Sheath Removal and Mid-Span Access of Armored SST Cables

1. General

1.1 This procedure describes installation and handling practices for Corning Cable Systems armored standard single tube (SST) fiber optic cables containing either ribbon, loose fibers, or bundled fibers. Both conventional sheath removal and mid-span access procedures are outlined in this document (Figure 1).

1.2 The cable illustrated in this procedure is an armored cable manufactured with a central buffer tube. Two steel rods located beneath the sheath, along with the armor, provide tensile strength for the cable.

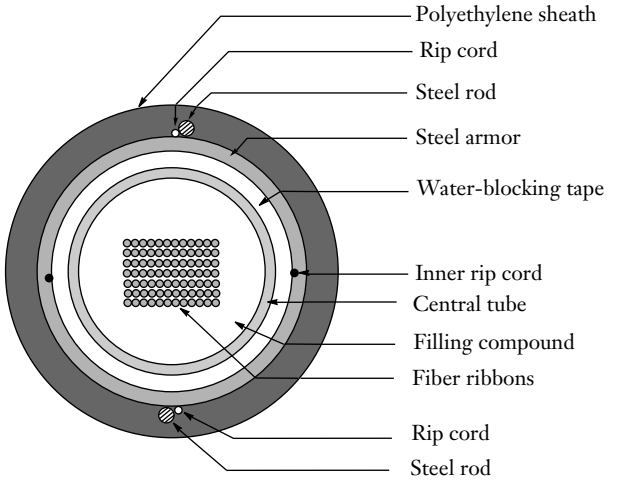
1.3 This issue includes reflects the current design of armored SST-Drop cables.

2. Precautions

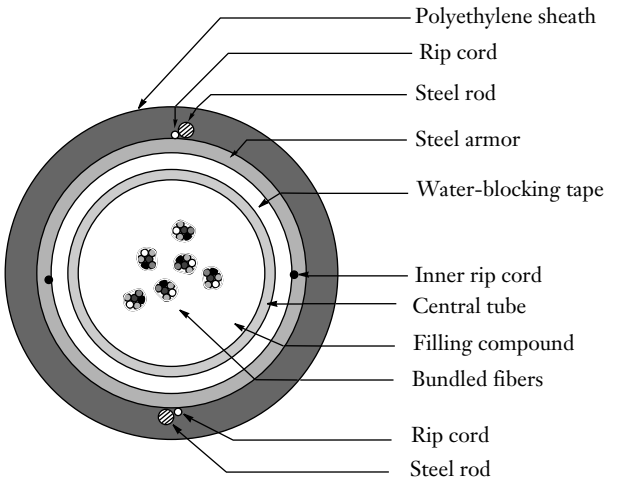
2.1 General Precautions

WARNING: *The wearing of* ***safety glasses*** *to protect the eyes from accidental injury is strongly recommended when handling chemicals and cutting steel rods or fiber. Pieces of glass fiber are very sharp and can damage the cornea of the eye easily.*

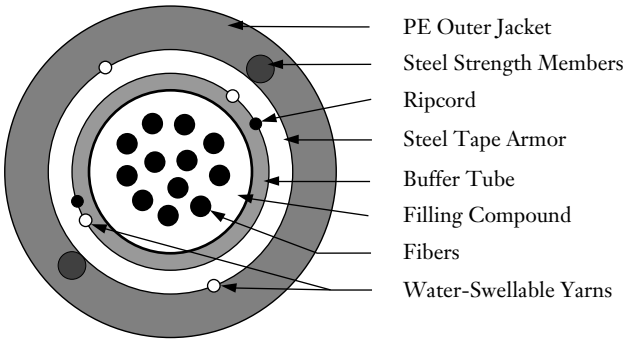
CAUTION: *The wearing of* ***safety gloves*** *to protect your hands from accidental injury when using sharp-bladed tools or working near exposed steel rods from the sheath is strongly recommended. Use extreme care when the tool is open and its blades are exposed. Dispose of used blades properly.*



Ribbon fiber SST cable



Bundled fiber SST cable



SST - Drop cable

Figure 1

2.2 Laser Precautions

WARNING: *Laser light can damage your eyes. Laser light is invisible. Viewing it directly does not cause pain. The iris of the eye will not close involuntarily as when viewing a bright light. Consequently, serious damage to the retina of the eye is possible. Never look into the end of a fiber which may have a laser coupled to it. Should accidental eye exposure to laser light be suspected, arrange for an eye examination immediately.*

2.3 Buffer Tube Handling Precautions

CAUTION: *Central tubes are sensitive to excessive pulling, bending and crushing forces. Great care should be used when handling central tubes. Excessive bending will cause kinking which may damage the fibers inside.*

2.4 Fiber Precautions

WARNING: *Cleaved glass fibers are very sharp and can pierce the skin easily. Do not let cut pieces of fiber stick to your clothing or drop in the work area where they can cause injury later. Use tweezers to pick up cut or broken pieces of the glass fibers and place them on a loop of tape kept for that purpose alone. Good housekeeping is very important.*

2.5 Filling Compound Remover

WARNING: *Contains petroleum distillates. Harmful or fatal if swallowed. DO NOT INDUCE VOMITING. Call a physician immediately.*

3. Tools and Materials

3.1 The following tools and materials are required for this procedure:

- Utility knife with hook-blade *
- Scissors *
- Filling compound remover *
- Vinyl tape *
- Cable tie tool and cable ties *
- Pliers
- Side cutters*
- Paper towels or cloth
- Tape measure *
- Permanent marking pen *
- Ideal® model 45-164 ($^1/_4$ to $^9/_{16}$ in O.D.) coaxial cable stripper
- Small Phillips head screwdriver *
- Number markers *
- Cable sheath knife
- Needle nose pliers
- Corning Cable Systems Universal Access Tool II (UAT II) and SRP-004-069 (see section 6)

or

- Corning Cable Systems Universal Access Tool III (UAT III) and SRP-004-074.
- Ribbon Splitting Tool (RST-000) and SRP-004-098

* Items available in the M67-003 Fusion Splicing Tool Kit

Additional items required for grounding:

- 3M® grounding clips
- 10 mm wrench

3.2 Options for accessing individual fibers are outlined in:

- SRP-004-048, *Accessing Individual Fibers in Corning Cable Systems Ribbon Fiber Optic Cables with the TKT-050 Kit.*
- SRP-004-076, *Accessing Individual Fibers in Corning Cable Systems Optical Fiber Ribbons Using the TKT-060 Kit.*

4. Cable End Sheath Removal

4.1 Determine the proper sheath removal length for the hardware being used. Mark a point at this distance from the end of the cable with a wrap of tape (Figure 2).

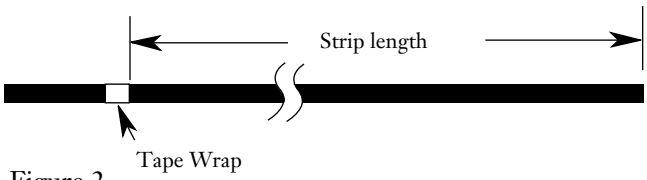


Figure 2

4.2 Taking care not to cut or flex the armor, use the hook blade knife to make a *shallow* ring cut through the black outer sheath at the tape mark (Figure 3).

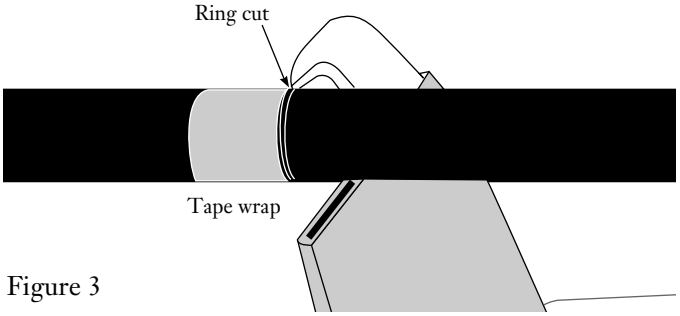


Figure 3

4.3 Starting at the end of the cable, use the cable sheath knife to shave off 15 cm (6 in.) of the outer sheath directly over the steel rods. Shave the sheath until both of the steel rods are visible (Figure 4). Shave off approximately 7.5 cm (3 in.) for armored drop cables

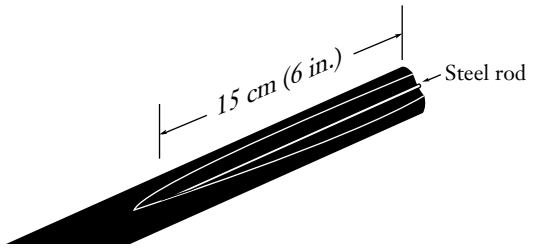


Figure 4

4.4 Using needle nose pliers, bend the steel rods away from the cable (Figure 5). TAKE CARE TO AVOID ACCIDENTAL INJURY FROM CONTACT WITH THE ENDS OF THE RODS.

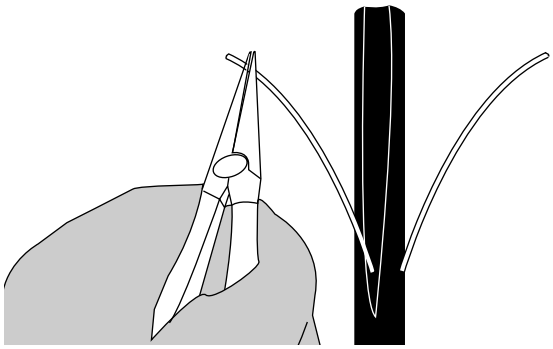


Figure 5

NOTE: For armored SST-Drop cables, proceed directly to Step 4.10.

4.5 Locate the yellow rip cords under each steel rod. The rip cord will be to the left or right of the steel rods.

4.6 Using the shaft of a screwdriver as a handle, pull one rip cord at a time through the sheath to the wrap of tape (Figure 6). *Be sure to pull the rip cord through the sheath on the same side of the steel rod as the cord is located.*

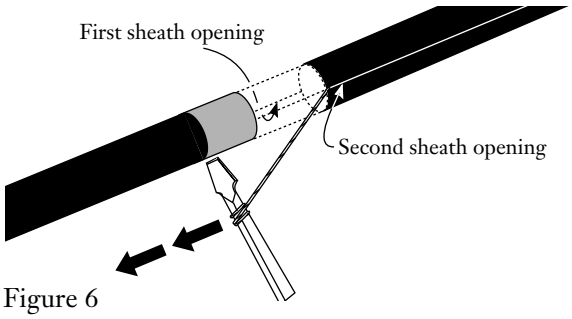


Figure 6

4.7 Cut the rip cords flush at the tape wrap with scissors.

4.8 Pull the steel rods out and away from the sheath through the openings made by the rip cords.

4.9 Use side cutters to cut the steel rods 12.7 cm (5 in.) from the tape wrap (Figure 7). Some hardware may require a greater length for proper strain relief. ALWAYS WEAR SAFETY GLASSES WHEN CUTTING THE STEEL RODS.

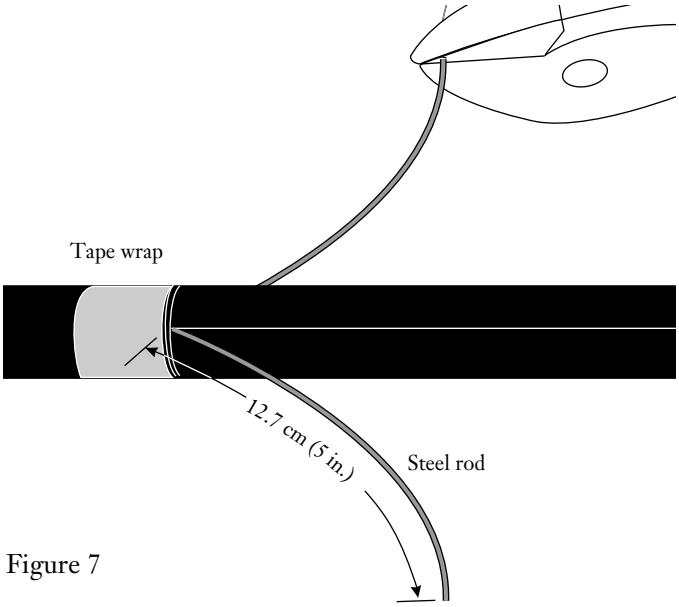


Figure 7

4.10 Use the hook blade knife to make a ring cut through the outer sheath 10 cm (4 in.) [5 cm (2 in.) for armored SST-Drop] from the end of the cable (Figure 8).

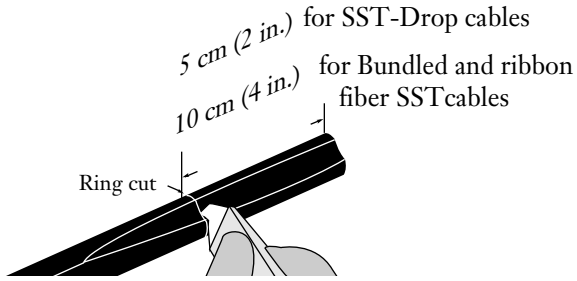


Figure 8

4.11 At the ring cut, carefully flex the cable to break the armor.

4.12 Slide the end section of sheath and armor off the cable and discard (Figure 9).

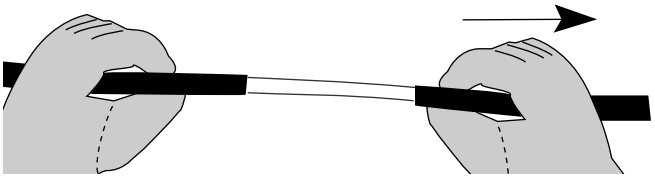


Figure 9

You may have to cut the water blocking tape at the ring cut in order for the sheath to slide off.

4.13 Locate the inner rip cords. Use the hook blade knife to make starting notches in the cable sheath for each rip cord (Figure 10).

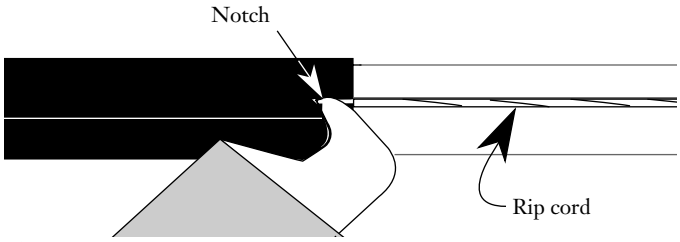


Figure 10

Note: *For armored SST-Drop cables, it is not necessary to make starting notches in the cable sheath.*

4.14 Using the shaft of a screwdriver as a handle, pull the rip cord through the armor and and outer sheath to 5 cm (2 in.) past the tape wrap on the outer sheath (Figure 11). The extra 5 cm (2 in.) of split sheath will permit the ground clamp to slide easily under the armor in a later step. *With armored SST-Drop cables, hold the shaft of the screwdriver against the outer jacket of the cable. Instead of pulling the rip cord through the armor, roll the shaft of the screwdriver down the side of the cable to start the cut.*

Caution: *Take care to avoid injury on the steel rods when pulling the rip cord.*

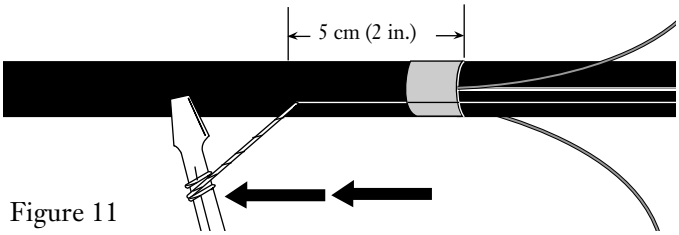


Figure 11

4.15 Cut the inner rip cord flush with the sheath with scissors.

4.16 Peel off the split sections of armor and sheath down to the wrap of tape.

4.17 Carefully flex the sections of armor and sheath and remove them. Side cutters may be helpful in removal (Figure 12).

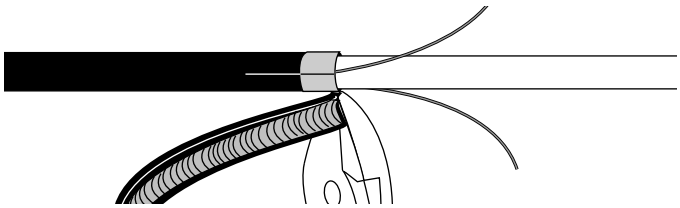


Figure 12

4.18 Cut away the water-blocking tape flush at the tape mark with scissors (Figure 13).

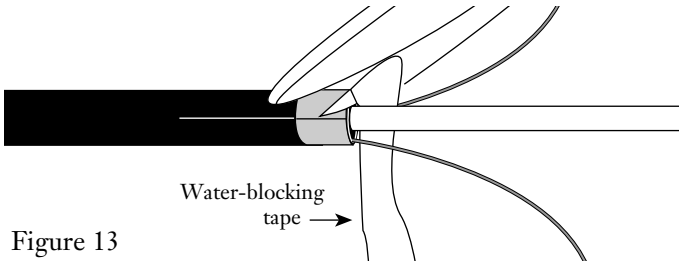


Figure 13

4.19 Remove the tape wrap from the end of the cable.

5. Grounding

5.1 To ground the armor, carefully pry up the armor and sheath so that the baseplate of the grounding clamp can be slid under the armor.

5.2 Slide the baseplate under the armor. Be careful not to damage the central tube. Place the top plate over the baseplate and tighten down with the 10 mm locknut (Figure 14). A few light taps on the top plate may help seat the teeth of the grounding clamp.

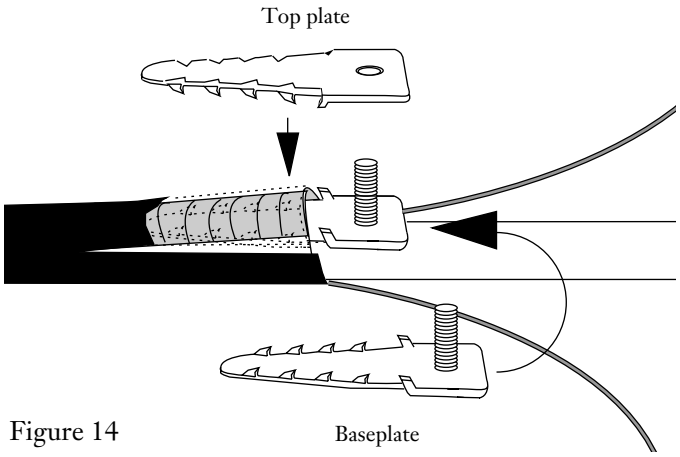


Figure 14

5.3 Place the grounding braid on top of the lock nut and secure with a second lock nut.

5.4 Cover the grounding clamp and split portion of the sheath with vinyl tape as shown in Figure 15.

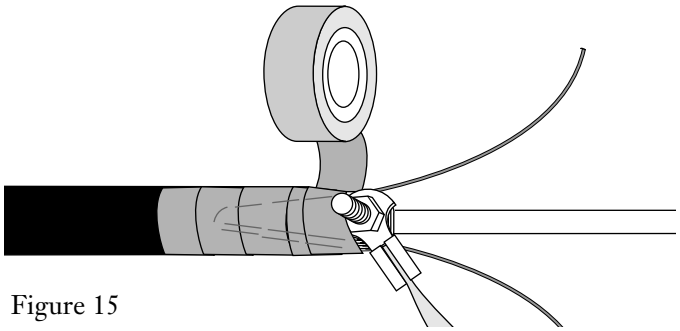


Figure 15

6. Accessing Cable End Central Tube

6.1 Use an Ideal® model 45-164 coaxial cable stripper to remove the needed strip length of central tube in 60 cm (24 in.) increments. Scoring the circumference of the tube will enable you to make a clean break in the tube with minimal risk to the fibers inside.

Before using the stripper, make sure that it is properly adjusted. Use a small Phillips head screwdriver to adjust *one* of the blades on the side of the central tube cutter so that it seats against the lower jaw but does not force the jaw open (Figure 16).

Leave the blades on the front and other side of the tool fully retracted so that they do not extend into the grooves of the lower jaw.

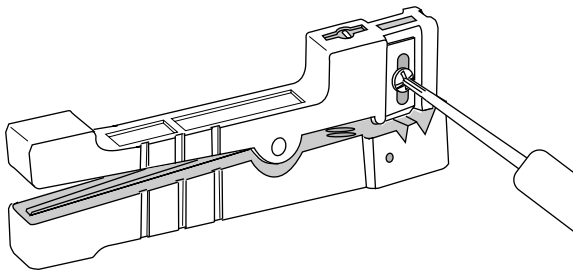


Figure 16

6.2 Use the last 2 to 3 inches (5 to 7.5 cm) at the end of the cable end to determine the sharpness of the stripper's blade and how many turns of the tool will be required to score the tube. *To minimize damage to the fibers inside the tube, always use the tool to score the tube,* ***not*** *ring cut it.*

To score a central tube:

a) Open the tool by squeezing its handles together and place the stripper's blade on the central tube at the desired scoring point.

b) Hold the central tube steady with one hand to prevent it from twisting.

c) Use your other hand to rotate the tool around the central tube two to three complete turns to score it (Figure 17). Remove the tool from the central tube.

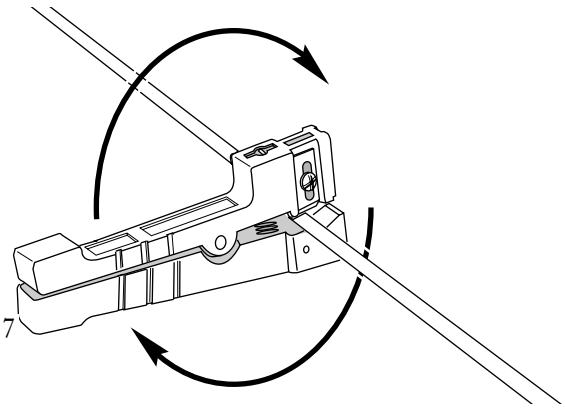


Figure 17

If the stripper completely cuts through the tube during this trial step, move the tool to a new trial area at the end of the central tube and repeat a) through c) with ***fewer*** *rotations in step c). If the blade cuts completely though the tube, damage to the fibers inside may result.*

d) Carefully flex the tube to break it at the score point. The break should be clean and free of rough edges (Figure 18).

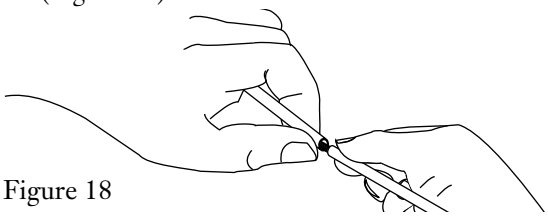


Figure 18

If the break is not clean, repeat the trial at a new location at the end of the tube with an additional rotation or two.

e) Slide the severed tube off the fibers/ ribbons. USE CARE TO AVOID DAMAGING THE FIBERS.

f) Repeat these steps until the desired length of central tube is removed, leaving at least 2.5 cm (1 in.) of exposed central tube beyond the end of the sheath (Figure 19). *The length of exposed buffer tube may vary depending on the hardware being used.*

6.3 Use a lint free tissue or cloth to wipe the filling compound from each ribbon or bundle of fibers (Figure 19). If cleaner fibers are desired, filling compound remover may be used.

> ⚠ **CAUTION:** *If filling compound remover or other solvents are used to clean ribbons, wipe away excess solvent with a clean, dry tissue or cloth. NEVER ALLOW OPTICAL FIBERS TO SOAK IN SOLVENTS FOR EXTENDED PERIODS OF TIME– DAMAGE TO THE FIBER COATING CAN OCCUR.*

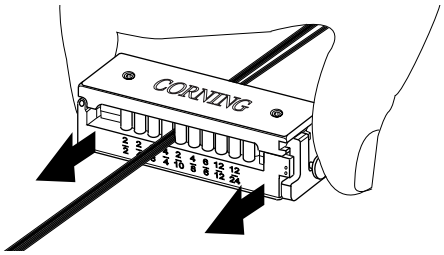


Figure 19

6.4 Route and secure the SST cable to the hardware being installed.

Accessing Ribbon Fibers

6.5 Secure the ribbons within the hardware in accordance with the hardware manufacturer's instructions.

6.6 If appropriate for your installation, divide the ribbon(s) using the RST-000 too as described in SRP–004–098 (Figure 20).

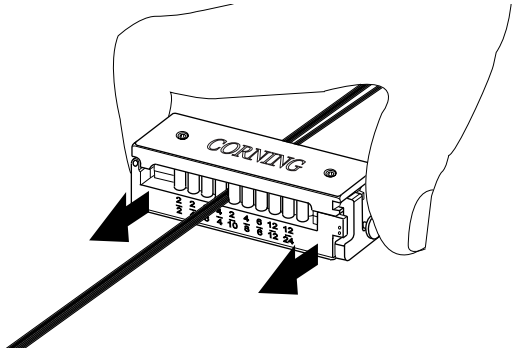


Figure 20

6.7 To access individual fibers in a ribbon, refer to Section 4 in Standard Recommended Procedure SRP-004-048, *Accessing Individual Fibers in Ribbon Fiber Optic Cables With the TKT-050 Kit.*

Accessing Bundled Fibers

6.8 Bundled fiber SST cables use color-coded binder threads to group and identify fibers. Steps 5.10 - 5.14 outline a procedure for separating the fiber bundles.

6.9 Secure the cable to a work surface or have someone hold it steady. With one hand, tightly grasp the groups of fibers 50 cm (20 in.) below the end of the central tube. With the opposite hand, pick out a binder thread and its fibers at the end of the tube (Figure 21).

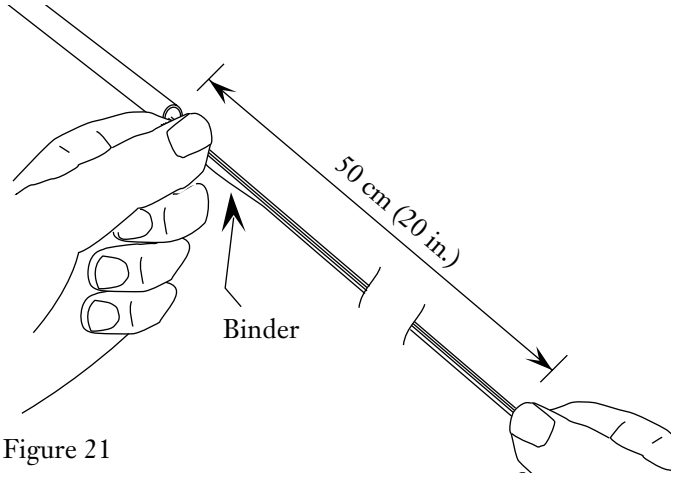


Figure 21

6.10 Slide your finger along this binder and fibers while still tightly holding the groups of fibers with the opposite hand. This will cause the lay lengths of this group of fibers to decrease, making the fiber bundle evident (Figure 22).

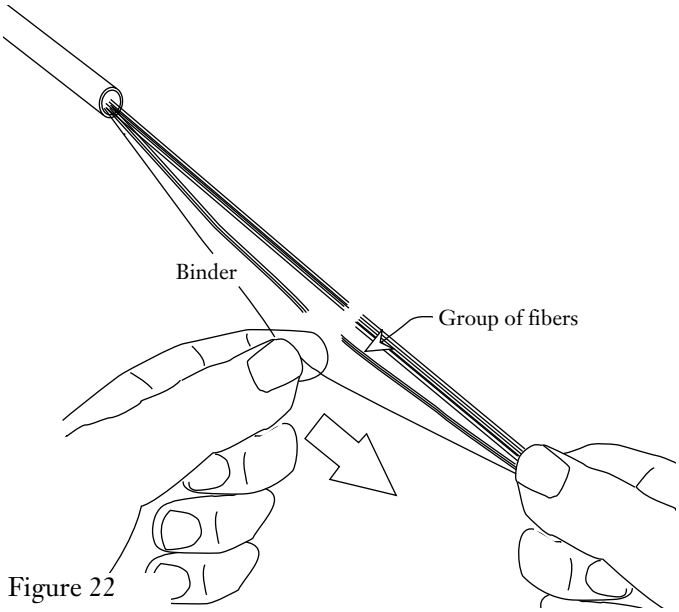


Figure 22

6.11 Separate this bundle from the rest, and clean this bundle with filling compound remover.

Note: *For easiest bundle separation, leave the filling compound on the other fiber groups.*

6.12 Label and separate this group of fibers with an identification number that corresponds to the color of the binder thread (Figure 23).

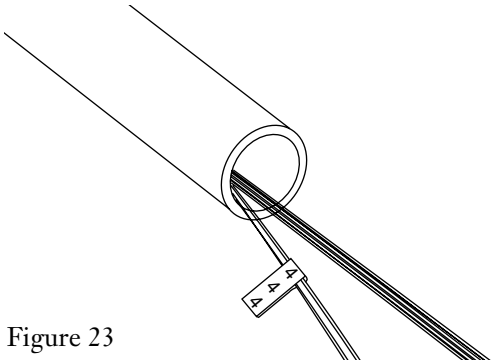


Figure 23

6.13 Repeat steps 6.10 - 6.13 until all the binder groups of fibers are separated.

6.14 Splice the fibers according to the system design plan.

6.15 Follow the closure or hardware manufacturer's instructions for buffer tube mounting and routing. Complete the hardware or closure assembly according to its manufacturer's instructions.

7. Mid-span Access of the Cable

Note: *For armored SST-Drop cables, extreme care must be taken to prevent kinking the buffer tube during the mid-span access process due to the small cable diameter. It is recommended to have a co-worker help hold the drop cable and keep it under hand-tension to reduce the possibility of kinking.*

7.1 This mid-span access procedure is dependent upon sufficient slack cable for access. The minimum amount of cable slack is determined as follows:

• Slack needed = 60 x cable diameter + 105 cm (42 in.): for example, a 1.25 cm (0.5 in.) OD cable, 60 X 1.25 cm = 75cm + 105 cm = 180 cm (72 in.) of slack.

• Add any necessary additional slack needed to reach the splicing workstation from a pole or manhole.

IMPORTANT: *Please read and understand this procedure before attempting to access a buffer tube.*

7.2 Prepare the tie-in (drop) cable according to manufacturer's instructions. Set the cable aside in a secure place.

7.3 Determine the amount of slack needed. Place a wrap of tape at each end of the cable sheath that is to be removed (Figure 24).

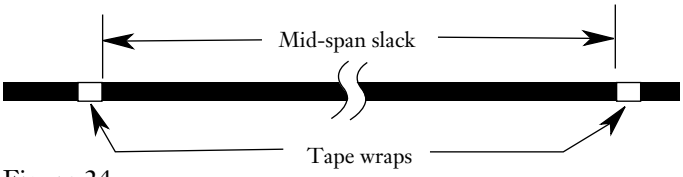


Figure 24

7.4 Taking care not to cut or flex the armor, use the hook blade knife to make a shallow ring cut through *only* the black outer sheath at both tape marks (Figure 25).

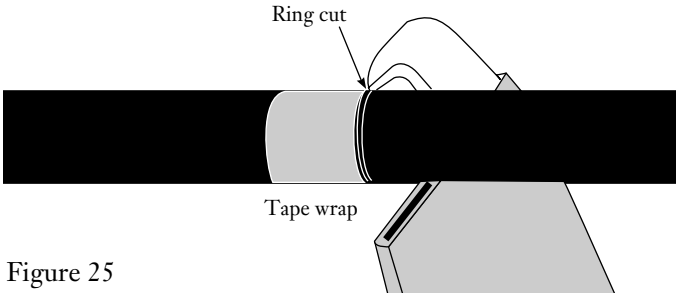


Figure 25

7.5 Starting at one tape mark, use the cable sheath knife to shave off 25 cm (10 in.) of outer sheath over both steel rods. Shave the sheath until both steel rods are visible (Figure 26).

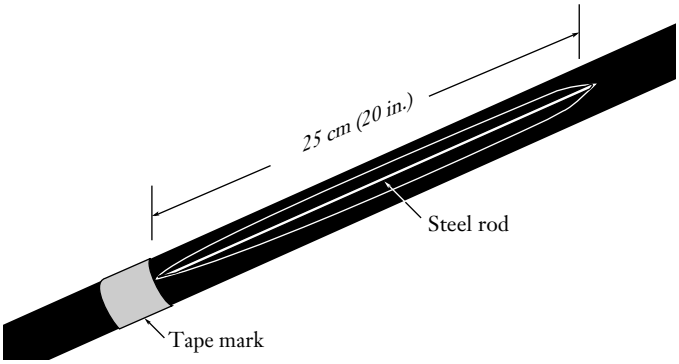


Figure 26

WARNING: *Use extreme care in performing the remaining steps to avoid injury from the exposed steel rods.* ***The use of safety gloves and safety glasses is strongly recommended.*** ALWAYS WEAR SAFETY GLASSES WHEN CUTTING THE STEEL RODS. *Failure to do so may result in serious personal injury.*

7.6 Using needle nose pliers, bend the embedded steel rods away from the cable sheath (Figure 27).

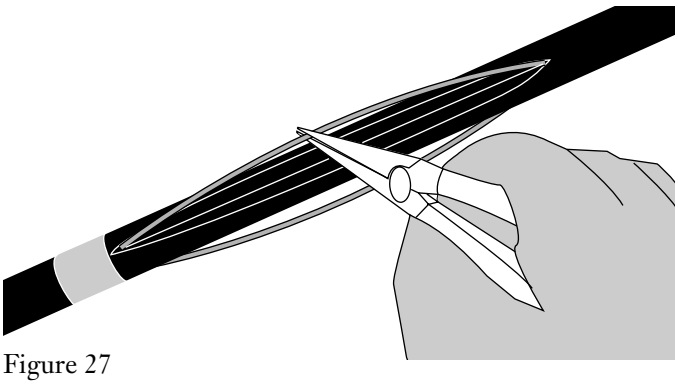


Figure 27

7.7 Use side cutters to cut the steel rods 12.7 cm (5 in.) from the tape wrap (Figure 28).

Note: *For armored SST-Drop cables, repeat steps 7.5-7.7 at the other tape mark. Then proceed to Step 7:13.*

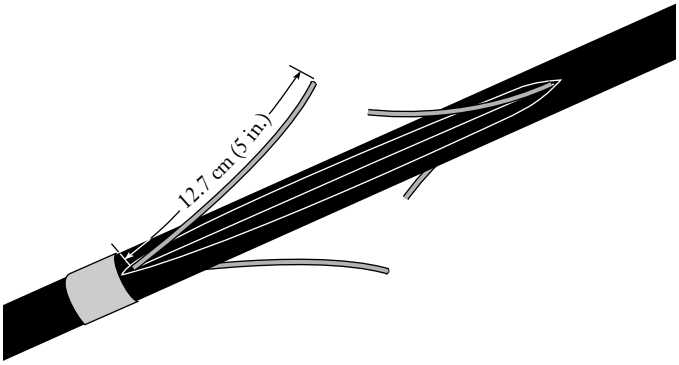


Figure 28

7.8 Locate the rip cords under the steel rods. Cut the outer rip cords near the tape mark (Figure 29).

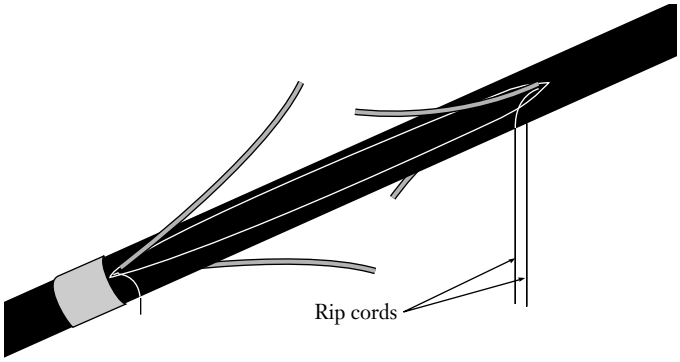


Figure 29

7.9 Using the shaft of a screwdriver as a handle, pull one rip cord at a time through the sheath to the opposite wrap of tape (Figure 30).

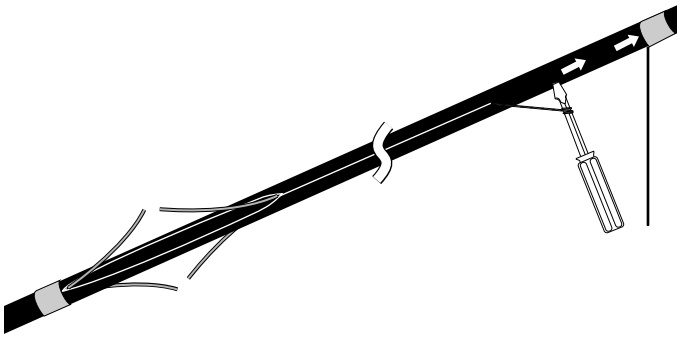


Figure 30

7.10 Cut the rip cords flush at the tape wrap with scissors.

7.11 Pull the steel rods out and away from the sheath through the openings made by the rip cords.

7.12 Cut the steel rods 13 cm (5 in.) from the tape wrap (Figure 31). ALWAYS WEAR SAFETY GLASSES WHEN CUTTING THE STEEL RODS.

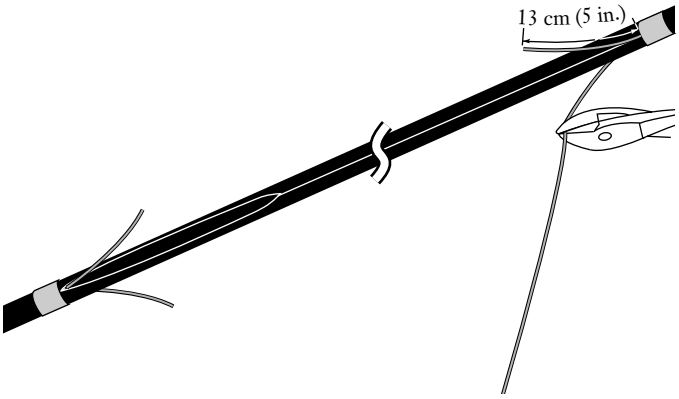


Figure 31

7.13 Use the hook blade knife to make a ring cut through the black outer sheath 15 cm (6 in.) from the other tape mark (Figure 32).

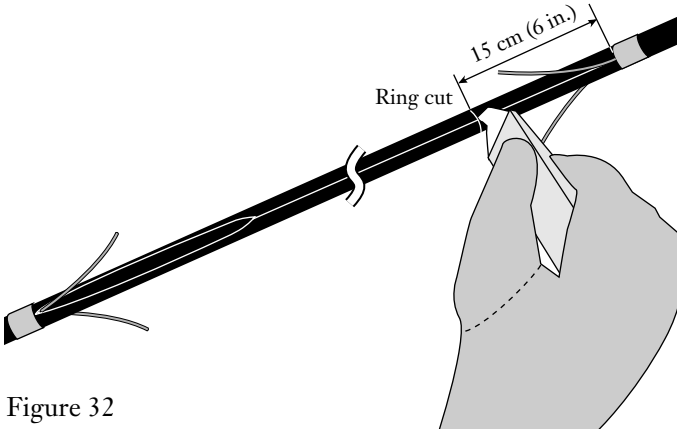


Figure 32

7.14 At the ring cut made in step 7.13, carefully flex the cable to break the armor. *Do not violate the minimum bend radius of the cable during this step.*

7.15 Position the blade of the knife in the new ring cut so that it can travel down the cable between the armor and the buffer tube towards the ring cut at the tape mark.

Hold the knife at a 45° angle to the cable to prevent the blade from slipping out of the sheath. TAKE CARE TO AVOID ACCIDENTAL INJURY FROM CONTACT WITH THE ENDS OF THE RODS.

Slit the armor and outer jacket of the cable 5 cm (2 in.) past the tape mark by holding the arm which has the knife out straight and pulling the cable "through" the hook blade with your other hand (Figure 33).

The extra 5 cm (2 in.) of split sheath will permit the ground clamp to fit easily under the armor in a later step.

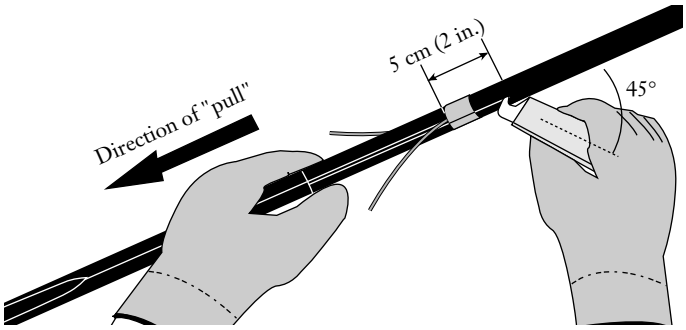


Figure 33

7.16 Repeat step 7.15 on the opposite side of the cable (180°) to make a second 15 cm (6 in.) slit.

7.17 Remove the two split sections of sheath and armor. Side cutters may be helpful in removal (Figure 34).

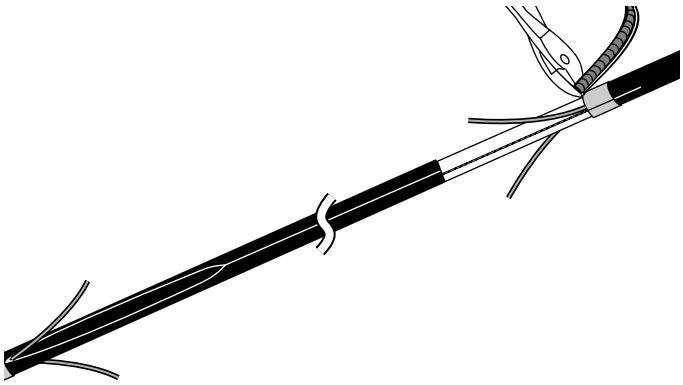


Figure 34

7.18 Cut the two inner rip cords near the tape mark.

7.19 Using the shaft of a screwdriver as a handle, pull one rip cord at a time through the sheath and armor 5 cm (2 in.) past the opposite wrap of tape on the outer sheath (Figure 35). The extra 5 cm (2 in.) of split sheath will permit the ground clamp to fit easily under the armor in a later step).

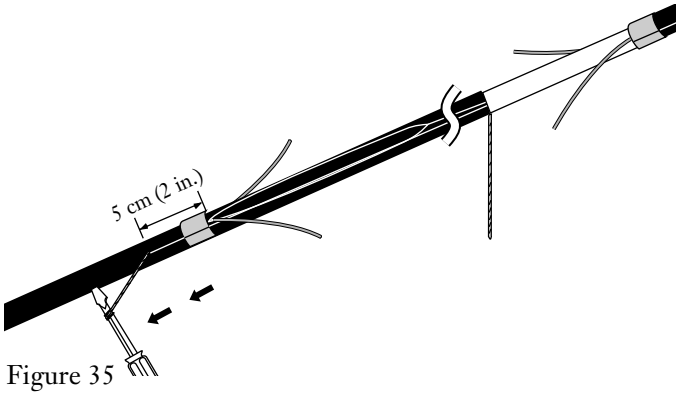


Figure 35

7.20 Cut the rip cords flush with the sheath with scissors.

7.21 Carefully peel off the split sections of armor and sheath down to the tape mark.

7.22 Carefully flex the sections of armor and sheath and remove them. Side cutters may be helpful in removal (Figure 36).

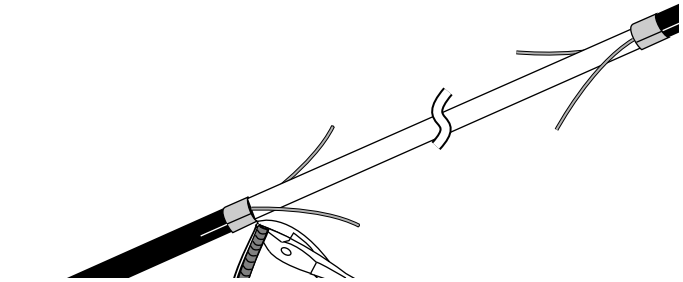


Figure 36

7.23 Cut away the water-blocking tape, if present, flush at the tape marks with scissors (Figure 37).

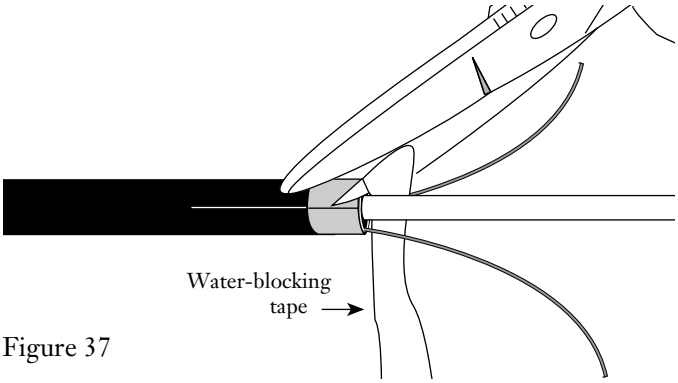


Figure 37

7.24 Ground the armor by apply grounding clips on both exposed ends as described in Section 5 (Figure 38).

Note: *For armored SST-Drop cables, use the Corning Cable Systems Optical Fiber Access Tool (p/n OFT-000) as described in SRP-004-014 to access the buffer tube. Then return to this procedure and clean the fibers per Step 7:28 and then skip to Step 7:38.*

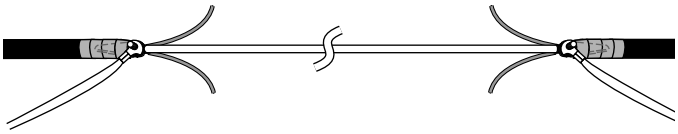


Figure 38

7.25 Corning Cable Systems Universal Access Tool II and III are designed to access the fibers of single-tube cables in a mid-span location where slack is present (see Figure 39).

For further information about these tools, refer to the manual provided with the tool, SRP-004-069, *Universal Access Tool II Operating Instructions* or SRP-004-074, *Universal Access Tool III Operating Instructions.*

Note: *The UAT II is capable of accessing the fibers in high fiber count (> 432-f) SST-UltraRibbon cables; however, it is not optimized for use on the polyethylene buffer tubes associated with these cables.*

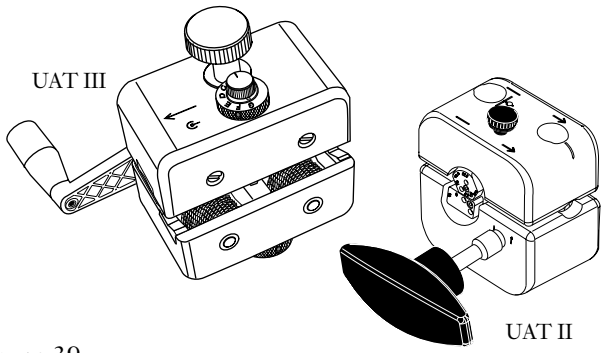


Figure 39

7.26 Place a mark 12.7 cm (5 in.) from the end of each side of the exposed section of central tube with a permanent marking pen (Figure 40). *This length may vary depending on the hardware being used.*

Note: *Depending upon the type of closure being used, assembly may be easier if you install cable mounting hardware and sealants at this time.*

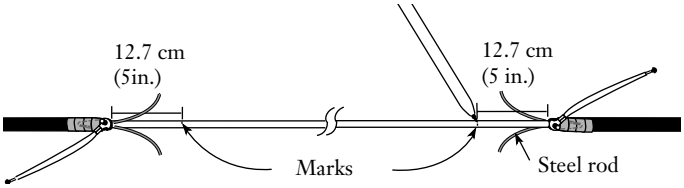


Figure 40

7.27 Follow the UAT instructions for accessing ribbons or bundled fibers. After using the UAT, the final result should resemble Figure 41.

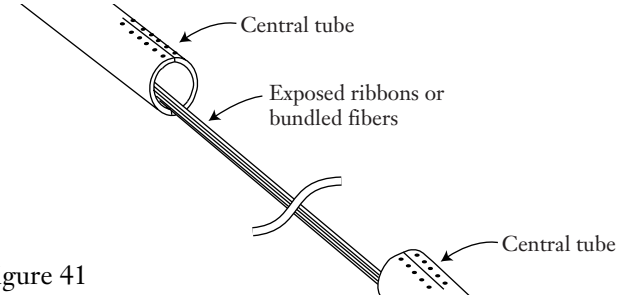


Figure 41

7.28 Use a lint free tissue or cloth to wipe the filling compound from each ribbon or bundle of fibers. If cleaner ribbons / fibers are desired, filling compound remover may be used.

7.29 Use a lint free tissue or cloth to wipe the filling compound from each ribbon. If cleaner ribbons are desired, filling compound remover may be used.

> ⚠ **CAUTION:** *If filling compound remover or other solvents are used to clean the ribbons, wipe away excess solvent with a clean, dry tissue or cloth. NEVER ALLOW OPTICAL FIBERS TO SOAK IN SOLVENTS FOR EXTENDED PERIODS OF TIME– DAMAGE TO THE FIBER COATING CAN OCCUR.*

Accessing Ribbon Fibers

7.30 If appropriate for your installation, divide the ribbon(s) using the Ribbon Splitting Tool (RST-000) (Figure 42).

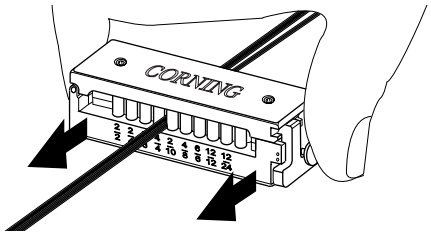


Figure 42

7.31 If an entire ribbon or section of divided ribbon can be cut at the mid-span point, access the individual fibers by following Section 4 of Standard Recommended Procedure SRP-004-048, *Accessing Individual Fibers in Ribbon Fiber Optic Cables with the TKT-050 Kit.*

If individual fibers are to be accessed at the mid-span point, follow either the **mechanical** process described in SRP-004-076, *Accessing Individual Fibers in Coring Optical Fiber Ribbons Using the TKT-060 Kit*, or the **chemical** process for accessing fibers at the mid-span points described in Section 5 of SRP-004-048.

Skip to step 7.37.

Accessing Bundled Fibers

7.32 Bundled fiber SST cables use color-coded binder threads to group and identify fibers. Steps 7.33 - 7.36 outline a procedure for separating the fiber bundles for mid-span access.

7.33 With one hand, tightly grasp the groups of fibers 50 cm (20 in.) away from one end of the central tube. With the opposite hand, pick out a binder thread and its fibers at the end of the tube (Figure 43).

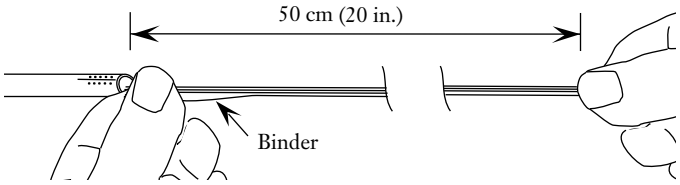


Figure 43

7.34 Slide your finger along this binder and fibers while still tightly holding the groups of fibers with the opposite hand. This will cause the lay lengths of this group of fibers to decrease, making the fiber bundle evident (Figure 44).

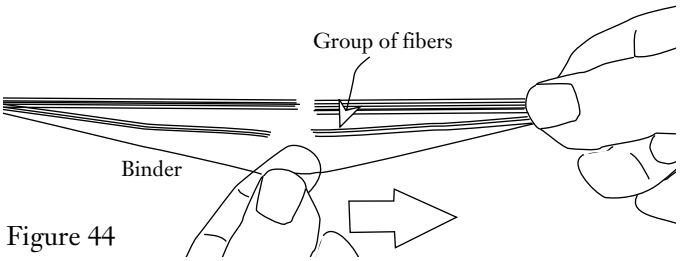


Figure 44

7.35 Separate this bundle from the rest, and clean this bundle with filling compound remover.

Note: *For easiest bundle separation, leave the filling compound on the other fiber groups.*

7.36 Separate the required fiber from the bundle.

7.37 Determine the end of the accessed fiber(s) to be cut by checking the system design splice plan and the feet/meter marks printed on the cable sheath before cutting any fibers.

As shown in Figure 45, typically the fiber ribbon is cut at the end opposite the desired point of origin.

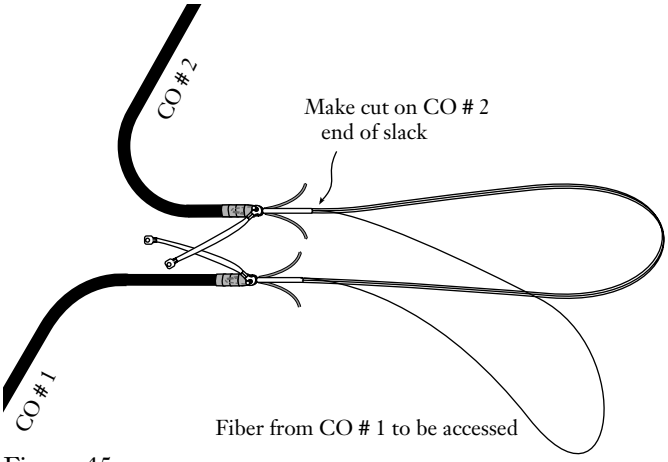


Figure 45

7.38 Using scissors, cut the fiber(s) to be accessed as close as possible to the appropriate end of the central tube (Figure 46) USE EXTREME CARE TO CUT ONLY THE FIBER(S) TO BE ACCESSED.

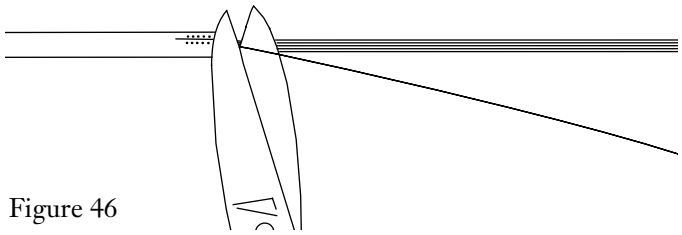


Figure 46

7.39 Follow the closure or hardware manufacturer's instructions for central tube mounting and routing.

7.40 Splice the fibers or according to the system design plan.

7.41 Complete the hardware or closure assembly according to its manufacturer's instructions.

Special Note: Fiber Optic Training Program

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