A Furukawa Company

Sheath Removal and Mid-Span Access for Single Jacket, Option1™, and AccuTube® Loose Tube Optical Fiber Cables

Contents **Section**

1. General

1.1 This practice provides instructions for sheath removal and mid-span access of OFS Single Jacket, Option1™, and AccuTube® optical fiber cables. It is intended for personnel with prior cable splicing experience. A working familiarity with cable access tools, splicing equipment, and splice closures is necessary as this guide does not cover all aspects of cable splicing.

1.2 Standard loose tube fiber optic cables containing more than 144 fibers are provided in a dual layer construction. Mid-span access of dual-layer cables is described in Section 7. Once the outer jacket has been removed from the cable, mid-span access of the buffer tubes and fibers is identical for single jacket, light armor, and armored cables

1.3 *AccuTube* cables contain fiber ribbons in a traditional loose tube cable design. *AccuTube* cables are available in fiber counts from 288 to 864 fibers.

2. Precautions

2.1 OFS optical fiber cables are designed to meet the rigors of aerial, direct buried, and underground duct environments. However, care must be exercised during installation to ensure that the maximum rated cable load (MRCL) is not exceeded or that the minimum cable bend diameter is not violated.

2.2 Cable minimum bend diameters[1] are typically expressed as a multiple of the cable outside diameter (OD) under static and dynamic conditions. The static condition represents an installed cable that may be subjected to long-term residual load. The dynamic condition represents a cable during installation which may be subjected to the full tensile load rating of the cable. For standard loose tube cables, the minimum bend diameter under static conditions is 20 × OD. The minimum bend diameter under dynamic conditions is 30 × OD. For *AccuTube* cable, the minimum bend diameter under both static and dynamic conditions is 30 × OD.

2.3 Cable tensile load ratings are also specified for both static and dynamic conditions. The dynamic condition represents a cable during installation when it may be subjected to the MRCL (maximum rated cable load). The static condition represents an installed cable that may be subjected to a long-term residual load. The MRCL load for standard loose tube optical fiber cables is 600 pounds (2700N) and the maximum long-term load is 200 pounds (900 N).

[1] Some cable manufacturers specify minimum bend radius rather than minimum bend diameter. Minimum bend diameters can be converted to minimum bend radius by dividing the minimum bend diameter by two. For example, the minimum bend radii for standard loose tube cables are 10 × cable OD and 15 × cable OD, respectively, for static and dynamic conditions.

2.4 Breakaway pulling swivels and/or calibrated pulling devices are recommended for use during cable installation to protect the cable from excessive installation forces. Cable lubricants are also recommended during cable installation. Contact OFS or a cable lubricant manufacturer for guidance on proper lubricants to be used with optical fiber cable.

3. Required Tools

- Cable sheath knife
- Buffer tube cutter
- Scissors
- Cable shears
- Diagonal cutters
- Pliers
- Seam ripper
- OFS Quick Split tool (mid-span access only)
- OFS Quick Split RT tool (mid-span access of *AccuTube* cables only)
- Electrical tape
- Tape measure
- Lint free wipes
- Isopropyl Alcohol
- Gloves
- Safety glasses

Caution: Safety glasses should always be worn when working with optical fiber cable.

4. Sheath Removal for Single Jacket and *OPTION1* Cables

4.1 Consult the closure instructions for the correct length of cable to be prepped. Measure and mark the cable at the appropriate stripping length (Figure 1).

Figure 1 - Measure and mark the cable.

4.2 Use a cable sheath knife to ring cut the cable at the measured mark. Lightly score the cable jacket rather than cut all the way though (Figure 2).

Figure 2 – Ring cut the cable sheath.

4.3 Gently flex the cable with a circular motion at the score mark. Be careful not to violate the minimum bend radius. The cable jacket will separate at score mark (Figure 3).

Figure 3 – Flex and separate the cable jacket.

4.4 Make a second ring cut approximately 5 inches from the end of the cable. Gently flex the cable until the cable jacket separates.

4.5 Use a sheath knife to make a longitudinal cut between the second ring cut and the end of the cable (Figure 4). Remove the short section of cable jacket (Figure 5) to expose the rip cord.

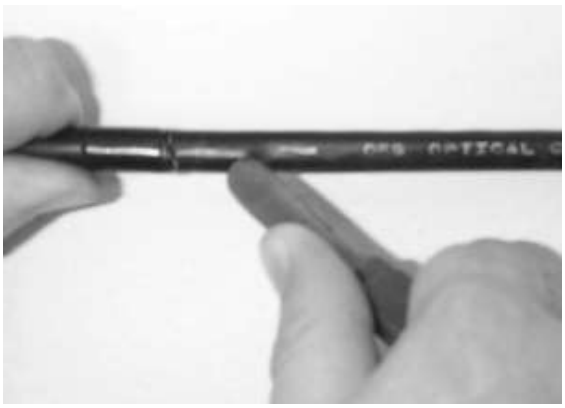

Figure 4 - Make a 5-inch longitudinal cut at the end of the cable.

Figure 5 - Remove the 5-inch section of cable jacket.

4.6 Locate and pull the ripcord to the first measured mark (Figure 6). A small starter slit can be cut in the cable jacket to help start the ripcord. If desired, grip the ripcord by wrapping it around the jaws of needle nose pliers.

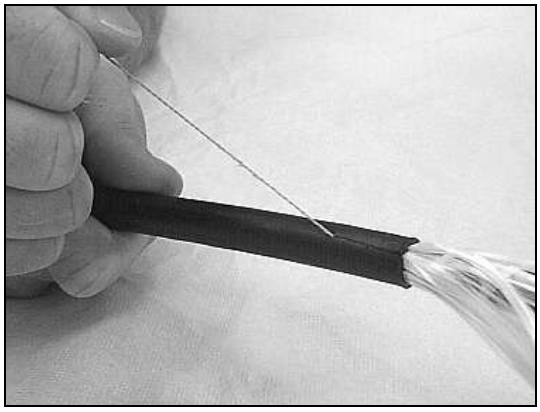

Figure 6 - Pulling the ripcord.

4.7 Remove the cable outer jacket to expose the core of the cable (Figure 7).

Figure 7 - Remove the outer jacket.

4.8 Consult the closure instructions for the length of dielectric strength elements that is required for strain relief. Separate the strength elements from the buffer tubes and cut them at the required length (Figure 8).

Figure 8 – Cut and remove the dielectric strength elements at the required length.

4.9 For single jacket and *Option1* cables, use a seam ripper to cut and remove the binder threads from stranded buffer tubes (Figure 9). Cut the binder threads flush with the outer jacket. For *AccuTube* cables, use a seam ripper to cut the binder threads over the water blocking tape. Remove the binders and water blocking tape and cut flush with the outer jacket. Use a seam ripper to cut and remove the second layer of binder threads over the stranded core buffer tubes.

Figure 9 – Cut and remove binder threads.

4.10 Carefully unwrap the buffer tubes from one another and remove any remaining water blocking threads between the tubes and the central strength member (Figure 10).

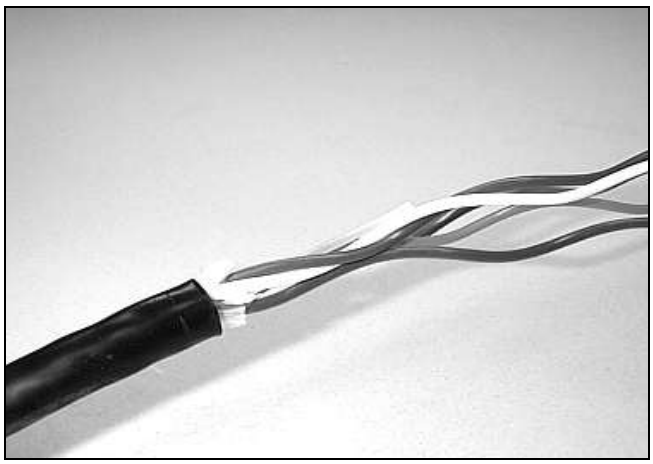

Figure 10 - Unwrap the buffer tubes.

4.11 Consult the closure instructions for the length of central strength member that is required for strain relief and/or grounding (metallic strength members only). Carefully separate the central strength member from the buffer tubes and cut it to the required length.

4.12 Consult the closure instructions and determine the length of fiber that is required in the closure. Use a buffer tube cutter to score the buffer tubes at the required length (Figure 11A). Flex the buffer tube at the score mark to separate the tube and remove it from the fibers. If a long length of buffer tube must be removed, it is recommended that the tube be removed in 14- to 18-inch sections.

NOTE: For *AccuTube* cables with 6.0 or 7.2 mm buffer tubes, use an OFS Quick Split RT tool to score the buffer tube (Figure 11B). Flex the buffer tube at the score mark to separate the tube and remove it from the fiber ribbons.

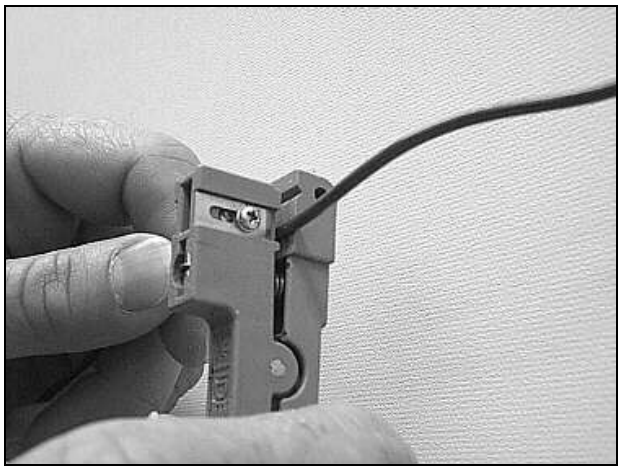

Figure 11A – Score the buffer tube with a buffer tube cutter.

Figure 11B – Use a Quick Split RT tool to score *AccuTube* buffer tubes.

4.13 Carefully clean the exposed fibers or ribbons with a lint free wipe and isopropyl alcohol taking care to avoid fiber damage. The cable is now ready for testing and/or splice preparation (Figure 12).

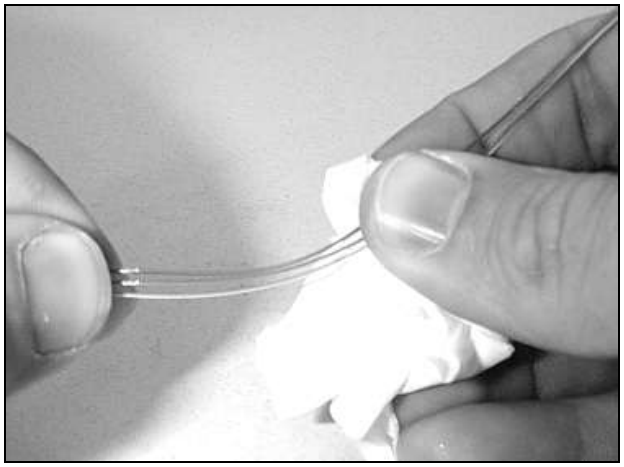

Figure 12 – Clean the optical fibers.

5. Sheath Removal for Single Jacket *AccuTube* Cables

5.1 The single jacket *AccuTube* cable is manufactured using 12 fiber ribbons in the place of single fibers. *AccuTube* cables may contain either 6.0 or 7.2 mm buffer tubes and are available in fiber counts of 288 up to 864.

5.2 Care should be taken during installation to ensure that the minimum cable bend diameter is not violated and the maximum rated cable load (MRCL) is not exceeded.

5.3 The minimum bend diameter for *AccuTube* cables under both static and dynamic conditions is 30 × cable OD.

5.4 The MRCL for single jacket *AccuTube* cable is 1000 pounds. The maximum long-term load for static conditions is 200 pounds.

5.5 The procedures for sheath preparation of single jacket *AccuTube* cable are similar to those outlined for single jacket and *Option1* cables in Section 4 with the following exceptions.

5.6 An OFS Quick Split RT tool is recommended to access the ribbons in the *AccuTube* cable (Figure 11B). The Quick Split RT tool can be used to ring cut and slit both 6.0 and 7.2 mm buffer tubes.

5.7 Use the appropriate grooves on the Quick Split RT tool to ring cut the tubes and remove them from the ribbons.

5.8 Clean and dry the ribbons using the guidelines outlined in OFS IP-041, *Enhanced AccuRibbon® Cleaning Procedure for Loose Tube Fiber Optic Cables*.

6. Mid-Span Sheath Removal for Single Jacket and *OPTION1* Cables

6.1 Use a wrap of electrical tape to make two marks, about 10 inches apart, at the mid-point of the cable length to be prepped for mid-span access (Figure 13).

Figure 13 – Mark cable jacket with electrical tape.

6.2 Use a cable sheath knife to score the cable jacket at one of the tape marks. Lightly score the cable jacket – do not cut completely through the jacket (Figure 14).

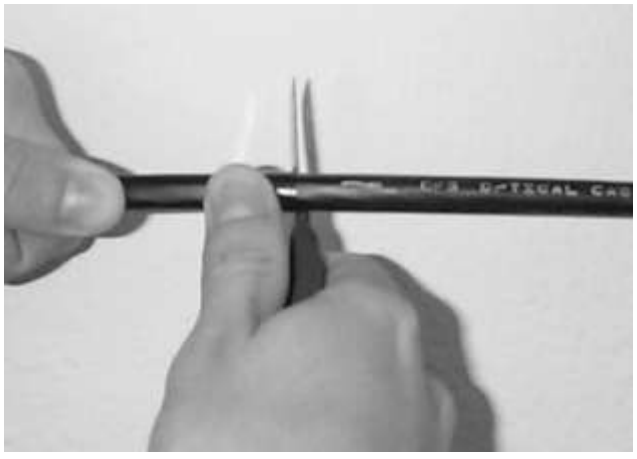

Figure 14 – Ring cut the cable jacket.

6.3 Using a circular motion, gently flex the cable at the score mark to separate the cable jacket (Figure 15). Be careful not to violate the cable minimum bend radius.

Figure 15 - Flex the cable jacket to separate it at the score mark.

6.4 Repeat steps 6.2 and 6.3 at the second tape mark.

6.5 Use a sheath knife to make a longitudinal cut between the two ring cuts (Figure 16). Be careful not to cut into the underlying buffer tubes.

NOTE: A round cable stripper tool, e.g., Ripley RCS-114, can be used to make both the longitudinal cut as well as the ring cuts. The blade depth on this tool can be adjusted to minimize the possibility of fiber damage. This is especially important for mid-span access into "live" working systems. Contact OFS Customer Support at 1-888-FIBER-HELP (1-888-342-3743) for additional information.

Figure 16 - Make a longitudinal cut between the two ring cuts.

6.6 Remove the 10 inch section of cable jacket to expose the dielectric strength elements and the core. (Figure 17).

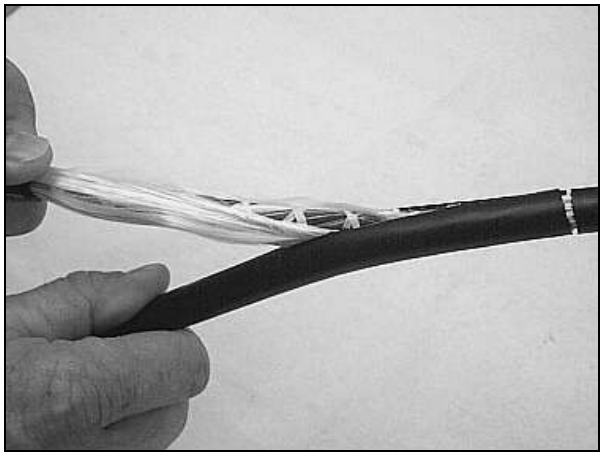

Figure 17 - Remove the 10-inch section of cable jacket.

6.7 Locate the ripcord and cut it in the middle to make two 5 inch rip cords (Figure 18).

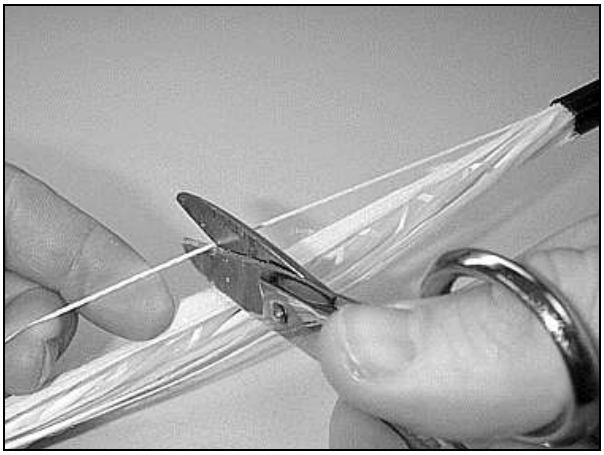

Figure 18 - Cut the ripcord in the center of the exposed length.

6.8 Separate and cut the dielectric strength elements. Be careful not to cut the ripcords (Figure 19).

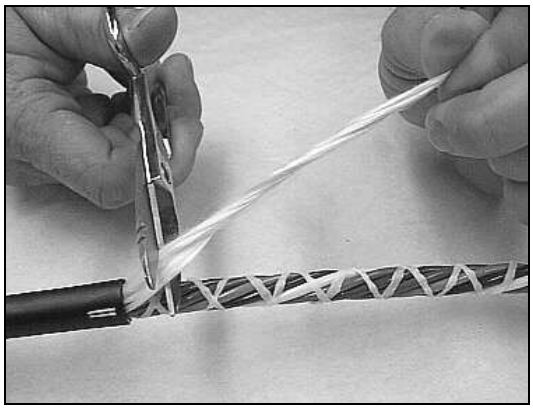

Figure 19 - Cut and remove the dielectric strength elements.

6.9 Locate the reversal point of the buffer tubes (Figure 20). The reversal point is the point at which the twist in the buffer tube changes direction. If the reversal point cannot be seen, use one of the ripcords to remove an additional 12 inches of outer jacket. Repeat this process at alternate ends of the sheath opening until the reversal point is located.

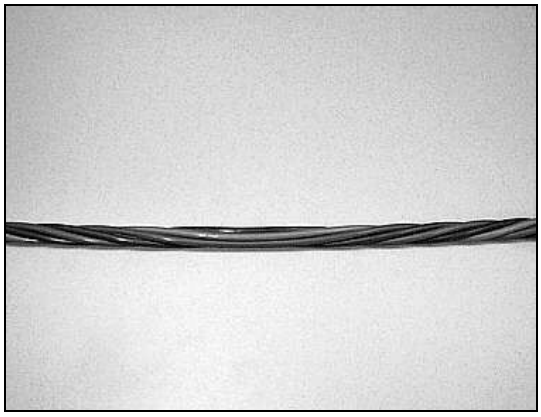

Figure 20 – Buffer tube reversal point.

6.10 Consult the splice closure instructions and determine the length of cable jacket that must be removed. Use the reversal point as the mid-point of the sheath opening and mark the outer edges of the sheath opening on the cable jacket (Figure 21).

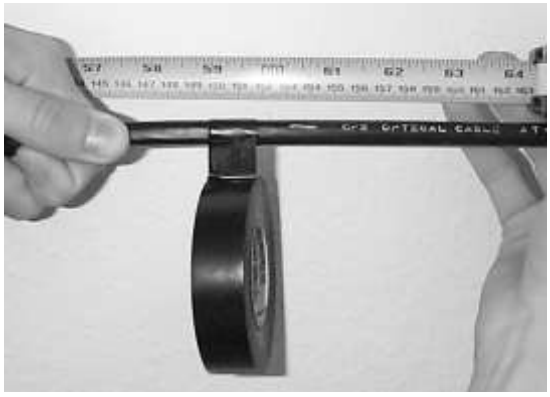

Figure 21 - Measure and mark the sheath opening at equal lengths from the reversal point.

6.11 Use a cable sheath knife to ring cut the cable at one of the measured marks. Lightly score the cable jacket – do not cut completely through the jacket (Figure 22).

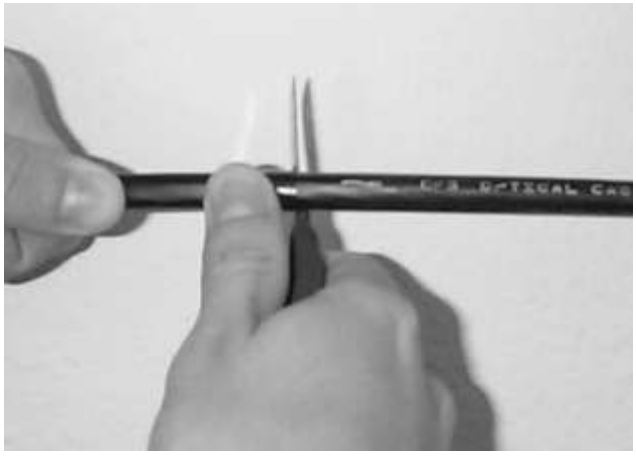

Figure 22 – Ring cut the cable jacket.

6.12 Using a circular motion, gently flex the cable at the score mark to separate the cable jacket (Figure 23). Be careful not to violate the cable minimum bend radius.

Figure 23 - Flex the cable jacket to separate at the score mark.

6.13 Repeat steps 6.11 and 6.12 at the second cable mark

6.14 Locate the ripcords and pull each one to the marked edge of the sheath opening (Figure 24). A small starter slit can be cut in the cable jacket to start the ripcord. If desired, wrap the ripcord around the jaws of needle nose pliers to grip it. Remove the cable jacket from the cable core.

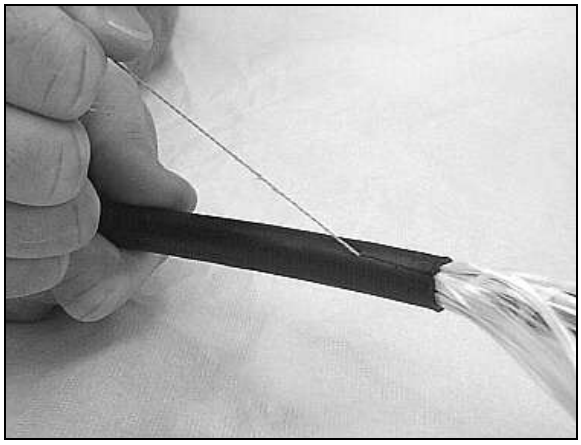

Figure 24 - Pull the ripcord to the marked length.

6.15 Refer to the splice closure instructions to determine the length of the strength elements that is required for strain relief. Cut and remove the dielectric strength elements at the required length (Figure 25).

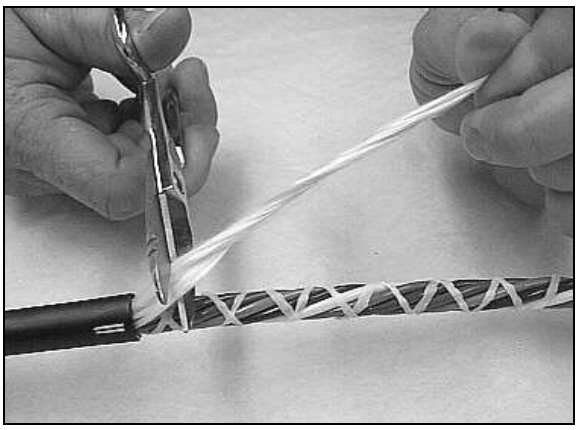

Figure 25 - Cut and remove the dielectric strength elements at the required length.

6.16 For single jacket and *Option1* cables, use a seam ripper to cut and remove the binder threads from stranded buffer tubes (Figure 26). Cut the binder threads flush with the outer jacket. For *AccuTube* cables, use a seam ripper to cut the binder threads over the water blocking tape. Remove the binders and water blocking tape and cut flush with the outer jacket. Use a seam ripper to cut and remove the second layer of binder threads from the stranded buffer tubes.

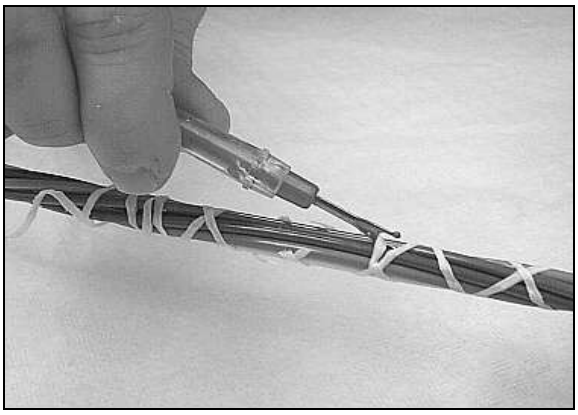

Figure 26 - Cut and remove the binder thread from the core.

6.17 For mid-span access of dual-layer cables, skip ahead to Section 7.

6.18 Carefully unwrap and separate the buffer tubes. (Figure 27).

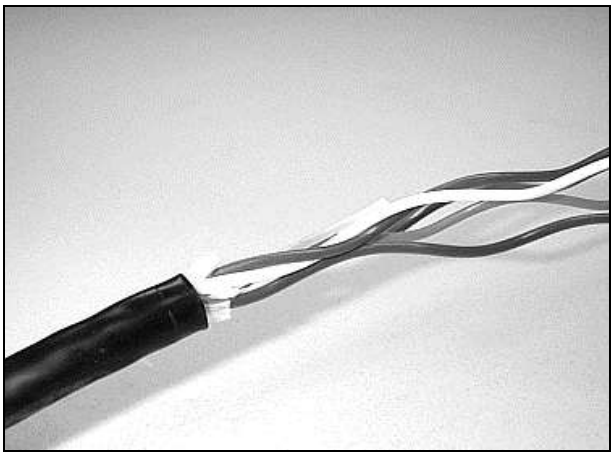

Figure 27 – Separate the buffer tubes.

6.19 Consult the splice closure instructions to determine the length of strength member that is required for strain relief and/or grounding (metallic strength member only). Separate the strength member from the buffer tubes and cut it to the proper length at both ends of the sheath opening (Figure 28).

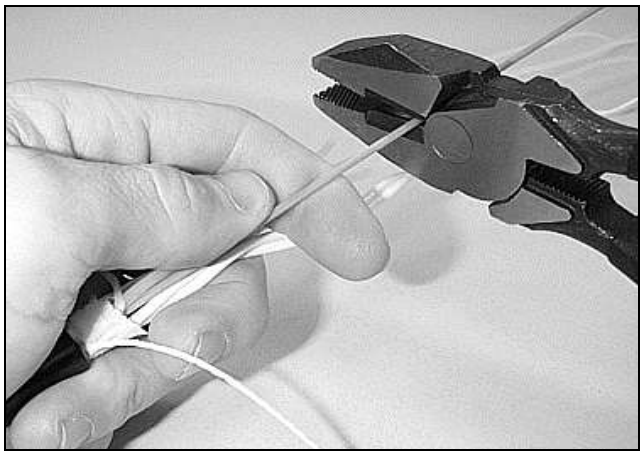

Figure 28 - Cut the central member to the required length.

6.20 The cable can now be fastened into the splice closure.

6.21 If all fibers in a buffer tube will be spliced, the buffer tube can be cut at the appropriate location. If some of the fibers will not be cut, skip ahead to Section 6.25.

6.22 Consult the closure instructions for the required fiber and tube lengths. Use a buffer tube removal tool to ring cut and remove the desired length of buffer tube (Figure 29). If a long length of tube must be removed, it is recommended to remove the tube in 14- to 18-inch sections.

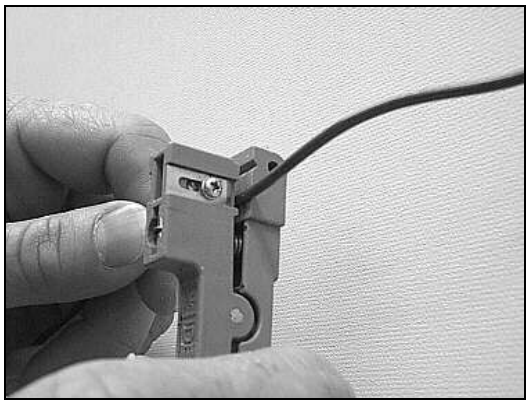

Figure 29 – Ring cut the buffer tube.

6.23 Clean the exposed fibers with a lint free wipe (Figure 30) and fasten the tube(s) to the appropriate splice organizer tray.

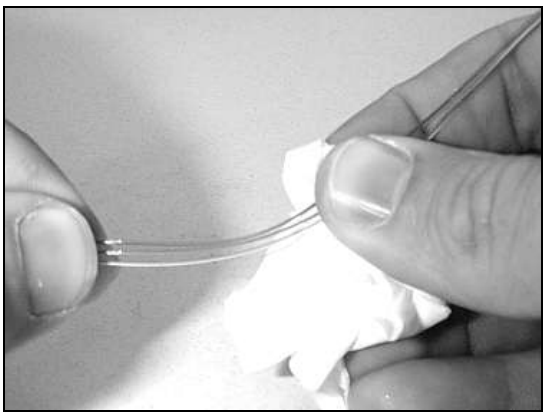

Figure 30 - Clean the optical fibers.

6.24 The fibers are now ready for splicing.

6.25 If select fibers in a buffer tube are spliced to a tap or drop cable, and other fibers in the same tube must remain continuous, an OFS Quick Split Tool is required to open the buffer tube (Figure 31). The Quick Split tool is used to ring cut and slit both 2.5 and 3.0 mm buffer tubes. Complete instructions are provided with each tool. Please refer to OFS IP-031, *Use & Care of OFS Quick Split Tool*, for additional information.

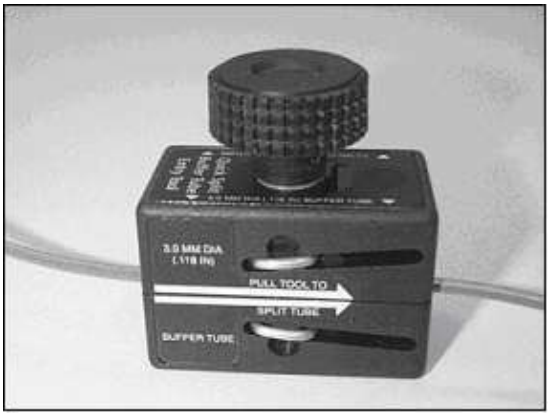

Figure 31 – OFS Quick Split tool.

6.26 Clean the exposed fibers using a lint free wipe and isopropyl alcohol and fasten the tube(s) to the appropriate splice organizing tray.

6.26 The fibers are now ready for splicing.

7. Mid-Span Access of Dual-Layer Cables

7.1 Figure 32 shows a dual layer cable after the outer jacket, armor layer (if applicable), aramid strength members, and binder threads have been removed to expose the outer layer of buffer tubes. This step corresponds to the completion of Section 6.16 described above. For a dual layer cable, the distance between the reverse-oscillating-lay (ROL) locations in the outer layer is typically about 45". Therefore, about 96" of cable jacket should be removed to expose three ROL locations as shown in Figure 32.

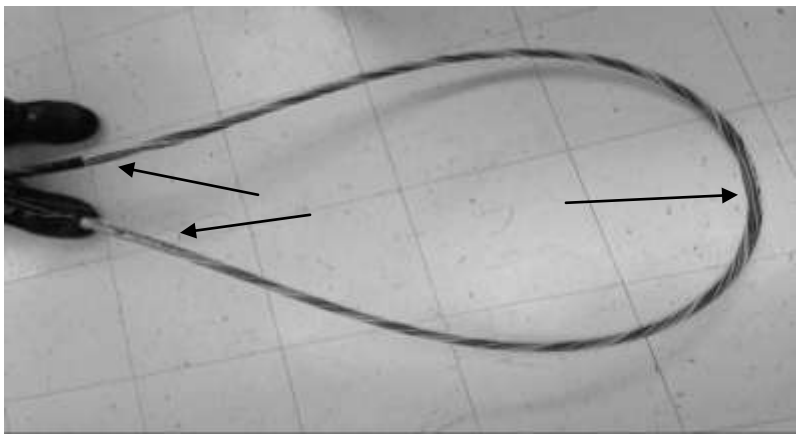

Figure 32 – Remove about 96" of cable jacket to expose three ROL locations indicated by the arrows.

7.2 Begin removal of the outer buffer tube layer at the middle ROL location. Wrap a small piece of vinyl tape around the outer buffer tubes before they are completely unwound (Figure 33). This will help maintain the tubes in a bundle while they are unwound and reduce clutter in the splice closure. Continue to unwind the outer buffer tube layer until it is completely separated from the inner layer as shown in Figure 34. Note that the outer layer of buffer tubes has retained a stranded shape.

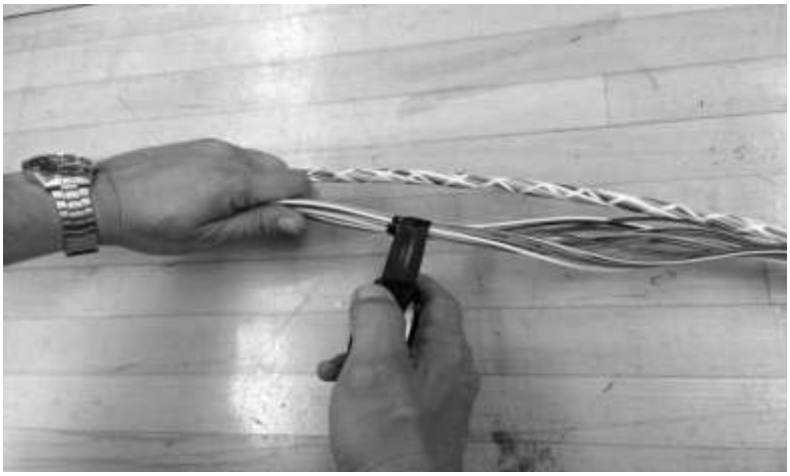

Figure 33 – Wrap a piece of vinyl tape around the outer buffer tubes to keep them in a bundle.

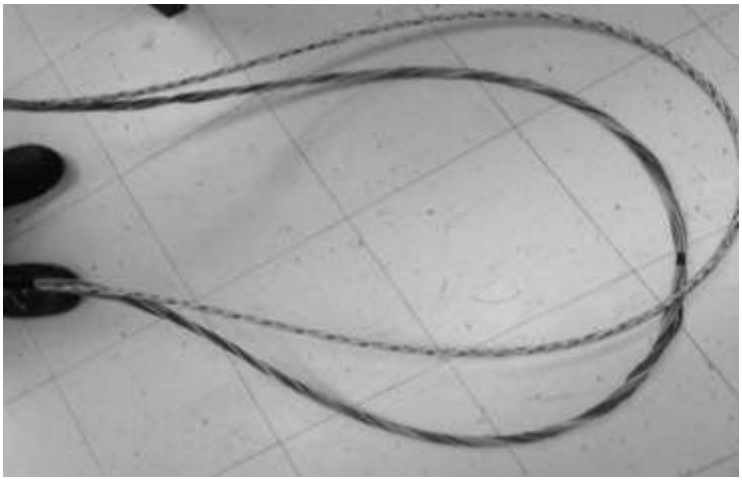

Figure 34 – Unwind the outer tube buffer layer from the inner layer.

7.3 Remove the binder threads from the inner layer and unwind the buffer tube(s) that will be routed to the splice tray for splicing (Figure 35). The tube(s) should be unwound as far as possible towards the ends of the jacket opening (Figure 36). Due to the different locations of the ROLs in the inner and outer layers, it may not be possible to completely unwind the tube(s).

Figure 35 – Unwind the buffer tube(s) that will be routed to the splice tray.

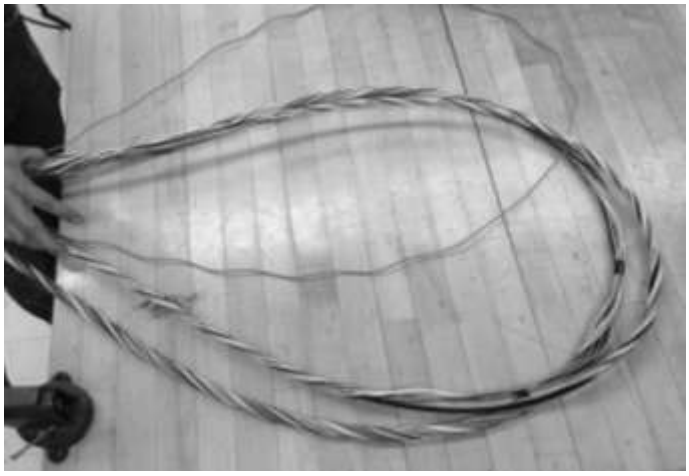

Figure 36 – Unwind the buffer tube(s) as far as possible as towards the end of the jacket opening.

7.4 Begin unwinding the remaining buffer tubes to expose the central strength member. Wrap a length of vinyl tape around the tubes at the centermost ROL location (Figure 37). Continue unwinding the buffer tubes as far as possible as allowed by the location of the ROLs (Figure 38).

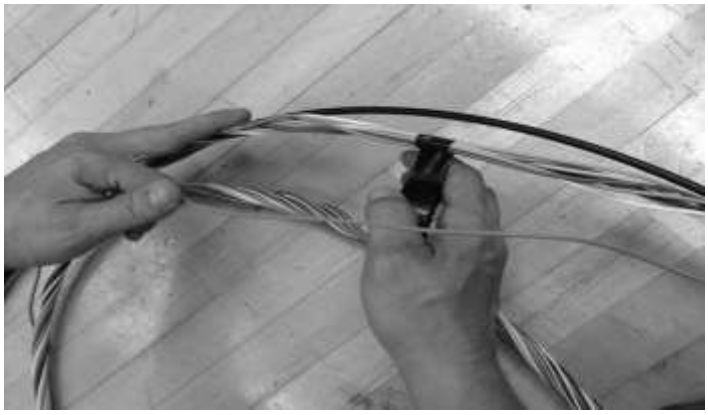

Figure 37 – Wrap a length of vinyl tape around the tubes at the ROL location.

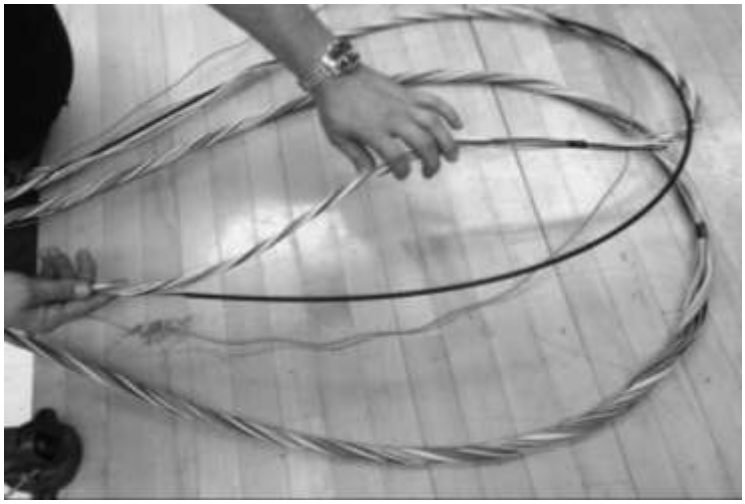

Figure 38 – Unwind the inner layer of buffer tubes to expose the central strength member.

7.5 After exposing the central strength member, cut it to length as required to clamp the cable in the closure. Refer to the closure instructions to determine the recommended length. The strength member can be cut in multiple steps to simplify unwinding the inner layer of buffer tubes (Figure 39 and 40).

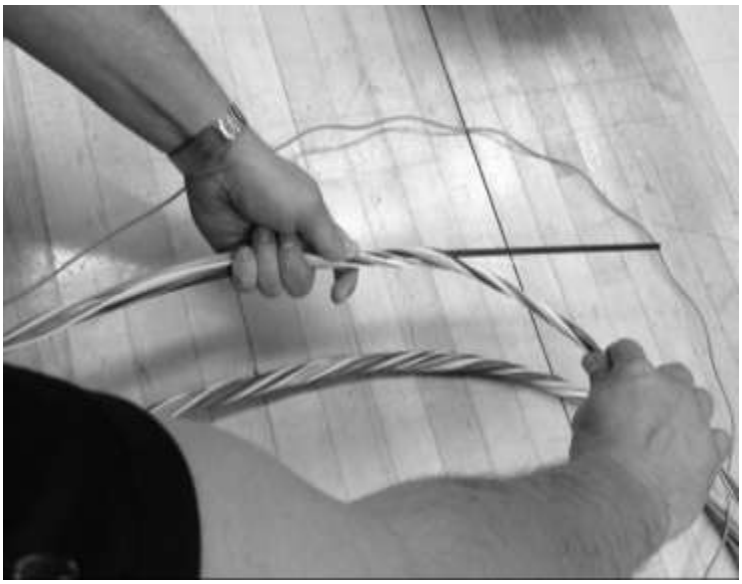

Figure 39 – Cut the central strength member in multiple steps while unwinding the buffer tubes.

Figure 40 – Cut the central strength member to length as required for clamping in the closure.

7.6 Figure 41 shows the completed mid-span opening prior to installing the cable into the splice closure. The buffer tube intended for splicing can be routed through the storage basket and into to the splice tray. The remaining express tubes, i.e., the buffer tubes which will not be accessed for splicing, should be stored in the splice closure storage basket.

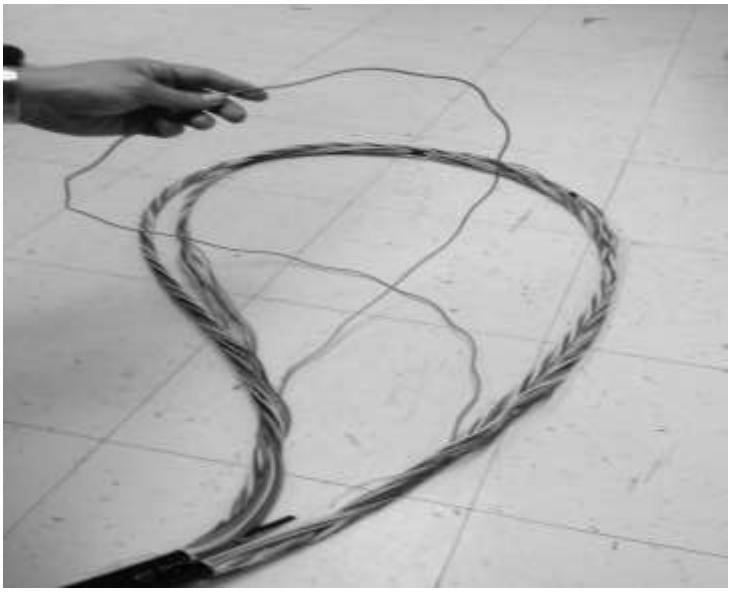

Figure 41 – Completed mid-span access of dual-layer cable.

7.7 Return to Section 6.21 for instructions regarding cutting and slitting the buffer tubes and accessing the optical fibers.

8. Mid-Span Sheath Removal for Single Jacket *AccuTube* Cable

8.1 Single jacket *AccuTube* cable is manufactured using 12 fiber ribbons in the place of single fibers. *AccuTube* cables are available in fiber counts of 288 to 864 and contain either 6.0 mm or 7.2 mm buffer tubes.

8.2 Care should be taken during installation to ensure that the minimum cable bend diameter is not violated and the maximum rated cable load (MRCL) is not exceeded.

8.3 The minimum bend diameter for single jacket *AccuTube* cable is 30 × OD for both static and dynamic conditions.

8.4 The MRCL for single jacket *AccuTube* cable is 1000 pounds. The maximum long-term load is 200 pounds.

8.5 The procedures for sheath preparation of single jacket *AccuTube* cable are the similar to those described for single jacket and *Option1* cables in Section 6 with the following exceptions.

8.6 An OFS Quick Split RT tool is required to access the ribbons within the buffer tubes. The Quick Split RT tool is used to ring cut and slit both 6.0 and 7.2 mm buffer tubes. Please refer to OFS IP-031A, *Use & Care of OFS Quick Split RT Tool*, for detailed instructions.

8.7 Use the appropriate grooves on the OFS Quick Split RT tool to ring cut and slit the buffer tubes and access the ribbons.

8.8 Clean and dry the ribbons using the guidelines outlined in OFS IP-041, *Enhanced AccuRibbon Cleaning Procedure for Loose Tube Fiber Optic Cables*.

For additional information please contact your sales representative. You can also visit our website at www.ofsoptics.com or call 1-888-FIBER-HELP (1-888-342-3743) from inside the USA or 1-770-798-5555 from outside the USA.

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