

3M™ Cold Shrink Splice Kit QS-III 5416A

for Jacketed Concentric Neutral (JCN) and
Concentric Neutral Cable

Instructions

IEEE Std. 404

15 kV Class

150 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
5416A	0.84" to 1.38" (21,3 to 35,1 mm)	4/0 AWG–350 kcmil* (95–185 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	0.69" (17,5 mm)	1.49" (38 mm)
Length Aluminum (Al/Cu) Compression	—	5.00" (127 mm)
Length Copper Compression and 3M™ Shearbolt Connector QCI 4/0-600	—	5.75" (146 mm)

1.0 Kit Contents

- a. 3M™ Cold Shrink Splice Body 5416A (1 ea.)
- b. Cold Shrink Jacketing Tube (1 ea.)
- c. Cold Shrink Adapter Tube (1 ea.)
- d. Red Compound Tubes (non-silicone grease) (2 ea.)
- e. Scotch® Mastic Sealing Strips 2230, 6" length (6 ea.)
- f. Scotch® Rubber Mastic Tape 2228 Rolls, 2" x 36" (2 ea.)
- g. Neutral Pad (1 ea.)
- h. 3M™ Cable Cleaning Pads CC-3 (1 ea.)
- i. Cable Preparation Template (1 ea.)
- j. 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: *Item “C,” Cold Shrink Adapter Tube, may not be included in all kits.*

2.0 Prepare Cables

- 2.1 Check to be sure the cable fits within the kit ranges as shown on the cover page.
- 2.2 Prepare cables according to standard procedures. Refer to template provided or illustration below for proper dimensions. **Additional distance is required on one cable to provide extra neutral wire length for connecting the neutrals.** (Figure 1).

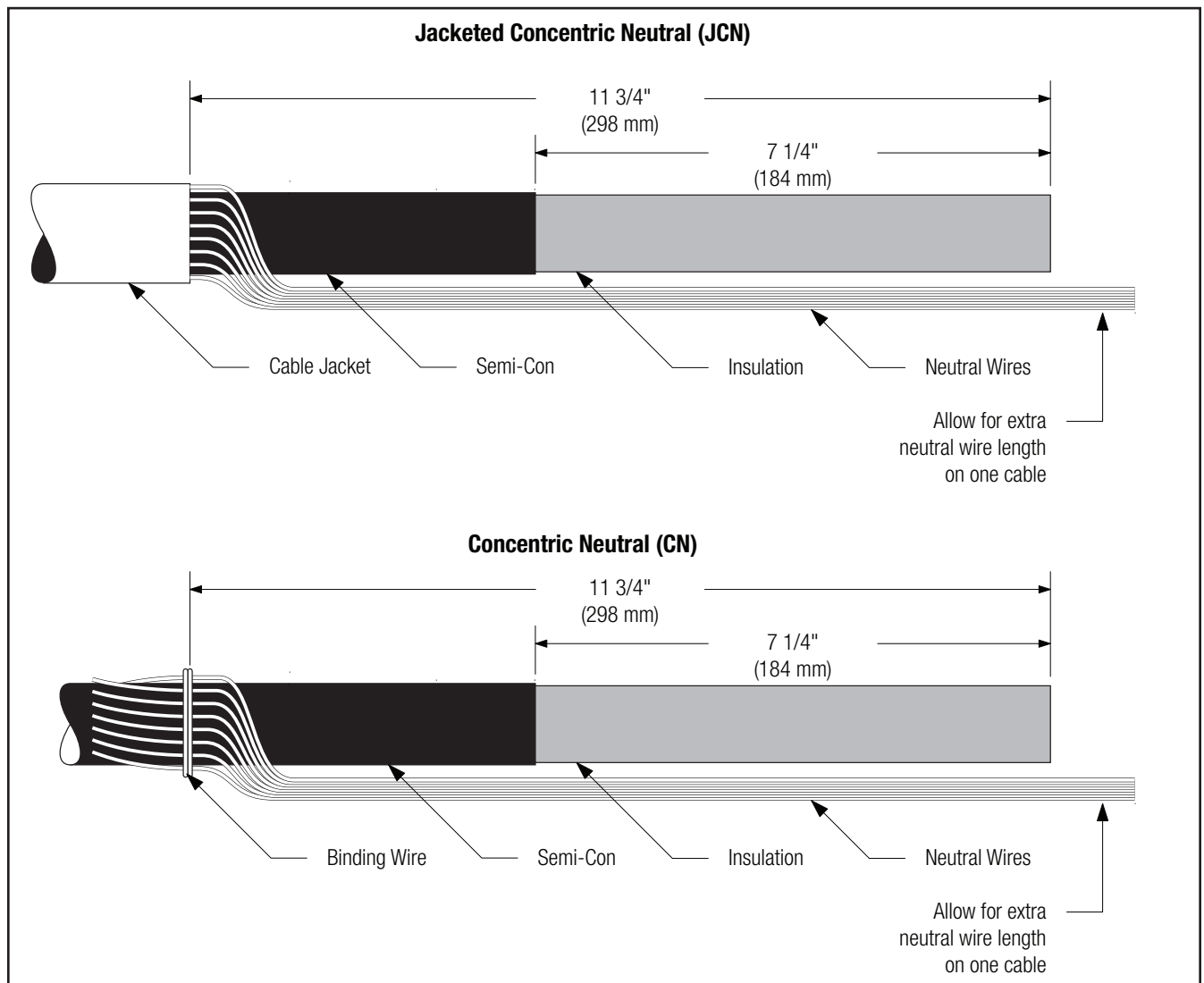


Figure 1

Note: Cables must be within the insulation O.D. range of the splice kit and the connector must meet the dimensional requirements shown on the front page.

- 2.3 **For JCN or CN splices with exposed neutral connections:** Carefully bend the neutral wires back over the edge of the cable jackets (JCN) or binding wire or tape (CN). Press them against the cable and temporarily secure/cover the end of the wires with vinyl tape (Figure 2).

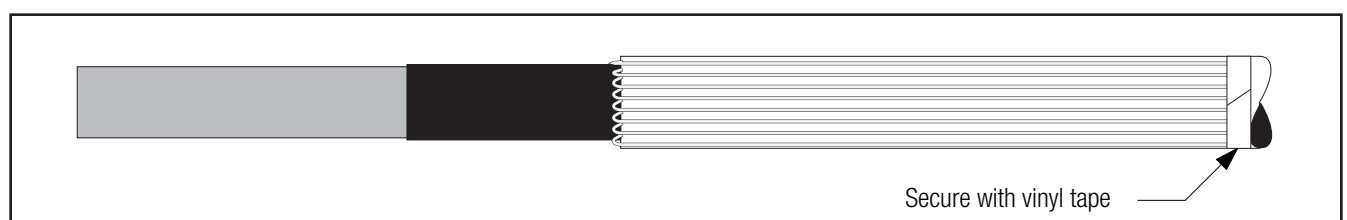


Figure 2

2.4 For CN to JCN transition splices or CN splices with covered neutral connections (as shown below):

2.4.1 Clean cable semi-con as shown (*Figure 3*). **Do not use cable cleaning solvent.**

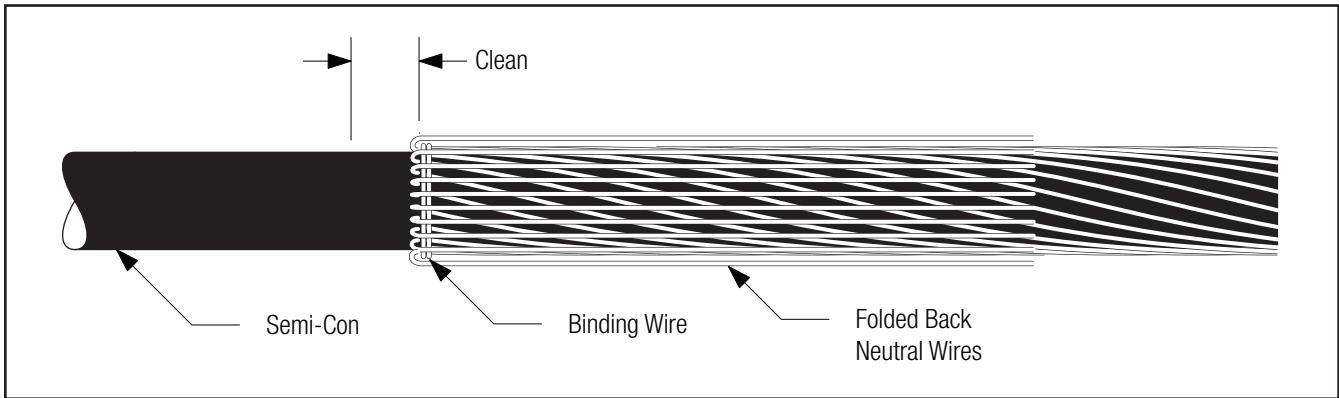


Figure 3

2.4.2 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 4*).

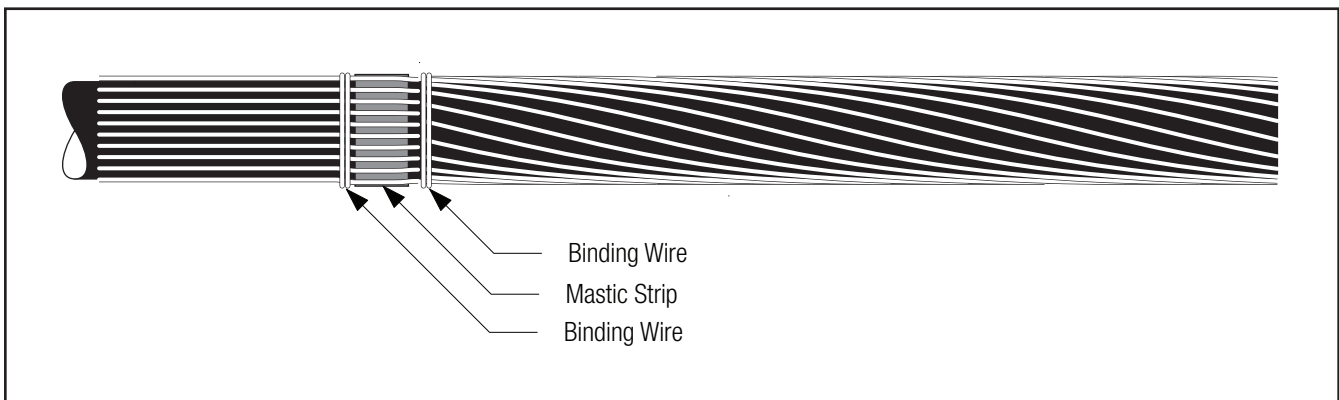


Figure 4

2.4.3 Wrap two additional strips of mastic over the first one and cover with two half lapped layers of vinyl tape (*Figure 5*).

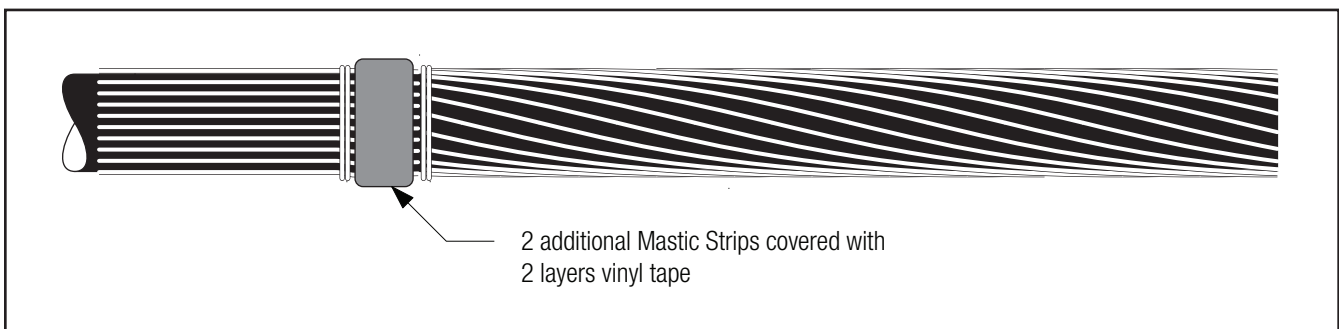


Figure 5

2.4.4 Fold neutrals over mastic seal and temporarily secure ends with vinyl tape (*Figure 6*).

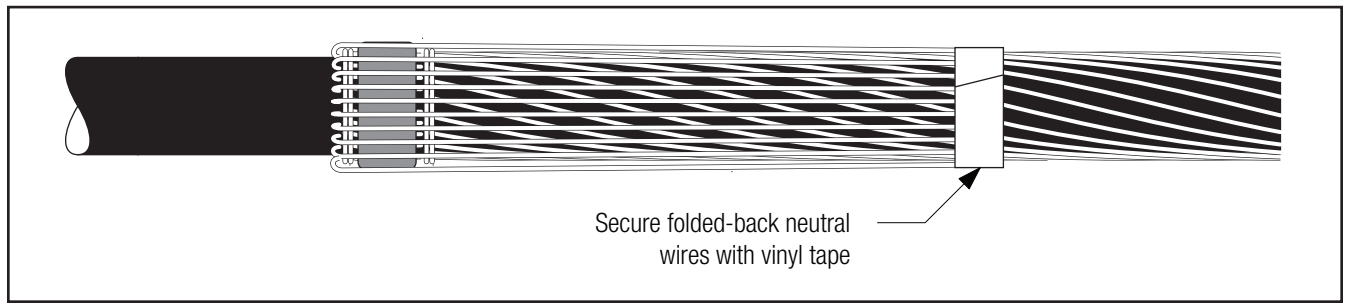


Figure 6

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

2.5 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 7*).

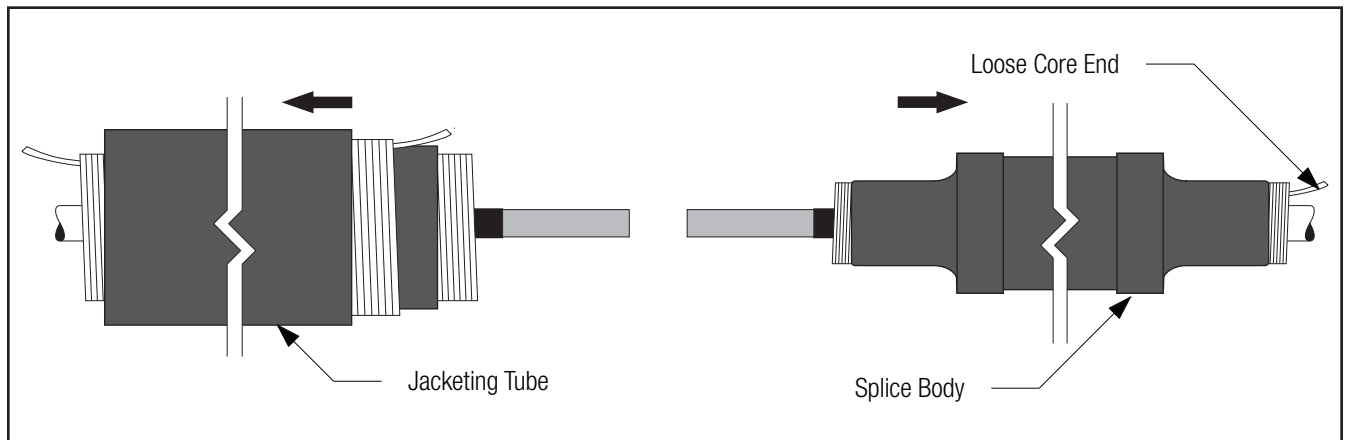


Figure 7

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

3.0 Install Connector

Note: *If using a crimp-type connector, go to step 3.3.*

3.1 If using a 3M™ Shearbolt Connector QCI 4/0-600, refer to the instructions included with the connector for insulation cut-back dimension. Insulation removal length shall not exceed 3" (76 mm) from conductor end (*Figure 8*).

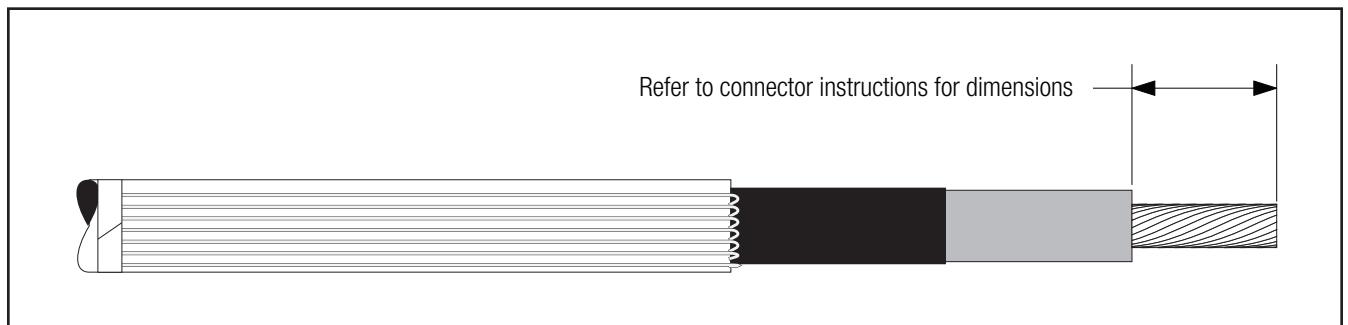


Figure 8

3.2 Install 3M™ Shearbolt Connector QCI 4/0-600 according to the instructions included with the connector (Figure 9).

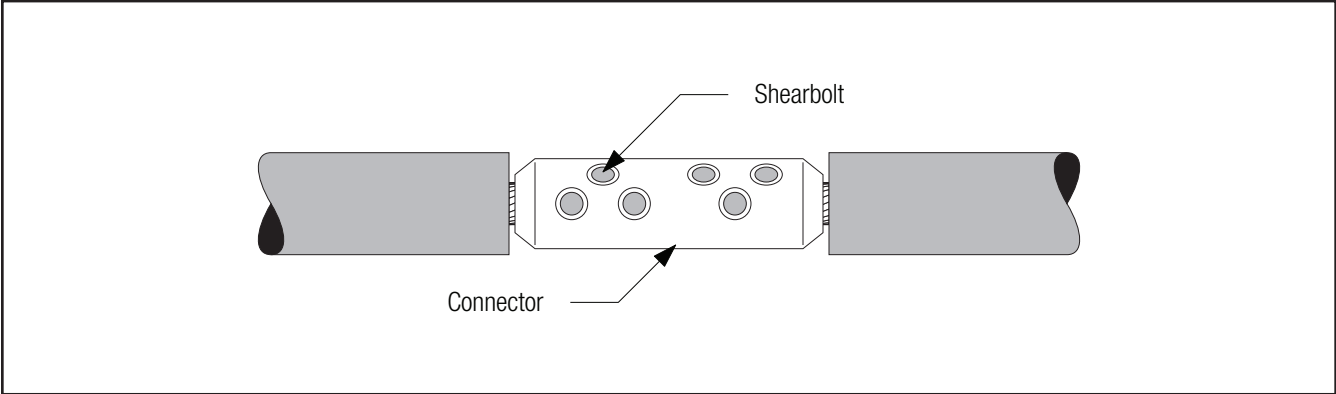


Figure 9

Go to section 4.0 “Install Splice.”

3.3 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 2 7/8" (73 mm) from conductor end. **Do not install connector now** (Figure 10).

**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)
4/0 AWG–350 kcmil	1/4" (6 mm)

*Note: 1) Copper connectors do not require a length change allowance.
2) Maximum aluminum connector crimped length allowed is 5.75" (146 mm).*

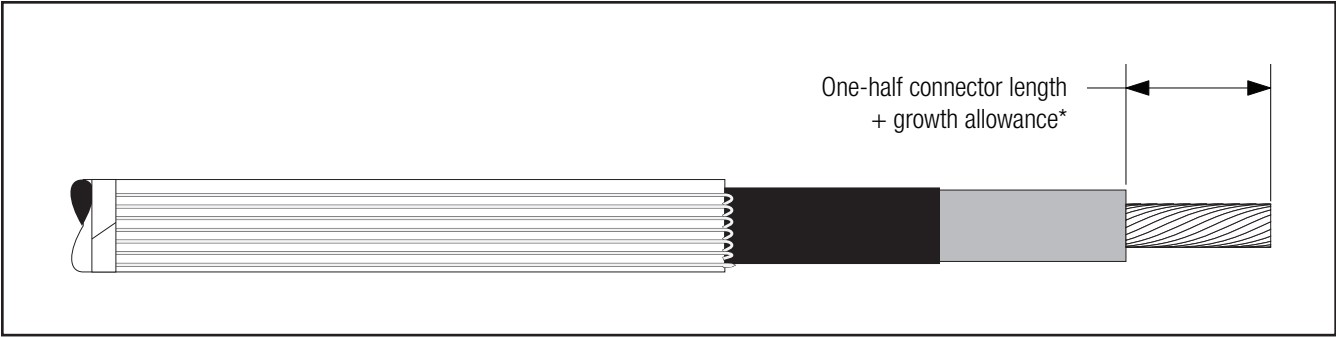


Figure 10

- 3.4 For 4/0 AWG through 350 kcmil copper connectors, or connectors with an O.D. between 0.69–0.84" (17,5–21,3 mm): Slide the cold shrink adapter tube onto the insulation with the loose core ribbon end going on first, away from the cable end.

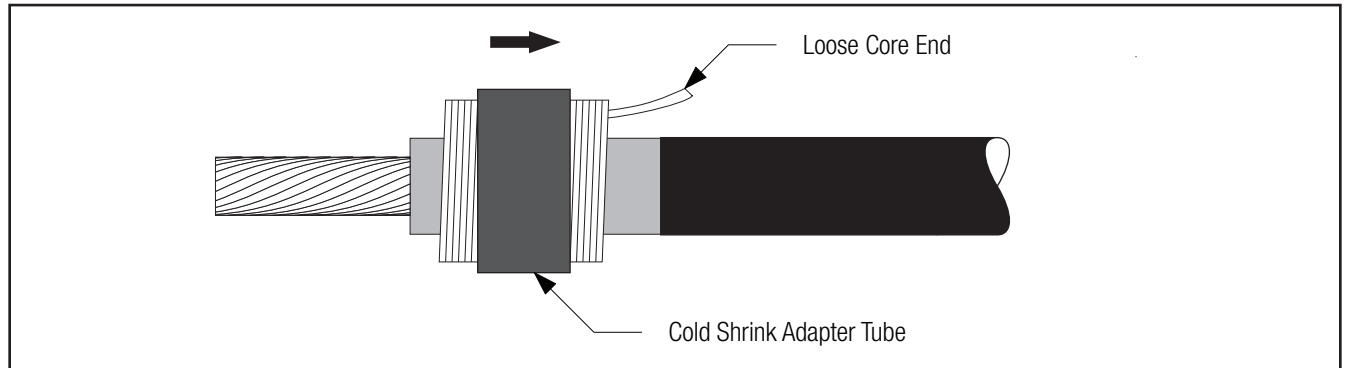


Figure 11

- 3.5 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 12*).

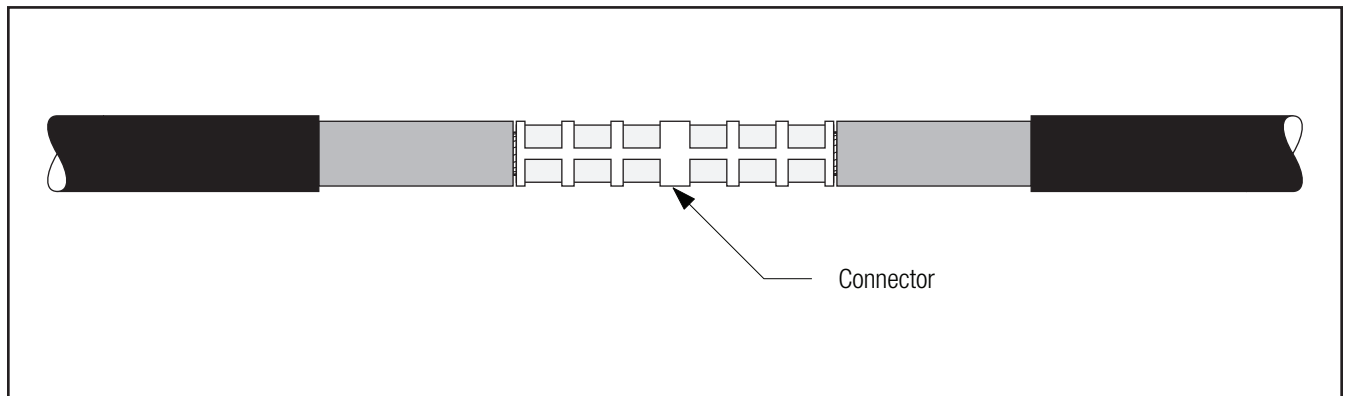


Figure 12

4.0 Install Splice

- 4.1 Apply a tape marker to semi-con insulation shield on cable which does not contain splice. Measure 9" (229 mm) from center of connector (*Figure 13*).

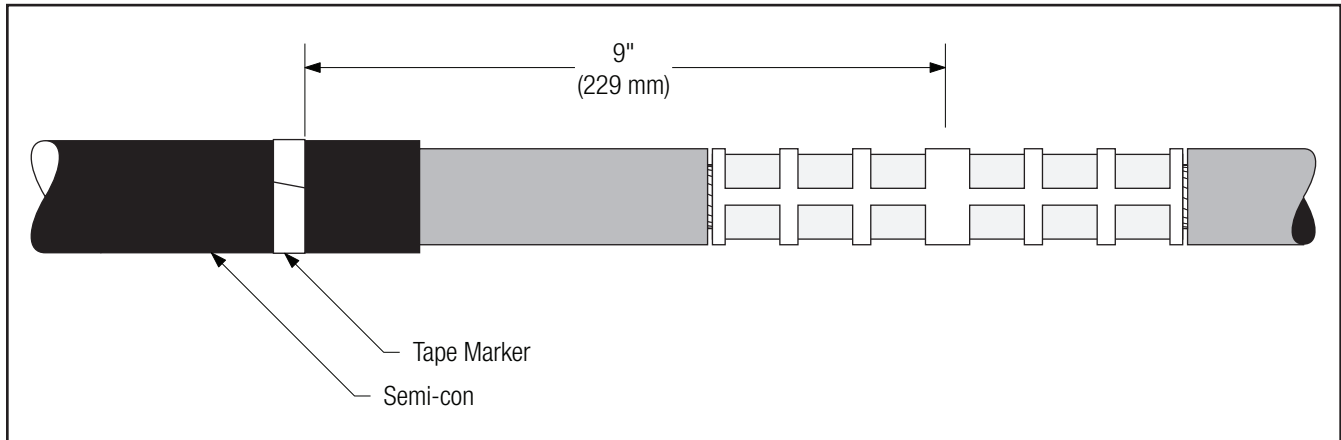


Figure 13

- 4.2 **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 14*).

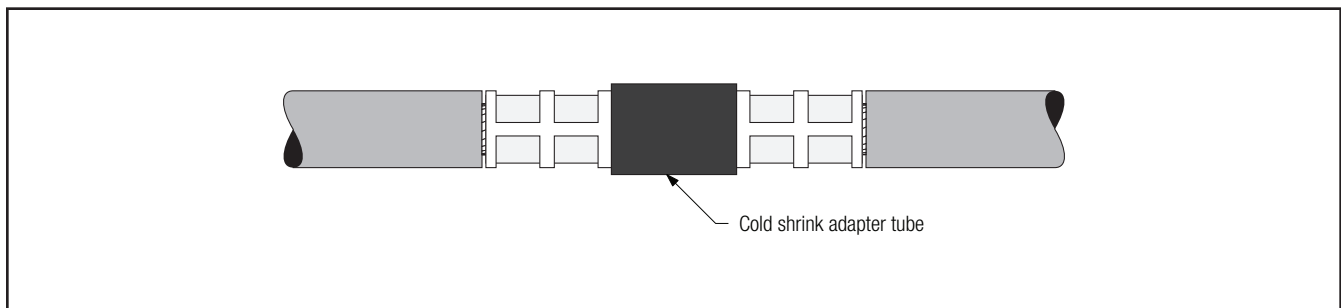


Figure 14

- 4.3 Clean cables using standard practice:
- Do not allow solvent or abrasive to contact the cable semi-conductive insulation shield.
 - Do not reduce cable insulation diameter below 0.84" (21,3 mm) specified for the splice.
 - 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.
 - Make certain that the cable insulation is smooth, clean and dry before continuing.

- 4.4 Apply red compound on cable insulations, making certain to fill in edge of cable semi-con. **Do not use silicone grease** (Figure 15).

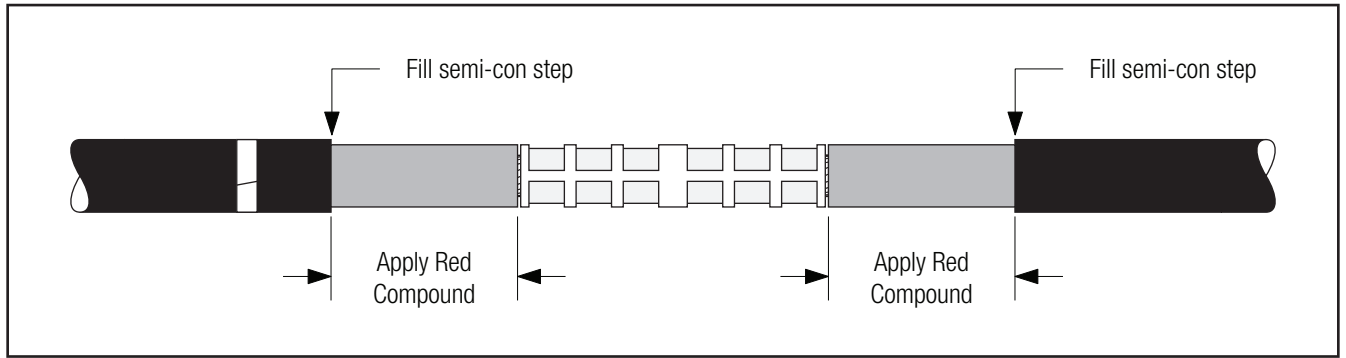


Figure 15

- 4.5 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 $\frac{1}{4}$ " (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 16).

Note: The splice body ends must overlap onto the semi-con of each cable by at least $\frac{1}{2}$ " (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.

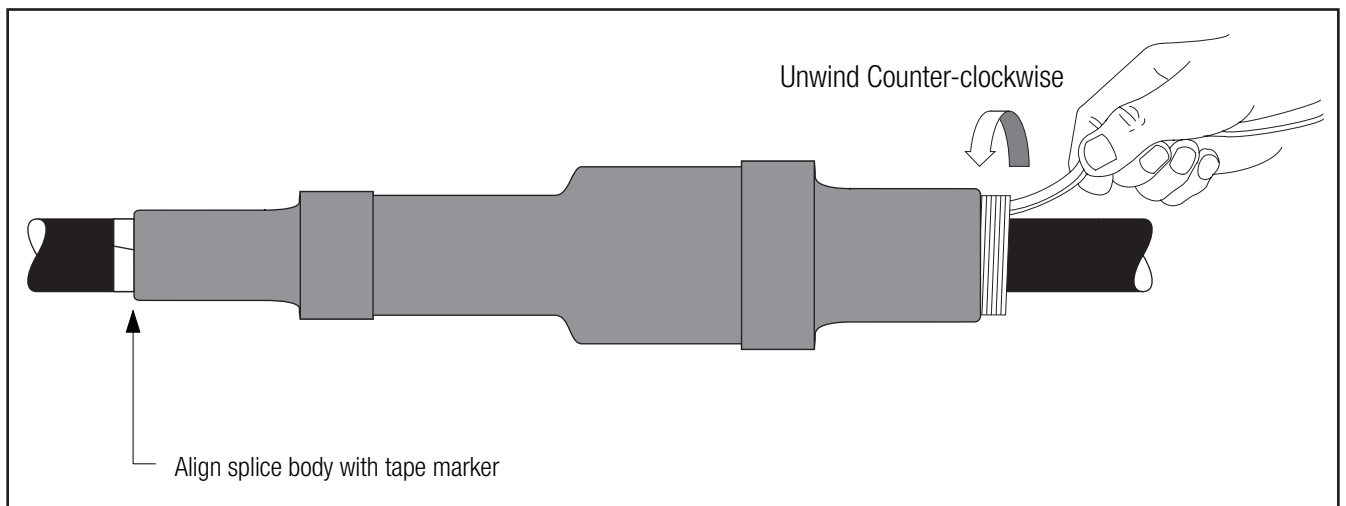


Figure 16

For JCN to JCN Splices

5.0 Connect Neutral Wires for JCN Splices

5.1 For bundled neutrals using neutral pad:

- 5.1.1 Center neutral pad on splice body. Remove temporary vinyl tape from neutral wires and connect with an inline compression connector (crimp sleeve). Route neutrals and connector over the neutral pad (Figure 17).

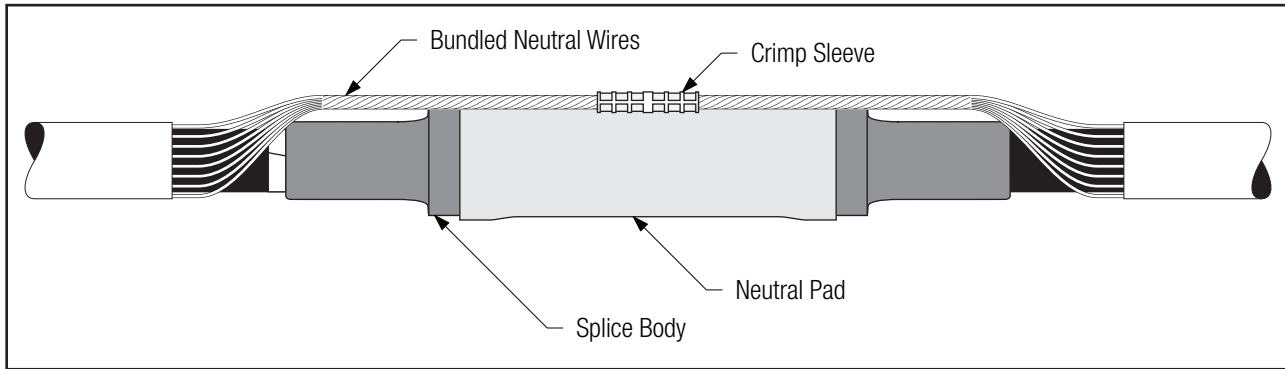


Figure 17

- 5.1.2 Apply two wraps of vinyl tape around each end of the neutral pad and over the connector (Figure 18).

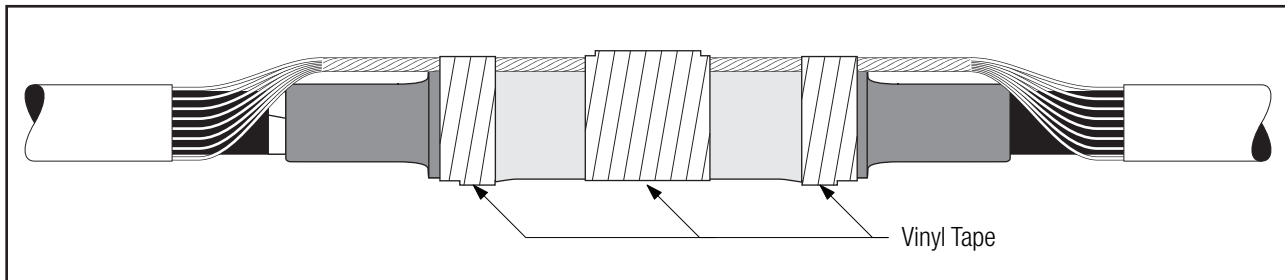


Figure 18

Go to step 6.0 “Grounding (Optional) for JCN Splices.”

5.2 For neutrals evenly spaced around splice body:

- 5.2.1 Center neutral pad on splice body. Route neutrals either straight or concentrically around splice body and secure using vinyl tape (Figure 19).

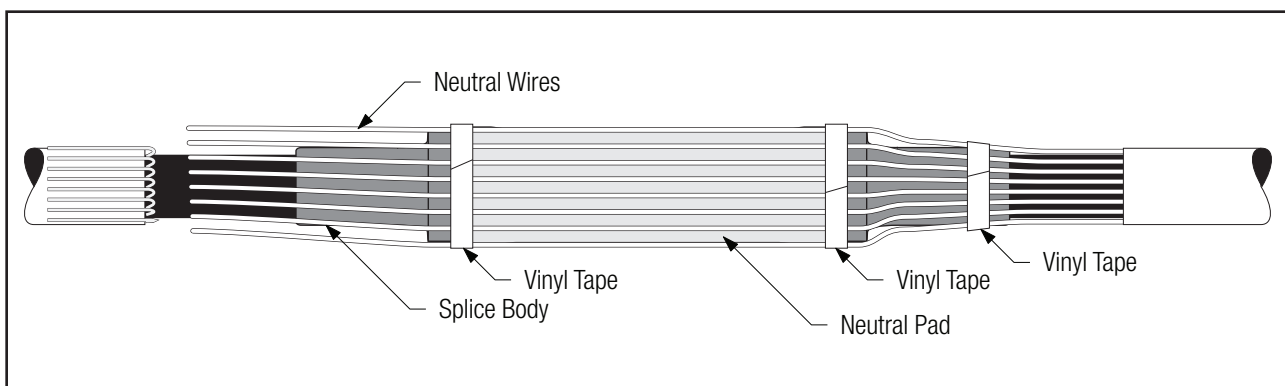


Figure 19

For JCN to JCN Splices

- 5.2.2 Use a piece of cable jacket, removed during cable preparation, to cover and protect exposed cable semi-con under the area where the neutral and/or ground connection will be made. Secure with tape. Ensure that the cable jacket piece does not touch the splice body (*Figure 20*).

Note: *If grounding splice, leave sufficient neutral wire length to allow for a ground wire connection next to cable jacket or make both neutral and ground connections using a single connector.*

- 5.2.3 Connect neutrals using a suitable compression connector ("INLINE", "C", or "H" type) between jacket end and reduced splice diameter. Keep connector profile as low as possible. Crimp connector following the connector manufacturer's recommendation (*Figure 20*).

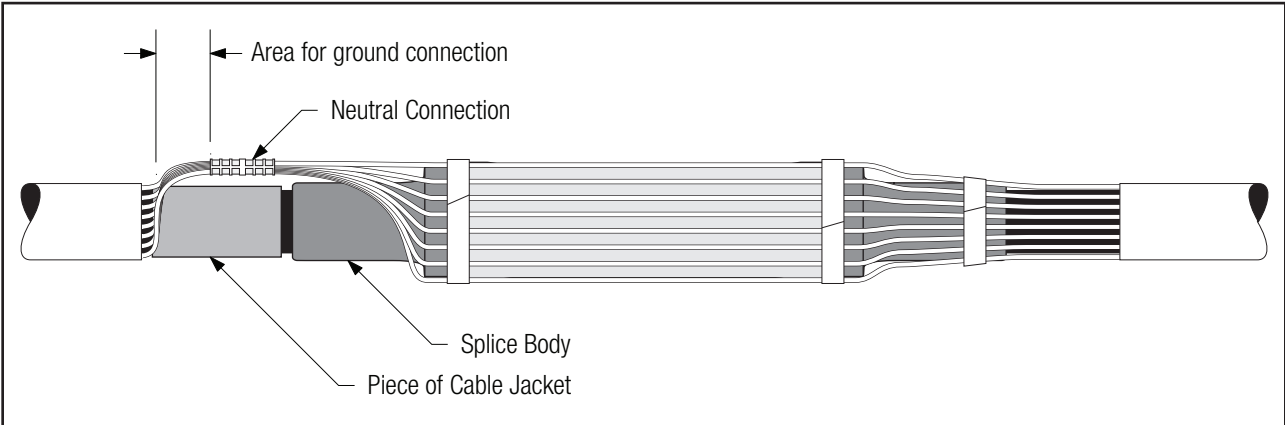


Figure 20

6.0 Grounding (Optional) for JCN Splices

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

- 6.1 Connect a ground wire to the neutrals, in the area where the splice diameter is reduced. To protect the cable semicon, place a piece of cable jacket (removed during the cable preparation) under the ground connector. Ensure that the cable jacket piece does not touch the splice body. Keep connector profile as low as possible. For C-Tap or H-Tap connectors, position flat against the cable (*Figure 21*).

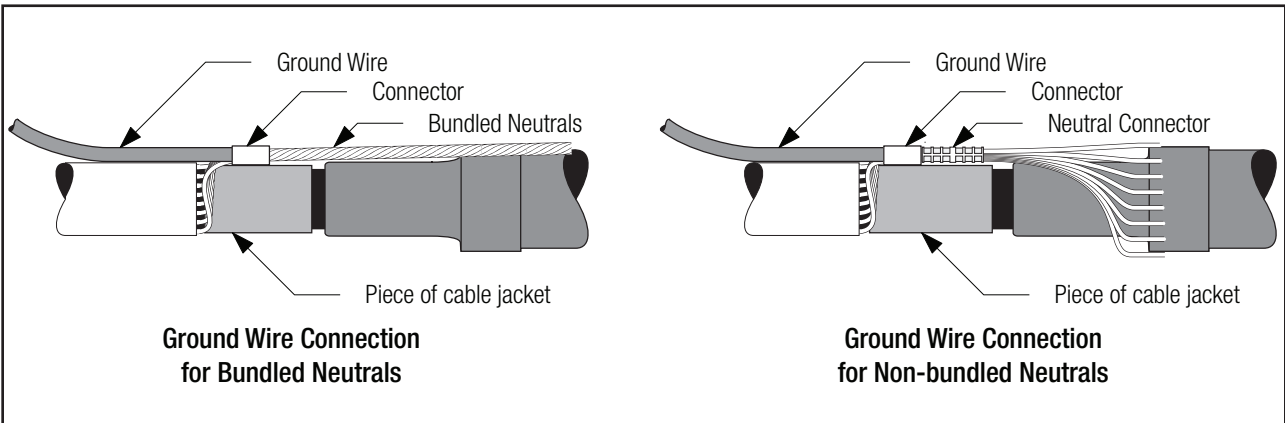


Figure 21

For JCN to JCN Splices

- 6.2 Cut one mastic sealing strip into two equal pieces. Place one piece on the cable jacket centered under the ground wire, near the jacket end. Roll the two remaining full length mastic strips into small rolls. Place one roll on each side of the ground wire (*Figure 22*).

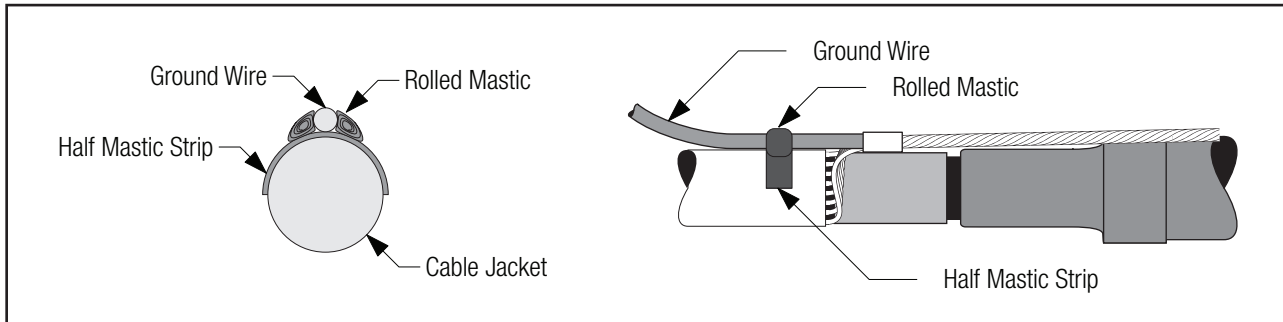


Figure 22

- 6.3 Place the other half mastic strip over ground wire and two rolls. Press the mastic around the ground wire and to the cable jacket. Overwrap the connectors with vinyl tape (*Figure 23*).

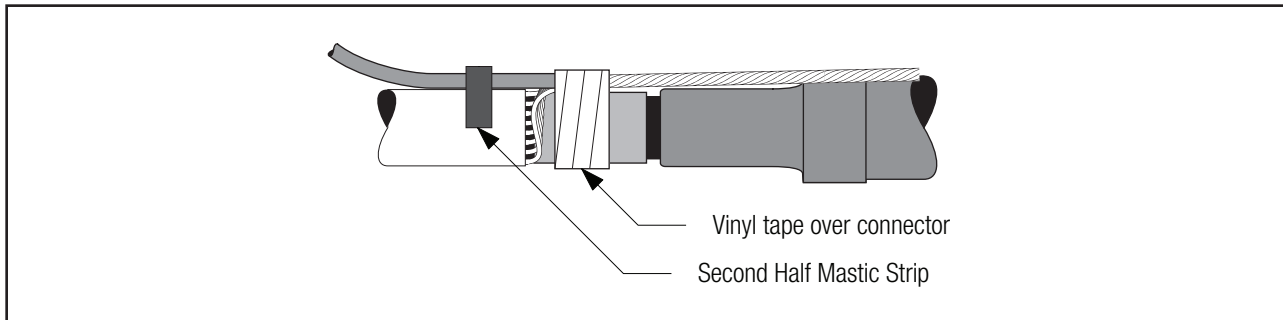


Figure 23

7.0 Install Jacket for JCN Splices

Note: *Jacketing is not optional.*

- 7.1 Apply one roll of slightly stretched rubber mastic tape around each jacket end (tacky side toward cable). If ground wire is connected, apply tape over mastic sealing strips. Stretch and tear off the end of the rubber mastic as shown.

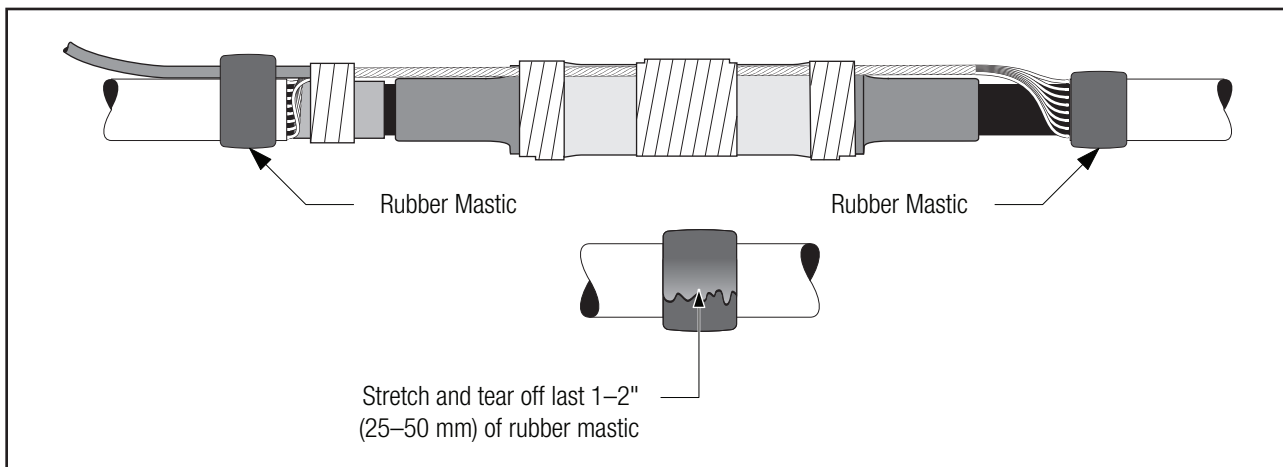


Figure 24

For JCN to JCN Splices

- 7.2 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 25*).

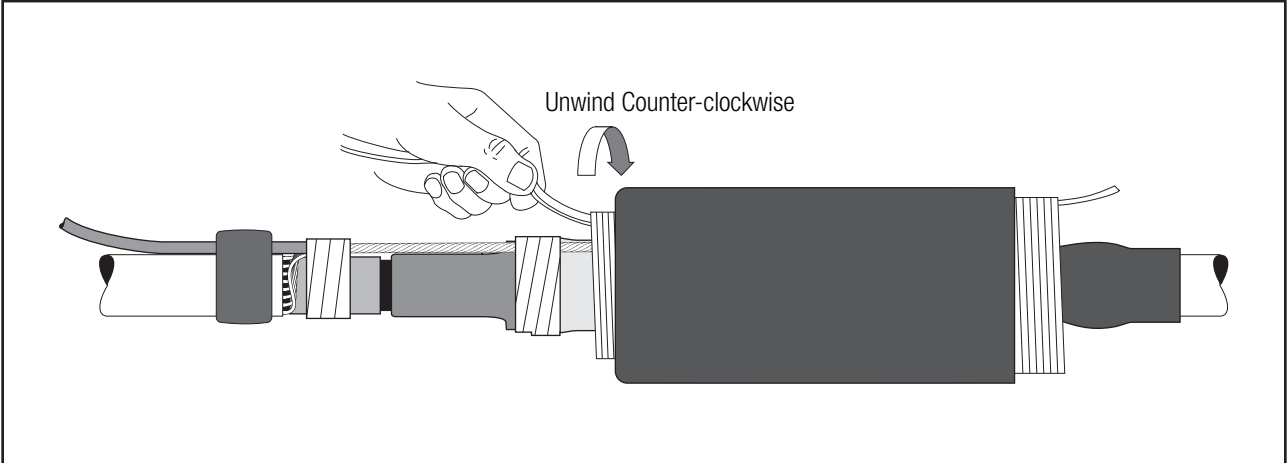


Figure 25

- 7.3 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 26*).

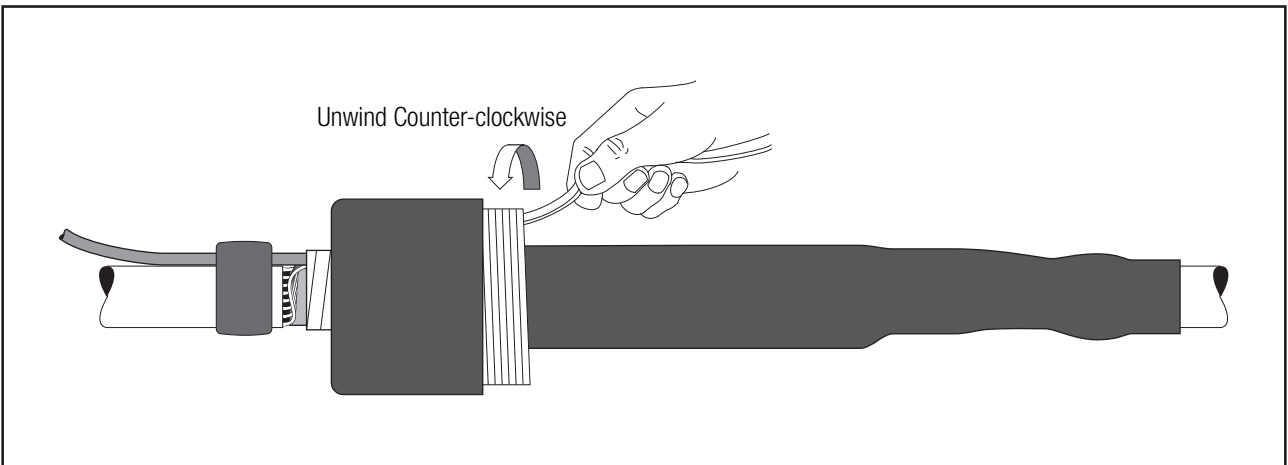


Figure 26

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.*

For CN to CN Splices

8.0 Connect Neutral Wires for CN Splices

8.1 For splices with exposed neutral connections:

8.1.1 Apply a mastic strip around the semi-con jacket of each cable at the location where neutral wires are bent back (*Figure 27*).

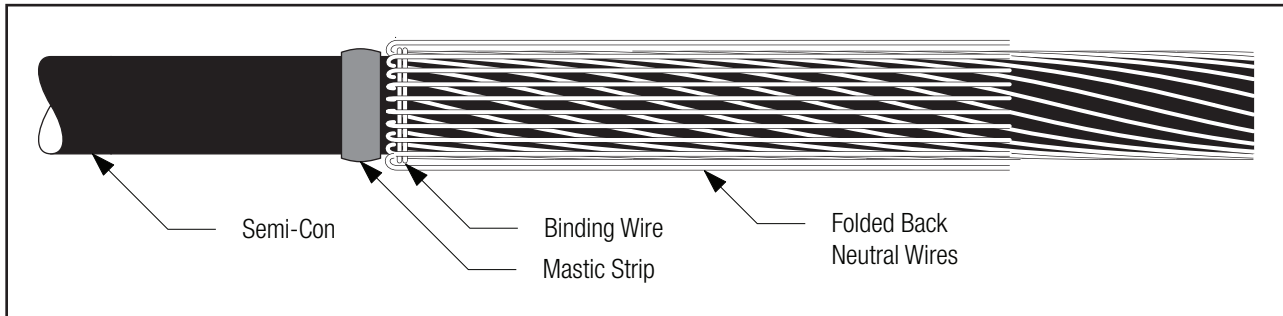


Figure 27

8.1.2 Run two solid bare wires across the splice and press them into the mastic on both cables. Leave 10"–12" (250–300 mm) of extra wire past each mastic (*Figure 28*).

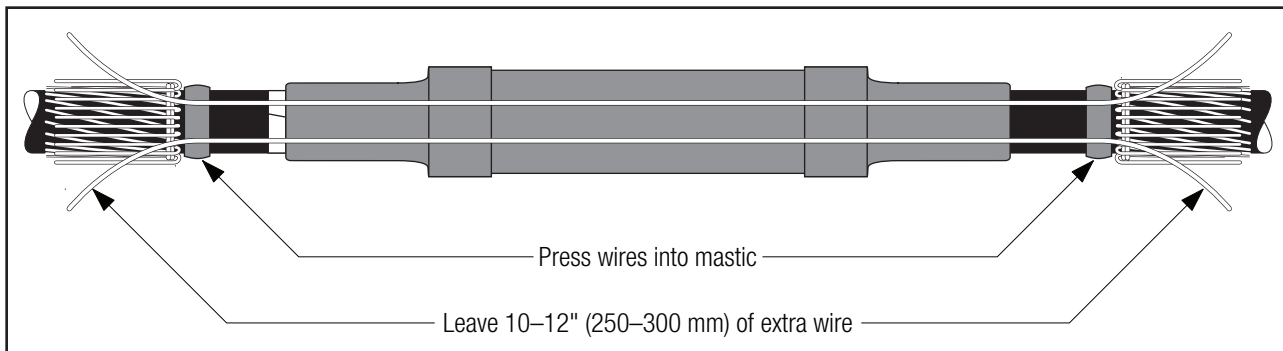


Figure 28

8.1.3 Apply one roll of slightly stretched rubber mastic tape over each mastic strip (tacky side towards cable). Stretch and tear off the end of the rubber mastic as shown (*Figure 29*).

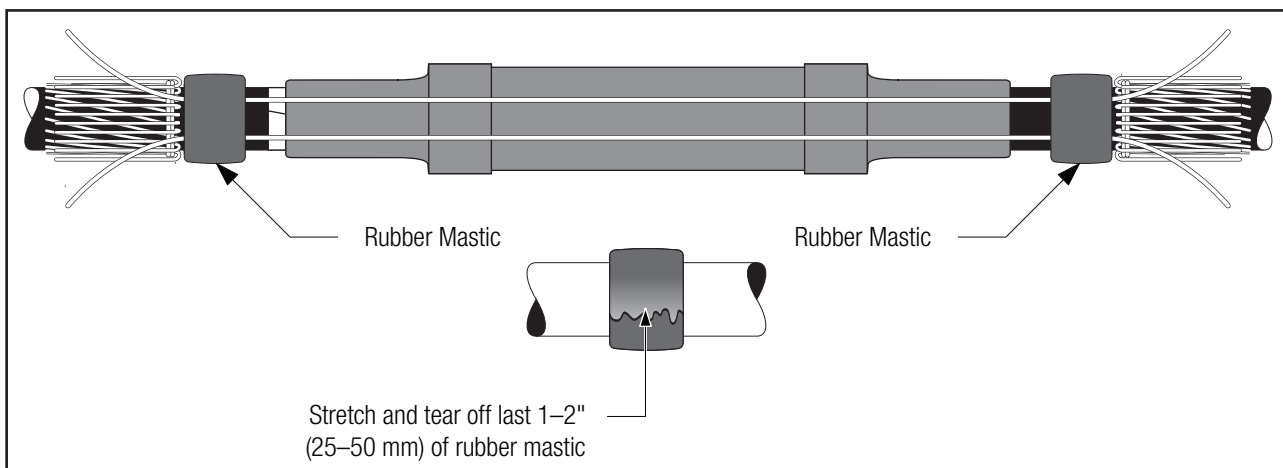


Figure 29

Go to section 9.0 "Install Jacket for CN Splices."

For CN to CN Splices

8.2 For splices with covered neutral connections:

8.2.1 Center neutral pad on splice body. Remove temporary vinyl tape from neutral wires and connect with an inline compression connector (crimp sleeve). Route neutrals and connector over the neutral pad (Figure 30).

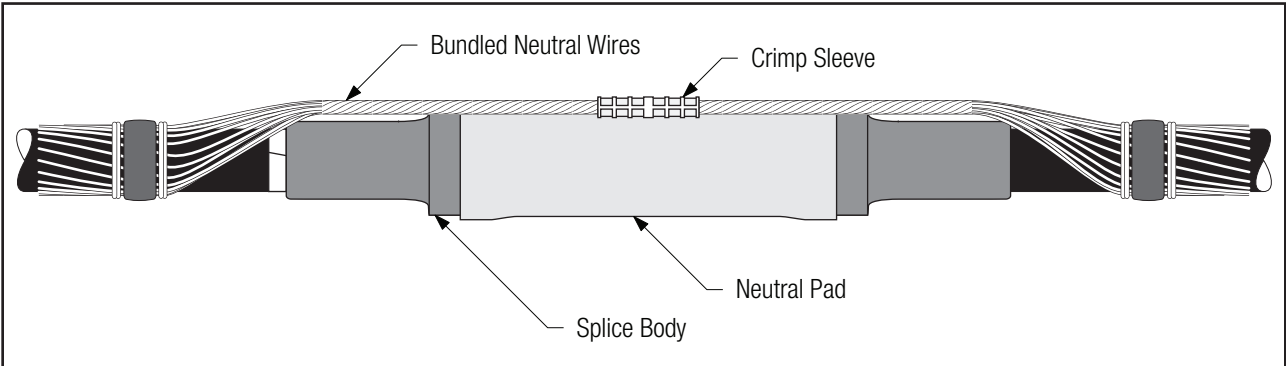


Figure 30

8.2.2 Apply two wraps of vinyl tape around each end of the neutral pad and over the connector (Figure 31).

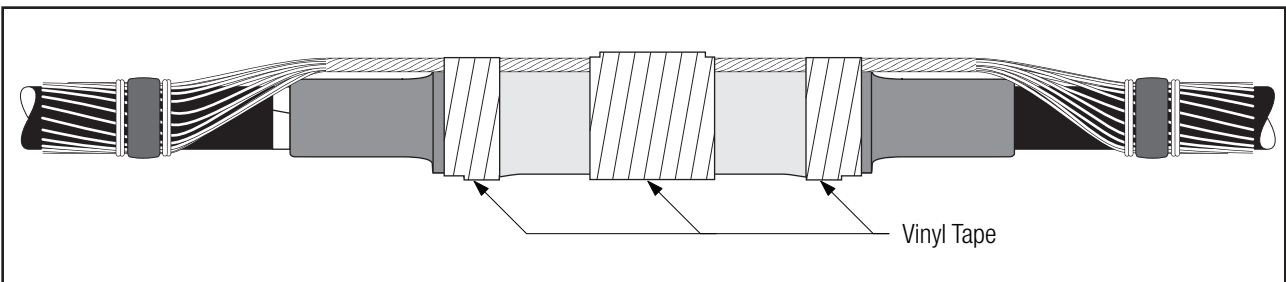


Figure 31

Go to step 8.3.

8.2.3 For neutrals evenly spaced around splice body:

Center neutral pad on splice body. Route neutrals either straight or concentrically around splice body and secure using vinyl tape (Figure 32).

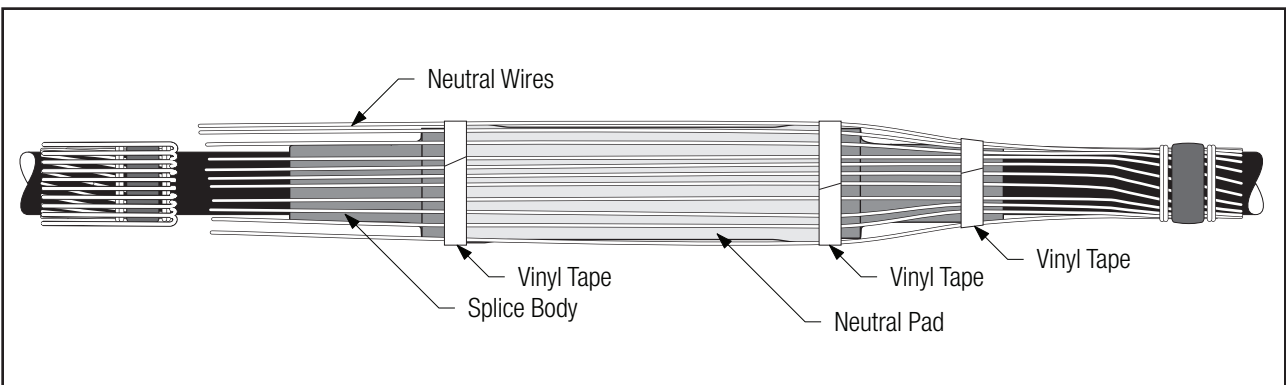


Figure 32

For CN to CN Splices

- 8.2.4 Use a piece of cable jacket, removed during cable preparation, to cover and protect exposed cable semi-con under the area where the neutral and/or ground connection will be made. Secure with tape. Ensure that the cable jacket piece does not touch the splice body (*Figure 33*).
- 8.2.5 Connect neutrals using a suitable compression connector (“INLINE,” “C,” or “H” type) between jacket end and reduced splice diameter. Keep connector profile as low as possible. Crimp connector following the connector manufacturer’s recommendation (*Figure 33*).

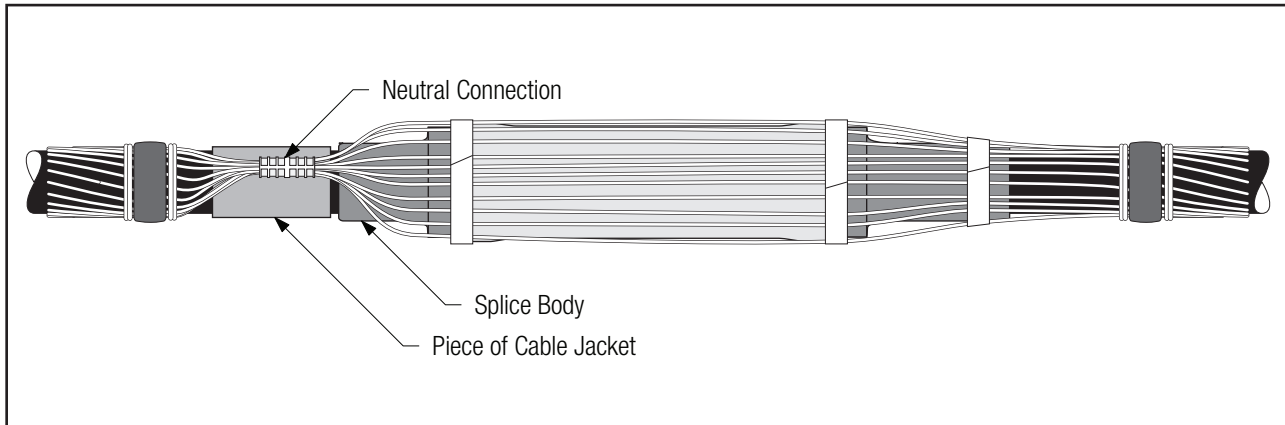


Figure 33

- 8.3 Apply one roll of slightly stretched rubber mastic over each mastic seal (tacky side toward cable). Stretch and tear off the end of the rubber mastic as shown (*Figure 34*).

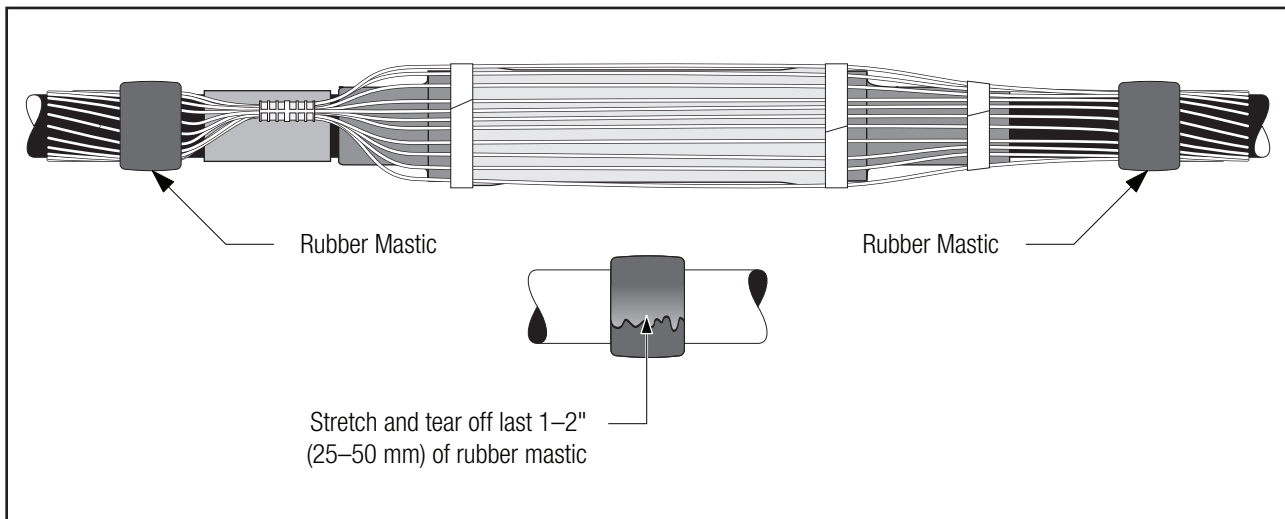


Figure 34

For CN to CN Splices

9.0 Install Jacket for CN Splices

Note: *Jacketing is not optional.*

- 9.1 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 35*).

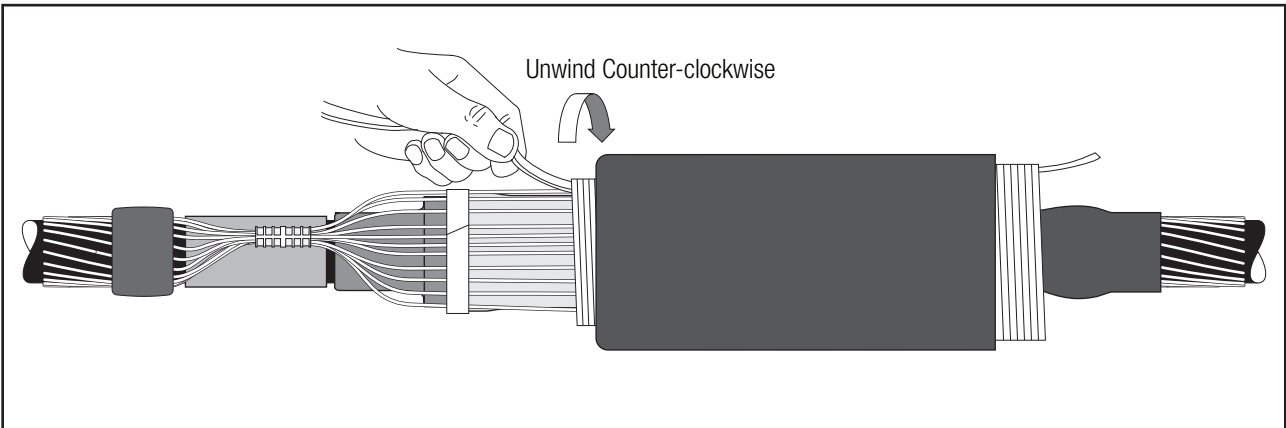


Figure 35

- 9.2 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 36*).

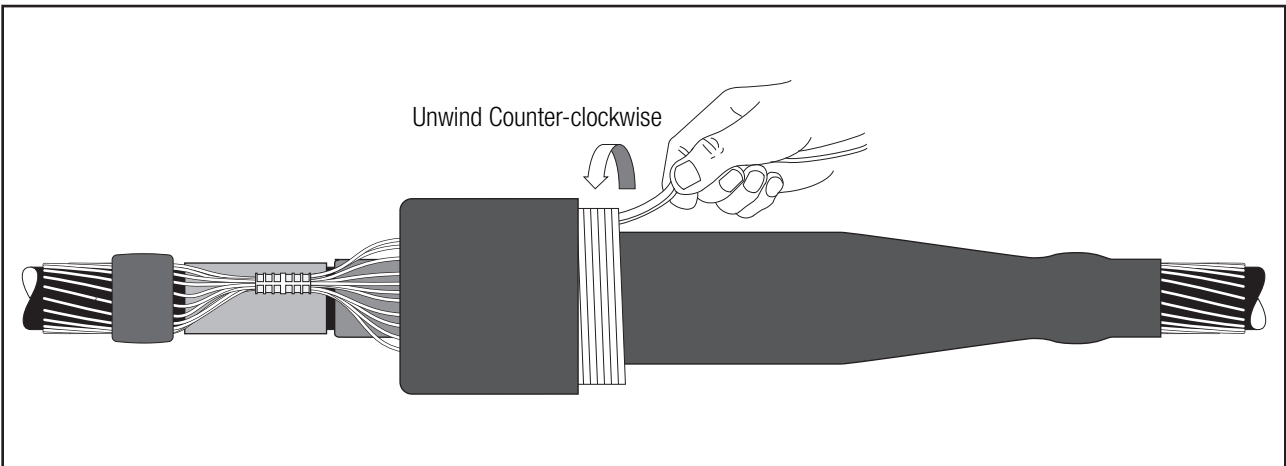


Figure 36

For CN to CN Splices

- 9.3 **For exposed neutral connection:** Route neutrals over splice and connect. Include two wires routed under splice jacket (*Figure 37*).

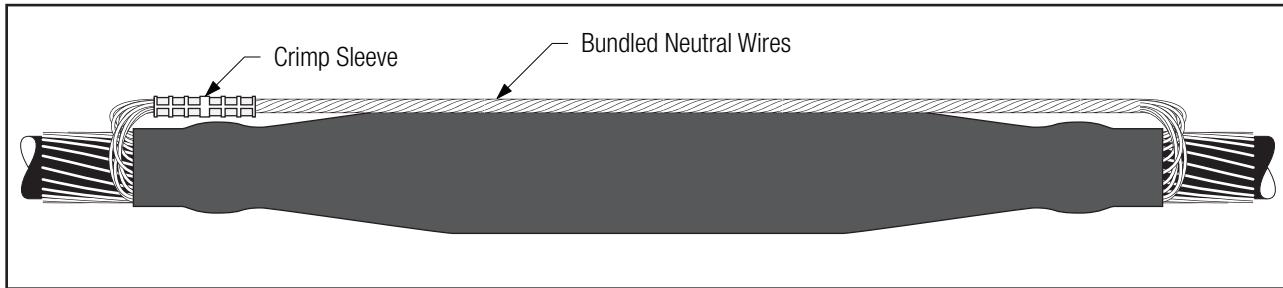


Figure 37

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: *If circuit grounding is required at this splice location, connect to exposed neutral wires.*

For CN to JCN Transition Splices

10.0 Connect Neutral Wires for Transition Splices

10.1 For bundled neutrals using neutral pad:

- 10.1.1 Center neutral pad on splice body. Remove temporary vinyl tape from neutral wires and connect with an inline compression connector (crimp sleeve). Route neutrals and connector over the neutral pad (*Figure 38*).

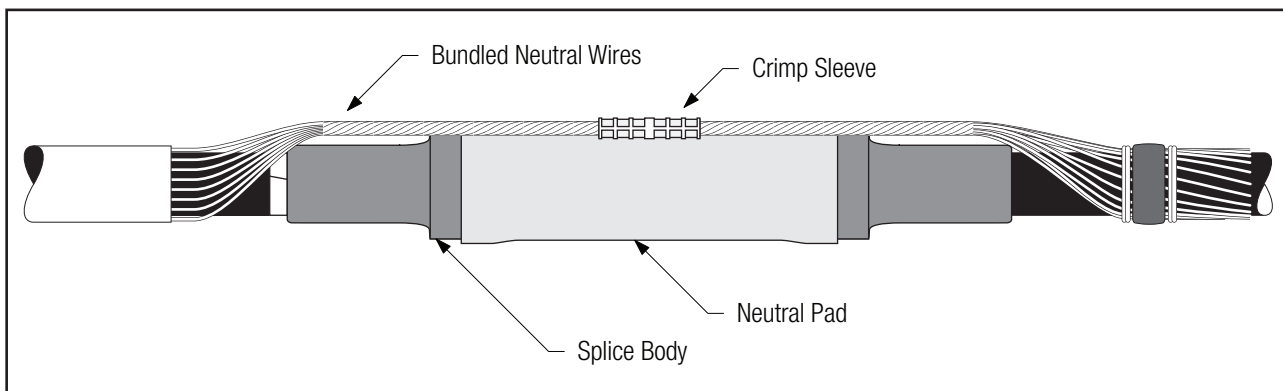


Figure 38

For CN to JCN Transition Splices

10.1.2 Apply two wraps of vinyl tape around each end of the neutral pad and over the connector (Figure 39).

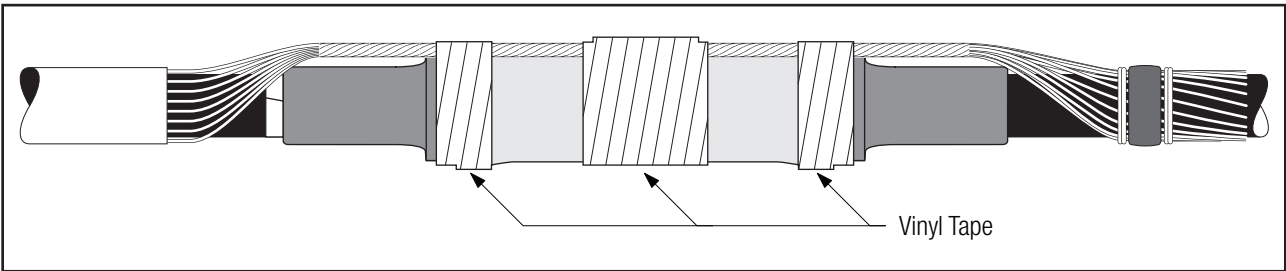


Figure 39

Go to section 11.0 “Grounding (Optional) for Transition Splices.”

10.2 For neutrals evenly spaced around splice body:

10.2.1 Center neutral pad on splice body. Route neutrals either straight or concentrically around splice body and secure using vinyl tape (Figure 40).

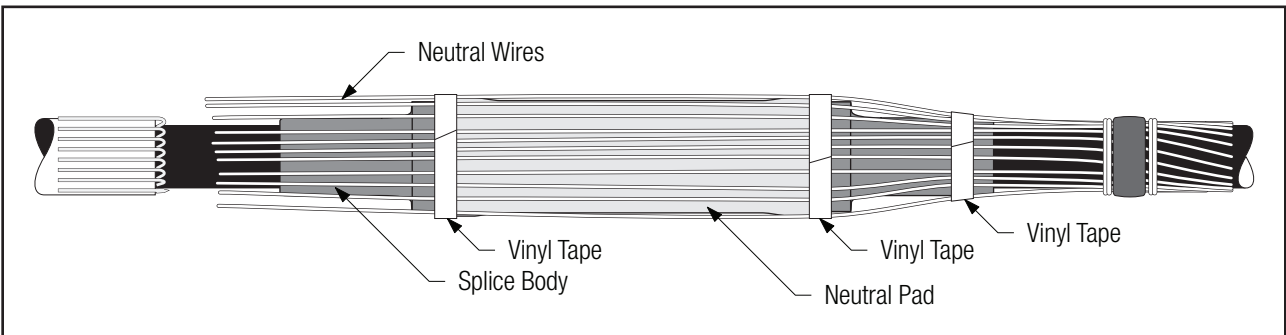


Figure 40

10.2.2 Use a piece of cable jacket, removed during cable preparation, to cover and protect exposed cable semi-con under the area where the neutral and/or ground connection will be made. Secure with tape. Ensure that the cable jacket piece does not touch the splice body (Figure 41).

Note: *If grounding splice, leave sufficient neutral wire length to allow for a ground wire connection next to cable jacket or make both neutral and ground connections using a single connector.*

10.2.3 Connect neutrals using a suitable compression connector ("INLINE", "C", or "H" type) between jacket end and reduced splice diameter. Keep connector profile as low as possible. Crimp connector following the connector manufacturer's recommendation (Figure 41).

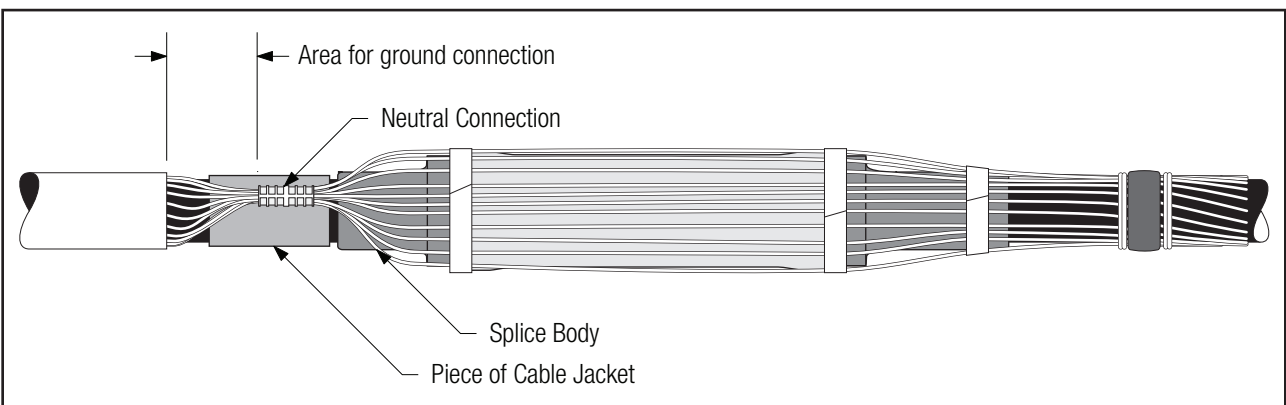


Figure 41

For CN to JCN Transition Splices

11.0 Grounding (Optional) for Transition Splices

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

- 11.1 Connect a ground wire to the neutrals, in the area where the splice diameter is reduced. To protect the cable semicon, place a piece of cable jacket (removed during the cable preparation) under the ground connector. Ensure that the cable jacket piece does not touch the splice body. Keep connector profile as low as possible. For C-Tap or H-Tap connectors, position flat against the cable (*Figure 42*).

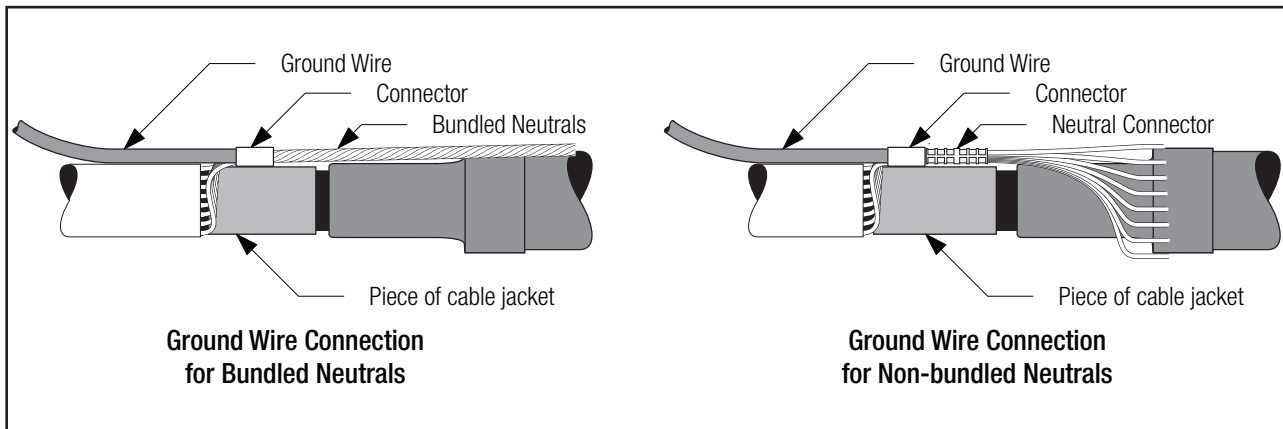


Figure 42

- 11.2 Cut one mastic sealing strip into two equal pieces. Place one piece on the cable jacket centered under the ground wire, near the jacket end. Roll the two remaining full length mastic strips into small rolls. Place one roll on each side of the ground wire (*Figure 43*).

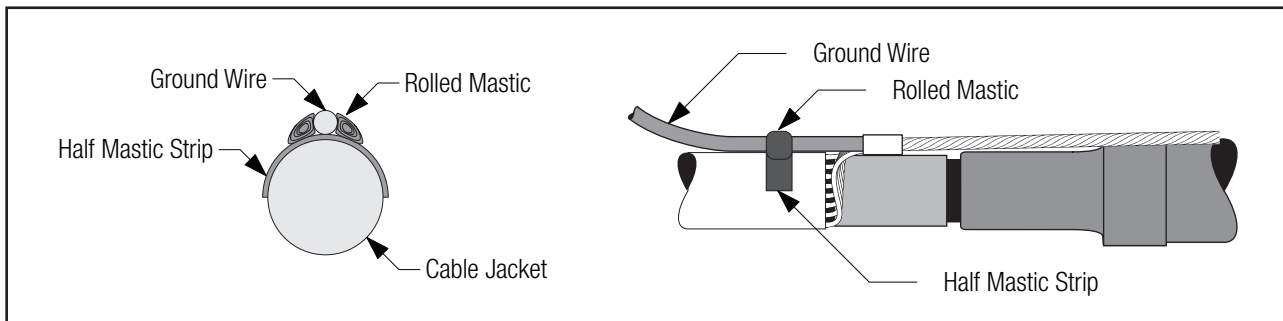


Figure 43

- 11.3 Place the other half mastic strip over ground wire and two rolls. Press the mastic around the ground wire and to the cable jacket. Overwrap the connectors with vinyl tape (*Figure 44*).

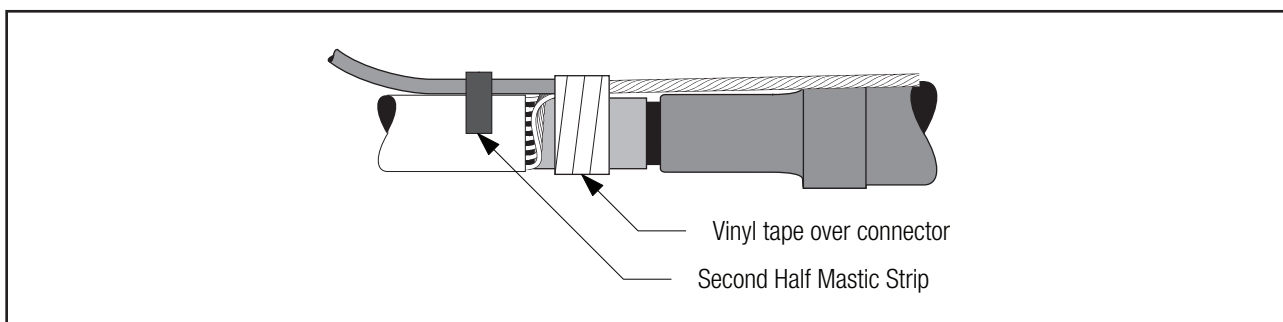


Figure 44

For CN to JCN Transition Splices

12.0 Install Jacket for Transition Splices

Note: *Jacketing is not optional.*

- 12.1 Apply one roll of slightly stretched rubber mastic tape around JCN cable jacket end (tacky side toward cable). If ground wire is connected, apply rubber tape over mastic sealing strips. Apply one roll of rubber mastic tape over CN cable mastic seal (tacky side toward cable). Stretch and tear off the end of the rubber mastic as shown (*Figure 45*).

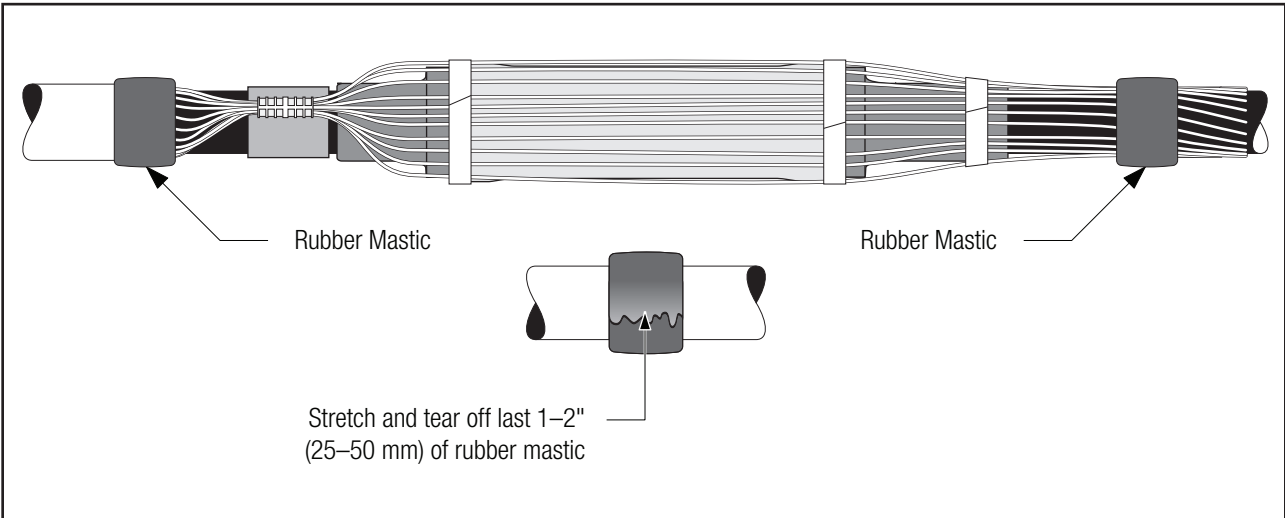


Figure 45

- 12.2 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 46*).

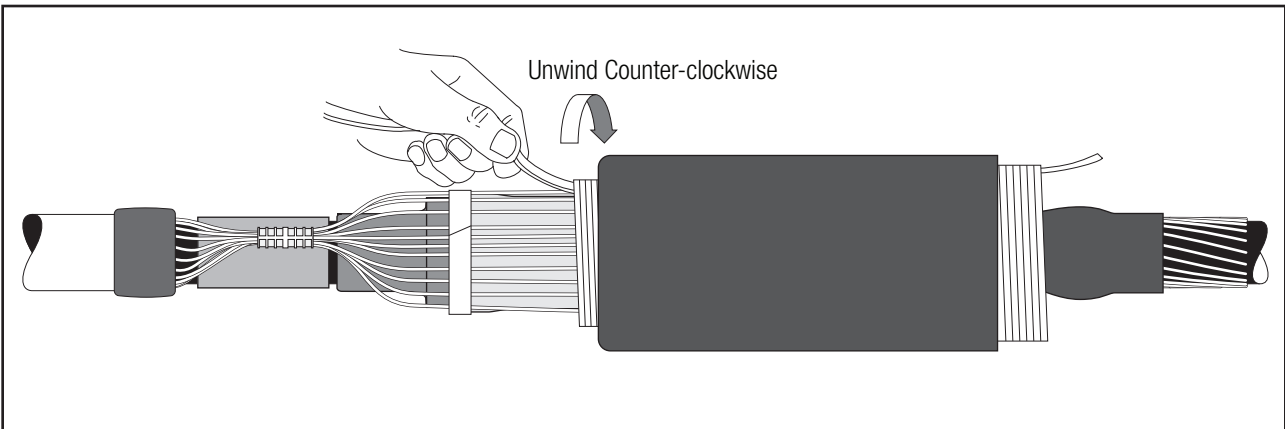


Figure 46

For CN to JCN Transition Splices

- 12.3 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 47*).

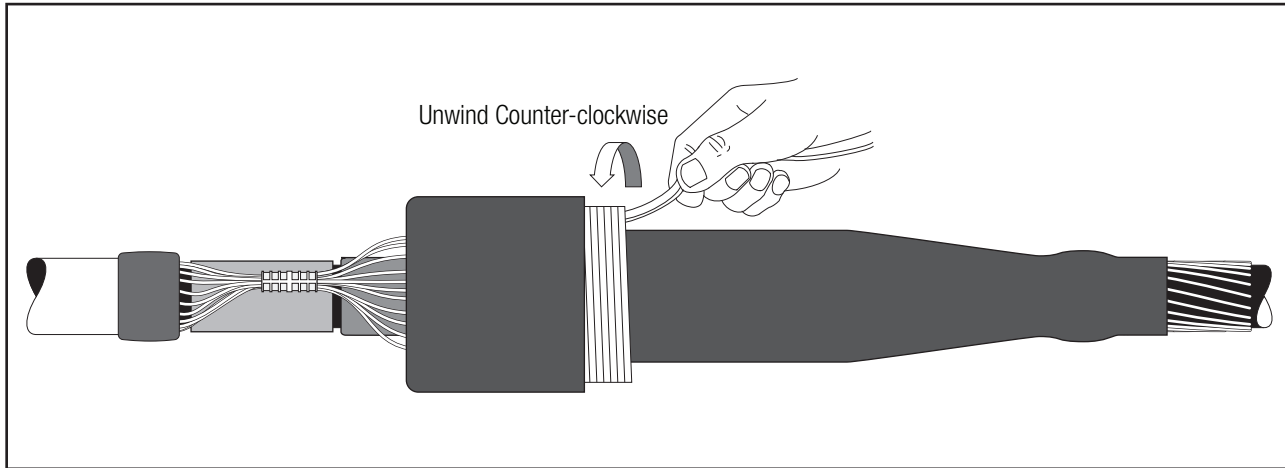


Figure 47

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 No.	Conductor Size (AWG or kcmil)	Burndy Corporation					Thomas & Betts Corp.				Square D Co. Anderson Div.	
		MD6	MY29	Y34A	Y35, Y39, Y45*, Y46*	Y1000**	TBM 5	TBM 8	TBM 12	TBM 15	VC6-3** VC6-FT**	VC8C
10008 (Cu)	4/0	BG(3)	4/0(1)	A28R(2)	U28RT(2)	---	Purple(2)	Purple(2)	---	54H(2)	(2)	---
20008 (Al/Cu)	4/0	W660(4)	4/0(2)	A28AR(2)	U28ART(2)	(1)	---	White(4)	---	66(4)	(2)	---
11008 (Cu)	4/0	BG(4)	4/0(2)	A28R(3)	U28RT(3)	---	Purple(3)	Purple(3)	---	54H(3)	(3)	---
CI-4/0 (Al/Cu)	4/0	W-249(3)	---	---	U28ART(2)	---	---	Blue(4)	---	76(2)	(2)	---
10009 (Cu)	250	W166(3)	250(1)	A29R(2)	U29RT(2)	---	Yellow(2)	Yellow(2)	---	62(2)	(2)	---
20009 (Al/Cu)	250	W249(3)	---	A29AR(2)	U29ART(2)	(1)	---	---	71H(2)	71H(2)	(3)	---
11009 (Cu)	250	W166(4)	250(2)	A29R(3)	U29RT(3)	---	Yellow(3)	Yellow(3)	---	62(3)	(3)	---
CI-250 (Al/Cu)	250	---	---	---	U31ART(2)	---	---	---	87H(2)	87H(2)	(2)	---
10010 (Cu)	300	---	---	A30R(3)	U30RT(2)	---	---	White(2)	---	66(2)	(2)	---
20010 (Al/Cu)	300	---	---	A30AR(2)	U30ART(2)	(1)	---	---	76H(3)	76(1)	(2)	---
11010 (Cu)	300	---	---	A30R(3)	U30RT(3)	---	---	White(3)	---	66(3)	(3)	---
CI-300 (Al/Cu)	300	---	---	---	U31ART(2)	---	---	---	87H(2)	87H(2)	(2)	---
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)	---

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

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

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