

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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SUBMARINE CABLE SPLICING

OVERLAP ARMOR WIRE METHOD

| Contents | Page |
|--|-------------|
| General | 1 |
| Tools and Materials..... | 1 |
| Preparing Cable for Splicing..... | 2 |
| Replacing Jute Covering Around Cable Sheath..... | 3 |
| Replacing Armor Wires | 4 |
| Replacing Jute Around Armor Wires..... | 12 |

1. GENERAL

1.01 The instructions given in this section outline the method of splicing submarine cables in which the armor wires from the two cable ends are wound spirally around the splice so as to overlap each other and are held in place with servings of galvanized iron wire and spun yarn.

1.02 This section covers primarily the details of handling the armor wires and jute protection in making splices by the overlap armor wire method.

2. TOOLS AND MATERIALS

2.01 The following special tools and materials will be required for the various operations in splicing submarine cables. Ordinarily these items can be obtained locally. The other tools and materials required are the same as those generally used in land cable splicing.

- Serving iron
- Serving board
- Wooden horses or other suitable supports
- Hacksaw with special blades to cut armor wires
- Bolt cutter
- Files
- Wooden mallet
- 109 galvanized wire
- Three-yarn tarred hemp spun yarn

SUBMARINE
CABLE SPLICING
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3. PREPARING CABLE FOR SPLICING

3.01 If the cable is protected with an outer jute covering the jute should be unwound from the cable for sufficient distance to make the splice. The jute should not be cut but should be wound on a stick so that it can later be replaced on the cable.

3.02 The armor wires should be unwrapped from each cable end, three or four at a time and laid aside. Lay one-half of the armor wires on each side of the cable leaving space for working on the splice. Care should be taken not to cut, bend or kink the wires nor disturb the original set or lay of the wires. After the armor wires have been unwrapped from a cable end and laid aside, they should be grouped together and tied in two or three places so that they will not be stepped on. With double armored cable, the inner and outer layers of armor wires should be tied in separate groups. The distance the armor wires should be unwrapped from the cable ends when making splices in the various types of submarine cables are as follows:

- (a) **Single-armored Cable:** Unwrap the armor wires from the end of one of the cables for a distance of about 19 feet and lay them aside. (This end will be referred to hereafter as the "long" end.) Then unwrap the armor wires from the other cable end for a distance of about 10 feet and lay them aside. (This end will be referred to hereafter as the "short" end.) Cut off the excess cable as described in Paragraph 3.03a, and then unwrap the jute covering from around the lead sheath on each cable end for a sufficient distance to permit making the splice. Do not cut the jute but wind each layer on a stick in preparation for rewinding around the cable in its original position after the splice has been completed.
- (b) **Double-armored Cable:** Unwrap the outer armor wires from each cable end for a distance of about 24 feet and lay them aside. Then cut the jute off the inner layer of armor wires and unwrap them. Cut off the excess cable as described in Paragraph 3.03b. Then unwrap the jute covering around the lead sheath on each cable end for a sufficient distance to permit making the splice and wind each layer on a stick as outlined under (a).
- (c) **Single-armored Cable Spliced to Double-armored Cable:** Unwrap the armor wires from the end of the single-armored cable for a distance of about 19 feet and lay them aside as outlined under (a), then unwrap both layers of armor wires from the double-armored cable for a distance of about 22 feet and lay them aside as outlined under (b). Cut off the excess cable as described in Paragraph 3.03c. Then unwrap the jute covering from around the lead

sheath on each cable end for a sufficient distance to permit making the splice and wind each layer of jute on a stick as outlined under (a).

3.03 To provide for the overlap of the armor wires, it is necessary to cut off cable from each end before making the splice between the cable conductors. The lengths of cable to be cut from the ends when making splices in the various types of submarine cables are indicated in the following subparagraphs. These lengths will provide for about a 4-foot overlap of the cable ends if a 27-inch sleeve is used. If a greater overlap of the cable ends will be required to make the splice, the lengths of cable to be cut from the ends should be reduced sufficiently to provide the desired overlap.

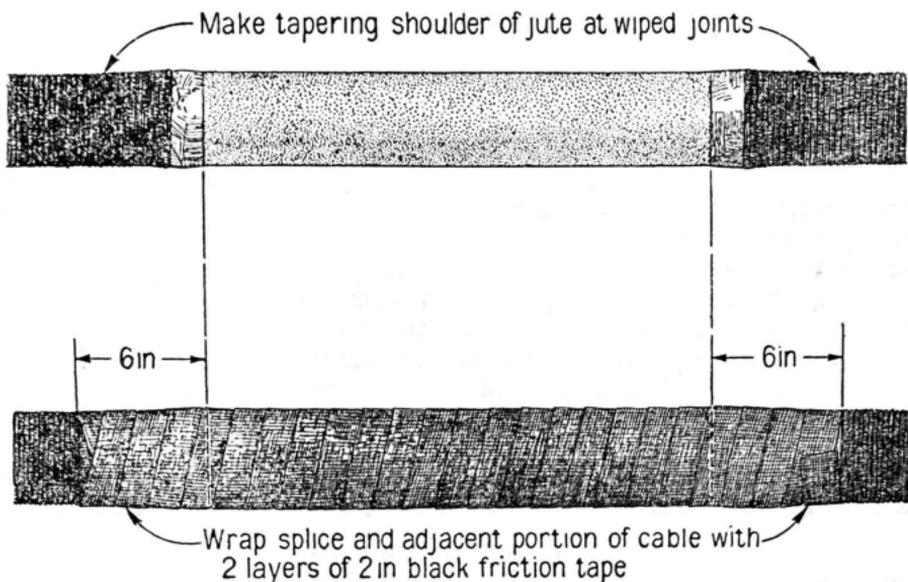
(a) Single-armored Cable: Cut off 1 foot of cable from the short end and strip the sheath from the remaining end for a distance of 3 feet. Cut off 11 feet from the long end and then strip the sheath off the remaining end for a distance of 3 feet.

(b) Double-armored Cable: Cut off 3-1/2 feet of cable from the short end and strip the sheath from the remaining end for a distance of 3 feet. Cut off 14 feet of cable from the long end and strip the sheath from the remaining end for a distance of 3 feet.

(c) Single-armored Spliced to Double-armored Cable: Cut off 11 feet of cable from the end of the single-armored cable and strip the sheath from the remaining end for a distance of 3 feet. Cut off 4 feet of cable from the end of the double-armored cable and strip the sheath from the remaining end for a distance of 3 feet.

4. REPLACING JUTE COVERING AROUND CABLE SHEATH

4.01 After the cable has been spliced rewind the jute covering around the cable sheath on each side of the splice. Extend the jute covering up to the wiped joint on each side of the splice. Wind the jute firmly around the cable at the wiped joints so as to make a tapered shoulder up to the lead sleeve. The jute should be packed solidly at this point so as to make a firm bedding for the armor wires which will be wound over the splice. Wrap two layers of 2-inch friction tape over the lead sleeve as shown in the following figure.



5. REPLACING ARMOR WIRES

5.01 Before starting to replace the armor wires, the cable should be as straight as possible.

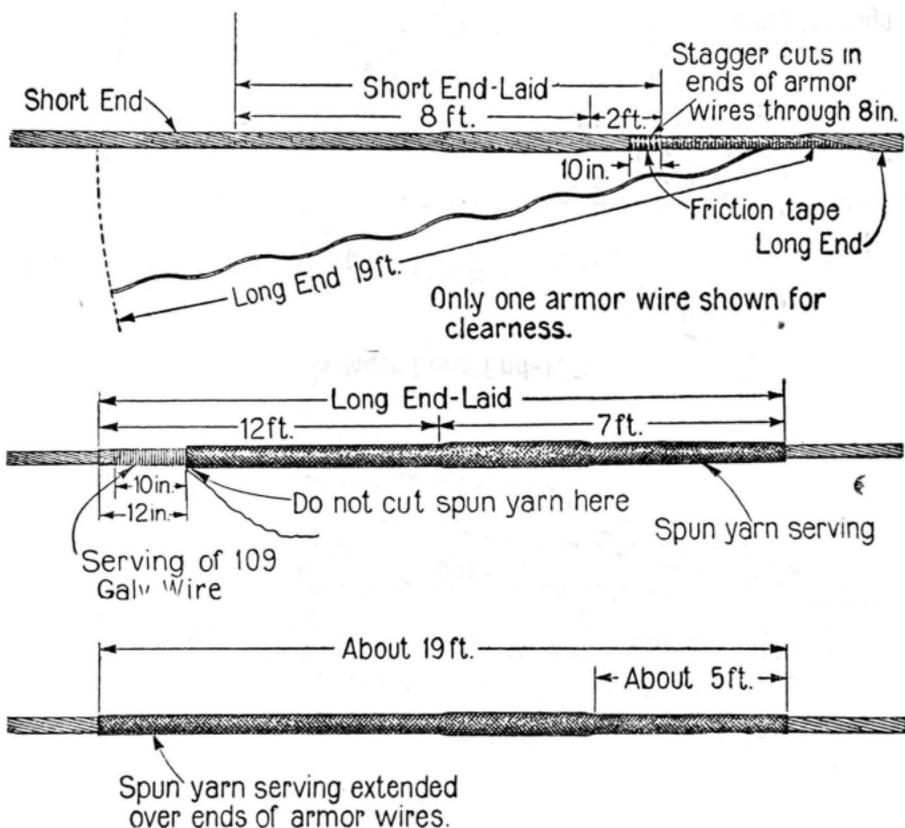
5.02 Replace the armor wires around the cable and lead sleeve, three or four at a time, being careful to keep the original lay of the wires. Beat the wires into place with a wooden mallet. The sequence of operations in replacing the armor wires on various types of cables is outlined in the following paragraphs.

5.03 Single-armored Cable: The armor wires from the short and long cable ends should be replaced as shown in the following figure. The detail methods of replacing the armor wires are as follows:

- (1) Relay the armor wires from the short cable end around the cable and splice. Stagger the cuts in the ends of the armor wires through a distance of about 8 inches. Place a temporary open serving of spun yarn around these wires with a serving board to force them down into place, bind the ends of the wires to the cable by means of a wrapping of 2-inch friction tape, and then remove the spun yarn serving.
- (2) Relay the armor wires from the long cable end around the cable and splice. Place a permanent spun yarn serving around these armor wires, forcing them into place. Carry this spun yarn serving up to a point about 12 inches from the ends of the armor wires, then, without cutting

the spun yarn, serve the armor wires through a distance of 10 inches with 109 galvanized wire; use a serving iron to place this iron wire serving. Extend the spun yarn serving over the iron wire serving and the ends of the armor wires. The procedure is illustrated below.

SPLICING SINGLE ARMORED CABLE



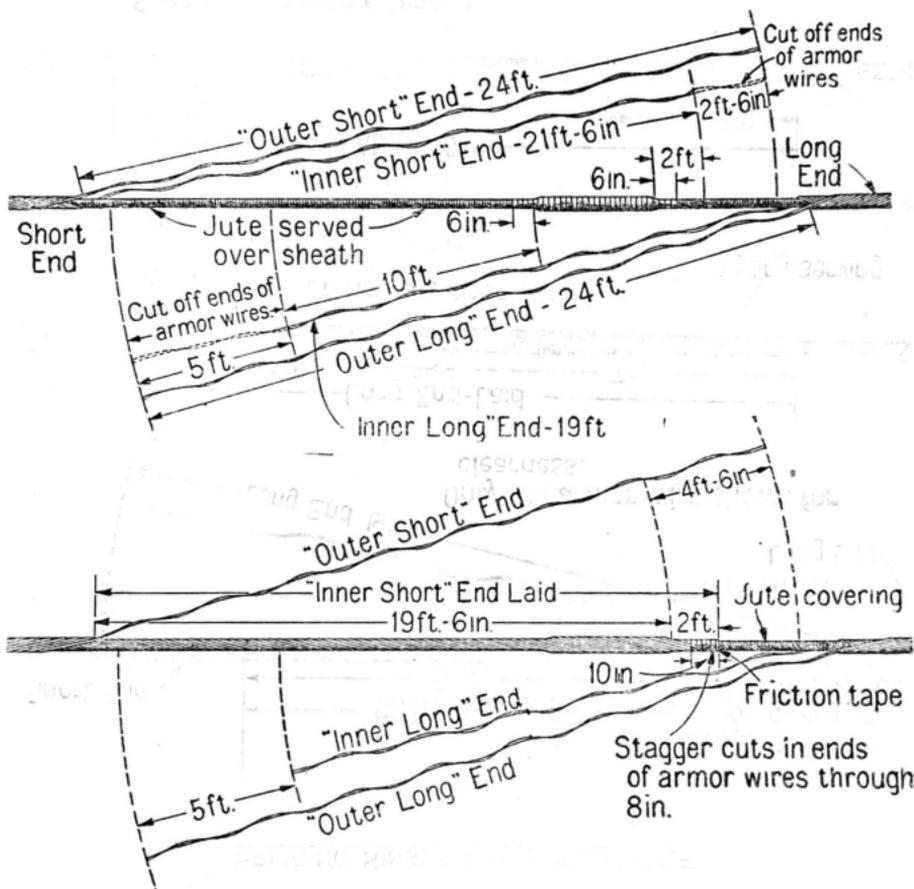
Note:-

Always serve the spun yarn and 109 wire in the same direction as the lay of the armor wires. This will ensure the removal of all slack in the wires.

5.04 Double-armed Cable: Cut off 2-1/2 feet of the inner layer of armor wires from the short end and 5 feet of the ends of the inner layer of armor wires from the long end, then replace the inner and outer layers of armor wires from both cable ends in the following manner:

(1) Relay the inner layer of armor wires from the short cable end around the cable and splice. Stagger the cuts in the ends of the armor wires through a distance of about 8 inches. Place a temporary open serving of spun yarn around these wires to force them down into place; bind the ends of the wires to the cable by means of a wrapping of 2-inch friction tape, and then remove the spun yarn serving. The method of relaying the armor wires is shown in the following figure.

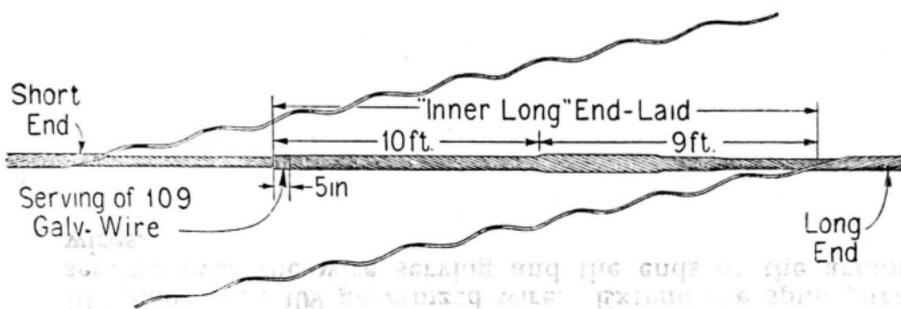
SPLICING DOUBLE ARMORED CABLE
RE-LAYING INNER ARMOR WIRES



Always serve the spun yarn and 109 wire in the same direction as the lay of the armor wires. This will ensure the removal of all slack in the wires.

(2) Relay the inner layer of armor wires from the long cable end around the cable and splice. Place a temporary open serving of spun yarn around the wires up to a point about 5 inches from the ends to force them into place, as shown in the following figure. Serve the ends of the armor wires permanently with 109 galvanized wire, and then remove the temporary serving of yarn.

SPlicing DOUBLE ARMORED CABLE
RE-LAYING INNER ARMOR WIRES

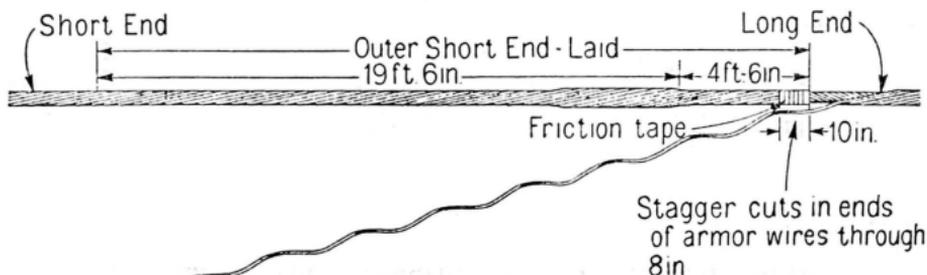


Notes:-

Only one armor wire shown for clearness.
Always serve the spun yarn and 109 wire in the same direction as the lay of the armor wires. This will ensure the removal of all slack in the wires.

(3) Relay the outer layer of armor wires from the short cable end around the cable and splice as shown in the following figure forcing them into place with a temporary open serving of spun yarn. Stagger the cuts in the ends of these armor wires through a distance of about 8 inches, and serve the ends of the armor wires with friction tape. Then remove the temporary serving of spun yarn.

SPlicing DOUBLE ARMORED CABLE
RE-LAYING OUTER ARMOR WIRES



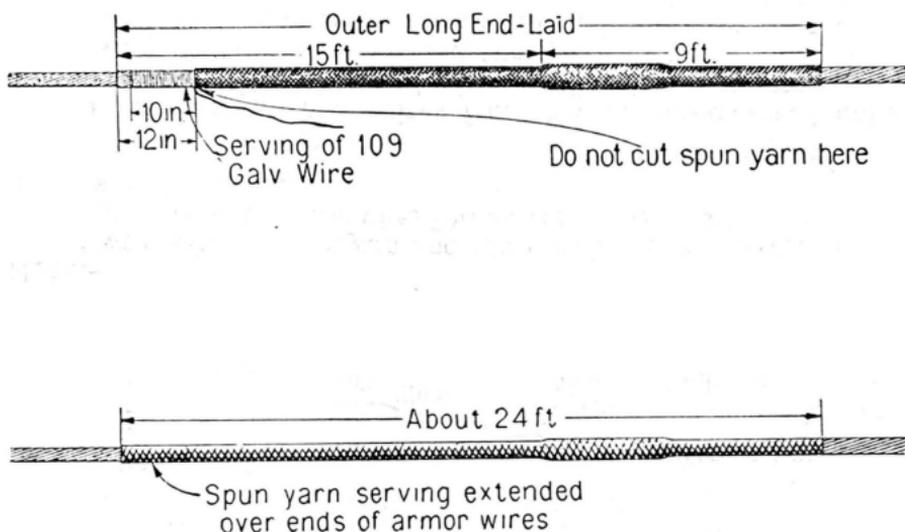
Notes:-

Only one armor wire shown for clearness

Always serve the spun yarn and 109 wire in the same direction as the lay of the armor wires. This will ensure the removal of all slack in the wires.

- (4) Relay the outer layer of armor wires from the long cable end around the cable and splice. Place a permanent spun yarn serving around the armor wires, forcing them into place as shown in the following figure. Carry the spun yarn serving up to a point about 12 inches from the ends of the armor wires. Then, without cutting the spun yarn, serve the armor wires through a distance of 10 inches with 109 galvanized wire. Extend the spun yarn serving over the wire serving and the ends of the armor wires.

SPLICING DOUBLE ARMORED CABLE
RE-LAYING OUTER ARMOR WIRES



Note -

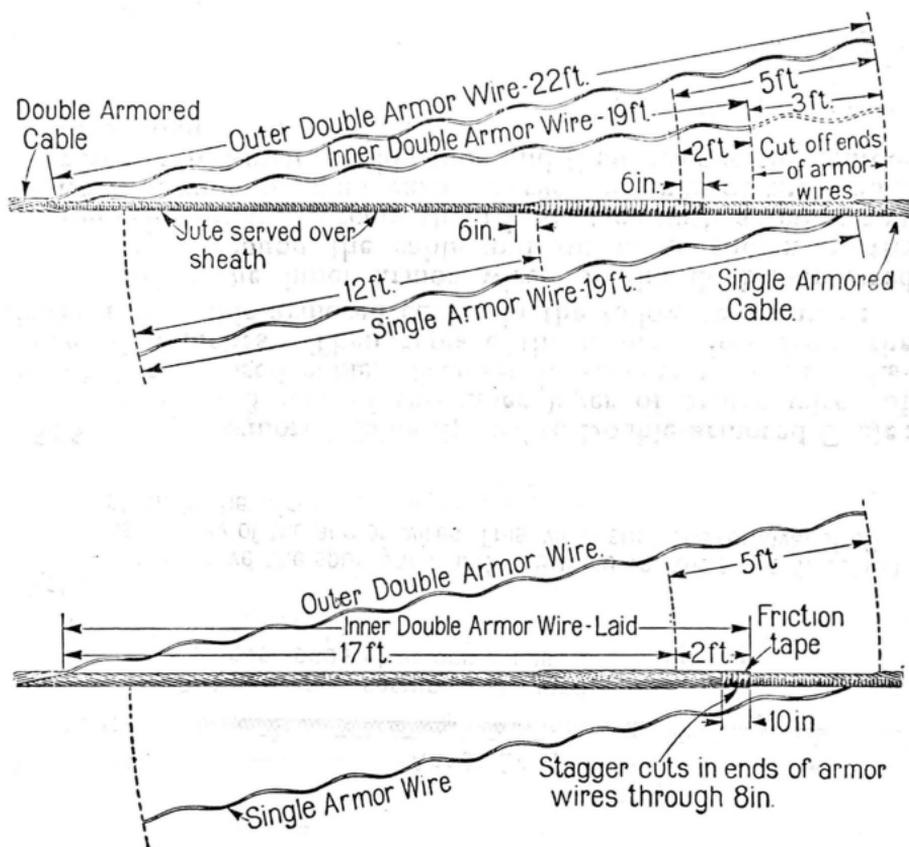
Always serve the spun yarn and 109 wire in the same direction as the lay of the armor wires. This will ensure the removal of all slack in the wires.

5.05 Single-armored Cable Spliced to Double-armored Cable:

Cut off 3 feet of the inner layer of armor wires of the double-armored cable. Stagger these cuts through a distance of 8 inches. Then replace the armor wires from the single and double-armored cables in the following manner:

- (1) Relay the inner armor wires of the double-armored cable around the cable and splice, as shown in the following figure, forcing them into place with a temporary open serving of spun yarn. Serve the ends of the armor wires with 2-inch friction tape and then remove the temporary spun yarn serving.

SPLICING SINGLE ARMORED CABLE TO DOUBLE ARMORED CABLE

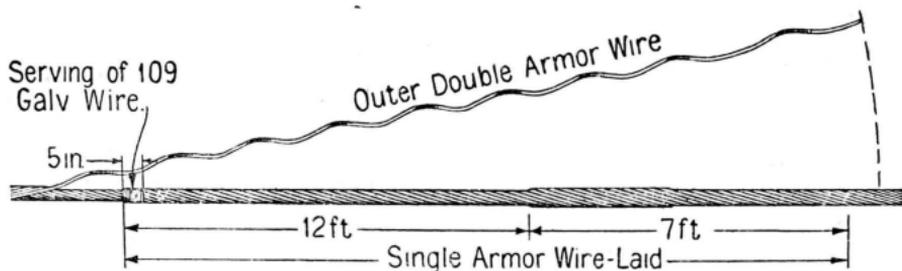


Note:-

Always serve the spun yarn and 109 wire in the same direction as the lay of the armor wires This will ensure the removal of all slack in the wires.

(2) Relay the armor wires from the single-armored cable around the cable and splice. Place a temporary open serving of spun yarn around the wires up to a point about 5 inches from the ends to force them into place. Serve the ends of the armor wires permanently with 109 galvanized wire and then remove the temporary serving of spun yarn, as shown in the following figure.

SPLICING SINGLE ARMORED CABLE TO DOUBLE ARMORED CABLE

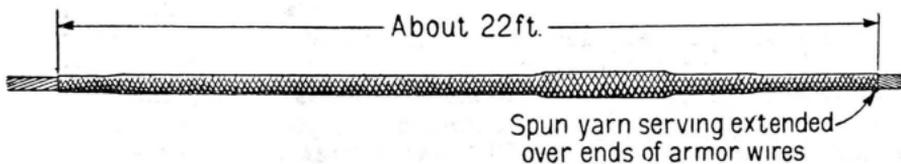
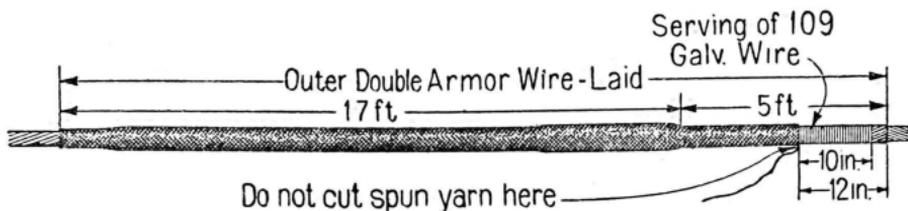


Notes:-

- Only one armor wire shown for clearness
- Always serve the spun yarn and 109 wire in the same direction as the lay of the armor wires. This will ensure the removal of all slack in the wires.

(3) Relay the outer layer of armor wires from the double- armored cable around the cable and splice. Place a permanent spun yarn serving around these armor wires, forcing them into place as shown in the following figure. Carry this spun yarn serving up to a point about 12 inches from the ends of the armor wires; then, without cutting the spun yarn, serve the armor wires through a distance of 10 inches with 109 galvanized wire. Extend the spun yarn serving over the iron wire serving and the ends of the armor wires.

SPlicing SINGLE ARMORED CABLE TO DOUBLE ARMORED CABLE



Note:-

Always serve the spun yarn and 109 wire in the same direction as the lay of the armor wires. This will ensure the removal of all slack in the wires.

6. REPLACING JUTE AROUND ARMOR WIRES

6.01 If the cable is protected by an outer covering of jute the jute should be rewound onto the cable and held in place with a close serving of spun yarn for a short distance back of the ends of the jute. The entire splice should then be given a liberal coating of hot asphalt.