

3M™ Cold Shrink Splice Kit QS-III 5536A

for UniShield®, Wire Shielded, Longitudinally Corrugated (LC),
and Tape Shielded (Ribbon Shielded) Cable or Transitions to
Concentric Neutral (CN)/Jacketed Concentric Neutral (JCN) Cables

Instructions

IEEE Std. 404

35 kV Class

250 kV BIL

CAUTION

Working around energized systems may cause serious injury or death. Installation should be performed by personnel familiar with good safety practice in handling electrical equipment. De-energize and ground all electrical systems before installing product.

Kit Selection Table

Kit Number	Cable Insulation O.D. Range	Conductor Size Range
5536A	1.24"–2.07" (31,5–52,6 mm)	350–1000 kcmil* (185–500 mm ²)

*Splices (including size transitions) can be made to smaller or larger conductors (but larger conductors may require special neutral handling), provided both cables are within the Insulation O.D. Range and the connector meets the dimensional requirements shown below.

Connector Dimensional Requirements

	Minimum Inches (mm)	Maximum Inches (mm)
Outside Diameter	0.87" (22,1 mm)	2.07" (52,6 mm)
Length Aluminum (Al/Cu) Compression	—	7.50" (191 mm)
Length Copper Compression and 3M™ Shearbolt Connectors QCI 350-750 or QCI 500-1000	—	8.25" (210 mm)

March 2011

78-8125-9901-3-C

3M

1.0 Kit Contents

- a. 3M™ Cold Shrink Splice Body 5468A (1 ea.)
- b. Cold Shrink Jacketing Tube (1 ea.)
- c. Cold Shrink Adapter Tube (1 ea.)
- d. Shielding Sleeve, 1/3 Neutral Maximum (1 ea.)
- e. Ground Strap (1 ea.)
- f. Constant Force Spring Ground Connectors (5 ea.)
- g. Red Compound Tubes (non-silicone grease) (2 ea.)
- h. Scotch® Mastic Sealing Strips 2230, 6" length (6 ea.)
- i. Scotch® Rubber Mastic Tape 2228 Rolls, 2" x 36" (2 ea.)
- j. Copper Foil Tape, 1/2" x 10" (2 ea.)
- k. 3M™ Cable Cleaning Pads CC-3 (1 ea.)
- l. Cable Preparation Template (2 ea.)
- m. Instruction Booklet (1 ea.)

Note: *Do not use knives to open plastic bags.*

Note: *Connector not shown, but if included, it is indicated on the packaging label.*

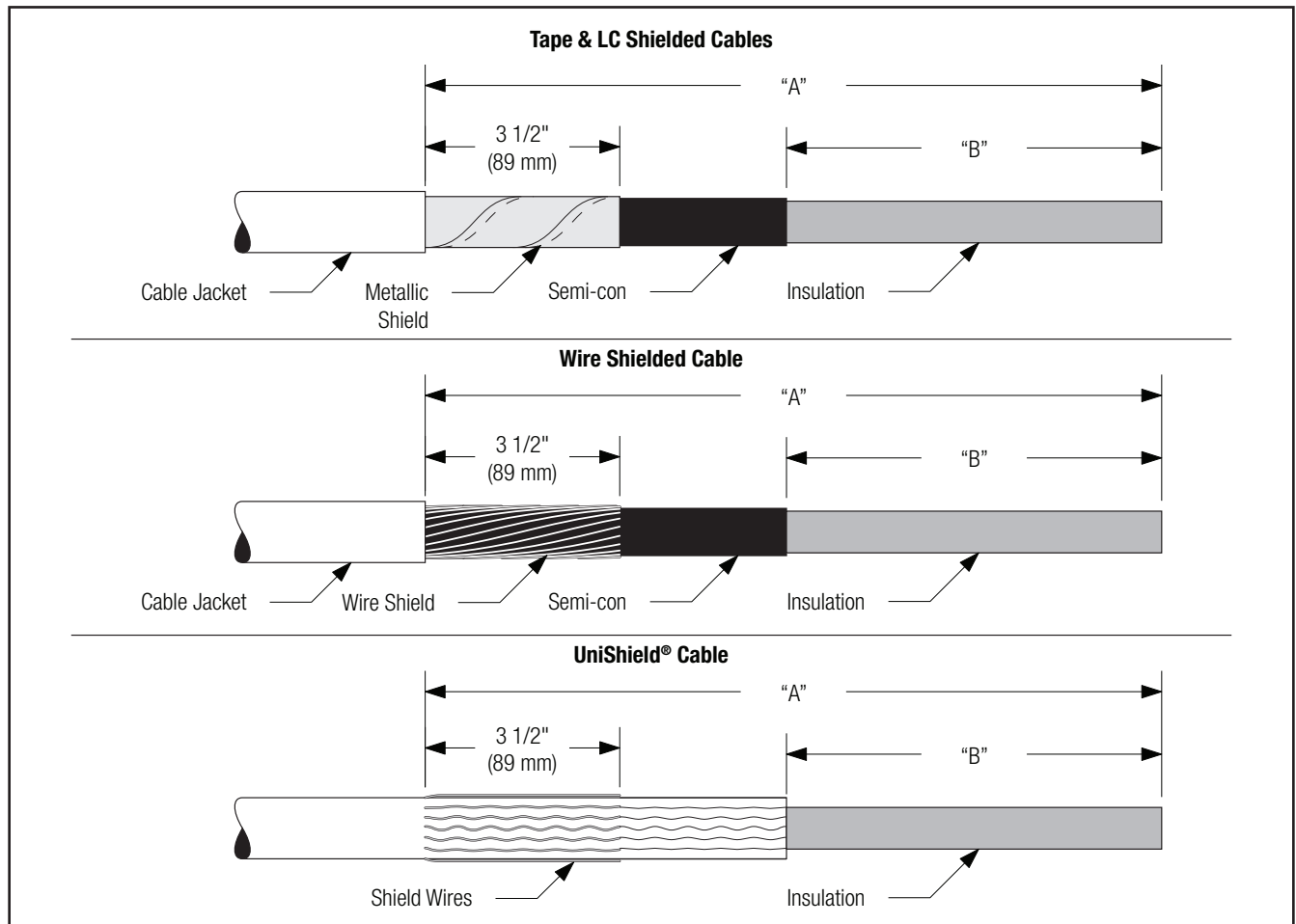
Note: *Cold shrink adapter tube may not be included in all kits.*

Note: *Kits contain either 1 or 2 Cut-back Templates, as needed per conductor size.*

2.0 Prepare Cables

2.1 For Tape, LC, Wire Shield or UniShield® Cable:

2.1.1 Prepare cables according to standard procedures. Refer to template provided or illustration below for proper dimensions. (Figure 1).



Typical Conductor Size* kcmil (mm ²)	Insulation OD Range Inches (mm)	Jacket Cutback "A" Inches (mm)	Semi-con Cutback "B" Inches (mm)
350**-500 (185-300)	1.24-1.70 (31,5-43,2)	15 3/4 (400)	9 1/4 (235)
750-1000** (325-500)	1.59-2.07 (40,4-52,6)	15 1/4 (387)	8 3/4 (222)

*For 100% and 133% insulation levels, Insulation OD is the final determining factor.

**Cables must be within the Insulation OD Range of the splice kit and the connector must meet the dimensional requirements shown on the front page.

Figure 1

- 2.1.2 **For Tape shield and LC shield:** Secure end of each metallic shield with a copper tape strip.
For Wire shield and UniShield®: Carefully bend shield wires back over cable jackets and temporarily secure with vinyl tape. (Figure 2).

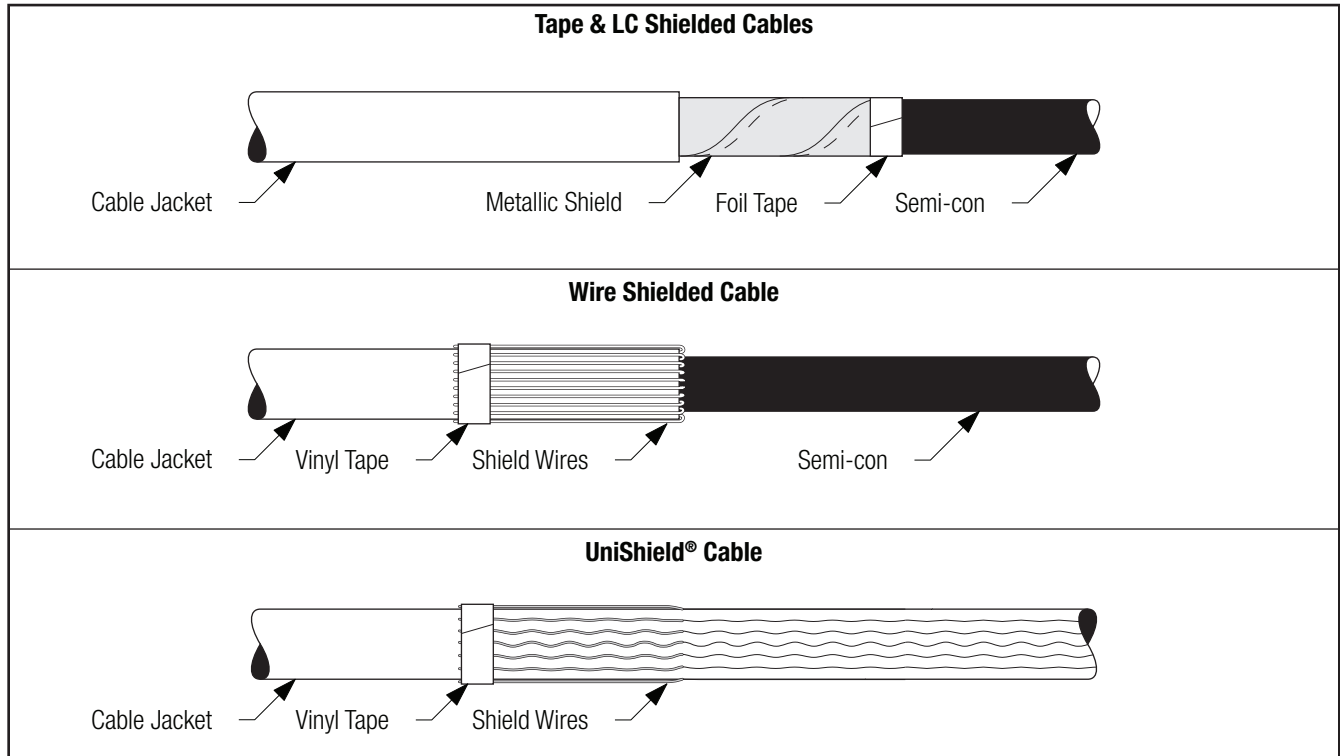
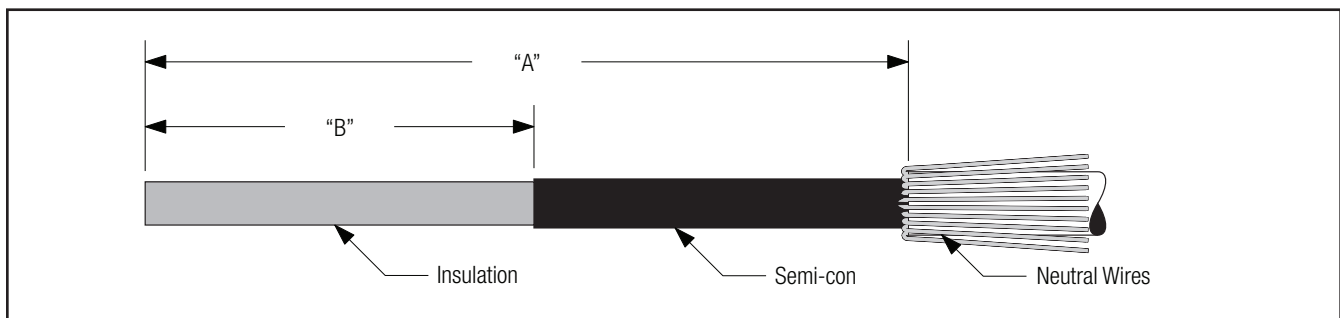


Figure 2

Go to section 3.0 “Park Splice Components.” if not transition splicing to JCN or CN cable.

2.2 For Transitions to Jacketed Concentric Neutral (JCN) Cable:

- 2.2.1 Prepare cables according to standard procedures. Refer to template provided or illustration below for proper dimensions (Figure 3).



Typical Conductor Size* kcmil (mm ²)	Insulation OD Range Inches (mm)	Jacket Cutback "A" Inches (mm)	Semi-con Cutback "B" Inches (mm)
350**-500 (185-300)	1.24-1.70 (31,5-43,2)	15 3/4 (400)	9 1/4 (235)
750-1000** (325-500)	1.59-2.07 (40,4-52,6)	15 1/4 (387)	8 3/4 (222)

*For 100% and 133% insulation levels, Insulation OD is the final determining factor.

**Cables must be within the Insulation OD Range of the splice kit and the connector must meet the dimensional requirements shown on the front page.

Figure 3

2.2.2 Carefully bend neutral wires back over edge of cable jacket and temporarily secure with vinyl tape.

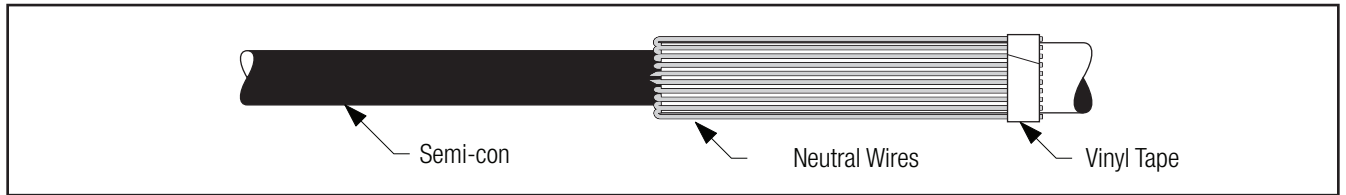
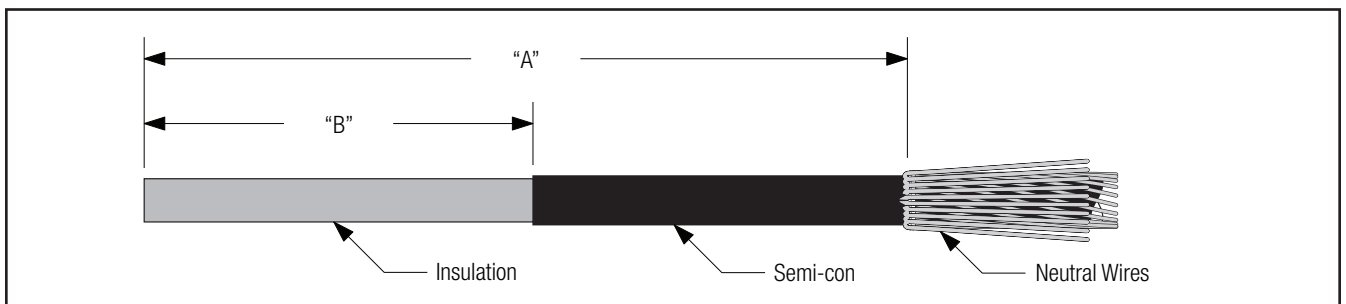


Figure 4

Go to section 3.0 “Park Splice Components.”

2.3 For Transitions to Concentric Neutral (CN) Cable:

2.3.1 Prepare cables according to standard procedures. Refer to template provided or illustration below for proper dimensions (*Figure 5*). **Do not cut neutral wires on CN cables.**



Typical Conductor Size* kcmil (mm ²)	Insulation OD Range Inches (mm)	Jacket Cutback "A" Inches (mm)	Semi-con Cutback "B" Inches (mm)
350**-500 (185-300)	1.24-1.70 (31,5-43,2)	15 3/4 (400)	9 1/4 (235)
750-1000** (325-500)	1.59-2.07 (40,4-52,6)	15 1/4 (387)	8 3/4 (222)

*For 100% and 133% insulation levels, Insulation OD is the final determining factor.

**Cables must be within the Insulation OD Range of the splice kit and the connector must meet the dimensional requirements shown on the front page.

Figure 5

2.3.2 Clean cable semi-con as shown (*Figure 6*).

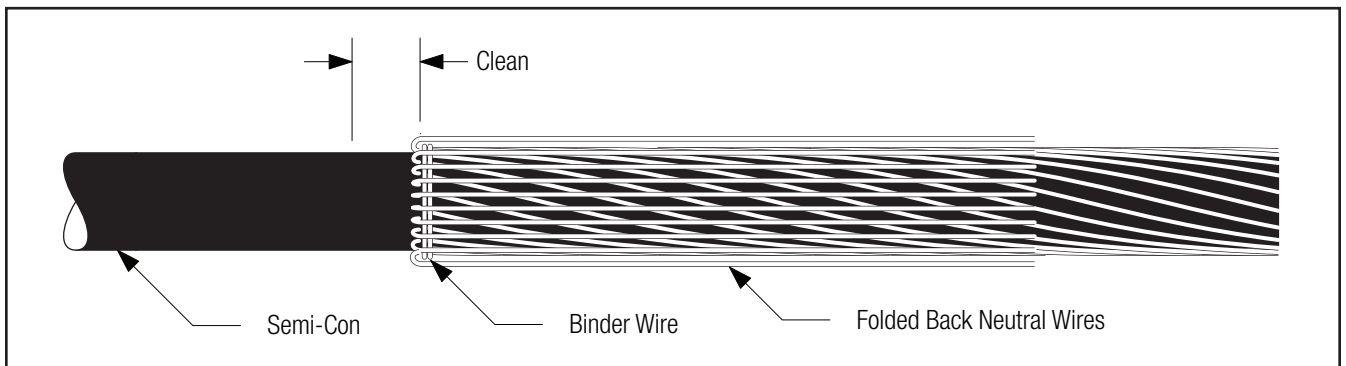


Figure 6

- 2.3.3 Place a strip of mastic around cable semi-con next to neutral binder. Fold neutrals into mastic and place another binder wire on the other side of the mastic (*Figure 7*).

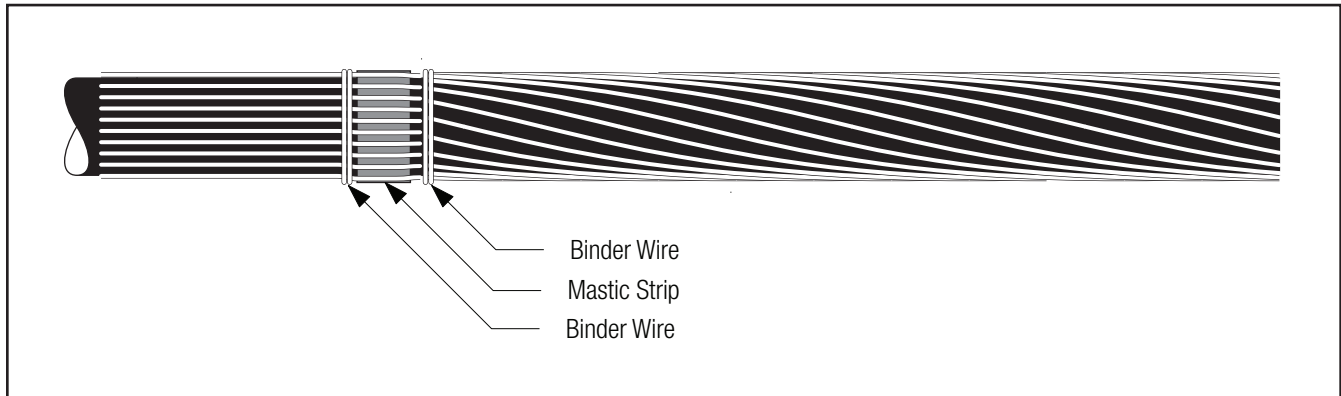


Figure 7

- 2.3.4 Wrap two additional strips of mastic over the first one and cover with two half lapped layers of vinyl tape (*Figure 8*).

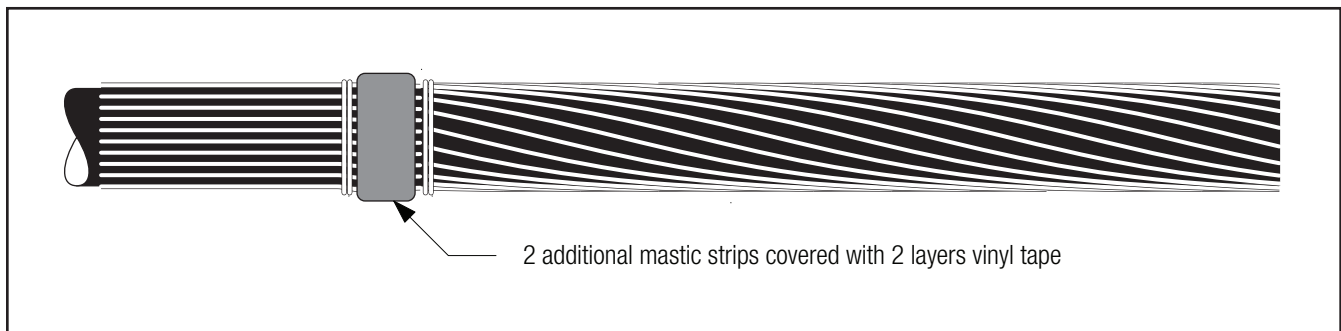


Figure 8

- 2.3.5 Fold neutrals over mastic seal and temporarily secure ends with vinyl tape (*Figure 9*).

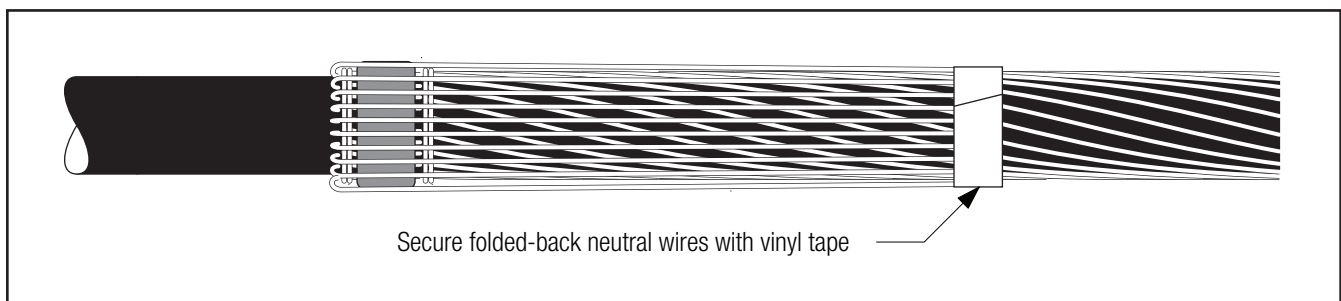


Figure 9

3.0 Park Splice Components

- 3.1 Clean or cover cable jacket if necessary, for cold shrink parking position. Slide jacketing tube onto one cable end. Slide splice body onto opposite cable, loose core end first. For size transitions, park splice on smaller cable (*Figure 10*).

Note: *Jacketing is not optional. Cold shrink jacketing tube must be installed.*

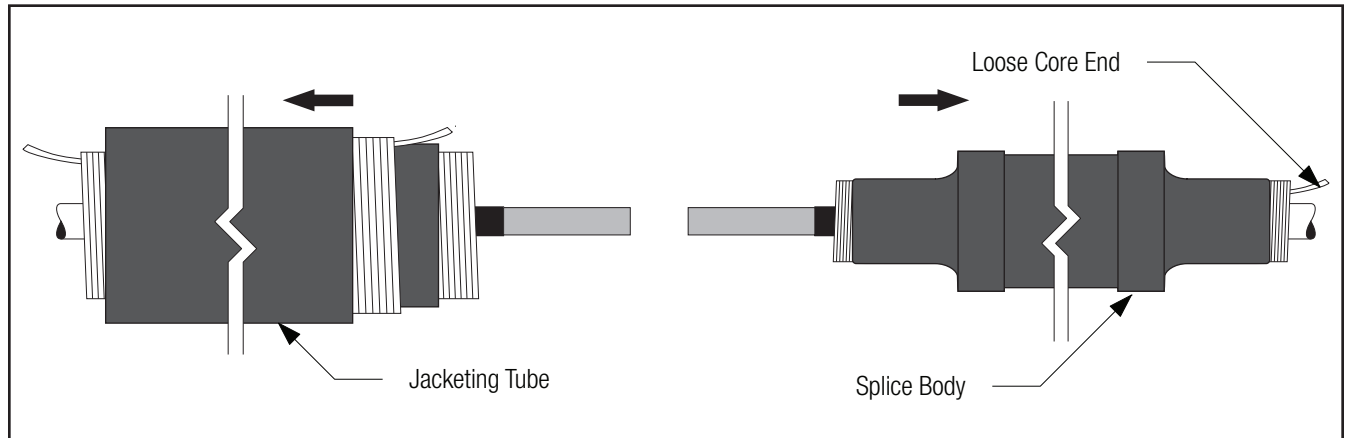


Figure 10

Note: *If space is limited, the jacketing tube and splice body can be put on the cable stacked inside each other.*

- 3.2 Position the expanded shield sleeve onto one cable. The shield sleeve is designed to carry up to 1/3 neutral current (*Figure 11*).

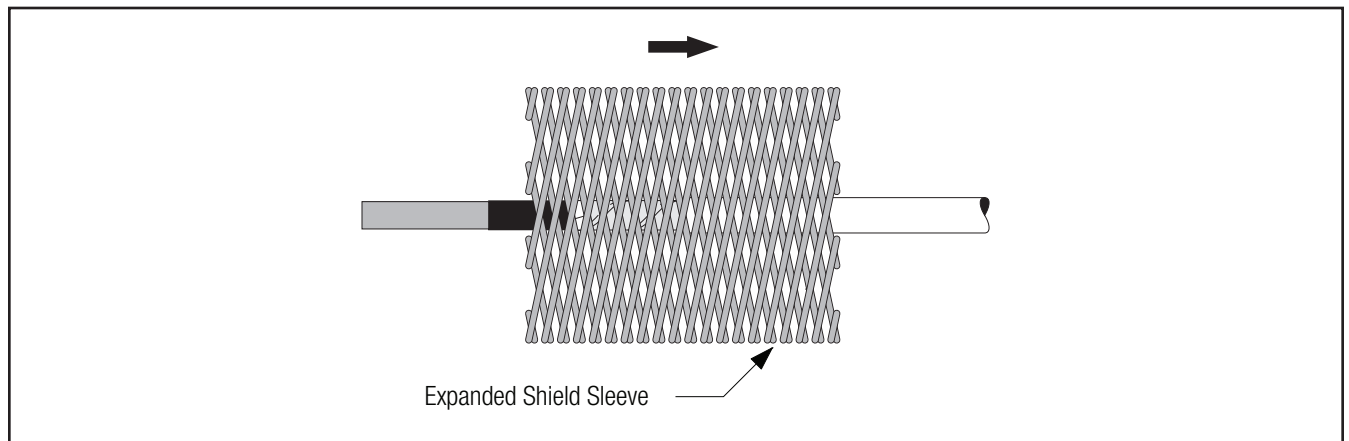


Figure 11

4.0 Install Connector

Note: *If using a crimp-type connector, go to step 4.3.*

- 4.1** If using a 3M™ Shearbolt Connector QCI 350-750 or QCI 500-1000, refer to the instructions included with the connector for insulation cut-back dimension. Insulation removal length shall not exceed 3 3/4" (95 mm) from conductor end (*Figure 12*).

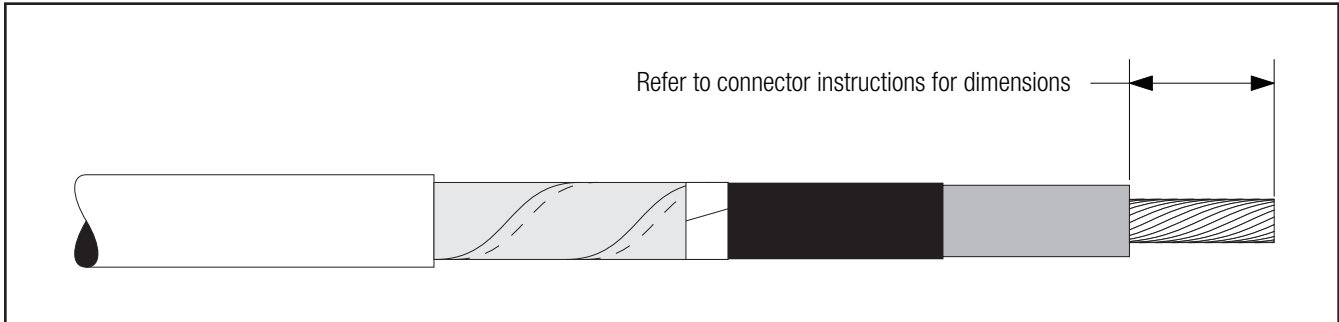


Figure 12

- 4.2** Install 3M™ Shearbolt Connector QCI 350-750 or QCI 500-1000 according to the instructions included with the connector (*Figure 13*).

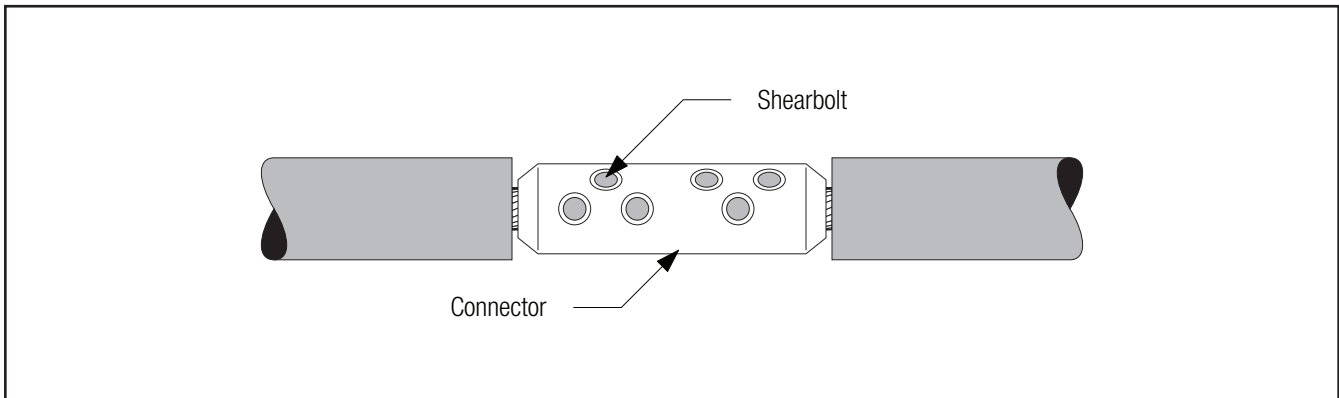


Figure 13

Go to section 5.0 “Install Splice.”

- 4.3 If using a crimp type connector, remove cable insulation for 1/2 connector length plus an allowance* for increases in connector length due to crimping. Insulation removal length shall not exceed 4 1/8" (105 mm) from conductor end. Do not install connector now (Figure 14).**

***Note:** *This assumes that the installer has determined the increased length of an aluminum connector crimped with a specific tool and die.*

Aluminum (Al/Cu) Crimp Connector Growth Chart

Conductor Size	Typical growth allowance (per end)
350–500 kcmil	1/4" (6 mm)
750-1000 kcmil	3/8" (10 mm)

- Note:** 1) *Copper connectors do not require a length change allowance.*
2) *Maximum aluminum connector crimped length allowed is 8.25" (210 mm).*

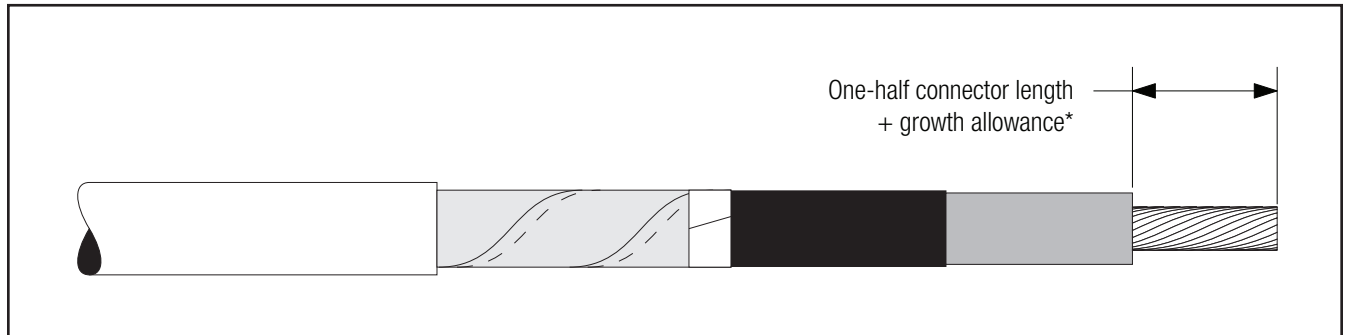


Figure 14

- 4.4 For 350 through 1000 kcmil copper connectors, 350 through 750 kcmil aluminum connectors, or connectors with an O.D. between 0.87–1.60" (22,1–40,6 mm): Slide the cold shrink adapter tube onto the insulation with the loose core ribbon end going on first, away from the cable end (Figure 15).**

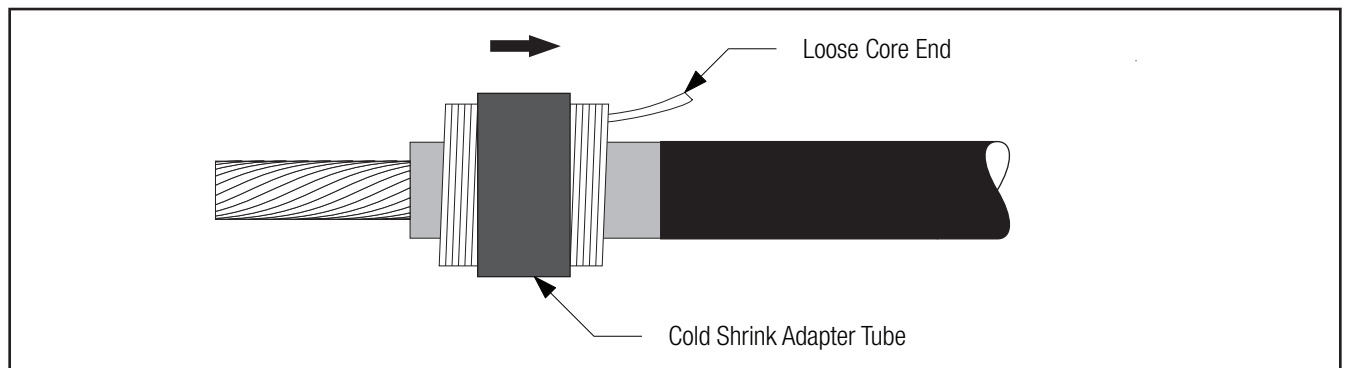


Figure 15

- 4.5 Install connector. See table (on cover) for proper connector dimensions. (For standard 3M™ Connectors, refer to table at the end of this instruction for crimping information). Remove any excess oxidation inhibitor from connector ends if aluminum connector is used. File sharp connector flashing if necessary, taking care to remove all metal filings from splice area (*Figure 16*).

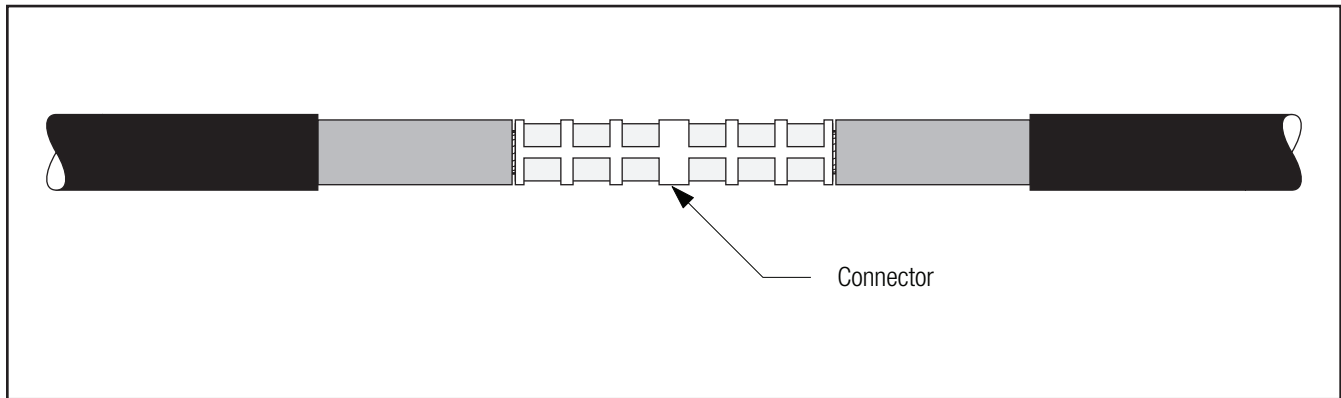


Figure 16

5.0 Install Splice

- 5.1 Apply a tape marker to semi-con insulation shield on cable which does not contain splice. Measure 11 1/4" (286 mm) from center of connector (*Figure 17*).

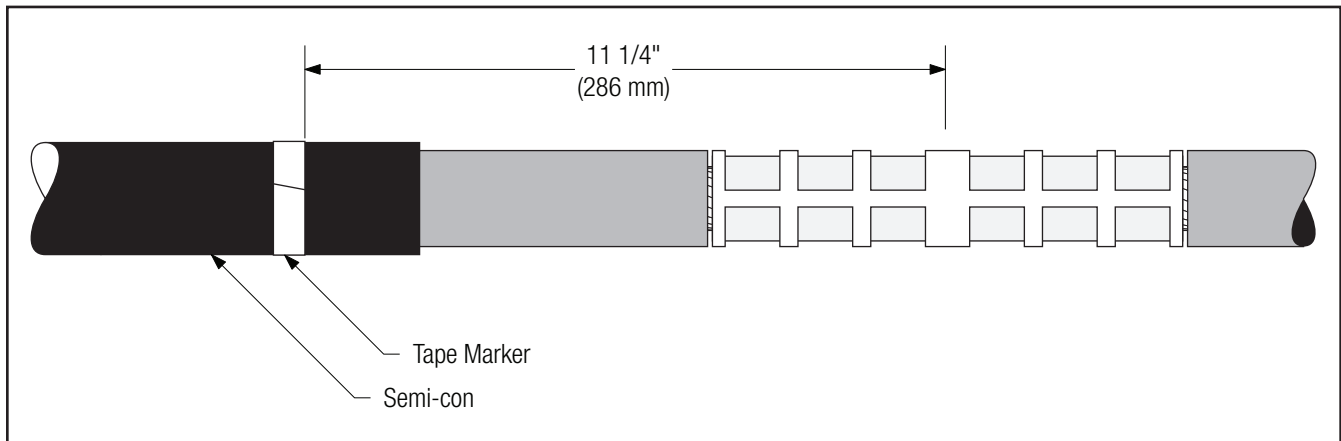


Figure 17

- 5.2 **If using cold shrink adapter tube:** Position adapter tube over the connector. Shrink adapter near center of connector by pulling and unwinding the loose core end in a counter-clockwise direction (*Figure 18*).

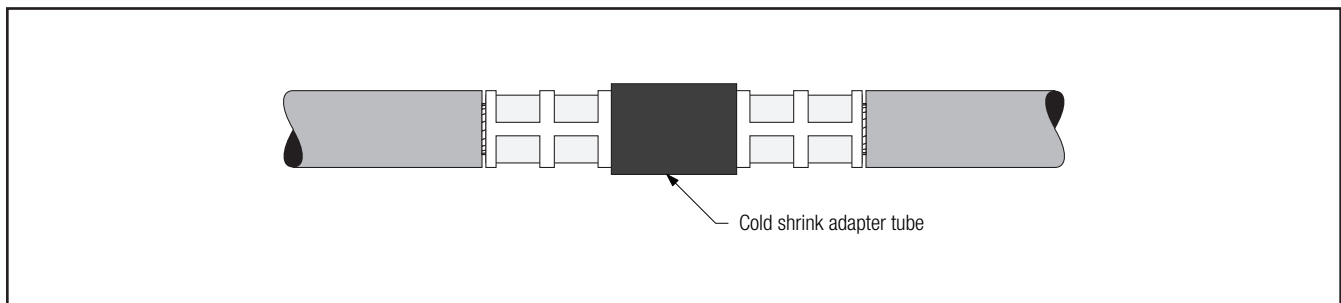


Figure 18

5.3 Clean cables using standard practice:

- a. Do not allow solvent or abrasive to contact the cable semi-conductive insulation shield.
- b. Do not reduce cable insulation diameter below 1.24" (31,5 mm) specified for the splice.
- c. The insulation surface must be round, smooth and free of cuts/voids. Sanding may be necessary, finish sanding should be done with a 300 grit or higher electrical grade abrasive.
- d. Make certain that the cable insulation is smooth, clean and dry before continuing.

5.4 Apply red compound on cable insulations, making certain to fill in edge of cable semi-con. **Do not use silicone grease** (Figure 19).

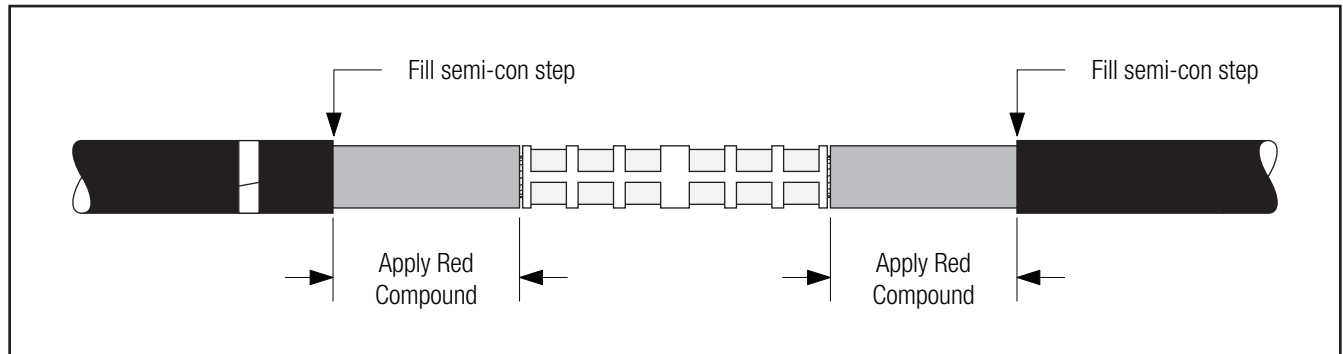


Figure 19

5.5 Position the splice body over connector area, aligning end of the splice body (not the core) at the center of the tape marker. Slowly start to remove the splice core by pulling and unwinding the loose core end counterclockwise, allowing only 1/4" (6 mm) of the splice to shrink onto the tape marker. Carefully slide the splice body off the tape marker by pulling and twisting until the entire tape marker is exposed. Continue removing the core to complete the splice body installation (Figure 20).

Note: The splice body ends must overlap onto the semi-con of each cable by at least 1/2" (13 mm).

Note: Do not push the splice body toward the tape marker as this may cause the end to roll under. If the end does roll under, DO NOT use sharp-edged tools to pull it out as this could cut and damage the splice.

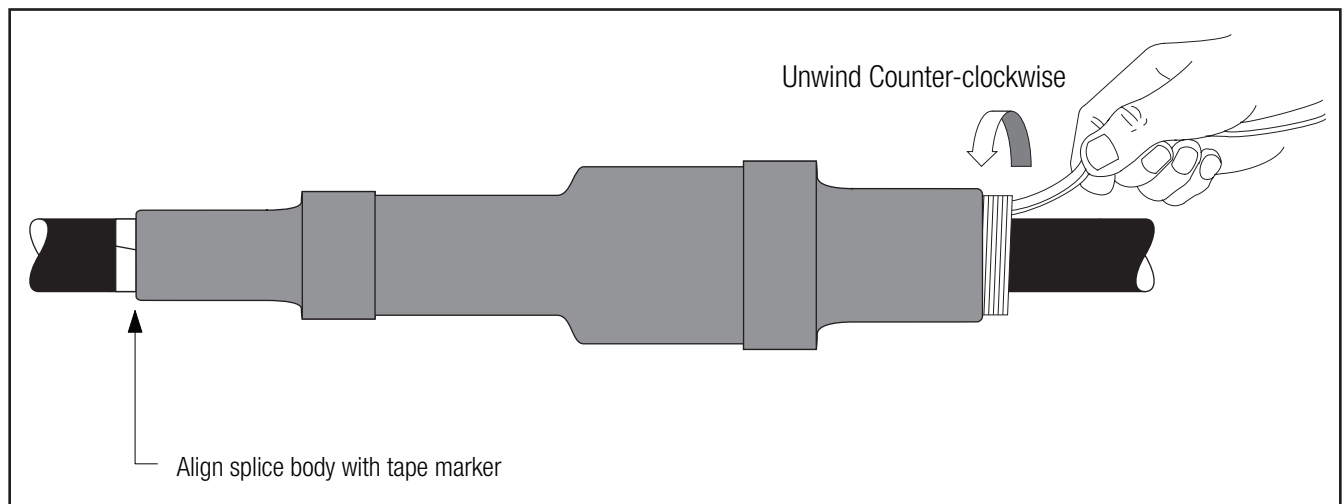


Figure 20

6.0 Connect Shield Sleeve

- 6.1 Center the expanded shield sleeve over splice body. Hand-tighten sleeve from splice center outward in both directions (*Figure 21*).

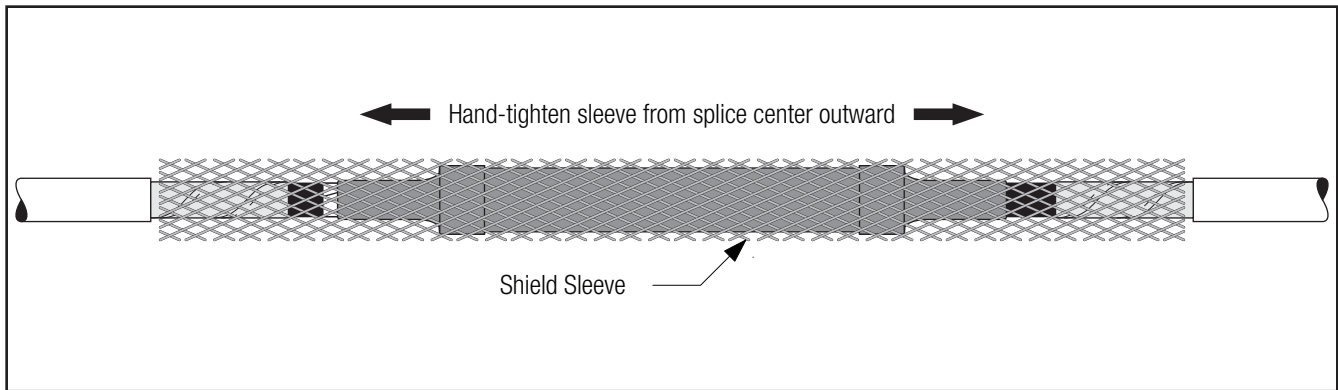


Figure 21

6.2 For Tape Shielded and LC Shielded Cables:

- 6.2.1 Secure sleeve to cable metallic shield next to each cable jacket using two wraps of vinyl tape (*Figure 22*).

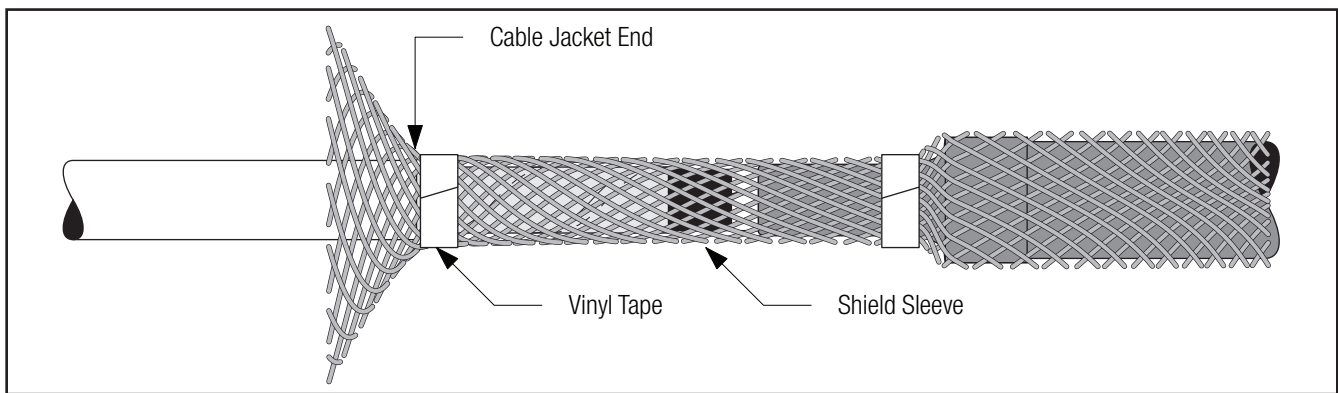


Figure 22

- 6.2.2 Bend ends of sleeve back over vinyl tape and secure with constant force springs at 1 1/2" (38 mm) and 2 1/2" (64 mm) from jacket end. Trim off excess sleeve 1/2" (13 mm) from springs, if necessary (*Figure 23*).

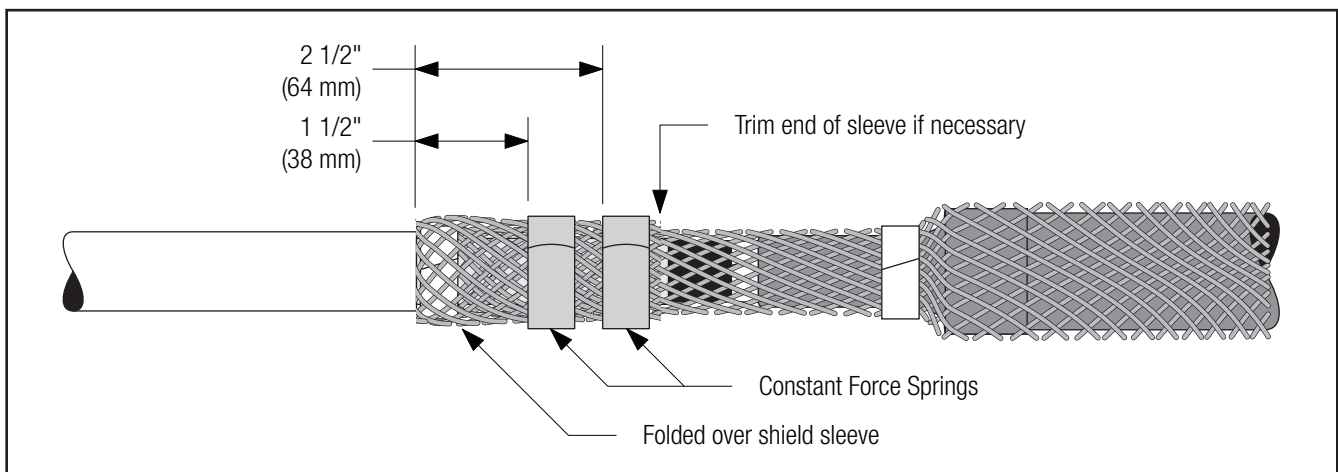


Figure 23

6.2.3 Wrap two layers of stretched vinyl tape over springs (*Figure 24*).

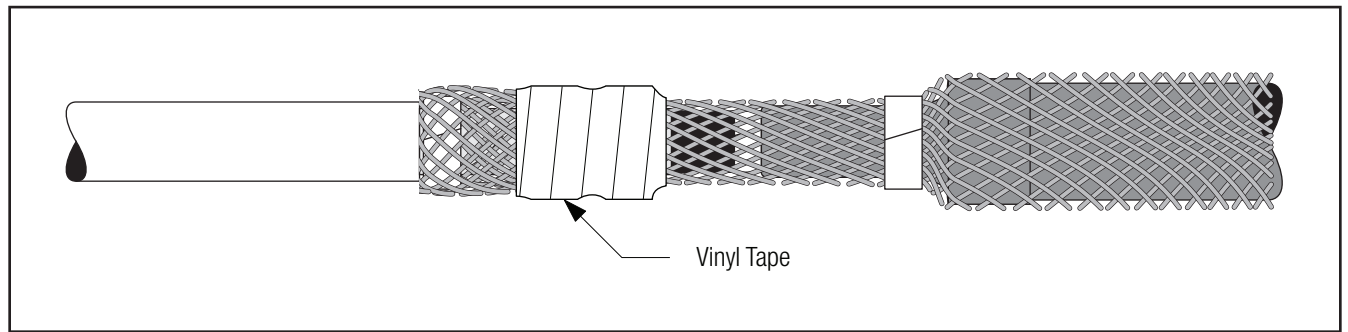


Figure 24

6.3 For Wire Shielded Cable:

6.3.1 Carefully remove vinyl tape from drain wires. Secure sleeve to cable semi-conducting layer next to each cable jacket using two wraps of vinyl tape (*Figure 25*).

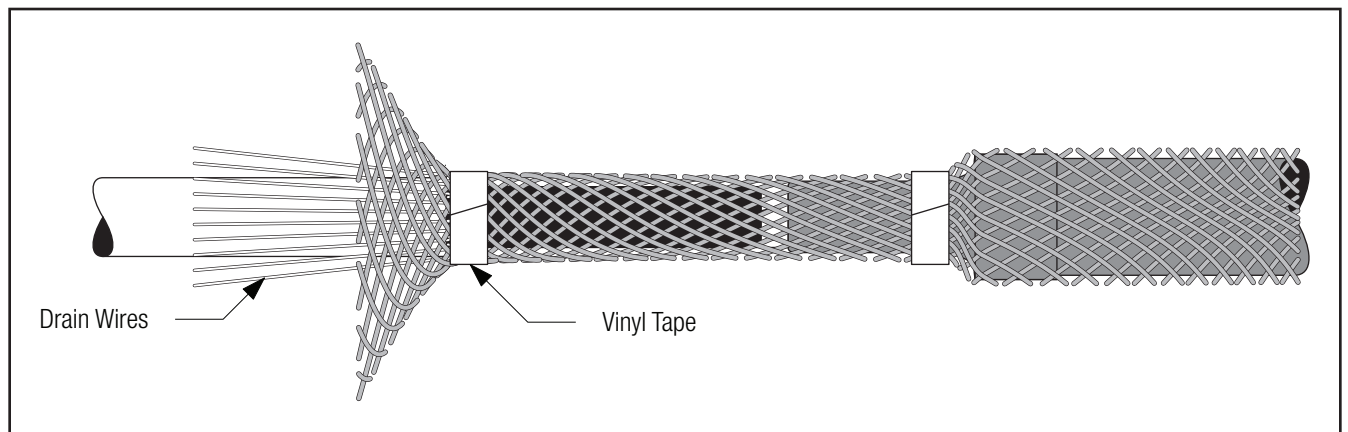


Figure 25

6.3.2 Bend ends of sleeve back over vinyl tape. Position drain wires over the shield sleeve and secure with constant force springs at 1 1/2" (38 mm) and 2 1/2" (64 mm) from jacket end. Trim off excess sleeve 1/2" (13 mm) from springs, if necessary (*Figure 26*).

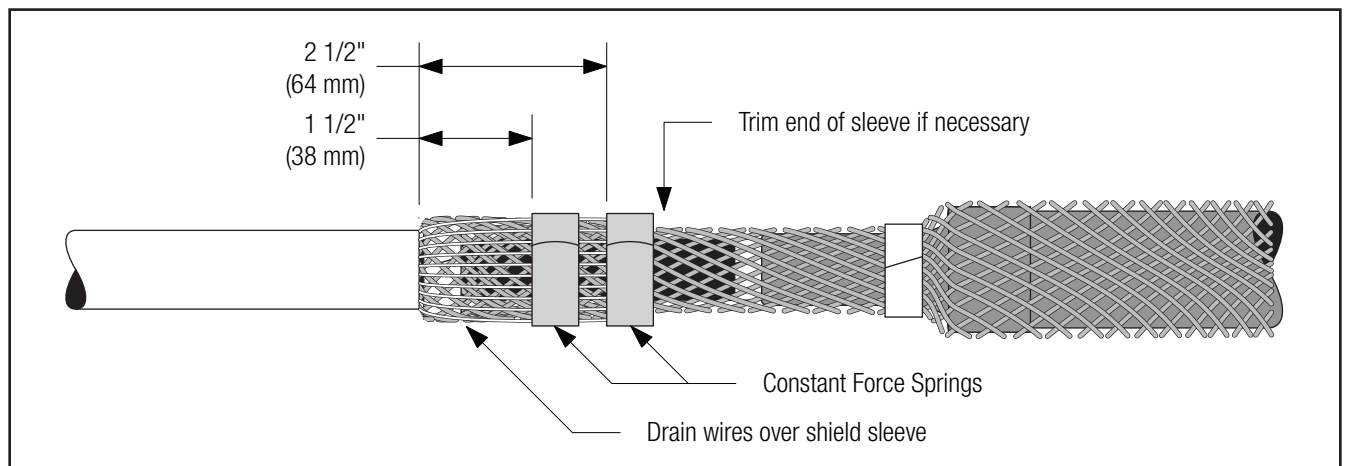


Figure 26

6.3.3 Wrap two layers of stretched vinyl tape over springs (*Figure 27*).

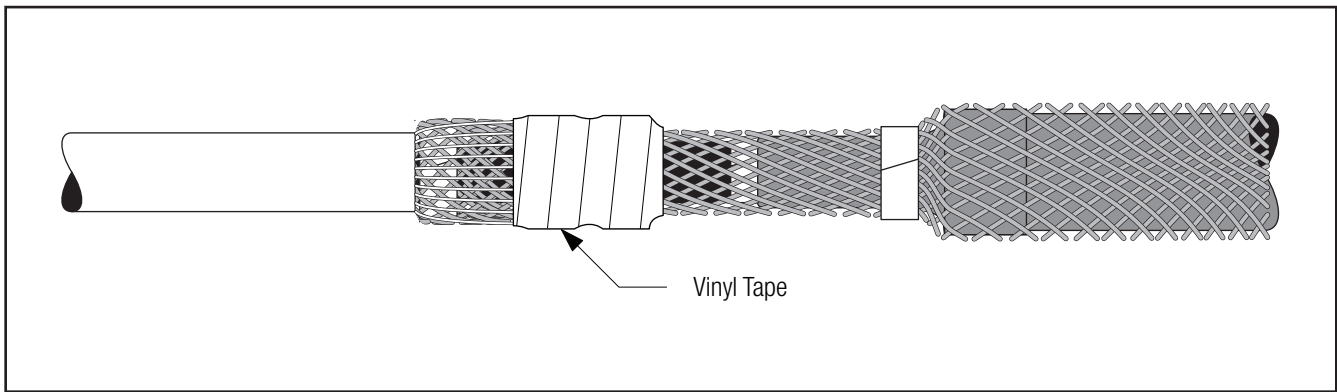


Figure 27

6.4 For UniShield® Cable:

6.4.1 Carefully remove vinyl tape from drain wires. Secure sleeve to cable semi-con jacket next to bent-back shield drain wires using two wraps of vinyl tape (*Figure 28*).

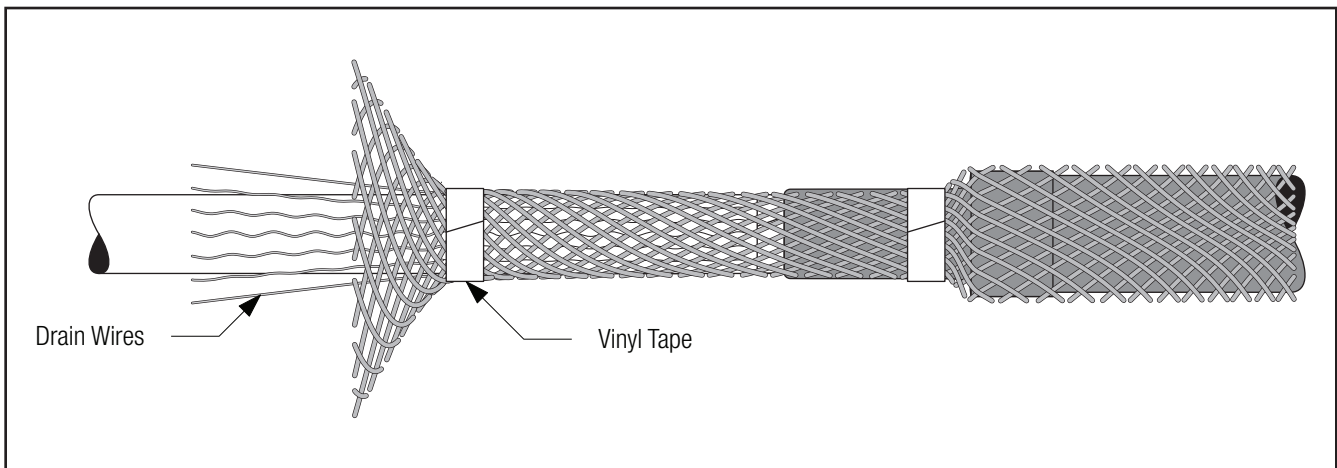


Figure 28

6.4.2 Bend ends of sleeve back over vinyl tape. Carefully position drain wires over the shield sleeve. Secure with constant force springs 1 1/2" (38 mm) and 2 1/2" (64 mm) onto drain wires. Trim off excess sleeve 1/2" (13 mm) from springs, if necessary (*Figure 29*).

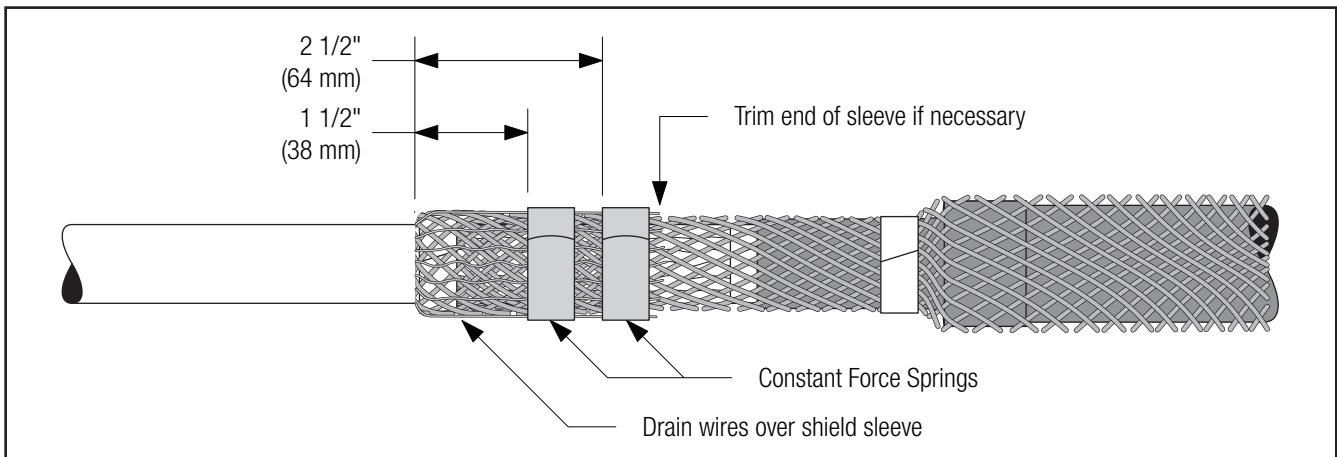


Figure 29

6.4.3 Wrap two layers of stretched vinyl tape over springs (*Figure 30*).

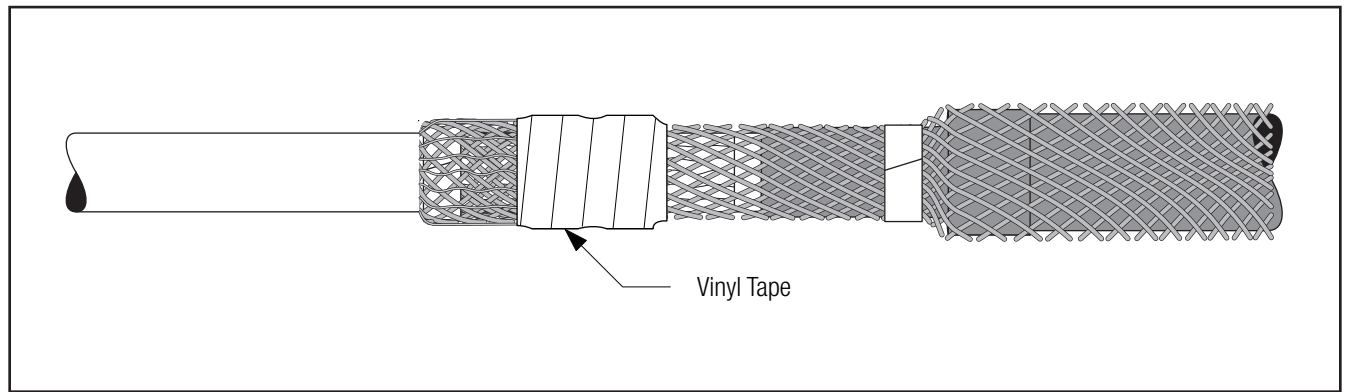


Figure 30

6.5 For CN and JCN Cable:

6.5.1 Connect shield sleeve to metallic (LC, etc.) shield first. Remove vinyl tape from neutral wires and route neutral wires upward next to end of cable jacket (or CN binder) (*Figure 31*).

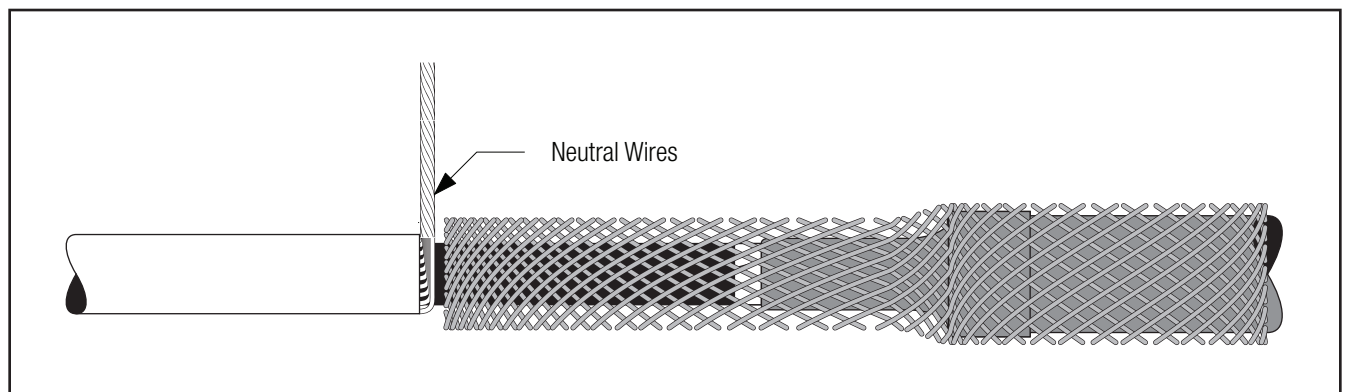


Figure 31

6.5.2 Secure sleeve to cable semi-con next to neutral wires using two wraps of vinyl tape. Cover the end of the splice body (as shown below) with two half-lapped layers of rubber or vinyl tape (*Figure 32*).

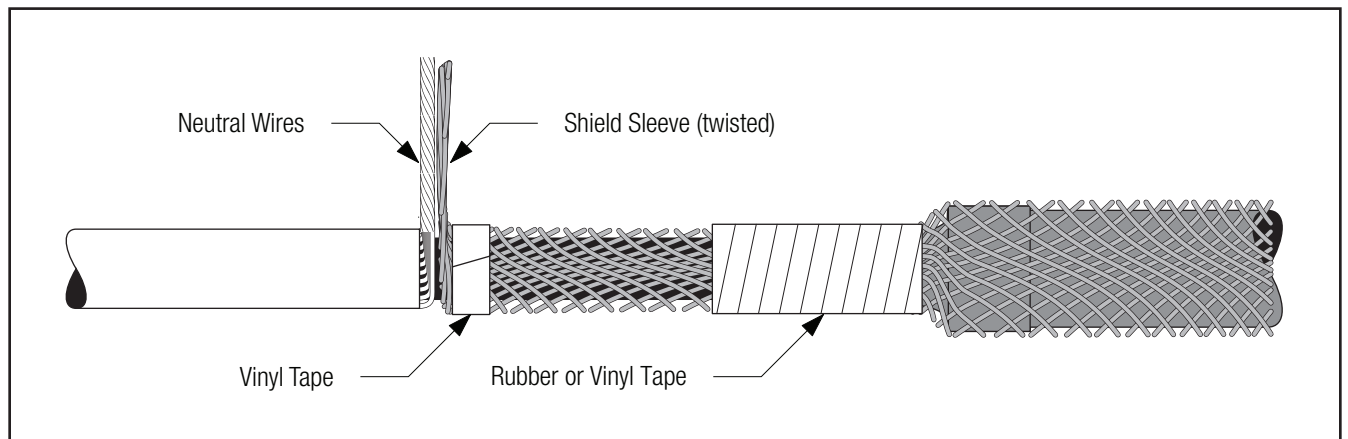


Figure 32

- 6.5.3 Place a 3-4" piece of cable jacket over the rubber or vinyl tape and cable semi-con as shown below. Secure with vinyl tape (*Figure 33*).

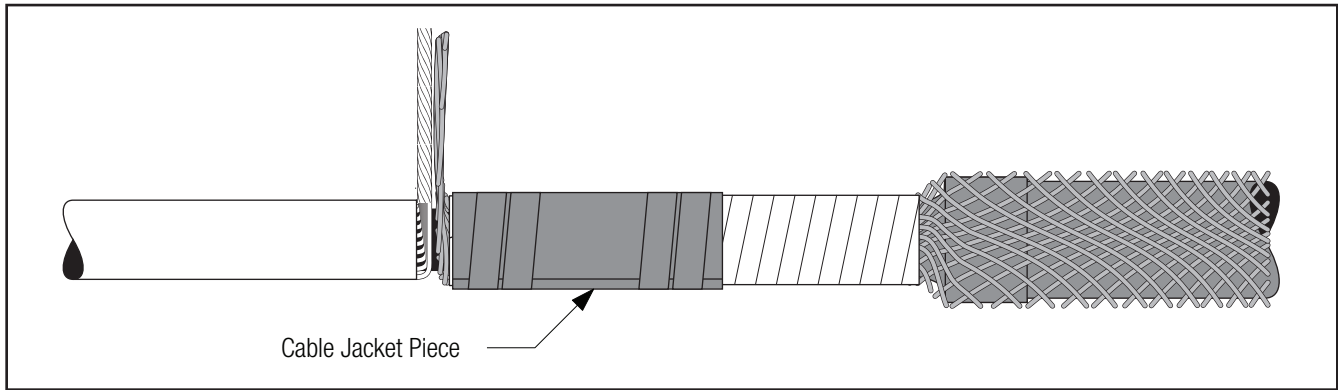


Figure 33

- 6.5.4 Keeping the connector as close as possible to the cable, connect shield sleeve and neutrals together, using a suitable compression connector. ("INLINE," "C," or "H" type). Crimp connector following the connector manufacturer's recommendation. Trim excess neutral wires and sleeve extending beyond the connector (*Figure 34*).

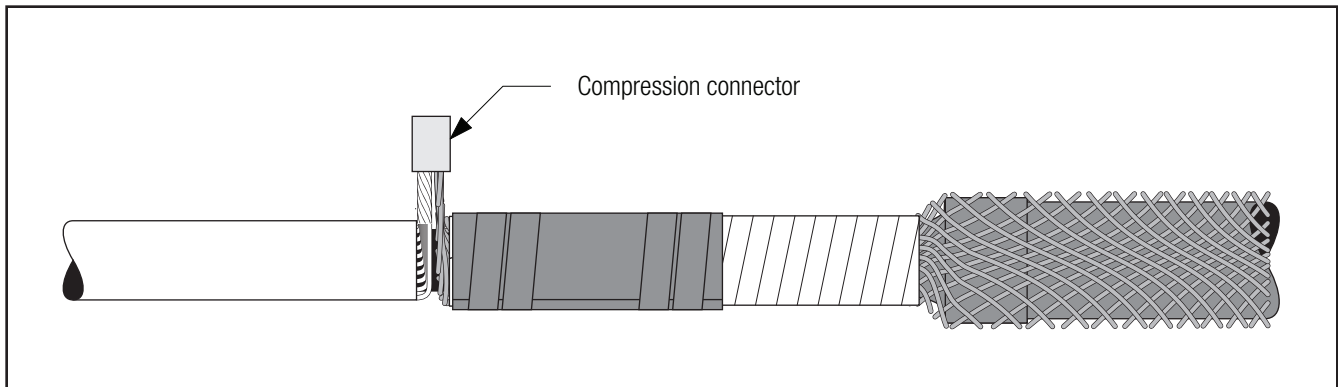


Figure 34

- 6.5.5 Fold connector over shield sleeve, ensuring that the connector is over the cable jacket piece, and secure with vinyl tape (*Figure 35*).

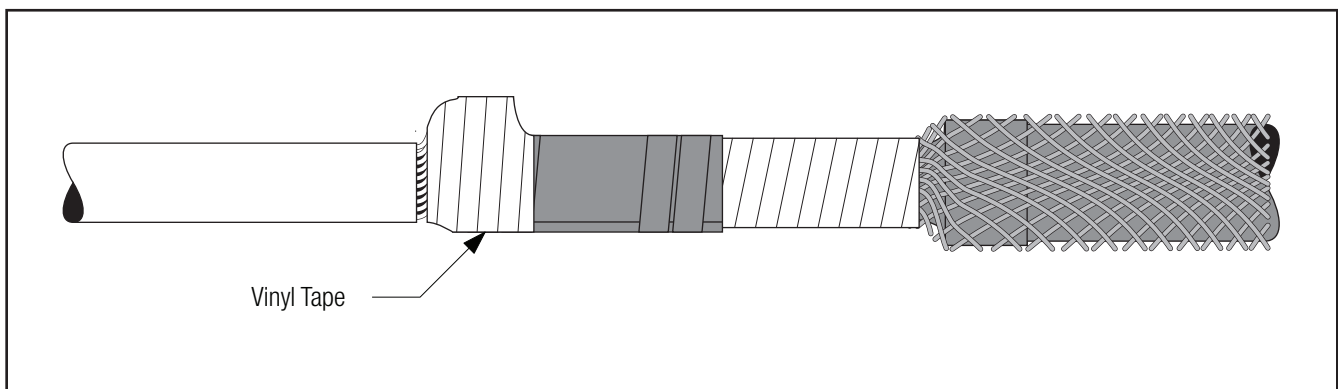


Figure 35

7.0 Grounding (Optional)

Note: Use these instructions if circuit grounding is required at this location.

- 7.1 On metallic shielded (non-neutral) cable, wrap the ground strap around the shield sleeve (between the cable jacket and constant force spring) with the tails towards the cable jacket (*Figure 36*).

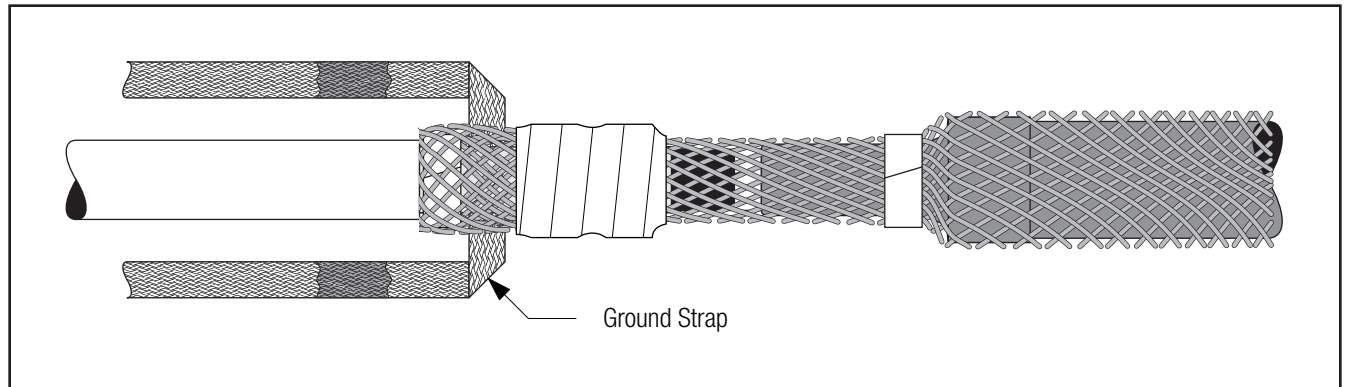


Figure 36

- 7.2 Secure ground strap to the shield sleeve using a constant force spring (*Figure 37*).

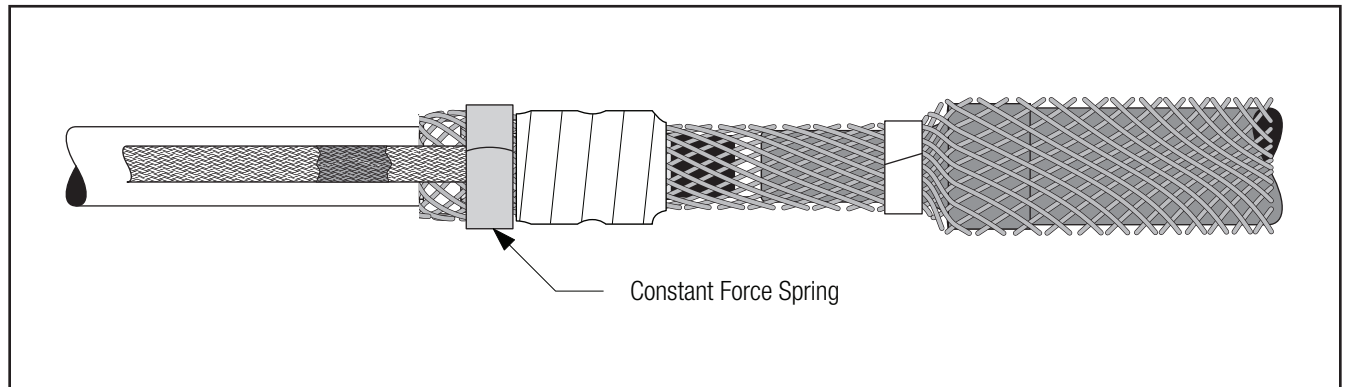


Figure 37

- 7.3 Wrap two layers of stretched vinyl tape over spring (*Figure 38*).

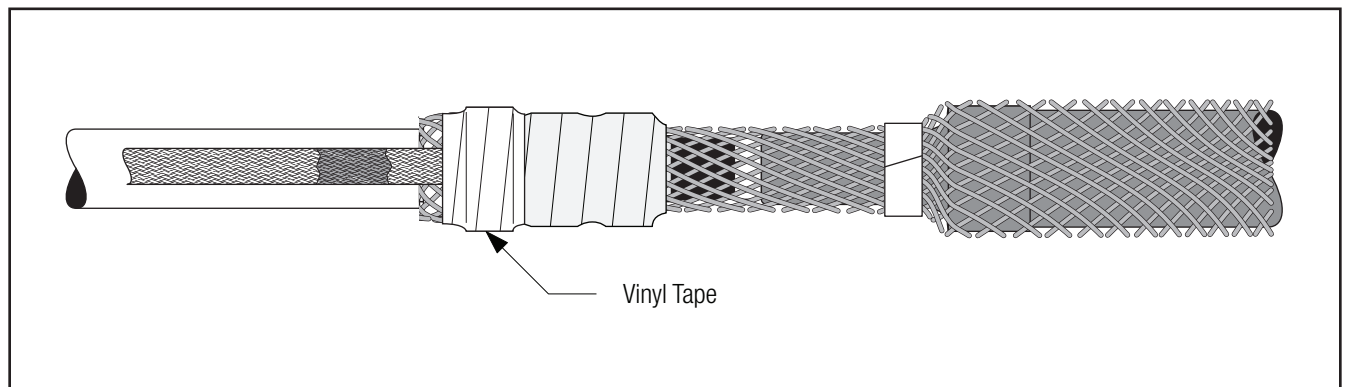


Figure 38

7.4 Place one mastic sealing strip on the cable jacket under the solder blocks of the ground strap (Figure 39).

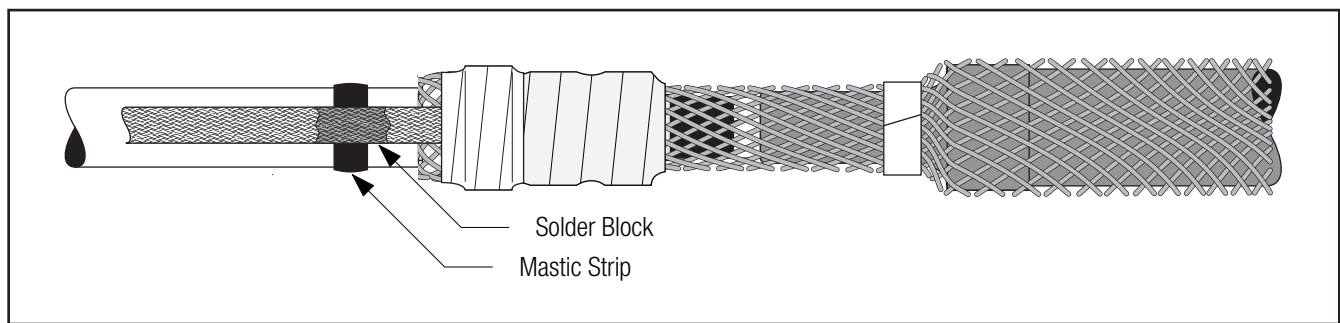


Figure 39

7.5 Place other strip over the solder blocks. Press the mastic strips around the solder block and to the cable jacket. If tails overlap at the solder blocks, place a piece of mastic between them (Figure 40).

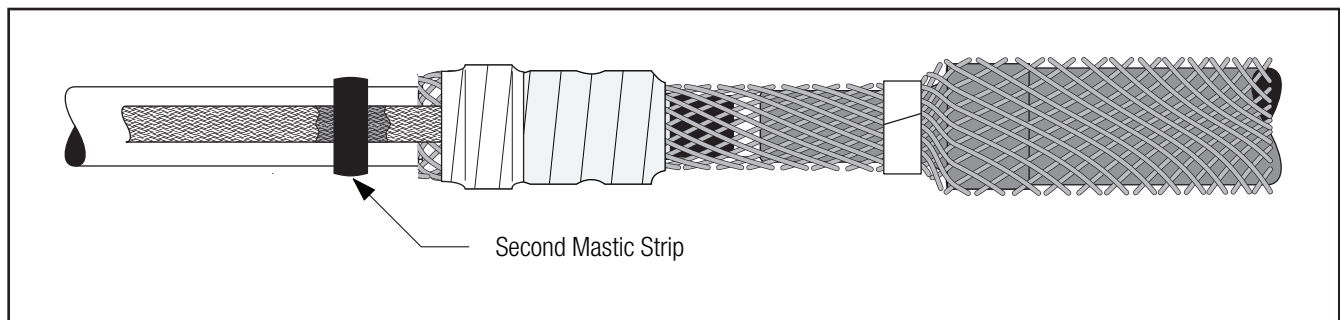


Figure 40

8.0 Install Jacket

Note: *Jacketing is not optional.*

8.1 Apply one roll of slightly stretched rubber mastic tape around each jacket end (tacky side toward cable). Stretch and tear off the end of the rubber mastic as shown below. If ground strap was applied, tape over mastic sealing strips. For CN cable, cover mastic seal next to binder (Figure 41).

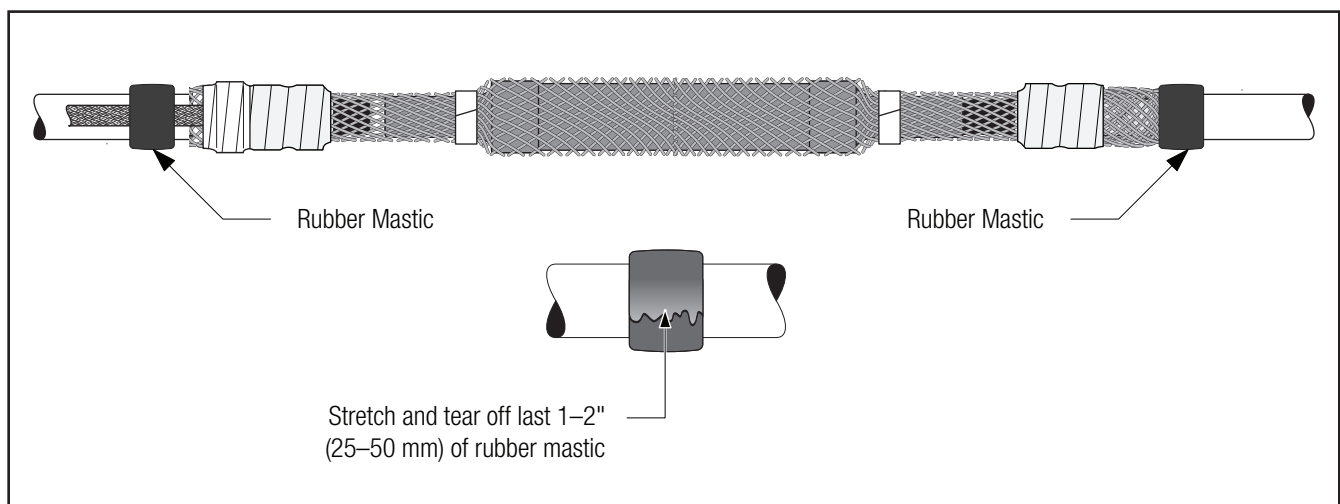


Figure 41

- 8.2 Begin to install the cold shrink tube by completely covering the rubber mastic, and slowly pulling and unwinding the inner core counterclockwise toward the splice body. The outer core should remain relatively stationary while unwinding the inner core. If the outer core begins to move towards the first mastic seal, gently pull the outer core and jacketing tube towards the second mastic seal and continue unwinding the inner core (Figure 42).

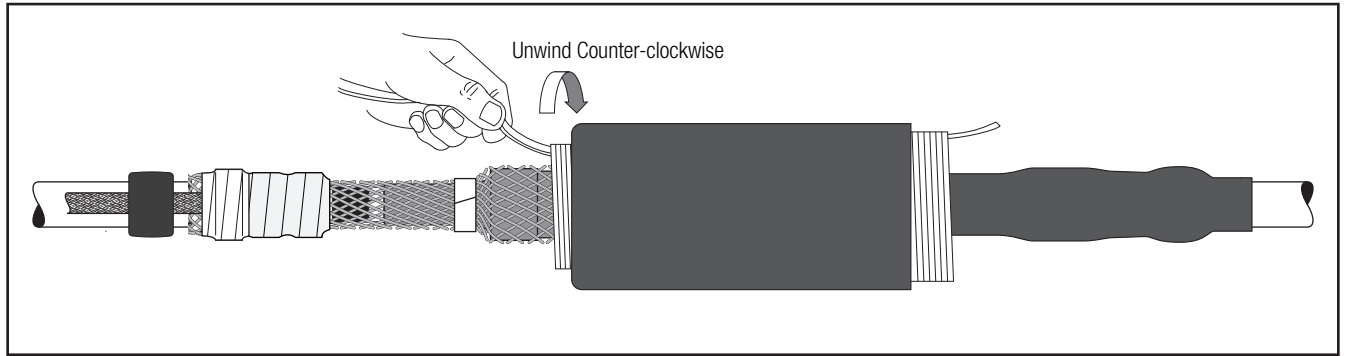


Figure 42

- 8.3 Continue to install the cold shrink tube over the rubber mastic on the other cable by slowly pulling and unwinding the outer core counterclockwise. This portion of the cold shrink tube installs differently than typical cold shrink products in that as the tube shrinks, the end rolls under. The tube may need a slight push to get over the second mastic seal (Figure 43).

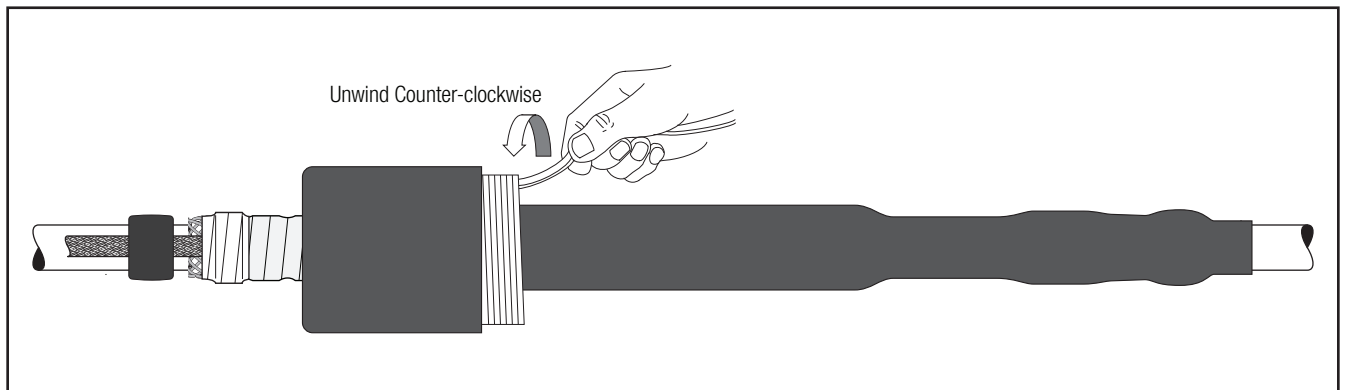


Figure 43

Note: In applications where the splice is regularly exposed to high levels of ultra-violet radiation (i.e. direct sunlight), wrap two half-lapped layers of Scotch® Super 33+™ Vinyl Electrical Tape or Scotch® Vinyl Electrical Tape Super 88 over the re-jacketing tubes.

Note: Connect optional grounding.

Crimping Tool - Die Sets (number of crimps/end)

3M™ Connector Number	Conductor Size (kcmil)	Burndy			Thomas & Betts Corp.			Square D Co. Anderson Div.	
		Y34A	Y35, Y39 Y45*, Y46*	Y1000**	TBM 8	TBM 12	TBM 15	VC6-3** VC6-FT**	VC8C**
10011 (Cu)	350	A31R (2)	U31RT (2)	—	Red (3)	—	71H (3)	(2)	—
20011 (Al/Cu)	350	—	U31ART (2)	(1)	—	87H (3)	87H (3)	(2)	—
11011 (Cu)	350	A31R (3)	U31RT (3)	—	Red (4)	—	71H (4)	(3)	—
CI-350 (Al/Cu)	350	—	U31ART (2)	—	—	87H (2)	87H (2)	(3)	—
20012 (Al/Cu)	400	—	U32ART (4)	(1)	—	94H (4)	94H (4)	(2)	(2)
10014 (Cu)	500	A34R (2)	U34RT (2)	—	Brown (3)	—	87H (3)	(2)	—
20014 (Al/Cu)	500	—	U34ART (4)	(1)	—	106H (3)	106H (4)	(2)	(2)
11014 (Cu)	500	A34R (4)	U34RT (3)	—	Brown (4)	—	87H (4)	(3)	—
CI-500 (Al/Cu)	500	—	U34ART (3)	—	—	—	106H (3)	(3)	—
20016 (Al/Cu)	600	—	U36ART (4)	(1)	—	—	115H (3)	(3)	(3)
10019 (Cu)	750	—	U39RT (3)	—	—	—	106H (3)	—	—
20019 (Al/Cu)	750	—	U39ART (4)	—	—	—	125H (5)	(3)	(3)
11019 (Cu)	750	—	U39RT (5)	—	—	—	106H (4)	—	—
CI-750 (Al/Cu)	750	—	S39ART (3)	—	—	—	140H (3)	(3)	—
10024 (Cu)	1000	—	S44RT, P44RT (4)	—	—	—	125H (3)	—	—
20024 (Al/Cu)	1000	—	S44ART, P44ART (4)	—	—	—	140H (4)	—	—
11024 (Cu)	1000	—	S44RT, P44RT (4)	—	—	—	125H (4)	—	—

*Y45 and Y46 accept all Y35 dies ("U Series"). For Y45, use PT6515 adapter. For Y46, use PUADP adapter.

**Anderson VC6-3, VC6-FT, VC8C and Burndy Y1000 require no die set.

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