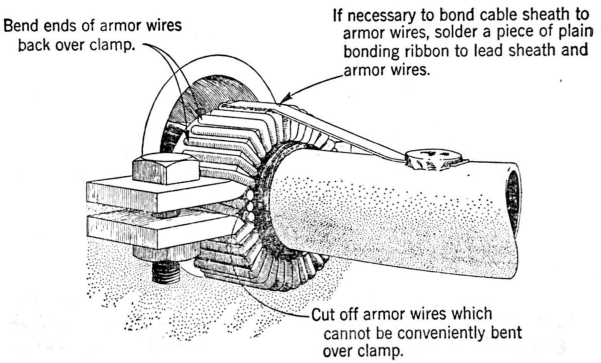


Distance to shore stamped on band of plain bonding ribbon.

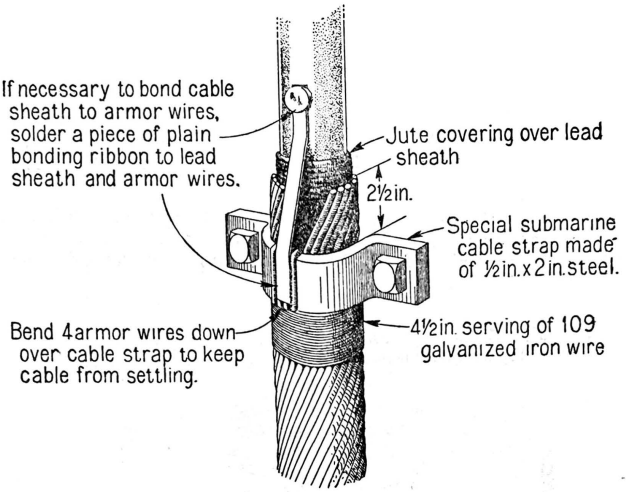
5. TERMINATING ARMOR WIRES

5.01 When a submarine cable is to be spliced to an underground cable in a manhole, the submarine cable should be anchored in the manhole by bolting a sturdy split clamp over the cable at the duct entrance. The armor wires should be removed from the cable and cut off leaving ends of sufficient length to permit bending them back over the clamp, as shown in the figure below. The ends of the clamp should extend a sufficient distance beyond the bore of the duct so that they will bear firmly against the wall of the manhole.





5.02 When a submarine cable is terminated at a cable house or a cable terminal on a pole, terminate the armor wires as shown in the following figure.


If necessary to bond cable sheath to armor wires, solder a piece of plain bonding ribbon to lead sheath and armor wires.
Jute covering over lead sheath
2½in.
Special submarine cable strap made of ½in.x2in.steel.
Bend 4 armor wires down over cable strap to keep cable from settling.
4½in. serving of 109 galvanized iron wire