

3M™ Cold Shrink QT-III Silicone Rubber Termination

For Tape-Over-Wire (TOW) or Wire-Over-Tape (WOT)
Shielded Cable

7673-S-8(S)-TOW/WOT

Instructions

IEEE Std. No. 48

Class 1 Termination

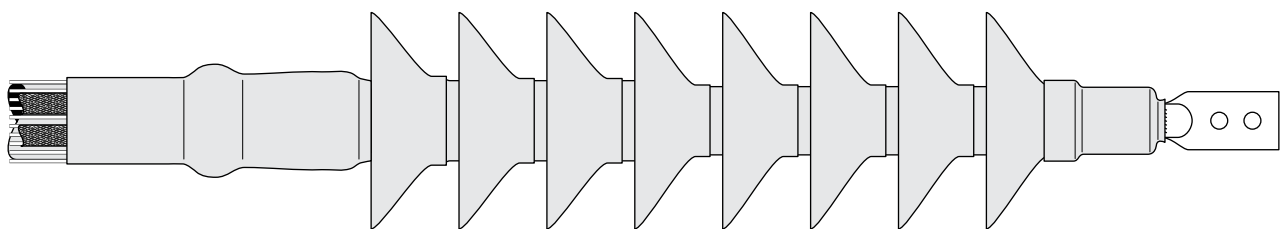
69 kV Class, 350 kV BIL

IEC 60840

72,5 kV

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 Contents

- 1 Silicone Rubber Lug Seal Insulator Assembly
- 1 High-K Stress Control Assembly
- 1 Silicone Rubber Ground Seal Assembly
- 1 Silicone Rubber Skirted Insulator Assembly
- 1 Pre-formed Ground Braid Assembly
- 3 Constant Force Springs
- 1 Roll Scotch® Electrical Shielding Tape 24
- 4 Tubes 3M™ Red Compound P55/R (Non-Silicone Grease)
- 1 Roll 3M™ Scotch-Seal™ Mastic 2229, 1" (25 mm) wide
- 1 Roll Scotch® Silicone Rubber Tape 70
- 1 Roll Scotch® Super Vinyl Electrical Tape 88, 3/4" × 66'
- 1 Roll Scotch® Rubber Mastic Sealing Tape 2228, 2" x 10'
- 2 3M™ Cable Cleaning Pads CC-3
- 1 Strip 3M™ EMI Copper Foil Shielding Tape 1181, 15" long
- 3 Instruction Sheets ((1) Tape-Over-Wire (TOW) or Wire-Over-Tape (WOT) Shielded Cable;
(2) Jacketed Concentric Neutral (JCN) Cable; (3) Tape Shield or Longitudinally Corrugated (LC) Shielded Cable)

Note: Utility Colth (Aluminum Oxide) abrasive materials are required for cable preparation, but are NOT INCLUDED IN KIT. Required grits are P180, P240 and P320. Available 3M™ Utility Colth (Aluminum Oxide) Rolls UPC Codes are:

P180: 51115-19788

P240: 51115-19786

P320: 51115-19784

Note: Do not use knives to open plastic bags.

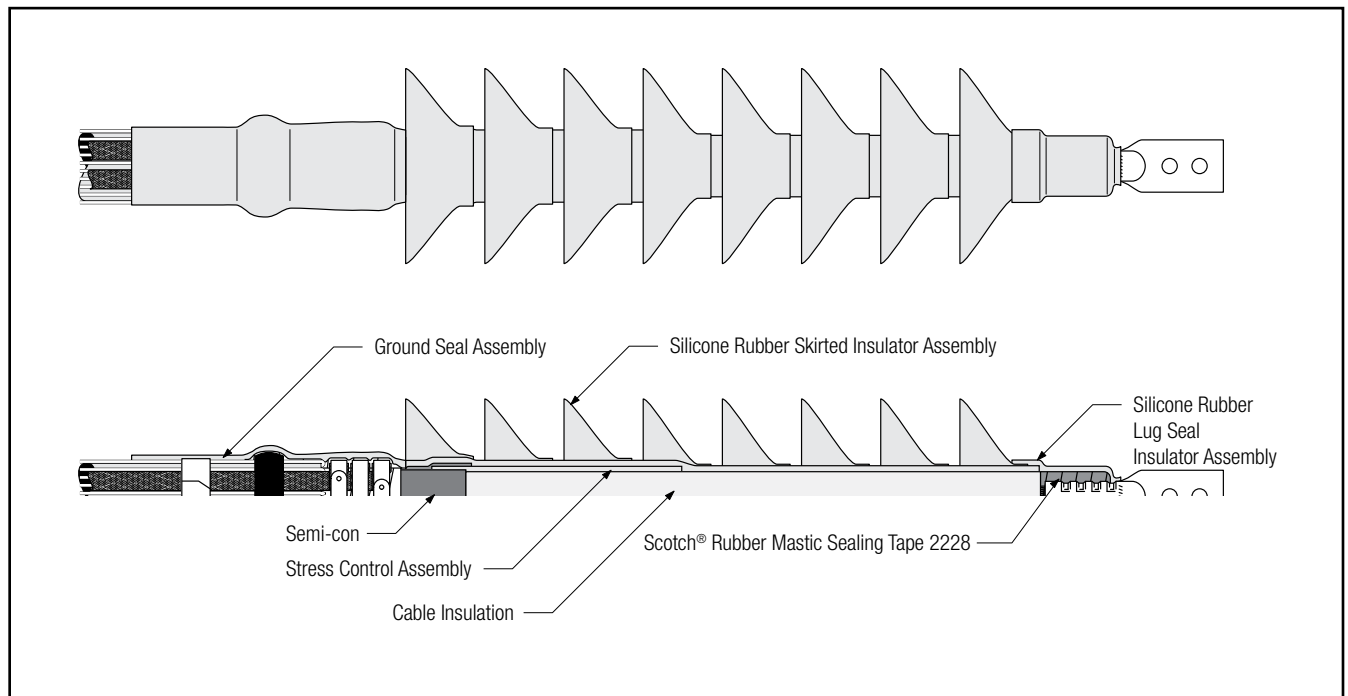
Kit Selection Table

Note: Final determining factor is cable insulation diameter.

Kit Number	Primary Insulation O.D. Range	Jacket O.D. Range	Conductor Size Range* AWG (mm²)
7673-S-8(S)	2.01"-2.87" (51,1-72,9 mm)	2.25"-3.45" (57,2-87,6 mm)	350-1500 (175-725)
*Based on 650 mil insulation thickness			

Table 1

Correct Installation of Termination



Note: Check to insure that the Lug Seal Insulator Assembly tube will fit over the lug. If the lug will not fit through the tube core, contact 3M for an alternative installation procedure.

I. Tape-Over-Wire (TOW) Shield Cable

(For Wire-Over-Tape (WOT) Shield, go to Section II on page 9.)

1.0 Prepare Cable

- 1.1 Check to be sure the cable fits within the kit ranges as shown in Table 1.
- 1.2 Prepare cable using dimensions shown in Figure 1. **BE SURE TO ALLOW FOR DEPTH OF TERMINAL LUG PLUS 0.5" (13 MM) PLUS CRIMP GROWTH.**

NOTE: Provide additional exposed conductor to allow for growth of aluminum lugs or connectors during crimping, as follows;

Conductor Size	250-350	400-650	750-1000	1100-3000
Growth Allowance	0.25" (6 mm)	0.5" (13 mm)	0.75" (19 mm)	Field Determined

Table 2

- 1.2a SANDING OF THE INSULATION IS REQUIRED. Start with P180 grit Utility Cloth (Aluminum Oxide), followed by P240 grit and finally P320 grit. **DO NOT** reduce the cable insulation diameter below that allowed by the kit (see Table 3).
- 1.2b Wipe the cable insulation per paragraph "5.0 Clean Cable Insulation Using Standard Practice" on page 13.
- 1.2c **For cables that have a bonded semi-conductive (semi-con) insulation shield that does not peel squarely. The following steps describe how to square the semi-con cutback. NOTE: GRAPHITE SPRAY IS NOT PROVIDED IN THIS KIT.**

Semi-conductive Graphite Spray can be used to square the semi-con after insulation sanding has been completed. During cable preparation, remove additional cable semi-con to bring the highest point 1/8"-1/4" (3-6 mm) past the instructions semi-con cutback dimension.

Following insulation sanding, use tape and clean plastic wrap to cover/mask the cable insulation from the original semi-con cutback dimension to the end of the insulation and partially cover the cable semi-con leaving 0.5"-1.0" (12-25 mm) exposed. Apply a coat of Graphite Spray (avoid runs caused by excessive spray) and let dry. Apply a second coat of Graphite Spray and let dry. Using soft towel, lightly buff the graphite to remove any loose material. Remove masking tapes and plastic wrap.

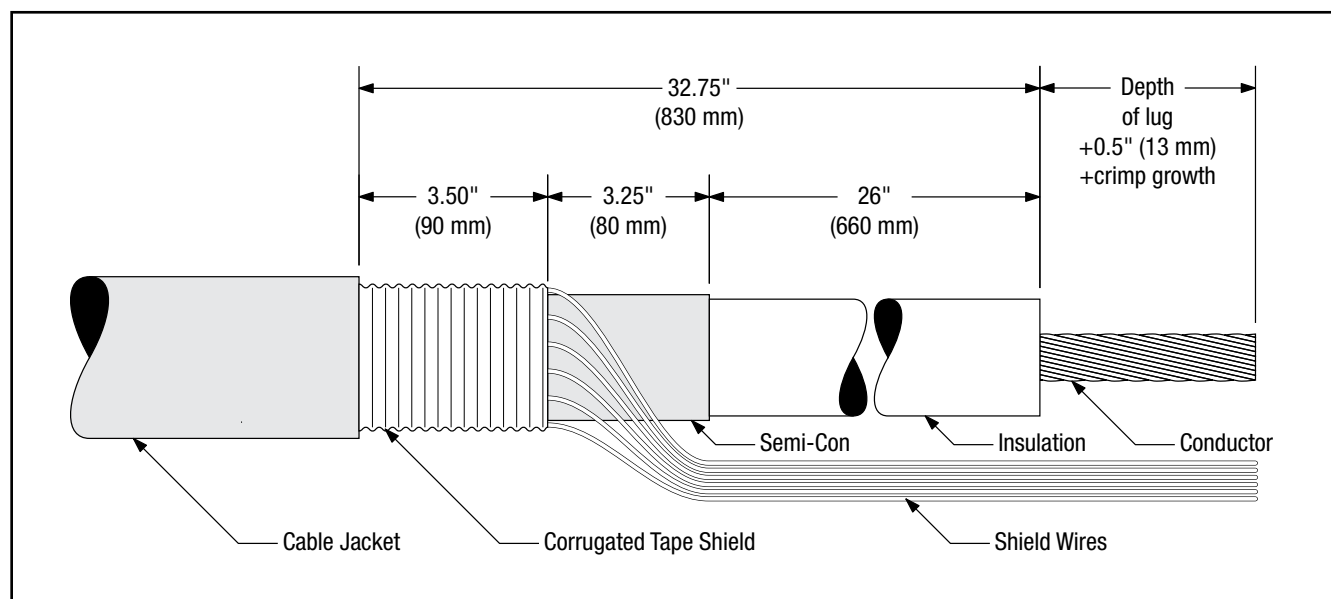


Figure 1

Typical Conductor Size Kcmil (mm ²)	Insulation OD after Preparation Inches (mm)
350-1500 (175-725)	2.01 - 2.87 (51,1 - 72,9)

Table 3

2.0 Install Ground Braid Assembly

- 2.1 For longitudinally corrugated (LC) cables, fill the valleys on the longitudinally corrugated shield with several wraps of Scotch® Electrical Shielding Tape 24. Half-hitch to tie off. (*Figure 2*)

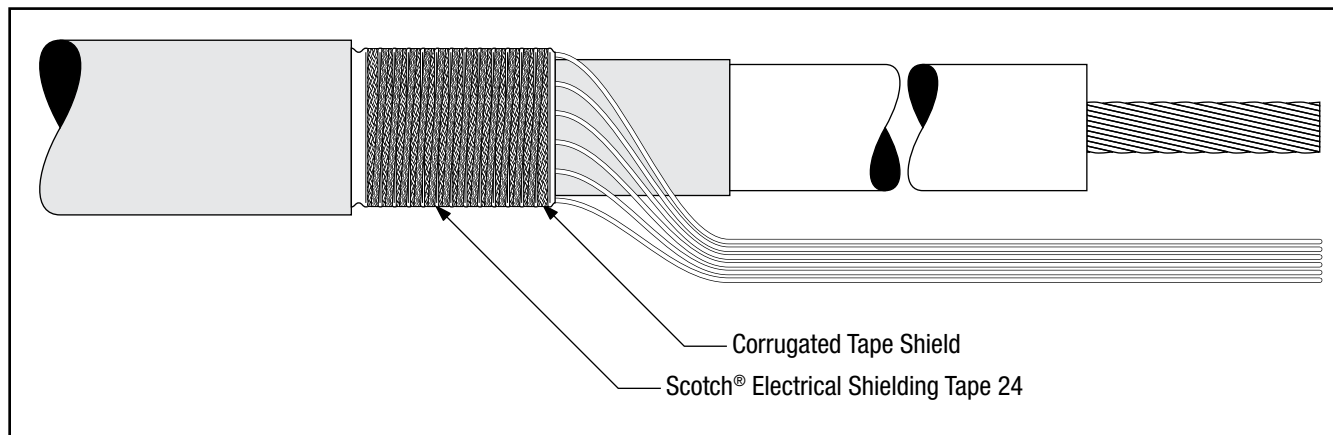


Figure 2

- 2.2 Select the pre-formed ground braid assembly from the kit. Pass the end of the cable through the ground braid assembly loop, and position the ground braid assembly around the flat or corrugated tape shield as shown. (*Figure 3*)

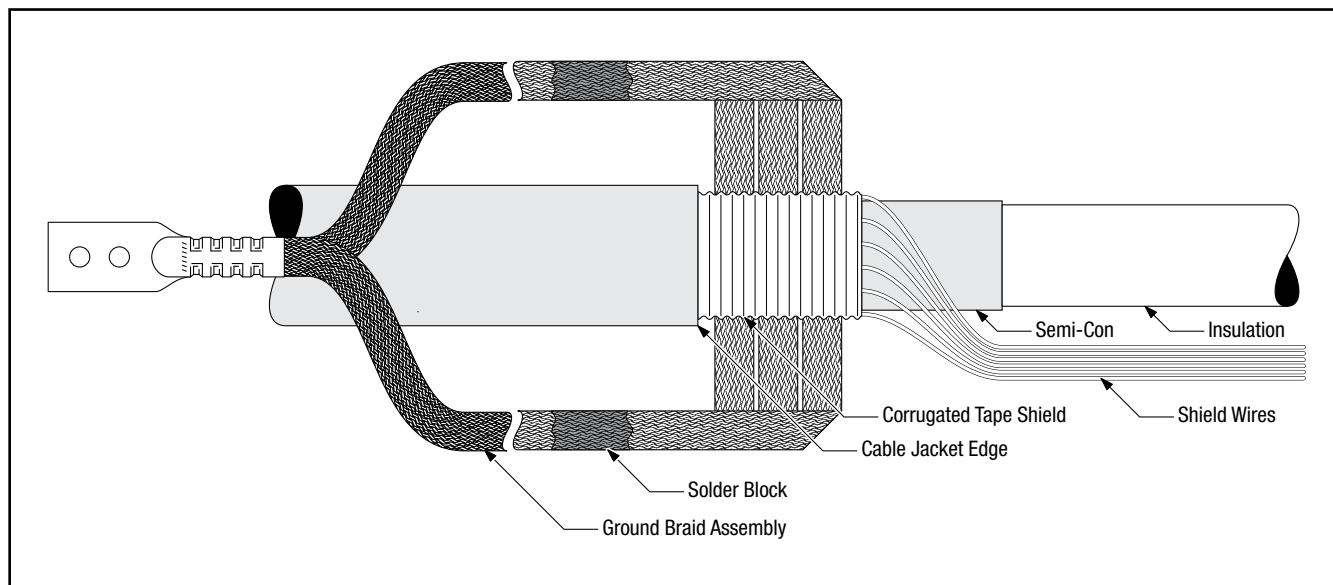


Figure 3

- 2.3 Select the 3 constant force springs from the kit. Starting at the loop of the ground braid assembly nearest the cable jacket edge, install the 3 constant force springs, one around each ground braid loop. Cinch (tighten) the springs after wrapping the final turn. Extend the ground braid tails down the cable jacket. (*Figure 4*)

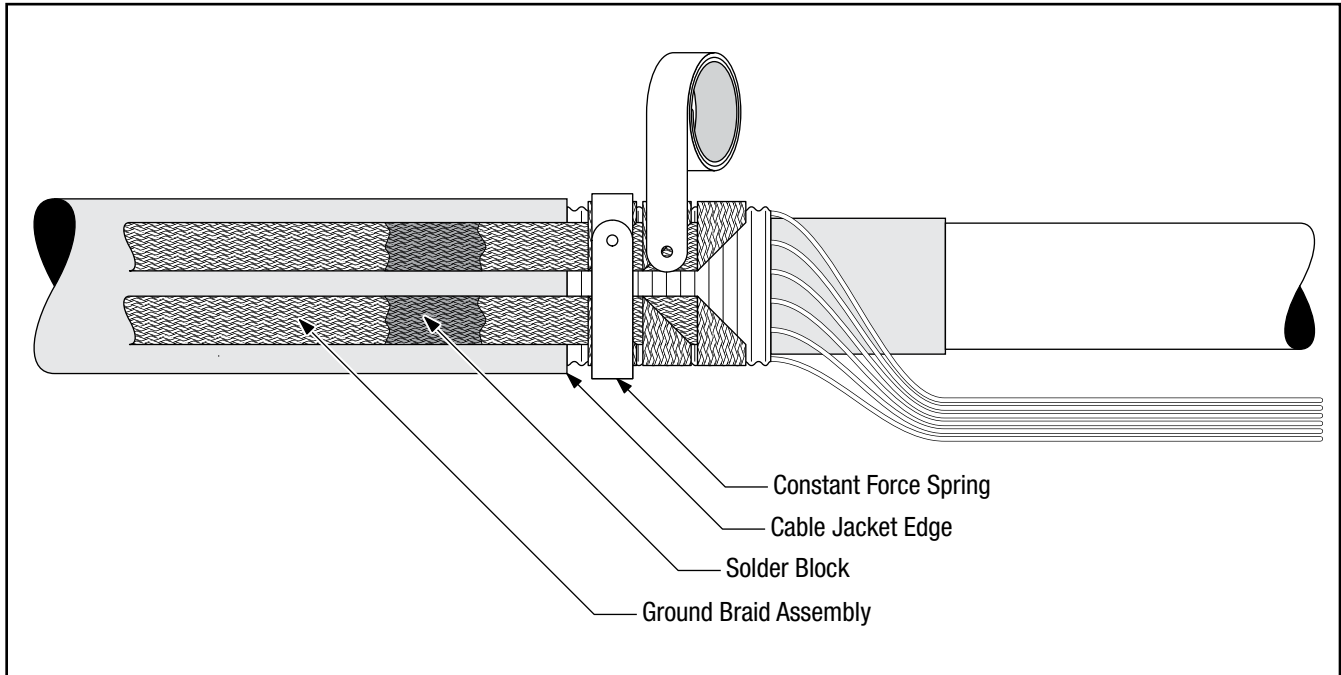


Figure 4

- 2.4 Select the roll of 1" (25 mm) wide 3M™ Scotch-Seal™ Mastic Sealing Tape 2229 from the kit. Cut a length of the tape long enough to wrap around the cable jacket. Remove the release liner from the mastic and, using light tension, apply a **SINGLE WRAP** of mastic around the cable jacket, positioned under the ground braid solder blocks. (*Figure 5*)

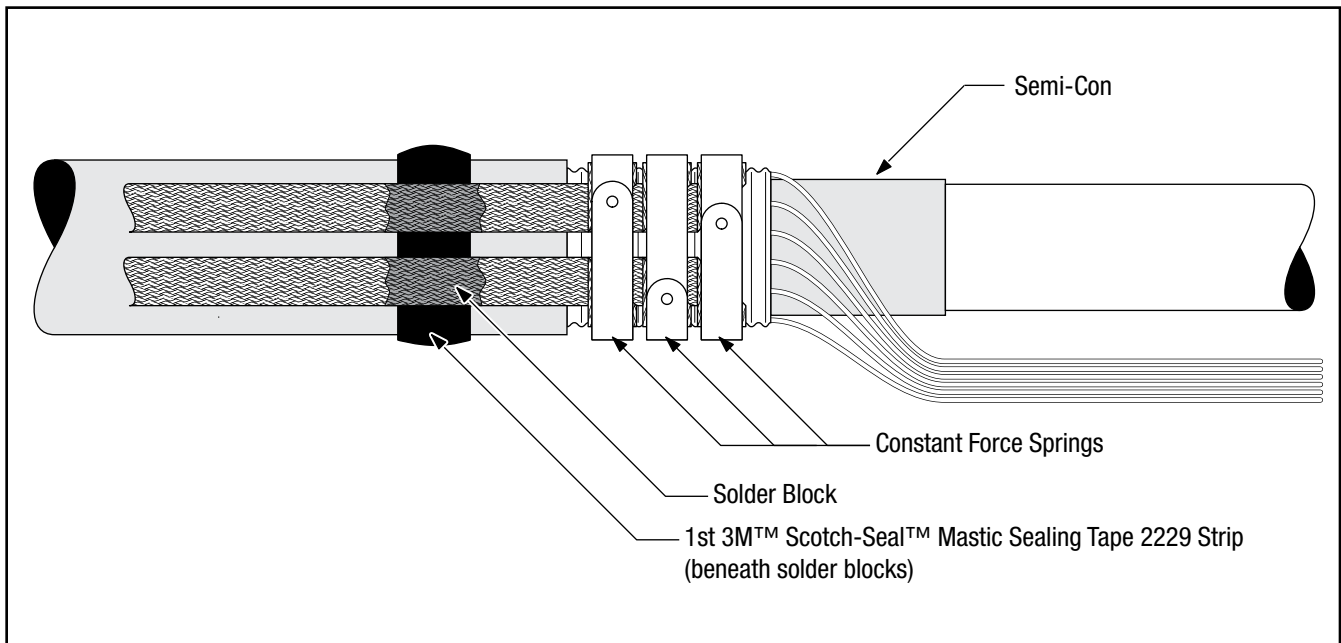


Figure 5

- 2.5 Cut four 1" (25 mm) lengths of 1" (25 mm) wide 3M™ Scotch-Seal™ Mastic Sealing Tape 2229. Remove the release liner and roll each mastic strip into a small roll. (*Figure 6*) Press the mastic rolls into place on either side of the ground braid solder blocks. (*Figure 7*)

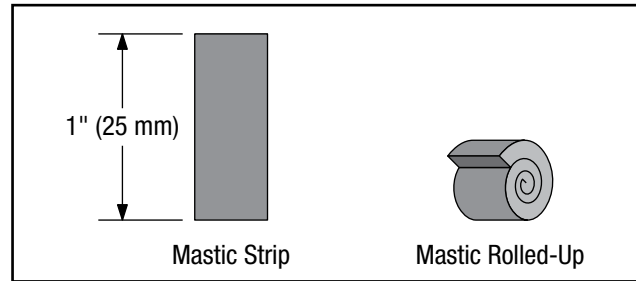


Figure 6

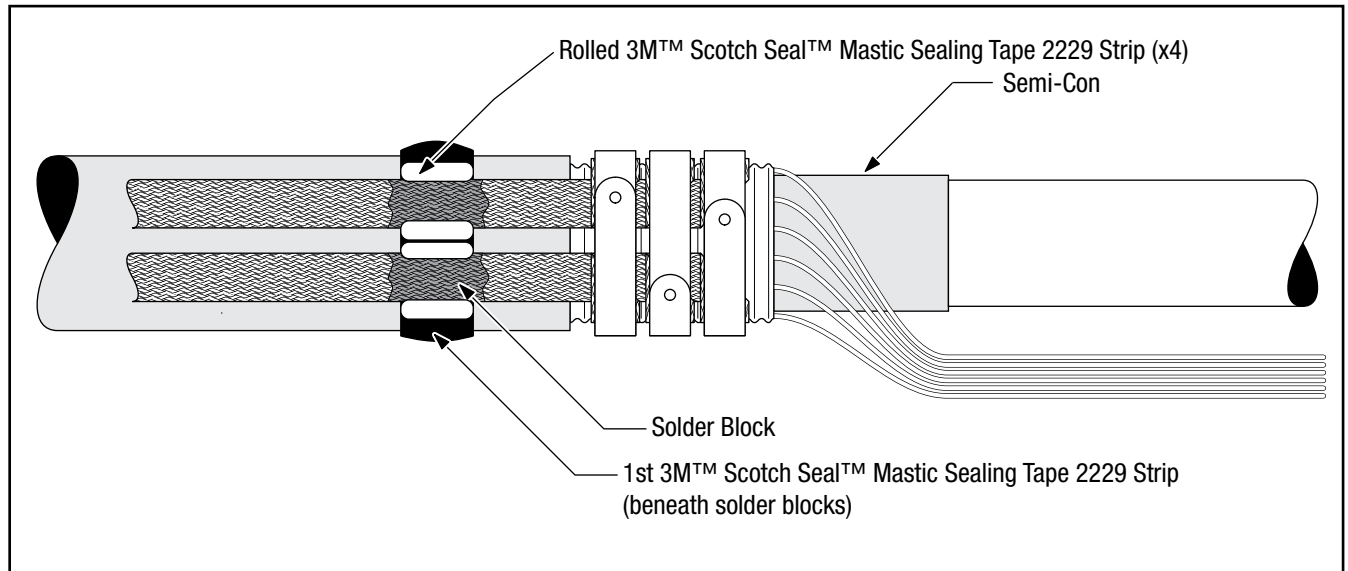


Figure 7

- 2.6 Select the roll of 1" (25 mm) wide 3M™ Scotch-Seal Mastic Sealing Tape 2229 from the kit and cut a length of the mastic long enough to cover the ground braid solder blocks and previously applied mastic. Using light tension, apply a **SINGLE WRAP** of mastic around the cable jacket over the ground braid solder blocks and the previously applied mastic. Fold the shield wires, evenly spaced, back over the mastic. (*Figure 8*)

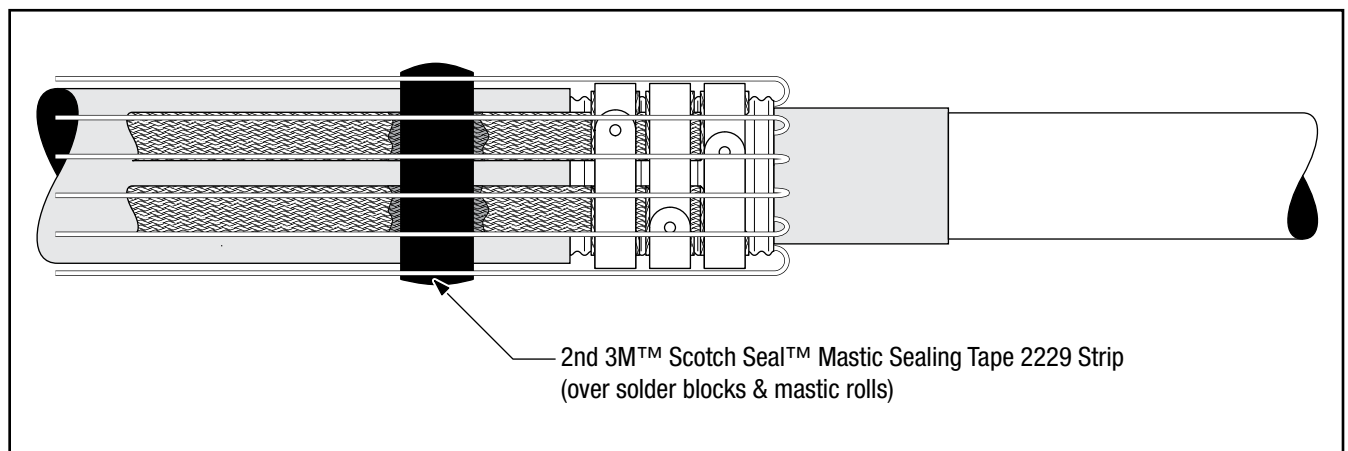


Figure 8

- 2.7 Cut a third length of 3M™ Scotch-Seal™ Mastic Sealing Tape 2229 long enough to wrap a **SINGLE WRAP** over wires, applied mastic and solder blocks. Remove the release liner from the mastic and, using light tension, apply mastic over the shield wires and previously applied mastic. (*Figure 9*)
- 2.8 Secure the shield wires and the two tails of the ground braid assembly to the cable jacket approximately 6" (150 mm) from the cable jacket edge with several wraps of vinyl tape. (*Figure 9*)

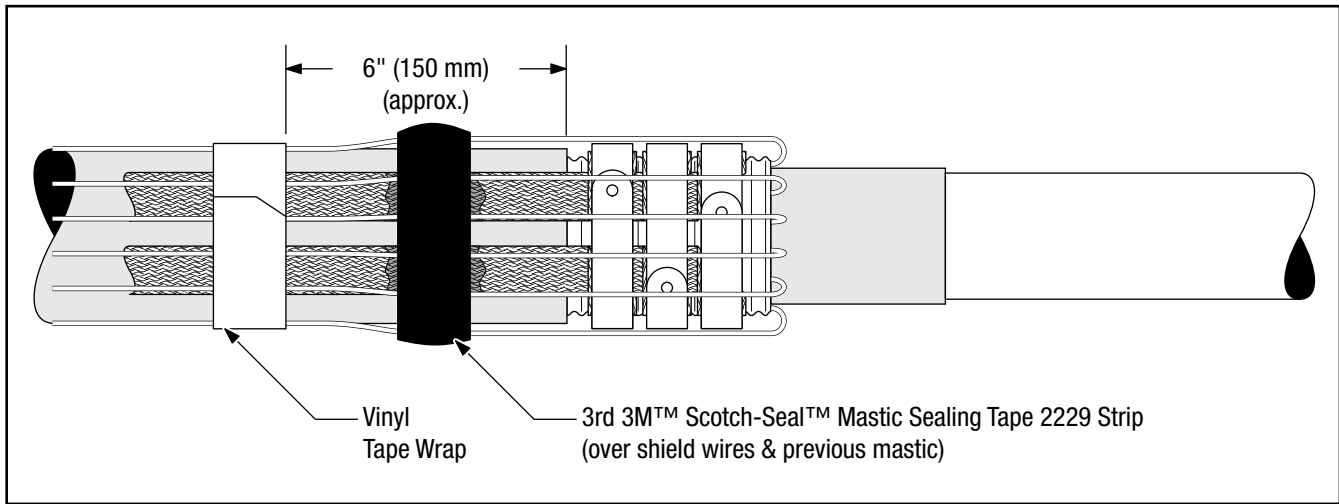


Figure 9

- 2.9 Wrap two half-lapped layers of highly-tensioned Scotch® Vinyl Electrical Tape Super 88 over the mastic seal and constant force springs. Cover all exposed mastic, constant force springs and tape shield, overlapping 0.25" (6 mm) onto the exposed cable semi-con. (*Figure 10*)

Note: Take care to leave 3.0" (76 mm) of exposed semi-con. This will be a marker tape location later.

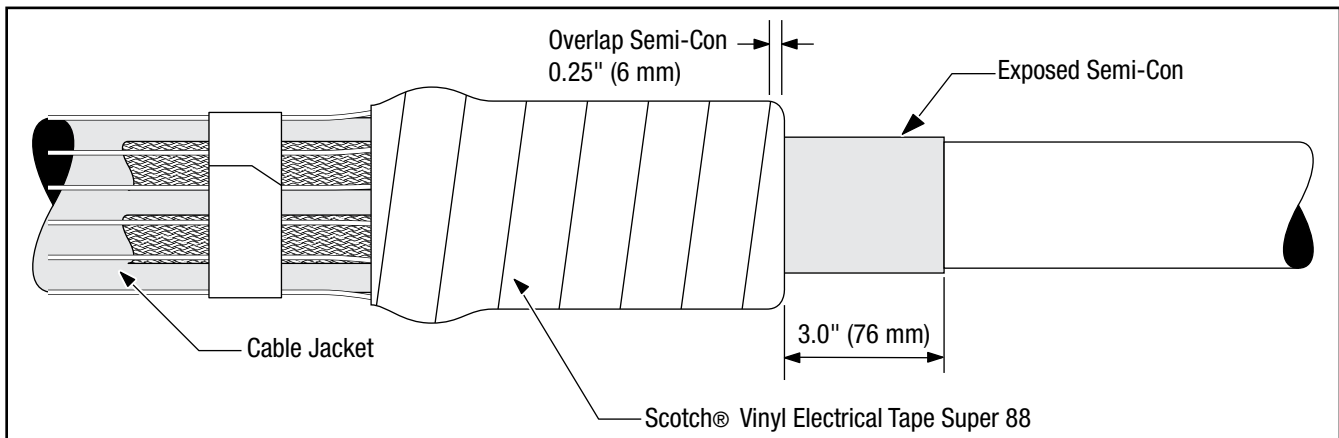


Figure 10

- 2.10 Proceed to paragraph "5.0 Clean Cable Insulation Using Standard Practice" on page 13.

II. Wire-Over-Tape Shield Cable

3.0 Prepare Cable

- 3.1 Check to be sure the cable fits within the kit ranges as shown in Table 1.
- 3.2 Prepare cable using dimensions shown in Figure 11. **BE SURE TO ALLOW FOR DEPTH OF TERMINAL LUG PLUS 0.5" (13 MM) PLUS CRIMP GROWTH.**

NOTE: Provide additional exposed conductor to allow for growth of aluminum lugs or connectors during crimping, as follows;

Conductor Size	250-350	400-650	750-1000	1100-3000
Growth Allowance	0.25" (6 mm)	0.5" (13 mm)	0.75" (19 mm)	Field Determined

Table 4

- 3.2a SANDING OF THE INSULATION IS REQUIRED. Start with P180 grit Utility Cloth (Aluminum Oxide), followed by P240 grit and finally P320 grit. **DO NOT** reduce the cable insulation diameter below that allowed by the kit (see Table 3).
- 3.2b Wipe the cable insulation per paragraph "5.0 Clean Cable Insulation Using Standard Practice" on page 13.
- 3.2c **For cables that have a bonded semi-conductive (semi-con) insulation shield that does not peel squarely. The following steps describe how to square the semi-con cutback. NOTE: GRAPHITE SPRAY IS NOT PROVIDED IN THIS KIT.**

Semi-conductive Graphite Spray can be used to square the semi-con after insulation sanding has been completed. During cable preparation, remove additional cable semi-con to bring the highest point 1/8"-1/4" (3-6 mm) past the instructions semi-con cutback dimension.

Following insulation sanding, use tape and clean plastic wrap to cover/mask the cable insulation from the original semi-con cutback dimension to the end of the insulation and partially cover the cable semi-con leaving 0.5"-1.0" (12-25 mm) exposed. Apply a coat of Graphite Spray (avoid runs caused by excessive spray) and let dry. Apply a second coat of Graphite Spray and let dry. Using soft towel, lightly buff the graphite to remove any loose material. Remove masking tapes and plastic wrap.

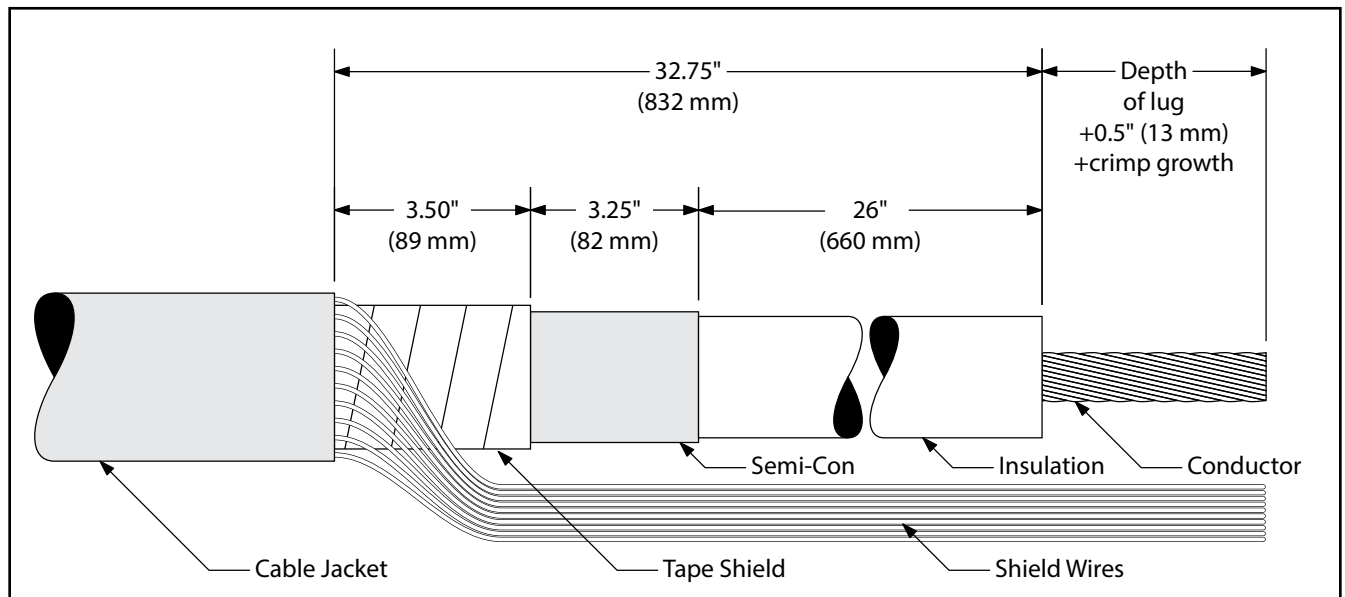


Figure 11

Typical Conductor Size Kcmil (mm²)	Insulation OD after Preparation Inches (mm)
350-1500 (175-725)	2.01 - 2.87 (51,1 - 72,9)

Table 5

4.0 Install Ground Braid Assembly

- 4.1 Fold the shield wires back along the cable jacket. Select the pre-formed ground braid assembly from the kit. Pass the end of the cable through the ground braid assembly loop, and position the ground braid assembly around the tape shield as shown. (Figure 12)

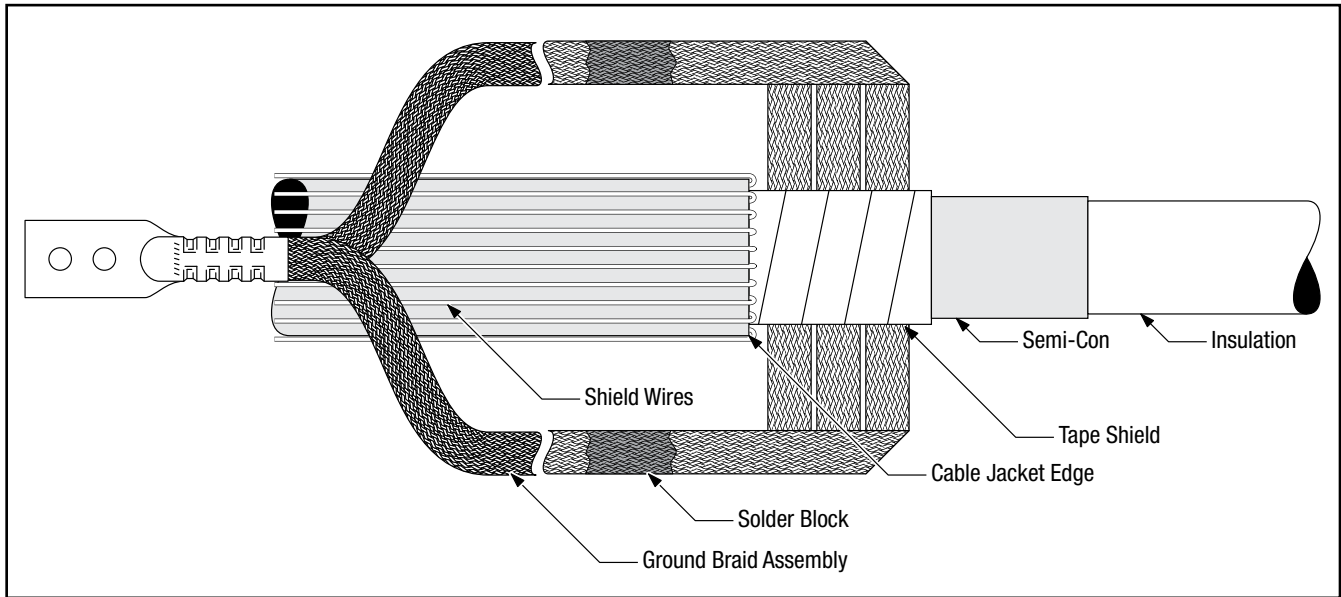


Figure 12

- 4.2 Select the 3 constant force springs from the kit. Starting at the loop of the ground braid assembly nearest the cable jacket edge, install the 3 constant force springs, one around each ground braid loop. Cinch (tighten) the springs after wrapping the final turn. Mark the solder block location on the cable jacket. (Figure 13)

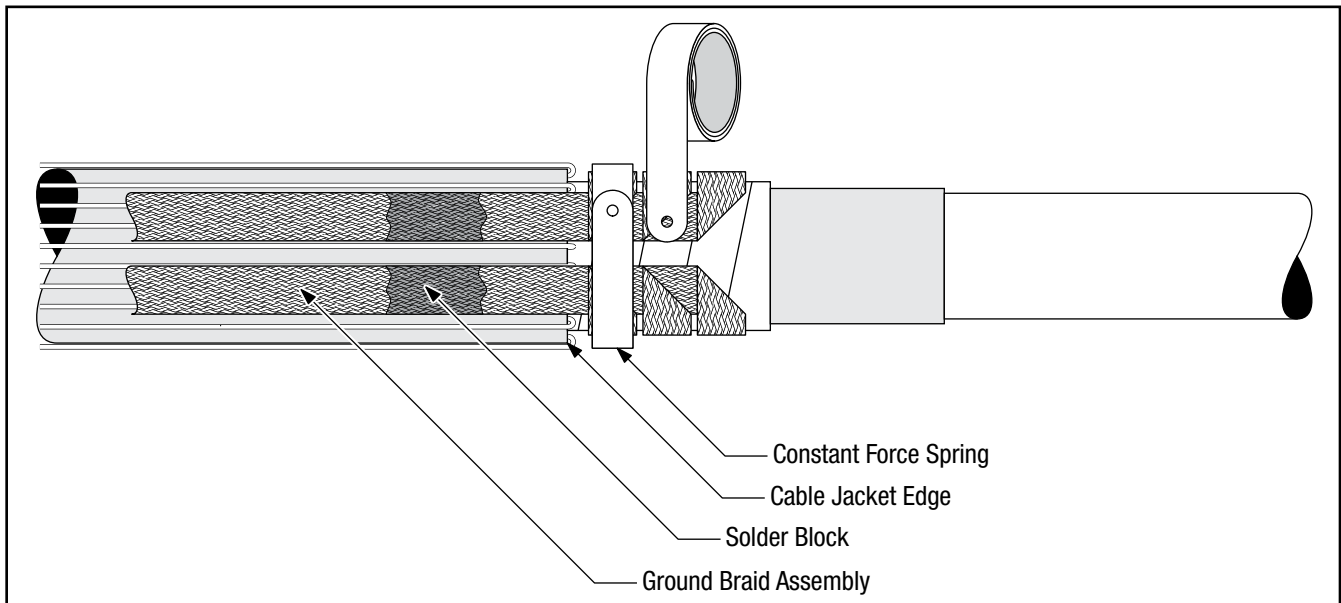


Figure 13

- 4.3 Select the roll of 1" (25 mm) wide 3M™ Scotch-Seal™ Mastic Sealing Tape 2229 from the kit. Cut a length of mastic long enough to wrap around the cable jacket. Lift the ground braid tails and shield wires. Remove the release liner from the mastic and using light tension, apply a **SINGLE WRAP** of mastic around the cable jacket positioned under the ground braid solder blocks and shield wires. Fold the shield wires, evenly spaced, back over the mastic. (Figure 14)

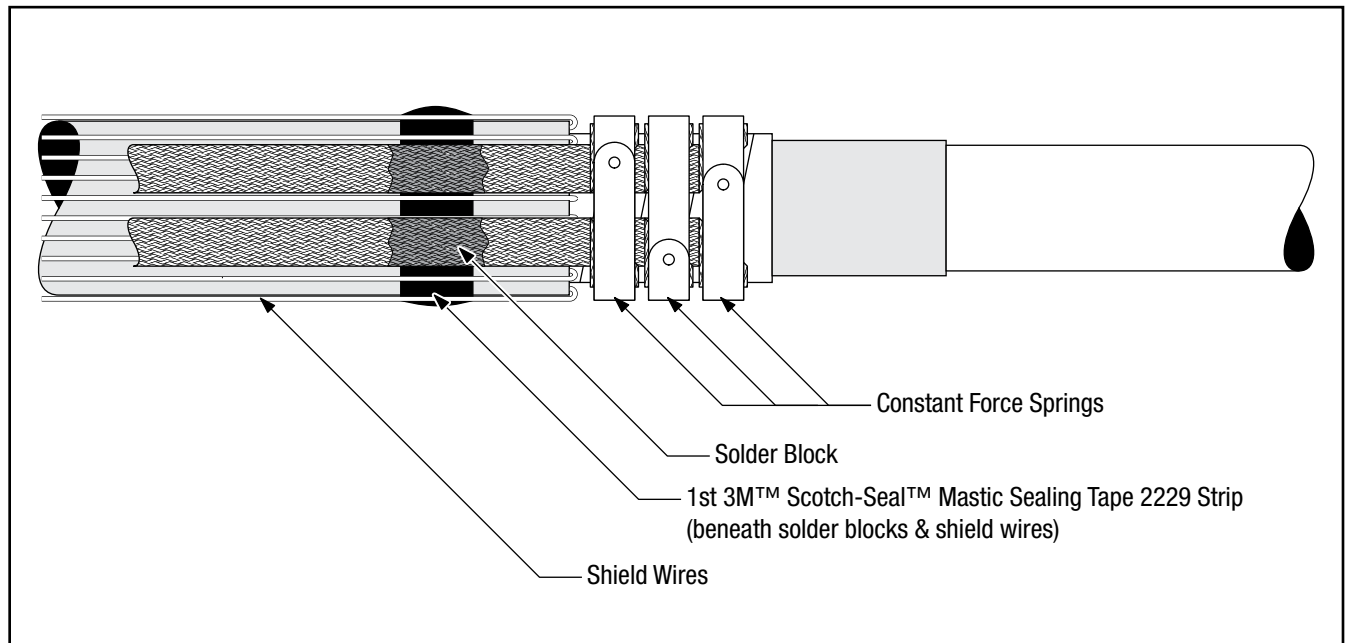


Figure 14

- 4.4 Select the roll of 1" (25 mm) wide 3M Scotch-Seal Mastic Sealing Tape 2229 from the kit. Cut a length of mastic long enough to wrap over the shield wires and previously applied mastic. Fold the ground braid tails out of the way. Remove the release liner from the mastic and, using light tension, apply a **SINGLE WRAP** of mastic around the cable jacket, positioned over the shield wires and previously applied mastic. (Figure 15)

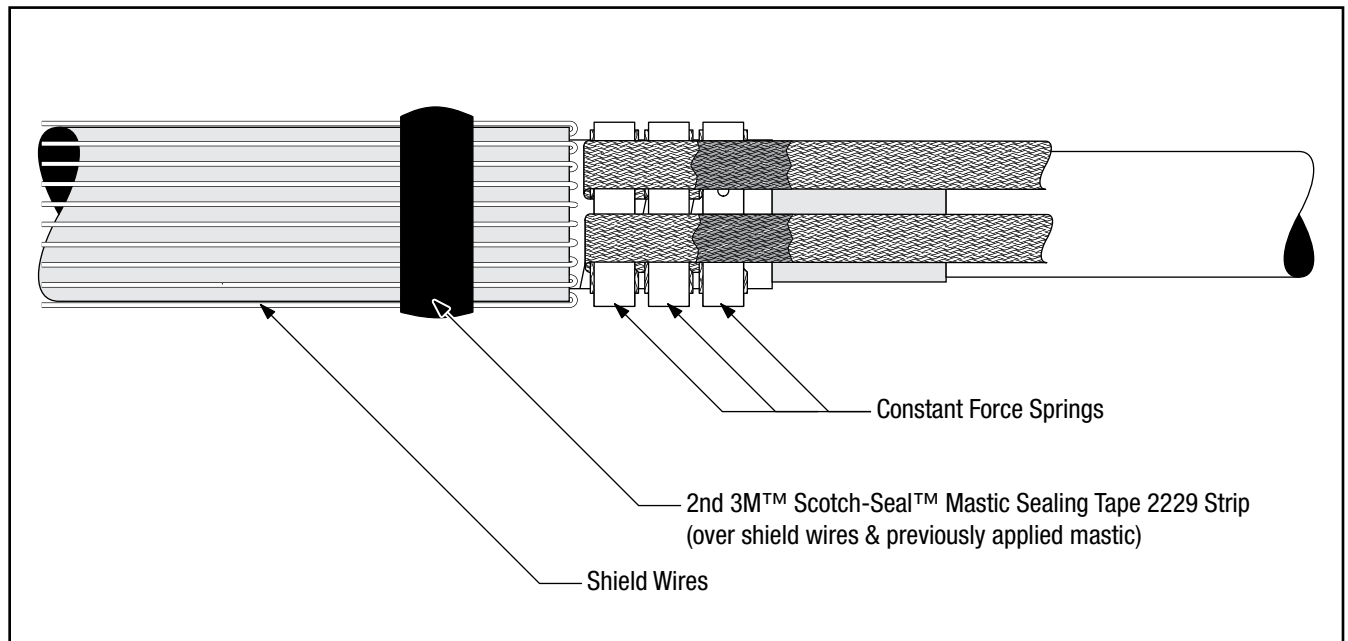


Figure 15

- 4.5 Cut four 1" (25 mm) lengths of 1" (25 mm) wide 3M™ Scotch-Seal™ Mastic Sealing Tape 2229. Remove the release liner and roll each mastic strip into a small roll. (*Figure 16*) Press the mastic rolls into place on either side of the ground braid solder blocks. (*Figure 17*)

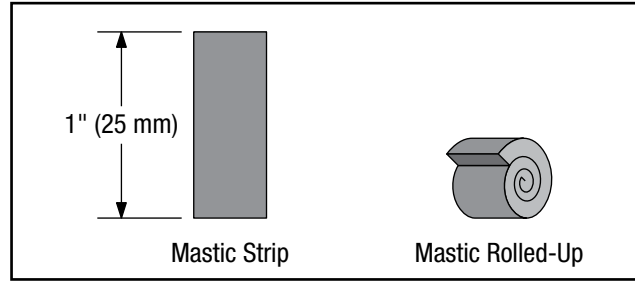


Figure 16

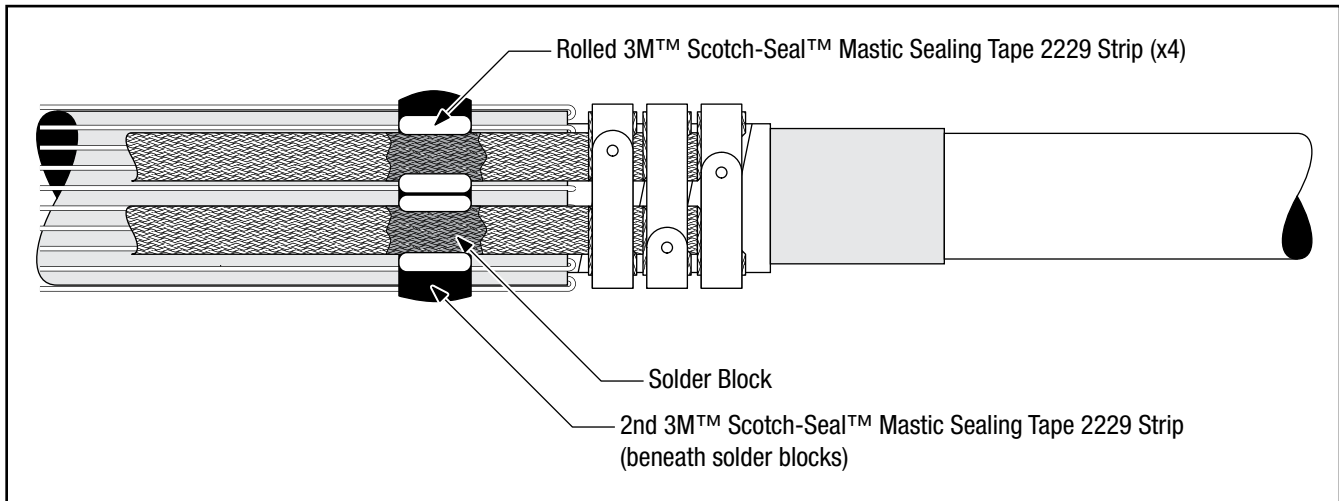


Figure 17

- 4.6 Cut a third length of 3M™ Scotch-Seal™ Mastic Sealing Tape 2229 Strip long enough to wrap a **SINGLE WRAP** over applied mastic and solder blocks. Remove the release liner from the mastic and, using light tension, apply mastic over the shield wires and previously applied mastic. (*Figure 18*)
- 4.7 Secure the shield wires and the two tails of the ground braid assembly to the cable jacket approximately 6" (150 mm) from the cable jacket edge with several wraps of vinyl tape. (*Figure 18*)

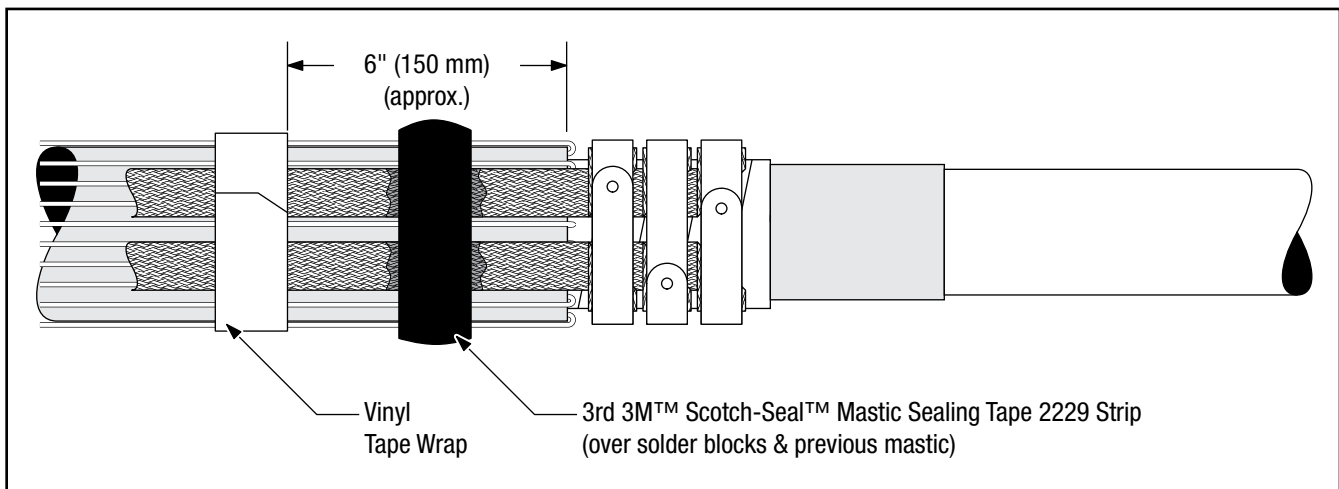


Figure 18

- 4.8 Wrap two half-lapped layers of highly-tensioned Scotch® Vinyl Electrical Tape Super 88 over the mastic seal and constant force springs. Cover all exposed mastic, constant force springs and tape shield, overlapping 0.25" (6 mm) onto the exposed cable semi-con. (Figure 19)

Note: Take care to leave 3.0" (76 mm) of exposed semi-con. This will be a marker tape location later.

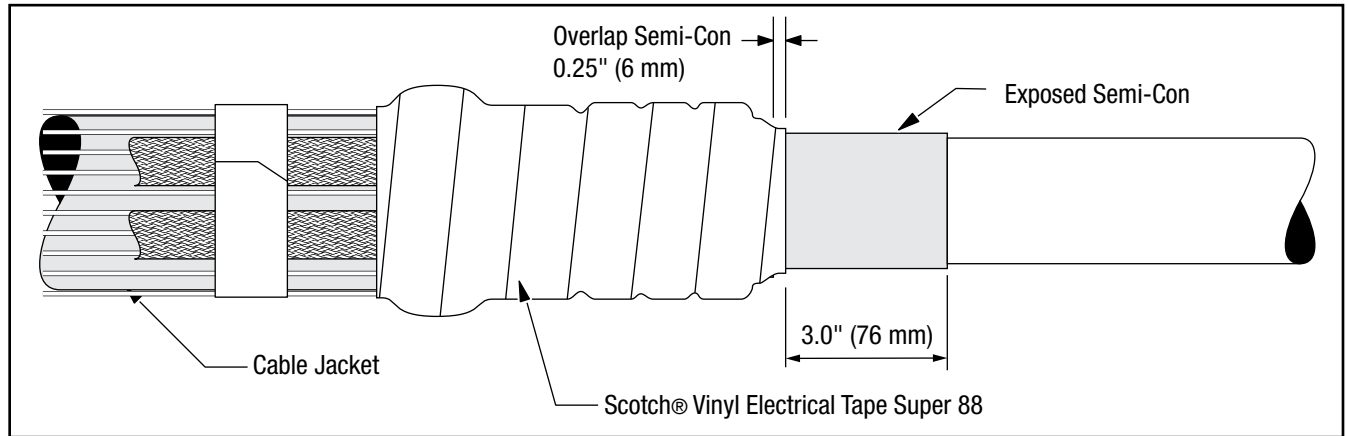


Figure 19

5.0 Clean Cable Insulation Using Standard Practice

- 5.1 Use only aluminum oxide abrasive (320 grit or higher) to finish and polish insulation surface, if not already completed during Prepare Cable section.
- 5.2 Use abrasive only on cable insulation. **DO NOT USE ON SEMI-CON.**
- 5.3 When using abrasive, do not reduce the cable insulation diameter below that allowed by the kit.
- 5.4 Wipe the cable insulation clean with a cleaning pad from the included 3M™ Cable Cleaning Pads CC-3 or an approved solvent. **DO NOT ALLOW THE SOLVENT TO TOUCH SEMI-CON INSULATION SHIELD OR GRAPHITE SPRAY, IF USED.**

Note: Remove any remaining solvent with 3M™ Cable Cleaning Pads CC-DRY (not supplied with kit) or lint-free cloth.

6.0 Install Termination

- 6.1 Slide the ground seal assembly (this is the cold shrink tubular assembly on the larger core) onto the cable jacket, loose core end first. (Figure 20)

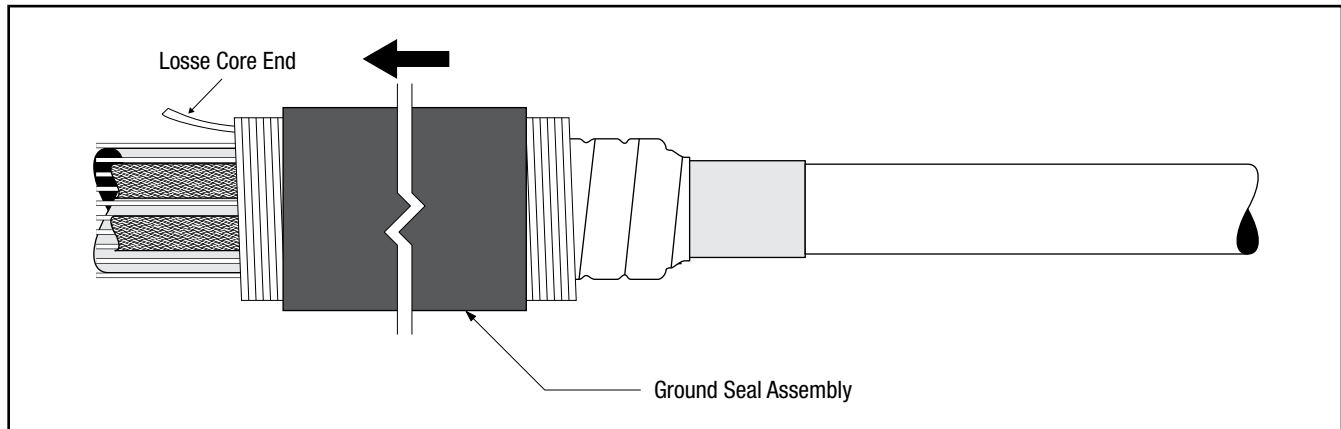


Figure 20

- 6.2 Place a marker tape on the cable semi-con located 1.75" (45 mm) from the end of the semi-con. (Figure 21)

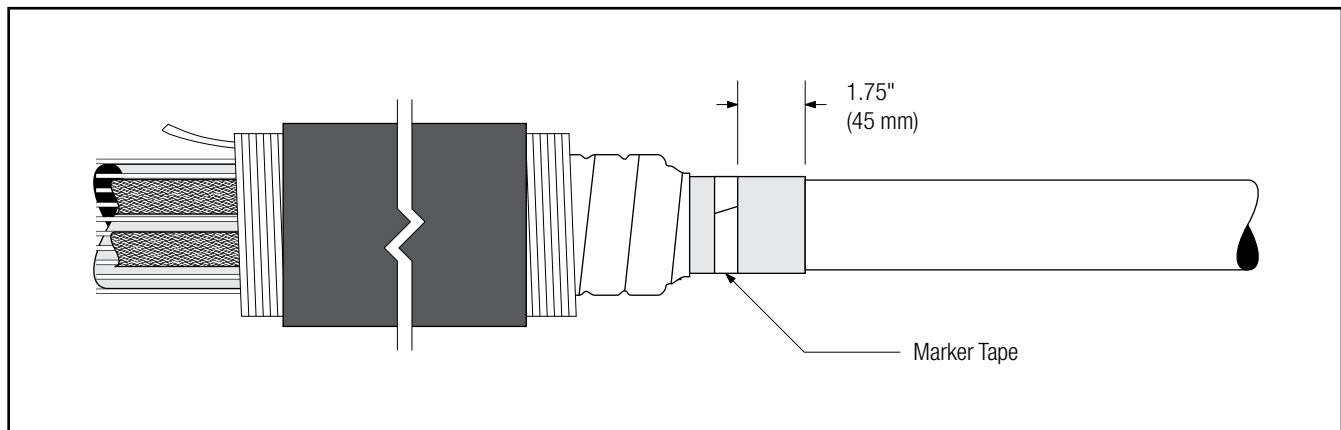


Figure 21

- 6.3 Apply 1 tube of 3M™ Red Compound P55/R starting at marker tape and continuing onto the cable insulation for approximately 8" (200 mm). (Figure 22)

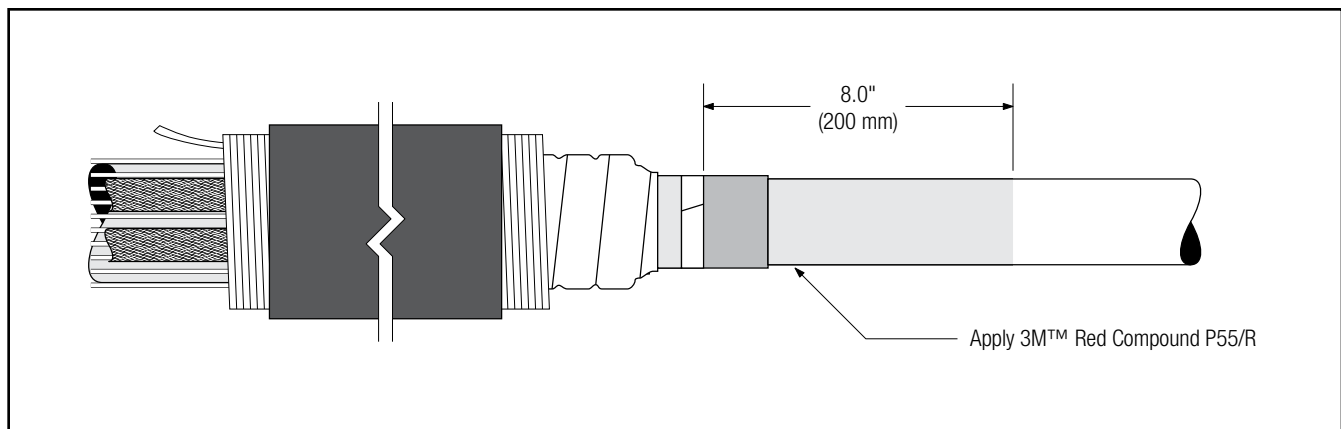


Figure 22

- 6.4 Select the stress control assembly (this is the medium length, black colored, two-piece cold shrink tubular assembly on one medium size core) from the kit. Slide the stress control assembly over the cable with the loose core end toward the cable end. Align the stress control assembly tube (not the core) with the marker tape, and remove the core by pulling the loose core end while unwinding counter-clockwise. (Figure 23)

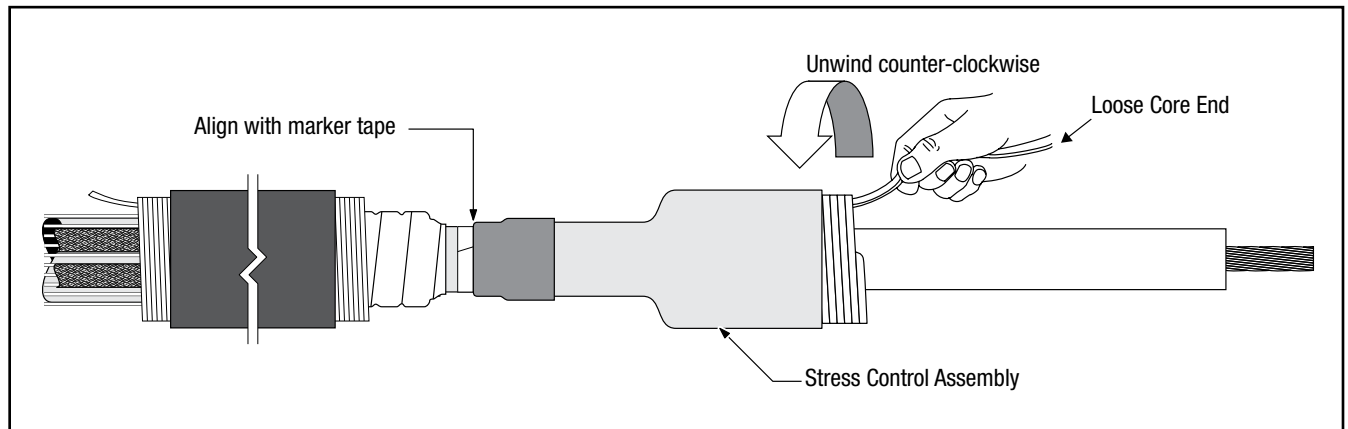


Figure 23

- 6.5 Apply 2 tubes 3M™ Red Compound P55/R to the exposed insulation and stress control assembly. Make certain to fill the steps of the stress control assembly, as indicated in figure 24, with the 3M™ Red Compound P55/R. (Figure 24)

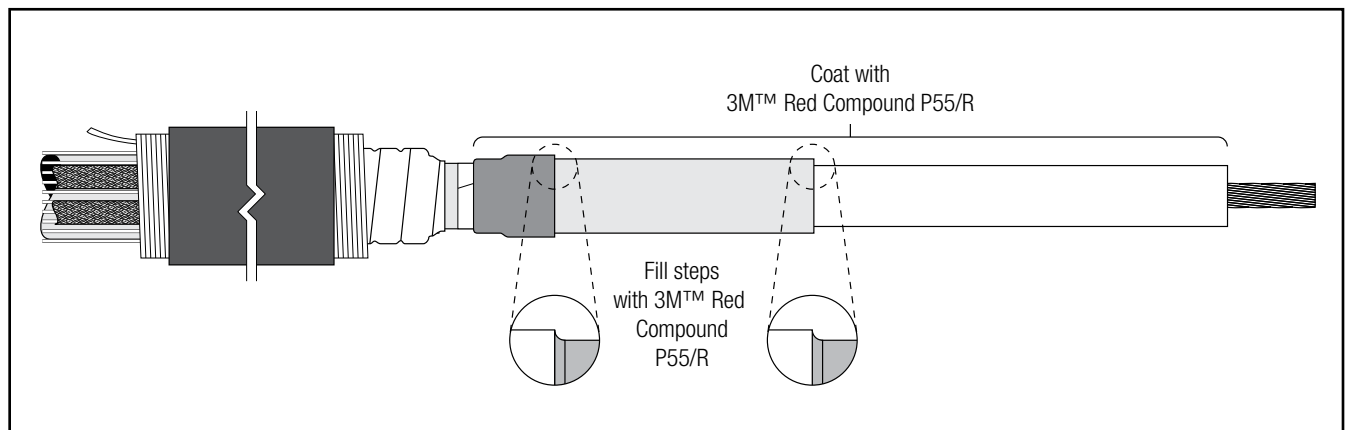


Figure 24

- 6.6 Slide the cold shrink silicone rubber skirted insulator assembly onto the cable. Align the assembly tube (not the core) with the end of the sealing mastic/constant force spring cover tape located 3.0" (76 mm) from the end of the cable semi-con. (Figure 25)

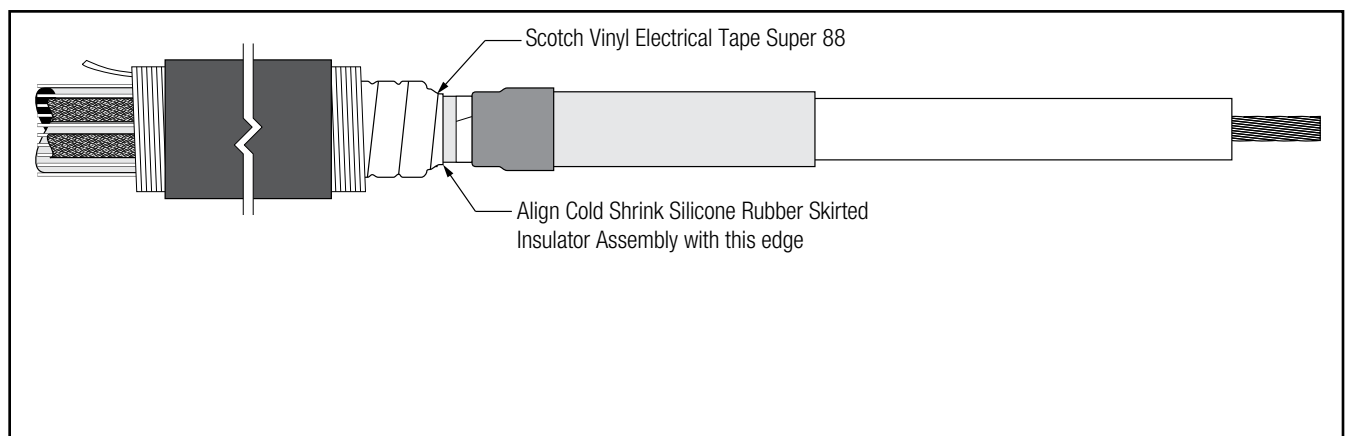


Figure 25

6.7 Remove the core by pulling the loose core end while unwinding counter-clockwise. (Figure 26)

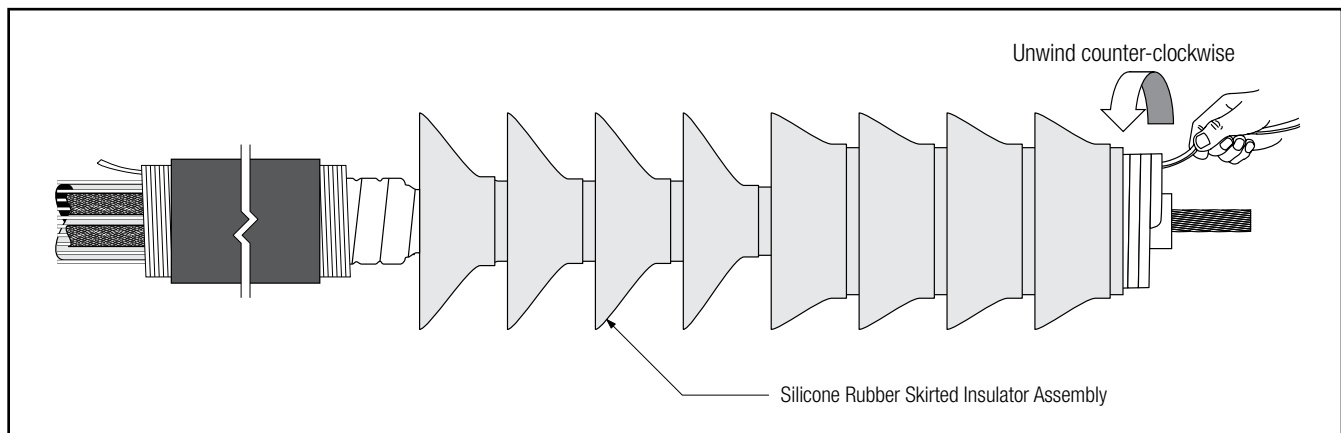


Figure 26

7.0 Install Lug or Connector

Note: For Aluminum Conductors - Thoroughly wire brush conductor strands to remove aluminum oxide layer. Immediately insert conductor into lug or connector barrel as far as it will go.

- 7.1 Position lug or connector and crimp according to manufacturer's directions. Remove excess oxide inhibitor and sharp crimp flashing following crimping. Figure 27 illustrates the appearance following installation of the Skirted Insulator Assembly and Lug. Note extension of approximately 1" (25 mm) cable insulation beyond the end of the installed Skirted Insulator Assembly and 1/2" (13 mm) gap from the end of the lug the cable insulation.

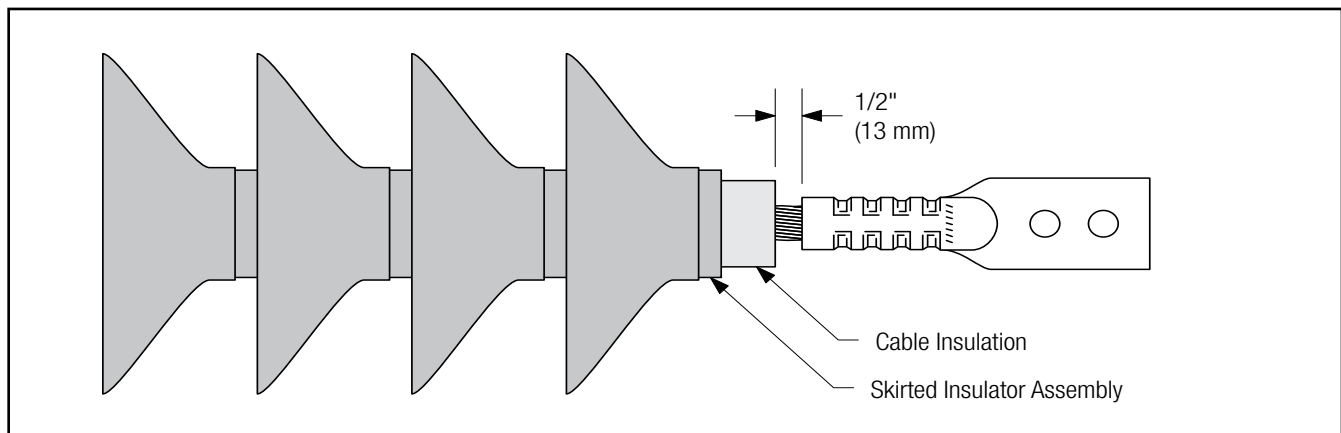


Figure 27

- 7.2 Wrap Scotch® Rubber Mastic Sealing Tape 2228 half-lapped over the lug or connector barrel and the 1/2" (13 mm) insulation/lug gap, building to a diameter equal to the cable insulation and tapered toward the required 2" (50 mm) coverage length onto the lug or connector barrel. Cover 2" (50 mm) of the lug or connector barrel. (*Figure 28*)
NOTE: Do Not build tape O.D. larger than the end of the Skirted Insulator Assembly and Do Not tape over the end of the Skirted Insulator Assembly.

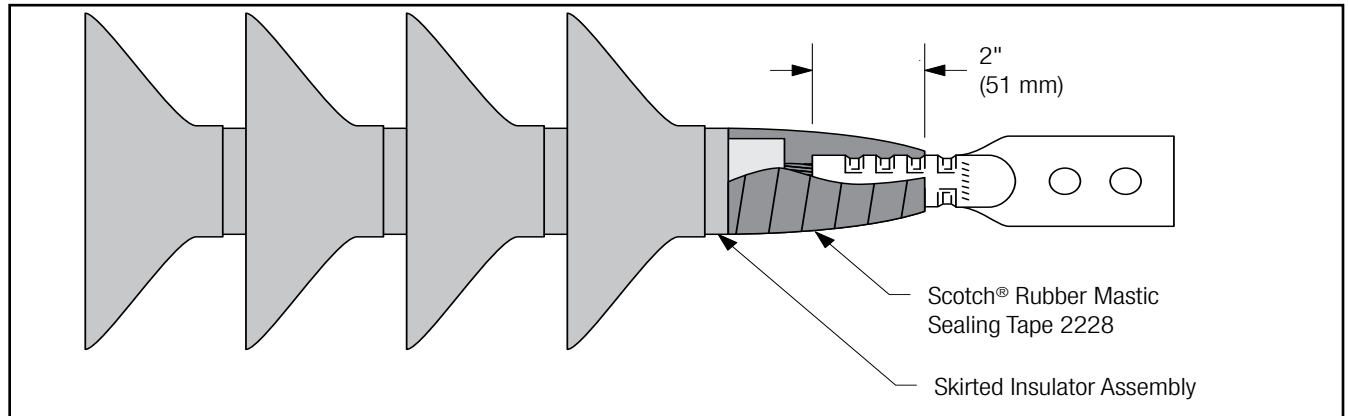


Figure 28

8.0 Install Sealing Tubes

- 8.1 Slide the parked cold shrink silicone rubber ground seal assembly onto the termination. Start to shrink underneath the first skirt. Remove the core by pulling the loose core end while unwinding counter-clockwise. (*Figure 29*)

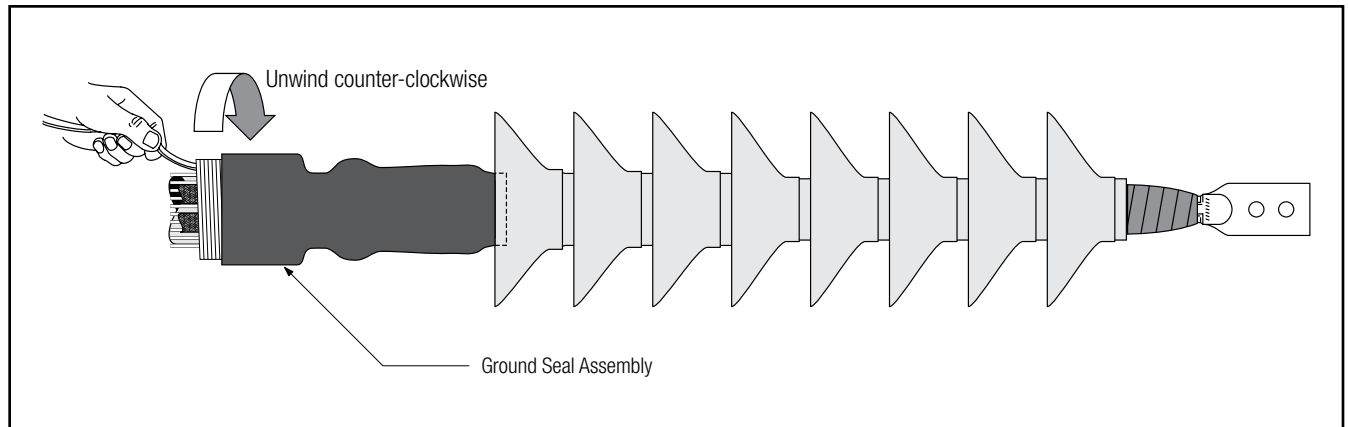


Figure 29

- 8.2 Slide the cold shrink silicone rubber lug seal insulator assembly tube onto the lug, or connector, and termination, as shown in Figure 30. Start to shrink the tube near the top of the last skirt and onto the lug or connector barrel. If the tube overlaps the lug pad, or is not tight to the lug barrel, carefully trim the tube just past (1/4" (6 mm)) the Scotch® Rubber Mastic Sealing Tape 2228. A roll of Scotch® Silicone Rubber Tape 70 is provided to cover the edge of the trimmed tube (See paragraph 8.4 and Figure 32.) Apply with moderate tension, stretching only enough to conform to the lug barrel and tube.

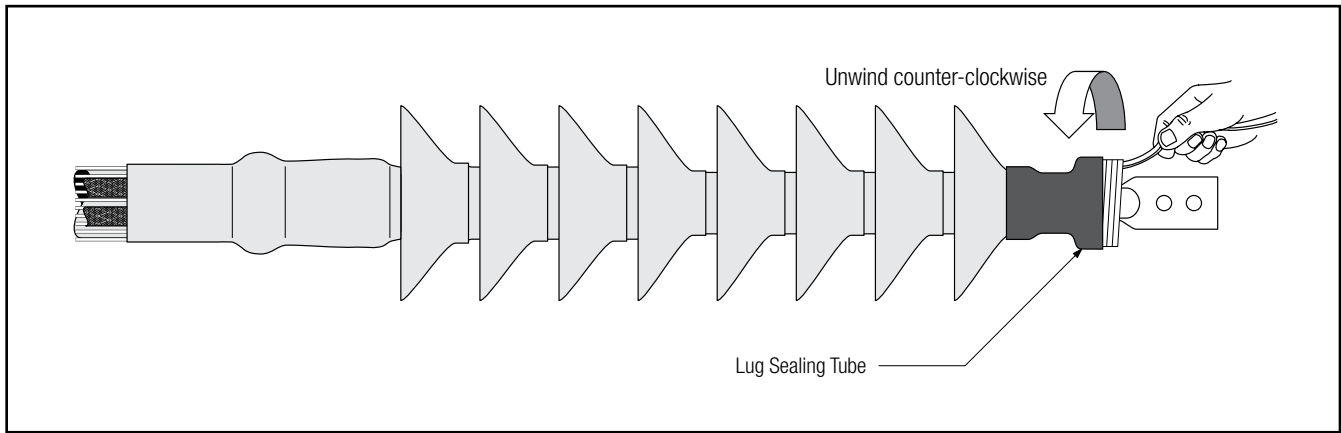


Figure 30

- 8.3 Figure 31 illustrates the appearance following installation of the Cold Shrink Silicone Rubber Lug Seal Insulator Assembly tube.

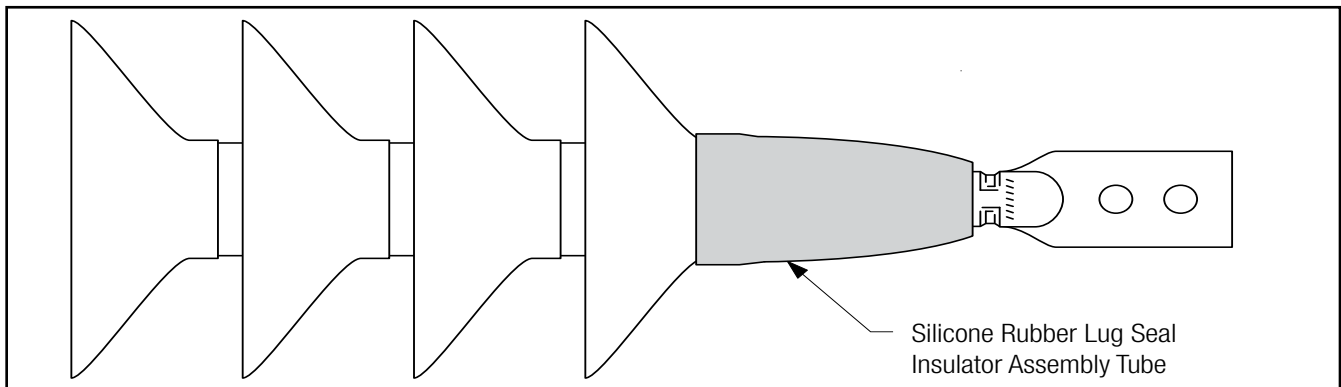


Figure 31

- 8.4 Figure 32 illustrates the appearance following installation of Scotch™ Silicone Rubber Tape 70 (if needed) partially over the the Cold Shrink Silicone Rubber Lug Seal Insulator Assembly tube and the lug barrel.

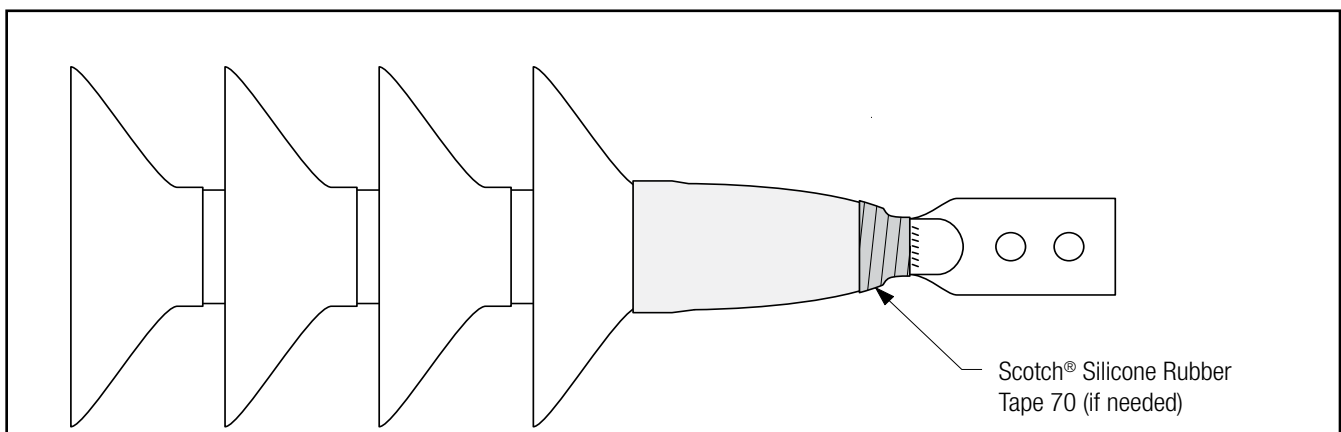


Figure 32

- 8.5 Connect the completed termination to equipment/system following standard practice.
- 8.6 Connect the neutral wires to the ground system following standard practice.

3M, Scotch-Seal and Scotch are trademarks of 3M Company.
All other trademarks are property of their respective owners.

Important Notice

All statements, technical information, and recommendations related to 3M's products are based on information believed to be reliable, but the accuracy or completeness is not guaranteed. Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use. Any statements related to the product which are not contained in 3M's current publications, or any contrary statements contained on your purchase order shall have no force or effect unless expressly agreed upon, in writing, by an authorized officer of 3M.

Warranty; Limited Remedy; Limited Liability.

This product will be free from defects in material and manufacture at the time of purchase. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** If this product is defective within the warranty period stated above, your exclusive remedy shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product. **Except where prohibited by law, 3M will not be liable for any indirect, special, incidental or consequential loss or damage arising from this 3M product, regardless of the legal theory asserted.**



Electrical Markets Division

6801 River Place Blvd.
Austin, TX 78726-9000
800.245.3573
Fax 800.245.0329
www.3M.com/electrical

Please Recycle. Printed in USA.
© 3M 2013. All Rights Reserved.
78-8141-5460-1 Rev B