

3M™ Cold Shrink Splice Kit QS-III 5516A-1T-PILC

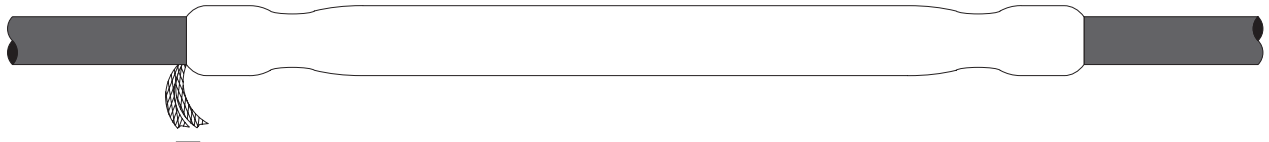
for splicing PILC cable to Poly/EPR insulated cable

Instructions

IEEE Std. 404

15 kV Class

110 kV BIL



Cable Types

- PILC (paper insulated lead covered)

To:

- Tape Shielded
- Wire Shielded
- CN (concentric neutral)
- JCN (jacketed concentric neutral)
- LC (longitudinal corrugated shield)
- UniShield®

Application Chart

| | PILC Cable | | Poly/EPR Cable |
|----------------------------------|--|--|--|
| | 100% Insulation (165 mils) | 133% Insulation (215 mils) | 100% or 133% Insulation |
| Conductor Size* (kcmil) | 750–1000 (400–500 mm ²) | 500–1000 (300–500 mm ²) | 500–1000 (240–500 mm ²) |
| Insulation O.D. Range | 1.24–1.63 in. (32–41 mm) | | 1.08–1.70 in. (28–43 mm) |
| Maximum O.D. Over Lead Sheath | 1.85 in. (47 mm) | | — |

*Insulation O.D. is the final determining factor.

Table 1

⚠ 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.

Connector Dimensional Requirements

| | Minimum | Maximum |
|------------------------------------|---------------------|----------------------|
| Outside Diameter | 1.05 in. (27 mm) | 1.85 in. (46 mm) |
| Overall Length Aluminum (Al/Cu) | — | 6.75 in. (171 mm) |
| Copper (Cu) | — | 7.5 in. (191 mm) |
| Center Oil Stop Length | — | 0.5 in. (13 mm) |

Note: For use with non-tapered connectors only.

Crimping information for standard 3M™ Connectors is located at the end of these instructions.

Table 2

Kit Contents

- 1 Cold Shrink Splice Body
- 1 Cold Shrink Foldback Jacket Tube
- 1 3M™ Cold Shrink Connector Adapter Tube QS-III
- 1 Strip 3M™ EMI Copper Foil Shielding Tape 1181
- 1 Pack 3M™ Cable Cleaning Pads CC-3
- 2 Tubes, P55/R Compound (red)
- 2 Rolls, Scotch® Rubber Mastic Tape 2228 (unmarked)
- 1 Shielding Sleeve (3 ft.)
- 5 Constant Force Springs (shield connectors)
- 1 Ground Braid
- 6 Scotch® Mastic Strips 2230, 6" (black)
- 1 Instruction Booklet

Oil Barrier Components Bag

- 1 Cold Shrink Oil Barrier Tube
- 1 Cold Shrink Oil Barrier Adapter Tube (bag "E")
- 1 Cold Shrink Semi-Conductive Tube
- 1 Roll, Scotch® Electrical Stress Control Tape 2220 (silver backing)
- 1 Roll White Restricting Tape

NOTE: Vinyl Tape is required, NOT INCLUDED in kit.

Instructions for PILC Cable to Poly/EPR Cable

1.0 Prepare Poly/EPR Cable

- 1.1 Prepare cable according to standard procedures. Refer to *Figure 1* below and include an allowance* for connector growth where applicable. Insulation removal length shall not exceed 3-3/4" (95 mm) from conductor end.

**This assumes that the installer has determined the increased length of an aluminum connector crimped with a specific die and tool. Typical growth for standard 3M™ Connectors is shown below.*

Aluminum (Al/Cu) Connector Growth Chart

| Conductor Size | Typical growth allowance (per end) |
|----------------|------------------------------------|
| 500–600 kcmil | 1/4" (6 mm) |
| 650–1000 kcmil | 3/8" (10 mm) |

Notes: 1) Copper connectors do not require a length change allowance.

2) Maximum aluminum connector crimped length allowed is 7.5" (191 mm).

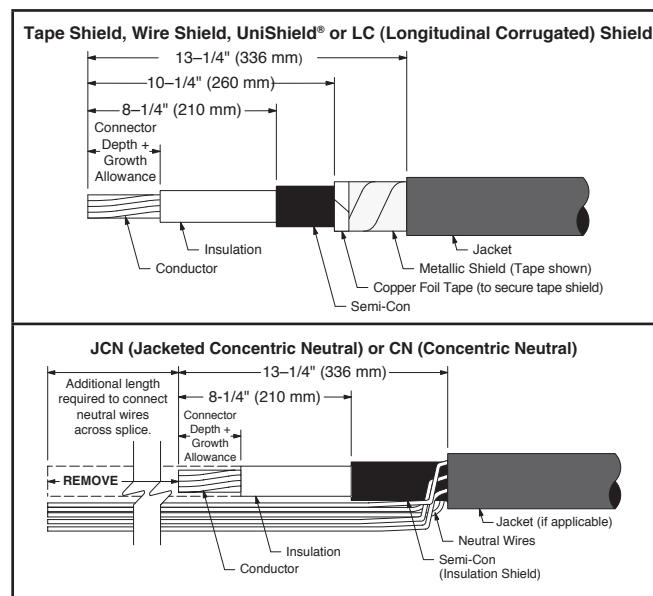


Figure 1

Note: Protect exposed cable to prevent contamination.

2.0 Prepare PILC Cable

- 2.1 Scrape lead clean prior to removing. Prepare cable according to *Figure 2*.

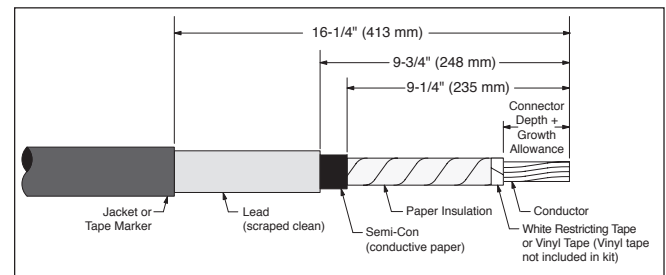


Figure 2

Note: Tape used to bind paper insulation need not be removed. **DO NOT EXCEED 2 WRAPS OF TAPE PER BAND.**

3.0 Install Oil Barrier

- 3.1 Beginning 1/2" (13 mm) on the lead sheath, build a smooth taper using the Scotch® Electrical Stress Control Tape 2220. Stretch to apply one half-lapped layer onto paper insulation to a distance of 1" (25 mm) from the lead edge, then back to the lead step as shown (*Figure 3*).

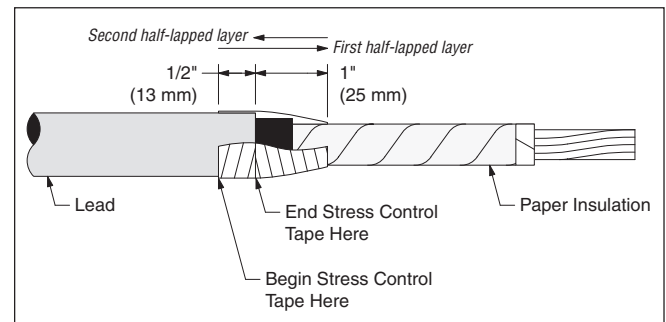


Figure 3

Note: There should only be 1 half-lapped layer on the lead sheath.

- 3.2 Overwrap the stress control tape with one half-lapped layer of electrical grade vinyl tape.

- 3.3 Install connector onto PILC Cable **ONLY**.
DO NOT CRIMP 1/4" (7 mm) FROM END
 (Figure 4).
- 3.4 Measure and note the distance from open connector end to uncrimped area adjacent to papers (Figure 4).

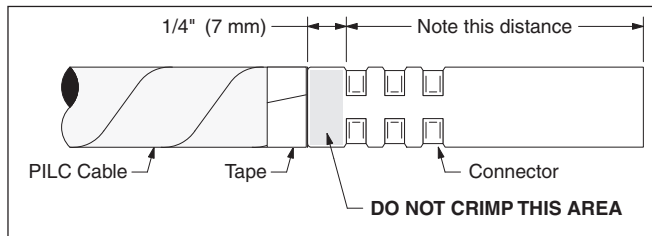


Figure 4

- 3.5 For connectors listed below, position and install the designated oil barrier adapter according to step 3.6.

| Connector Size/ Type* | Connector O.D. | Required Oil Barrier Adapter |
|--|-----------------------------|--|
| 500—750 kcmil Cu | 1.05—1.30 in. (27—33 mm) | Oil Barrier Adapter "E" |
| 800—1000 kcmil Cu 500—1000 kcmil Al | 1.31—1.85 in. (33—47 mm) | Oil Barrier Adapter Not Required. Proceed to Step 3.7. |

**Connector O.D. is the final determining factor, subject to requirements listed on cover.*

- 3.6 Align the edge of the oil barrier adapter tube with the PILC end of the connector and shrink by pulling and unwinding the ribbon tab. **Do not overlap the adapter tube onto the PILC cable insulation** (Figure 5).

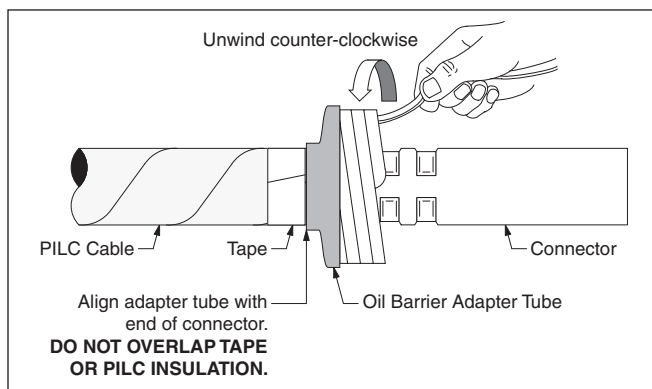


Figure 5

- 3.7 Align oil barrier tube assembly with connector center line. Install by unwinding ribbon tab counter-clockwise while maintaining alignment with center line (Figure 6).

Note: An occasional tug of the core ribbon while unwinding will aid core removal.

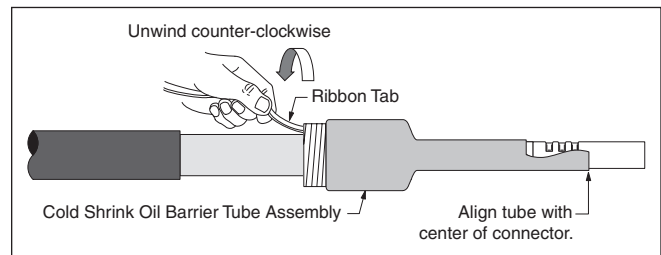


Figure 6

- 3.8 Apply three wraps of white restricting tape around the oil barrier tube at the end of the connector according to the distance noted in step 3.4, and around the edge of the tube at the lead end (Figure 7).

Note: This tape does not stretch, but should be applied with constant tension to avoid wrinkling.

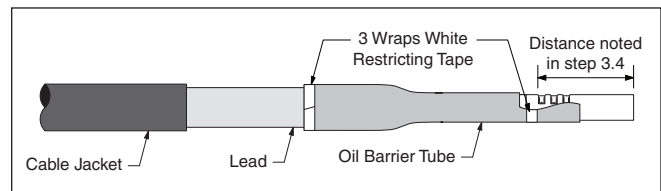


Figure 7

- 3.9 Mark oil barrier tube 8-1/4" (210 mm) from connector center line. Spread a light coat of P55/R Compound (red) over the oil barrier tube and the white restricting tape from the mark location to the lead end of the tube (Figure 8).

Note: Keep greased area clean and free from dirt prior to semi-con tube installation.

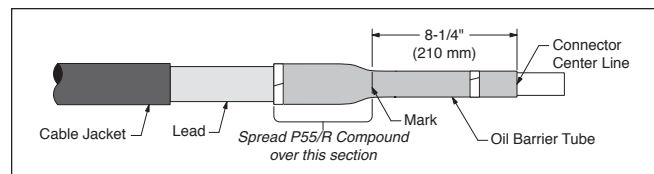


Figure 8

- 3.10 Position the cold shrink semi-conductive tube (approx. 5" [127 mm] long on core) over oil barrier tube with ribbon tab towards PILC cable. Align end of tube (not core) with mark on oil barrier tube. Install by unwinding ribbon tab counter-clockwise, carefully maintaining alignment with mark (Figure 9).

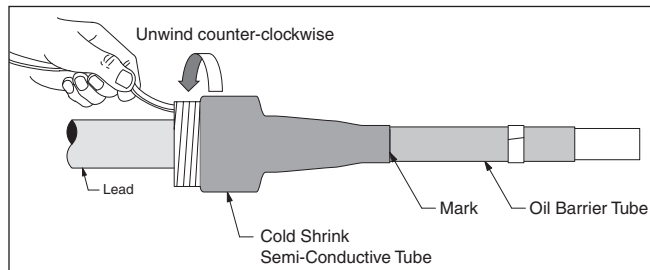


Figure 9

Note: Protect exposed cable to prevent contamination.

4.0 Position Components on Cable

- 4.1 Clean or cover cable jacket as necessary prior to parking components.
- 4.2 Expand diameter of shielding sleeve by pushing in at ends (to shorten) and slide onto either cable end (Figure 10).
- 4.3 Slide the nested splice and cold shrink foldback jacket tube onto either cable end (Figure 10). For size transitions, parking the splice on the smaller cable is recommended.

Note: For ease of installation, foldback jacket tube may be parked on opposite cable from splice and shielding sleeve.

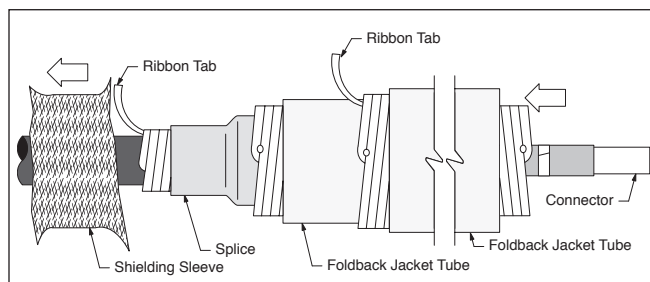


Figure 10

5.0 Install Splice

- 5.1 For connectors requiring a 3M™ Cold Shrink Connector Adapter QS-III, park the indicated adapter onto the Poly/EPR cable insulation with ribbon tab facing toward the cable end (Figure 11).

| Connector Size/ Type* | | Connector O.D. | Connector Adapter Required |
|----------------------------------|----|-----------------------------|-------------------------------|
| 500—800 kcmil Cu 500 kcmil Al | OR | 1.06—1.35 in. (27—34 mm) | Yes |

- 5.2 Prepare conductor according to standard practice and crimp connector onto Poly/EPR cable conductor (Figure 11).

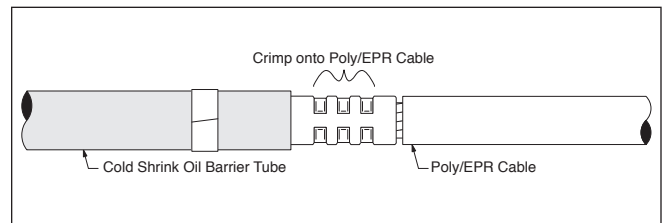


Figure 11

- 5.3 Place a tape marker 10-1/4" (260 mm) from connector center line on the cable opposite the splice body ribbon tab (Figure 12).

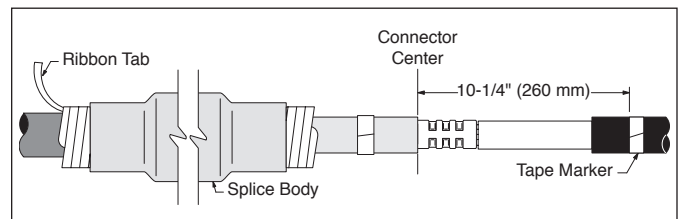


Figure 12

- 5.4 **If using cold shrink QS-III connector adapter:** Align edge of adapter tube with exposed edge of connector and shrink by pulling and unwinding the ribbon tab. **Do not overlap adapter tube onto the cold shrink oil barrier tube.**
- 5.5 Clean cable insulation using included 3M™ Cable Cleaning Pads CC-3. **DO NOT ALLOW SOLVENT TO TOUCH CABLE SEMI-CON.** If abrasive is used, do not reduce cable insulation diameter below the minimum O.D. specified on the front page.

Note: Allow solvent to fully dry or wipe with a clean dry rag before proceeding.

- 5.6 Apply a thin layer of P55/R Compound (red) over the exposed Poly/EPR cable insulation and cold shrink oil barrier tube, making certain to fill in the steps at the cable semi-con and cold shrink semi-conductive tube (*Figure 13*).

⚠ Caution: Do not use silicone grease.

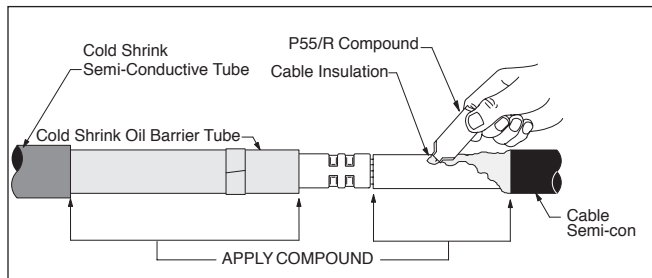


Figure 13

- 5.7 Position cold shrink splice so leading edge of splice (not core) aligns with the previously applied tape marker (*Figure 14*).
- 5.8 Install splice by pulling the ribbon tab and unwinding **counter-clockwise**, while maintaining alignment with the tape marker. (*Figure 14*).

NOTE: The splice body must overlap the poly/EPR semi-con and the PILC semi-conducting tube by at least 1/2" (13 mm) at each end.

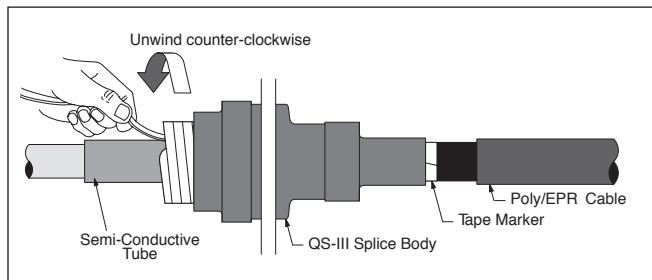


Figure 14

NOTE: If the end of the splice rolls under itself, DO NOT use sharp-edged tools to pull it out, as this could cut and damage the splice.

6.0 Install Ground Braid

- 6.1 Apply a mastic sealing strip at edge of PILC cable jacket, forming a seal to the cable lead (*Figure 15*).

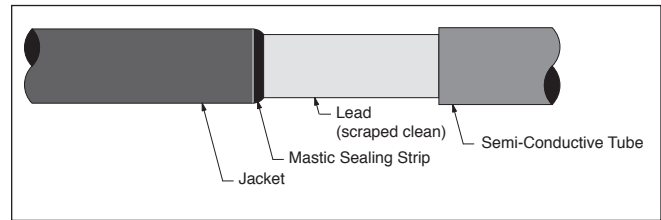


Figure 15

- 6.2 Apply a mastic sealing strip around cable jacket, 1/2" (13 mm) from jacket end or tape marker (*Figure 16*).
- 6.3 Position and tape one leg of ground braid along PILC cable, centering solder-block on mastic sealing strip. Wrap braid around cable lead (*Figure 16*).

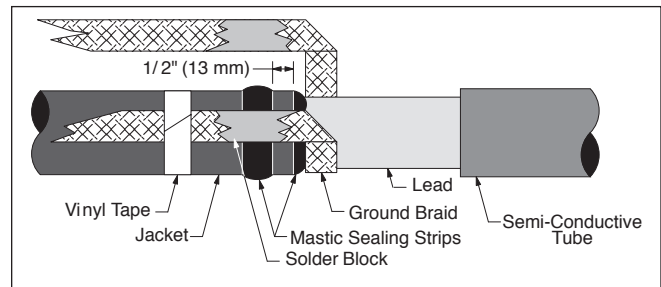


Figure 16

- 6.4 Secure braid with constant force spring. Wrap spring in the same direction as the ground strap and twist the final wrap to tighten (*Figure 17*).

NOTE: If solder-blocks overlap at mastic seal, apply a short length of mastic between them.

- 6.5 Hold second leg in place with an application of vinyl tape and press solder blocks into mastic (*Figure 17*).
- 6.6 Apply another mastic sealing strip over solder blocks and previous mastic seal (*Figure 17*).

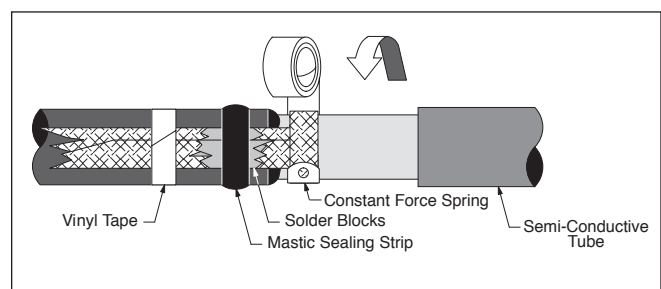


Figure 17

7.0 Install Shielding Sleeve

Note: Shielding sleeve is required for all applications, regardless of cable type or standard practice.

- 7.1 Center shielding sleeve over splice, stretching the sleeve to conform to surface of splice and cables (Figure 18).
- 7.2 Secure sleeve to PILC lead sheath by installing two constant force springs for 1 wrap only, around the sleeve and lead, just beyond edge of cold shrink semi-conductive tube (Figure 18).

NOTE: If transitioning to CN or JCN cable, use only one constant force spring to attach sleeve to lead closest to semi-conductive tube to leave room to solder neutrals to lead.

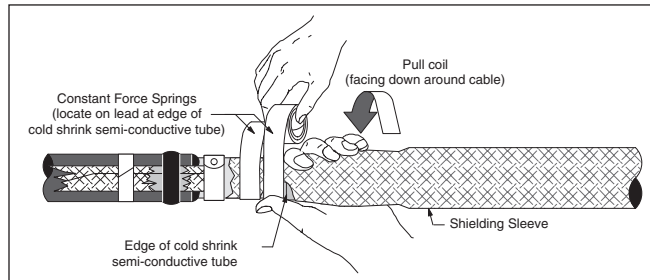


Figure 18

- 7.3 Fold end of shielding sleeve back over the single wrap of springs, then continue installing springs over the folded-back sleeve. Trim sleeve end 1/2" (13 mm) from spring (Figure 19).
- 7.4 Stretch shielding sleeve to conform snugly against splice and secure adjacent to splice shoulder with three wraps of white restricting tape (Figure 19).

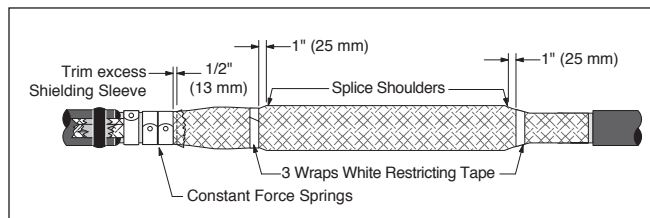


Figure 19

- 7.5 For non-JCN/CN cable, secure opposite end of sleeve to Poly/EPR metallic shield with 2 constant force springs. Refer to Steps 7.2 and 7.3 above and to the appropriate cable type in Figure 20.

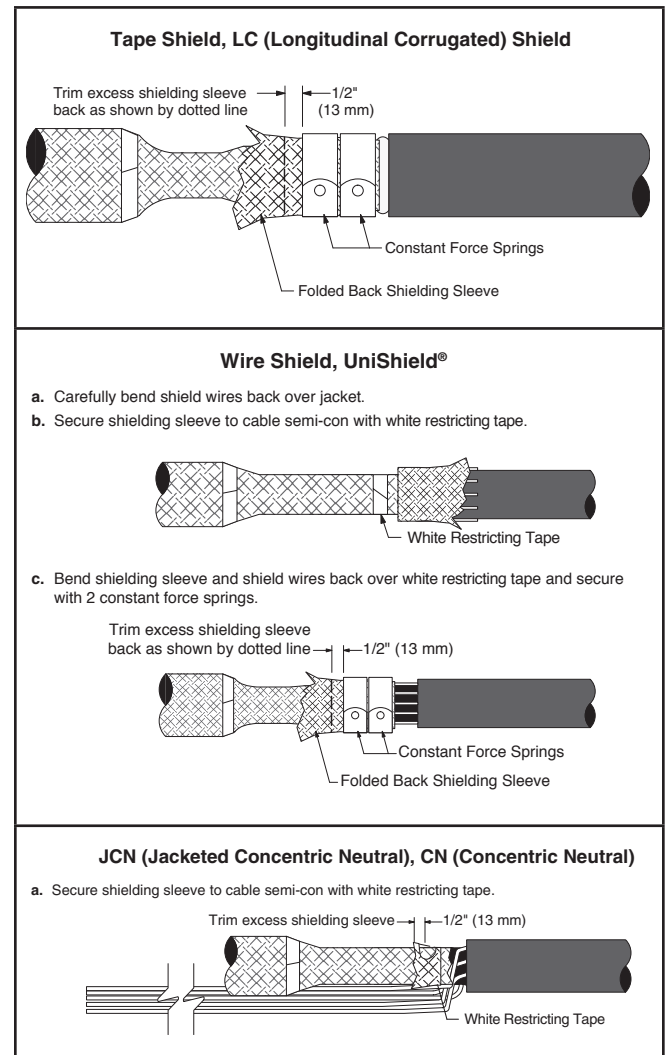


Figure 20

- 7.6 Trim shielding sleeve 1/2" (13 mm) from springs or white restricting tape (on CN or JCN cable) (Figure 20).
- 7.7 Apply three layers of white restricting tape over all springs. DO NOT tape over exposed PILC cable lead (Figure 21).

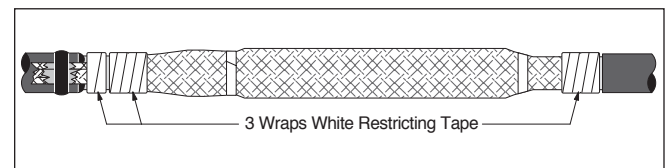


Figure 21

7.8 CN AND JCN CABLE ONLY:

Spread neutral wires and form them over splice. Bind wires to lead using a small copper wire or copper shielding braid tape (i.e.; Scotch® Electrical Shielding Tape 24). Cut neutral wires to proper length and solder neutral wires and binding to lead (*Figure 22*).

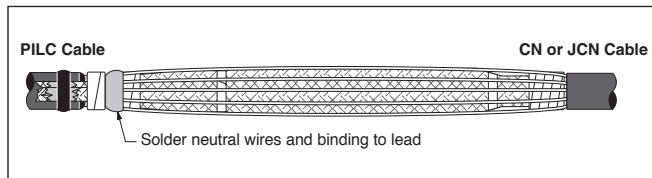


Figure 22

8.0 Install Splice Jacket

Note: Jacketing is not optional.

- 8.1 Apply one roll of slightly stretched rubber mastic tape (2" [51 mm] wide unmarked roll), 1/4" (6 mm) from each jacket end (tacky side toward cable). Stretch and tear the end of the rubber mastic and smear into itself (*Figure 23*).

Note: For Concentric Neutral Cable (CN) wrap mastic below and over neutral wires to form a seal. Cover mastic seal next to binder with rubber mastic tape.

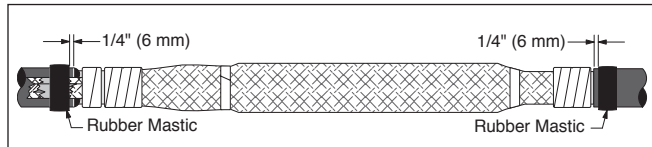


Figure 23

- 8.2 Install the cold shrink foldback jacket beginning with 1/2" (13 mm) overlap of the rubber mastic. Slowly pull and unwind the inner core counter-clockwise. 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 24*).

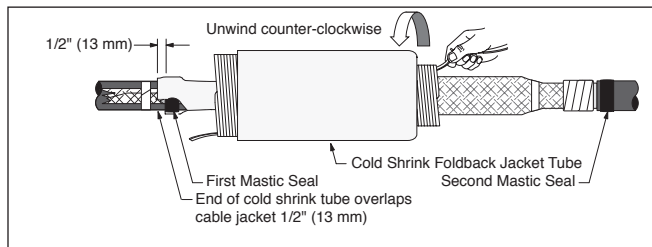


Figure 24

- 8.3 Continue to install the cold shrink foldback jacket by slowly pulling and unwinding the outer core counter-clockwise. As this portion of the cold shrink tube installs the end will roll under. The tube may need a slight push to get over the second mastic seal (*Figure 25*).

Note: The foldback jacket tube must completely cover the second mastic seal, but does not need to be symmetrical.

- 8.4 Connect optional grounding.

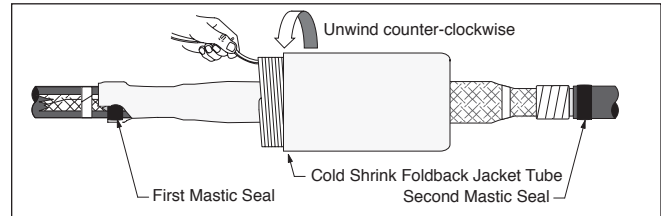
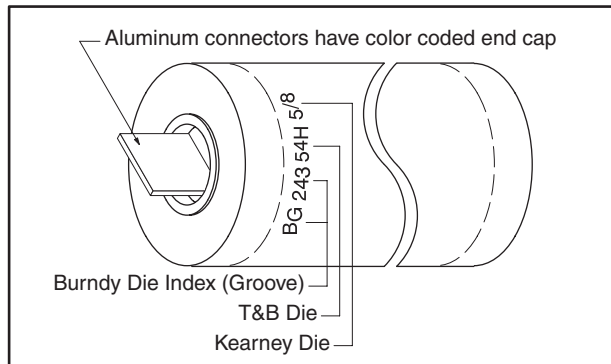


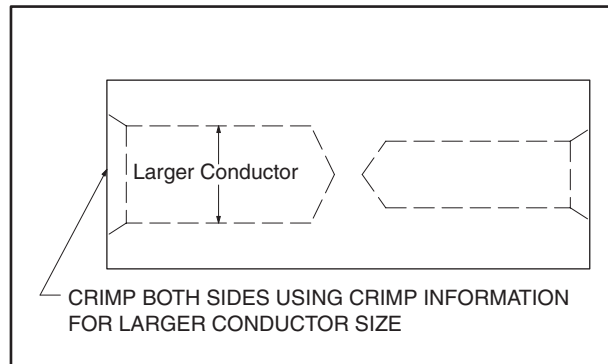
Figure 25

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

Connector Crimping Information – 3M™ Scotchlok™ Connector 2000T



Conductor Size Transition Aluminum Connectors (Copper/Aluminum)



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** |
| 20014 (Al/Cu) | 500 | — | U34ART (4) | (1) | — | 106H (3) | 106H (4) | (2) | (2) |
| CI-500 (Al/Cu) | | — | U34ART (3) | — | — | — | 106H (3) | (3) | — |
| 20016 (Al/Cu) | 600 | — | U36ART (4) | (1) | — | — | 115H (3) | (3) | (3) |
| 20019 (Al/Cu) | 750 | — | U39ART (4) | — | — | — | 125H (5) | (3) | (3) |
| CI-750 (Al/Cu) | | — | U39ART (3) | — | — | — | 125H (3) | (3) | — |
| 20024 (Al/Cu) | 1000 | — | S44RT, P44RT (4) | — | — | — | 140H (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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Note: The core material being removed from the Splice Body and Jacket Tubes are mixed polymers and can be recycled with other waste. 

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