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SP-F01-015 Dri-Tube Cable Installation Procedures, Issue 8

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1.0 General

This document describes the proper installation procedures for brake loops, coil placement, and cable preparation for Dri-Tube optical fiber cables. Brake coils are required in the installation of Dri-Tube cable and must be permanently installed on either side of cable termination points. Coiling is the most common method of preparing cable slack length for storage or staging prior to cable preparation and splicing. The cable preparation procedures review the steps for sheath removal from both armored and all-dielectric cables.

2.0 Construction

Sumitomo's DriTube Ribbon cables contain 12 to 432 optical fibers. The fibers are grouped into 12 or 24 fiber flat ribbon matrices. Water blocking yarns are applied around a stack of ribbons in a single central buffer tube. Water blocking tape, wrapped around the tube, also provides protection against water migration down the cable. There is no water blocking gel used in the construction of this cable. Armored versions of this cable type feature corrugated steel armor placed around the water blocking tape and central tube with ripcords underneath for easy sheath removal. Steel or fiberglass strength rods are longitudinally placed on each side of the cable core for tensile strength. Highly visible ripcords are placed along each group of strength elements for quick sheath entry. A smooth black medium density polyethylene (MDPE) sheath is extruded over the core and rods.

3.0 Safety Precautions

The use of safety equipment is strongly recommended during the installation and handling of optical fiber cable.

4.0 Reference Documents

SP-F01-001 *Cable Placing*
SP-FO1-008 *Methods to Figure-8 and Coil Cables*

5.0 Tools Required

The following is a list of tools and materials required to complete this procedure.

1. Marking Pen
2. Tape Measure
3. Utility Knife
4. Wire Cutters
5. Buffer Tube Remover/Coaxial Cutter
6. Needle Nose Pliers
7. Electrical Tape
8. Splicers' Scissors
9. Gloves
10. Safety Glasses
11. B-sealant (optional)
12. Tie Wraps

6.0 Installing Brake Loops

To reduce ribbon movement within the DriTube cable structure the use of brake loops is necessary. Installed cables will experience events or forces causing vibration or movement that may cause unwanted ribbon movement. This unwanted ribbon movement may cause attenuation within splice locations of live fibers. The cable coupling design for DriTube ribbon cable allows for a small amount of ribbon movement only to enable an equilibrium point after any cable strain event occurs. The installation of brake loops will reduce any unwanted amounts of ribbon movement due to cable strain and help to eliminate attenuation within splice locations.

Brake loops are required in the installation of Dri-Tube cable and need be installed on each side of cable termination points, where they will provide resistance to ribbon movements during any strain events. A strain event includes cable installations; any future service work by technicians after installation, ice loading, cable dig ups, and wind induced galloping and environmental vibrations, such as, cable across a bridge or close to a railway.

Brake loops may be installed in various ways. See FIG.1 below shows a coil of cable in an aerial installation that serves both as the brake loop and provides enough slack for any future Technician service work activity.

Figure 1

Figure 2 below is a sno-shoe device in an aerial installation that serves as a brake loop and also provides enough slack for any future technician service work activity.

Figure 2

Two sno-shoe devices will be needed for a brake loop at each end of the termination point. See Figure 3 below.

Figure 3

The brake loop coils must also be used in any underground installations. The slack cable coils in a vault, hand hole or storage devices under pedestals, such as, the storage cone below will also serve as brake coils that will reduce ribbon movement within the splice locations. See Figure 4 below.

Figure 4

The brake loops should be part of the installation and are to be secured with tie wraps. During installation of a cable reel, a minimum of one break loop should be installed on each end of the termination point, and this loop diameter should be 20x the cable diameter.

Note: A single loop of 20x the cable diameter will result in approximately 3 to 4 ft. of additional cable. To form brake coiling with no twists, simply create a loop at the cable end and then roll the

cable into a coil. The coil should be 20x the cable diameter. The end coil should then be secured using tie wraps.

In those instances where there are no slack coils, such as in adjacent splice points within the FTTH network architecture, tape approximately 1" to 2" of the yarn to the exterior of the central tube on both sides of the sheath opening. See Figure 5 below.

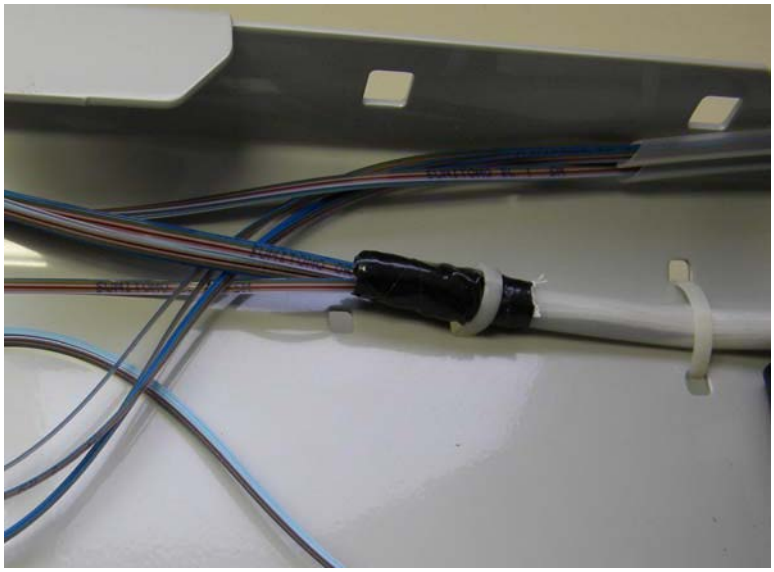

Figure 5

Then place 1 inch or more of B-Sealant into the center tube for both cable ends within the closure. See Figure 6 below.

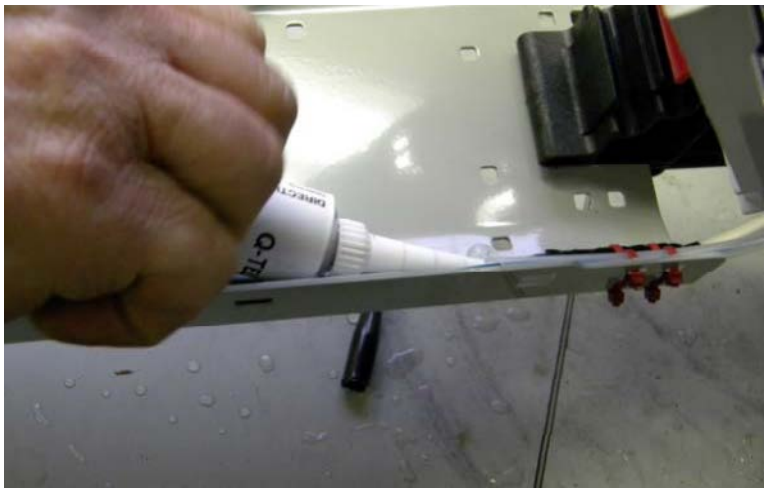

Figure 6

After a 24-hour curing period, the presence of this sealant along with localizing the SAP water-blocking yarns to the central tube will help contribute to the reduction of ribbon movement during any future technician service work activity. **

**** Note: This same procedure needs to be followed at reel end splices as an added step to prevent or minimize ribbon movement with the cable due to installation.**

7.0 Methods to Coil Cables

When installing ribbon cables Sumitomo Electric Lightwave recommends the use of one of the various coiling methods depicted below in this document. An "End Again" our any other mechanical device must not be used to coil the cable. These devices can damage cable due to the tension and the positioning of the cable.

Coiling is the most common method of preparing cable slack length for storage or staging prior to splicing. Applying coils at each end of the cable during installation is recommended. Some coiling techniques can impart twists to the cable. These twists are not a problem for cable performance but in some cases can inhibit smooth handling and produce irregular coils. Twists are more apparent in cables with a preferred bending direction. A variety of methods, as noted below, are available for coiling any cable type without inducing twists.

7.1 Figure-8 Configuration

The figure-8 configuration is recommended to prevent kinking or twisting when the cable must be unreeled or backfed. Fiber optic cable should not be coiled in a continuous direction except for lengths of 100 ft (30 m) or less. The recommended size for the figure-8 is about 20 ft (6.0 m) in length, with each loop 8ft (2.5 m) and a minimum of about 15ft (4.5 m) in length, with each loop 5ft (1.5 m) in diameter.

When figure-8ing a long length of cable, care should be taken to relieve pressure on the cable at the crossover of the eight. This can be done by forming a second figure-8.

7.2 End Coiling Method Prior to the Splicing Operation

Place at least one break loop/coil at each end of the installed cable. For end coiling with no twists, simply create a loop at the cable end and then roll the cable into a coil. The coil needs to be between 10 and 20x the cable diameter. The end coil is secured using tie wraps.

7.3 Mid-span Coiling (in lieu of using any mechanical device, such as the Sno-Shoe)

In this situation, the coiling method shown can be used where slack is to be stored for future splices, and also used when installing in-line splice closures which will be configured with 'break coils' on each side of the closure. Use one of the following procedures to prevent twists.

7.3.1 Horse-Shoe Method

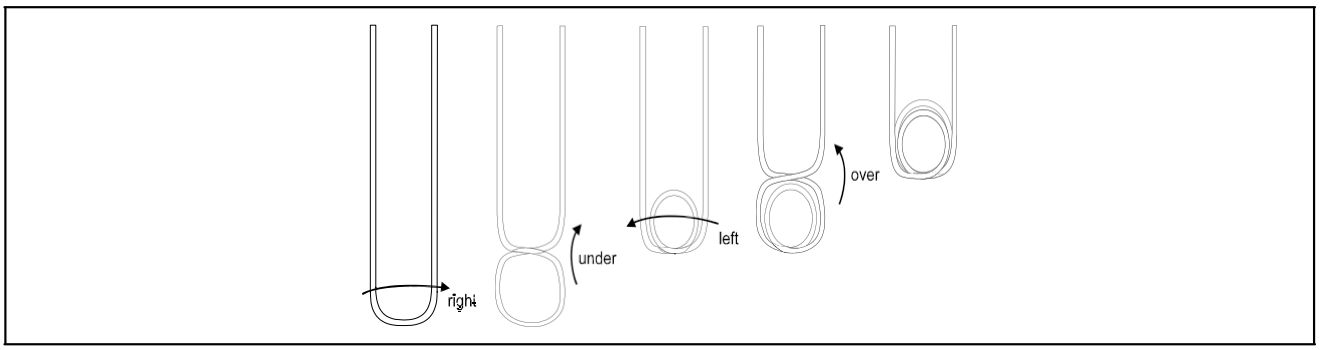

Figure 1

7.3.1.1 Place a length of cable to be coiled on the ground in the shape of a horseshoe.

7.3.1.2 Twist the cable *+½ rotation* at the end of the horseshoe to form a loop. Flip the loop *under*.

7.3.1.3 Twist the cable coil *-½ rotation* (or opposite direction from previous rotation) to form the next loop. This time flip the coil *over*.

7.3.1.4 Repeat steps 7.1.2 to 7.1.3 until the entire length of cable is coiled.

7.3.2 Rolling Horse-Shoe Method

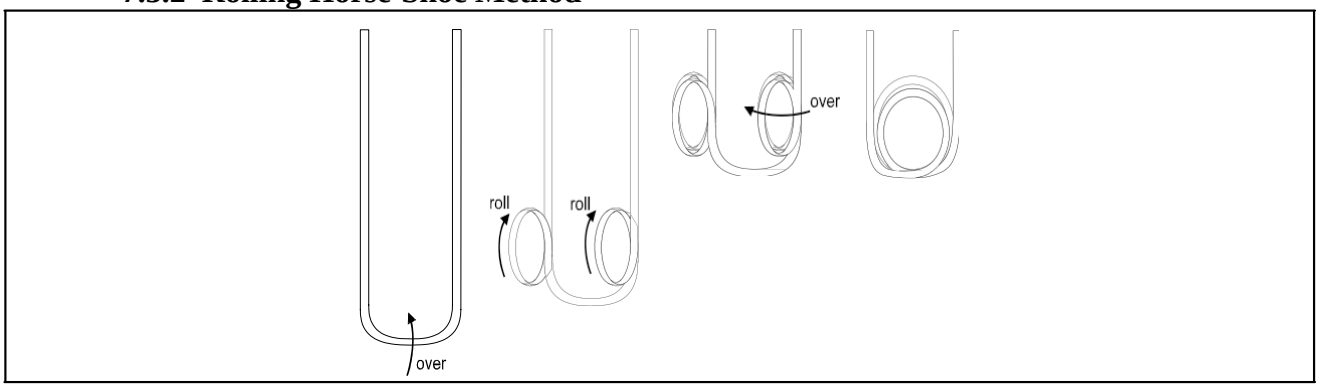

Figure 2

This method is similar to the horseshoe method described above but typically requires two people and combines the two coils into one.

7.3.3 Alternate Side Method

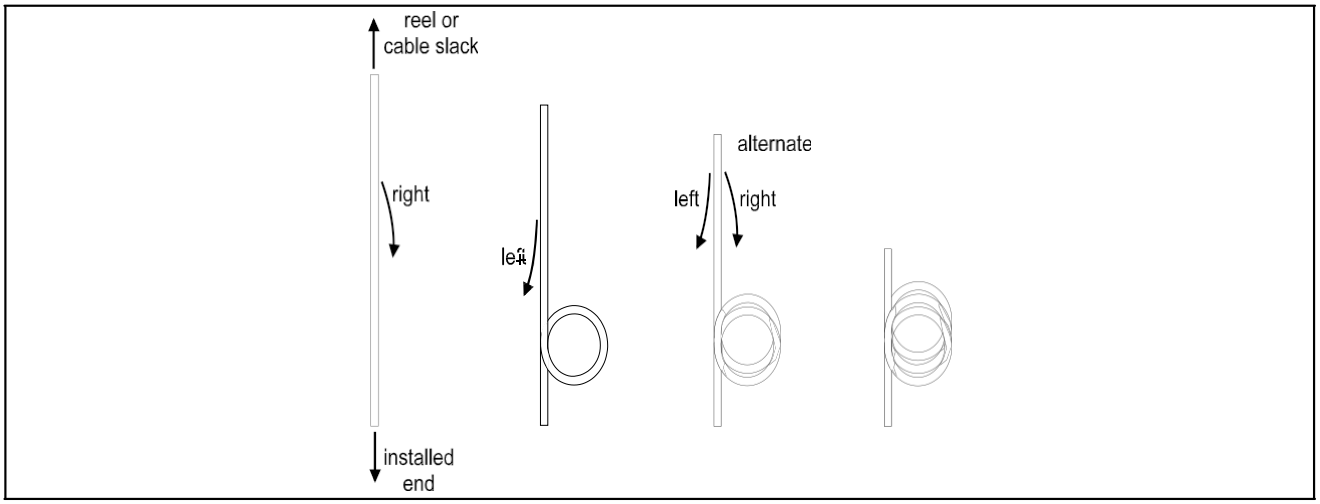

Figure 3

7.3.3.1 Create one full loop for the coil. The cable will have a +½ rotation.

7.3.3.2 Create the next full loop and place it on the opposite side of the coil as the previous loop. The cable will now have a Ø rotation.

7.3.3.3 Continue to alternate placing loops on one side of the coil and then the other (repeating steps 7.2.3.1 to 7.2.3.2) until the desired cable length is coiled.

NOTE: A swivel must always be used on the cable pull-end to prevent generating twists during installation. When severe twists are generated during cable installation the following damage can result.

8.0 Cable Preparation

NOTE: *It is recommended to place coils on each end of the cable prior to sheath removal. See section 7.1 for the recommended procedure.*

8.1 Armored Sheath Removal

8.1.1 Measure and mark the appropriate length of cable to be cleaned back for the particular application (splicing: typically 8 feet, pulling eyes: 6 inches).

8.1.2 With the utility knife, ring cut the jacket once at the mark and again approximately 12 inches towards the cable end.

8.1.3 By bending the cable, the location of the two steel wires can be determined.

8.1.4 Using a sharp utility knife, shave off the jacket material over the two wires between the two ring cuts. Using pliers, remove the remaining jacket between the two ring cuts.

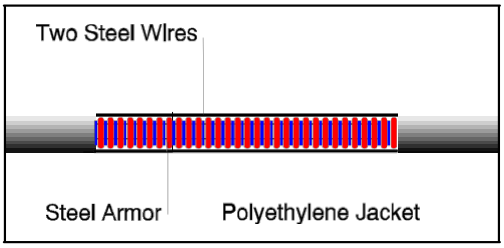

Figure 1

8.1.5 Midway along the exposed area, cut both steel wires with wire cutters. Be sure to leave enough wire on the inside end for grounding or pulling eye attachment (refer to appropriate procedures for necessary lengths). Bend back the wires to expose the corrugated armor.

8.1.6 Open a window in the steel armor by scoring the armor with the utility and pealing it off with needle nose pliers. This will expose the ripcord underneath the armor.

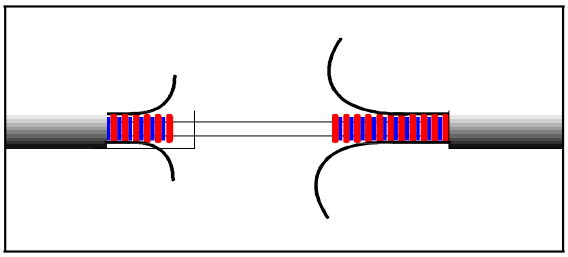

Figure 2

NOTE: For most pulling eye installations, the armor, tube and fibers can be cut away leaving only the two steel wires for attachment. Follow procedures for pulling eye attachments.

8.1.7 Scrape off the plastic coating on the steel armor with a utility knife. This will allow for proper grounding connections.

8.1.8 If local grounding practices require, make a small cut in the armor adjacent to the ripcord and slit approximately 1 to 1.5 inches of the armor to provide a grounding access.

8.1.9 Cut away the excess ripcord.

8.1.10 Find the appropriate tube size according to Table 1. Please refer to Sumitomo instructions for UCTS tool for blade depth settings. **Note: These are approximate blade depth settings. Perform a test cut before proceeding.** Score the tube 1” away from the end of the cable armor, cutting approximately 3/4 of the way through the plastic. Avoid cutting completely through the plastic as this may damage the fibers. Bend the tube gently at the score to cleanly separate the tube.

Fiber Count	ID/OD (mm)	Tube Slitter
12 – 48	4.3/5.6	UCTS-001 Dial Setting 1.75 Small Slitting Channel
60 – 96	6.5/8.0	UCTS-001 Dial Setting 2.05 Small Slitting Channel
108 – 144	7.4/8.7	UCTS-001 Dial Setting 2.25 Small Slitting Channel
156 – 216	10.5/12.5	UCTS-001 Dial Setting 0.00 Large Slitting Channel
240 – 288	12.6/14.6	UCTS-001 Dial Setting 0.25 Large Slitting Channel
312 – 432	14.8/16.8	UCTS-001 Dial Setting 0.80 Large Slitting Channel
456 – 576	16.5/18.5	UCTS-001 Dial Setting 1.25 Large Slitting Channel

Table 1

8.1.11 While holding the ribbon stack and yarns carefully slide the tube, rods and jacket off to expose the optical fibers.

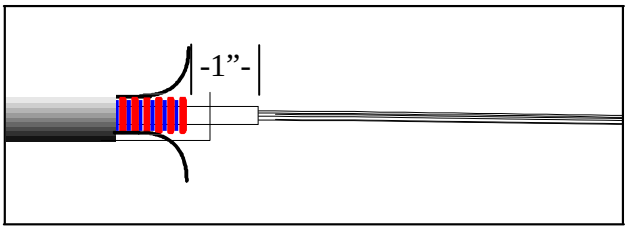

Figure 3

8.1.12 Tape the water blocking yarns to the 1” piece of exposed central tube using electrical tape. Trim off any excess yarn length.

8.2 All-Dielectric Sheath Removal

***Note**: It is recommended to place coils on each end of the cable prior to sheath removal. See section 6.1 for the recommended procedures.*

8.2.1 Measure and mark the appropriate length of cable to be cleaned back for the particular application (splicing - typically 8 feet).

8.2.2 With the utility knife, ring cut the jacket once at the mark and again approximately 12 inches towards the cable end.

8.2.3 By bending the cable, the location of the two sets of dielectric strength rods can be determined.

8.2.4 Using a sharp utility knife, shave off the jacket material over the dielectric strength rods between the two ring cuts. Using pliers, remove the remaining jacket between the two ring cuts.

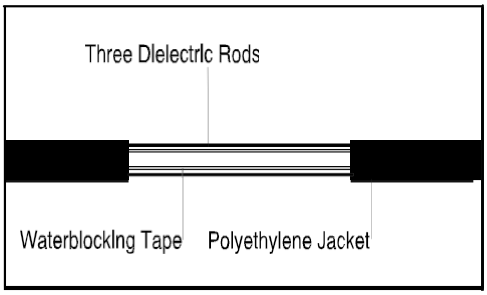

Figure 4

8.2.5 Midway along the exposed area cut all dielectric strength rods with wire cutters. Be sure to leave enough rod length for attachment in the closure (refer to appropriate closure procedures for the necessary lengths). The water blocking tape will be exposed.

8.2.6 Cut the water blocking tape layer at both ends of the opened window and remove it to expose the tube underneath.

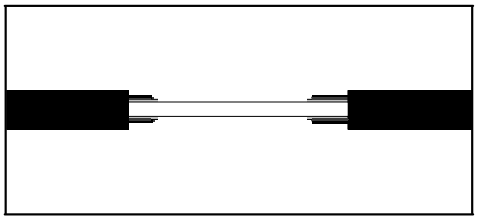

Figure 5

8.2.7 Since this cable construction contains no metallic elements, grounding is not necessary.

8.2.8 Find the appropriate tube size according to Table 2. Please refer to Sumitomo instructions for UCTS tool for blade depth settings. **Note: These are approximate blade depth settings. Perform a test cut before proceeding.** Score the tube, cutting approximately 3/4 of the way through the plastic. Avoid cutting completely through the plastic as this may damage the fibers. Bend the tube gently at the score to cleanly separate the tube.

Fiber Count	ID/OD (mm)	Tube Slitter
12 - 48	5.8/7.1	UCTS-001 Dial Setting 1.87 Small Slitting Channel
60 – 96	6.5/8.0	UCTS-001 Dial Setting 2.05 Small Slitting Channel
108 – 144	7.4/8.7	UCTS-001 Dial Setting 2.25 Small Slitting Channel
156 - 216	10.5/12.5	UCTS-001 Dial Setting 0.00 Large Slitting Channel
240 - 432	14.8/16.8	UCTS-001 Dial Setting 0.80 Large Slitting Channel
456 - 576	16.5/18.5	UCTS-001 Dial Setting 1.25 Large Slitting Channel

Table 2

8.2.9 While holding the ribbon stack and yarns carefully slide the tube, rods and jacket off to expose the optical fibers.

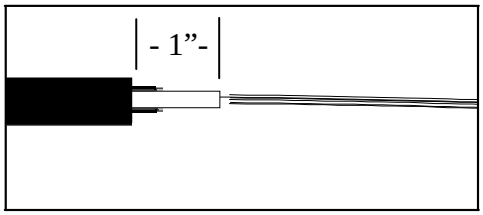

Figure 6

8.2.10 Tape the water blocking yarns to the 1” piece of exposed central tube using electrical tape. Trim of any excess yarn length.