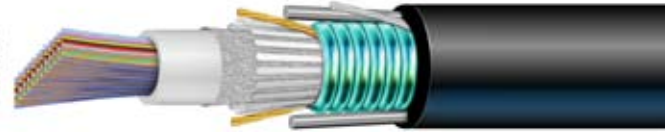


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**2.4** DO NOT use magnifiers in the presence of laser radiation. Diffused laser light can cause eye damage if focused with optical instruments. Should accidental eye exposure be suspected, arrange for an eye exam immediately.

**2.5** A Material Safety Data Sheet (MSDS) for Fiber Optic Cable is also available. Call **1-800-879-9862**.

## 3.0 General Installation Considerations

**3.1** Cable tension should not exceed 600lbf.

**3.2** The dynamic bend radius must be kept larger than 20 times the cable diameter. The static bend radius must be kept larger than 10 the cable diameter.

**3.3** Do not bend the central tube at sharp angles while removing the jacket, armor, tapes or strength members. The core tube shall not be routed inside closures or pedestals due to bending restrictions of the core tube. Draka recommends the use of the Draka ezTOOLS™ | UniShaver Ribbon Midspan Access Tool to open up the central tube. Call **1-800-879-9862** to order.

**3.4** Properly set the blade depth on ring cutters. A shallow blade using multiple rotations is recommended.

**3.5** Armor cable shall be bonded and grounded in accordance with customer requirements. Draka recommends all metallic components be bonded and grounded at each cable end.

**3.6** When storing cable in a coil, the reverse figure 8 hand coiling method should be used to minimize cable twisting.

## 1.0 Scope

These instructions explain key installation and cable handling considerations for gel tube or gel-free central tube ribbon cable. Ribbon in loose tube cable considerations are provided in other documents. When this cable is used in conjunction closures, cabinets, pedestals, hardware, etc, the user must obtain installation procedures from the appropriate component manufacturer. Failure to adhere to preparation & handling procedures may void the cable warranty.

**Questions? Call 1-800-879-9862.**

## 2.0 Safety

**2.1** Draka Comteq recommends the use of approved personal protective equipment in this procedure.

**2.2** Wear safety glasses and gloves, and use solvents in well-ventilated areas.

**2.3** Never look directly into the end of a fiber that may be carrying laser light. Laser light may be invisible and can damage your eyes. 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. Should accidental eye exposure to laser light be suspected, arrange for an eye examination immediately.

**3.7** Figure 8 machines are not permitted

**3.8** When blowing, a crash test should be performed for each cable to determine the maximum push force that can be applied. This force will vary for different cable sizes and duct inside diameters.

**3.9** Radial Strength Members (RSMs) should be secured at termination points. The cable jacket must also be secured.

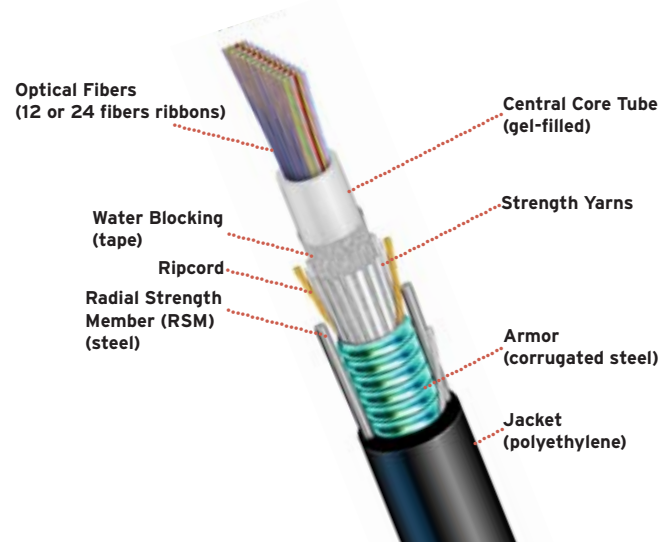
**3.10** Note that water swellable materials used but by the industry do not block water mixed with low levels of salt water. In applications where the cable or termination points are exposed to salt water, a gel filled cable is recommended.

**3.11** Gel free cable used in aerial applications must use coupling coils at termination points to prevent ribbon retraction; see Section 10 & II. 25 to 50 ft of extra cable length should be allocated for the coupling coil on each side of the splice point (50 to 75 feet total for both coils). When slack loops are left for aerial mid sheath entry splice points, 75 to 100 ft of cable should be stored to accommodate coupling coil and closure routing requirements.

**3.12** Gel free cable used in pulling applications must have pulling grips installed in accordance to section 7.

**3.13** Do not allow blades or sharp edges to contact the ribbons or fibers.

## 4.0 Reference Drawing

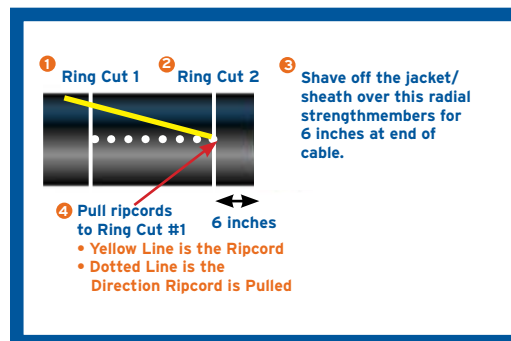


## 5.0 Tools and Materials Needed for Cable Access



- [+] Utility knife, or cable ring cutter
- [+] Central tube access tools (Draka UniShaver and coaxial ring cutter)
- [+] Pliers: needle nose, linesman, diagonal cutter
- [+] Scissors or snips
- [+] D'Gel or cable cleaning solution
- [+] Lint free wipes
- [+] Isopropyl alcohol
- [+] Flat-tip screwdriver
- [+] Disposable rags
- [+] Procedure from the closure, cabinet, pedestal, hardware manufacturer.

## 6.0 End of Cable Access Procedure Quick Reference Checklist



1. Determine length of cable to be stripped, make Ring Cut #1 that distance from the end of the cable.
2. Make Ring Cut #2 six (6) inches from the end of the cable.
3. Look at the end of the cable and locate the Radial Strength Members (RSM). The rods are located on opposite sides of the cable.
4. Shave off the jacket/sheath over each radial strength member (RSM), starting 6 inches from end of cable and cutting towards the end of the cable.
5. Remove the jacket and armor in this 6 inch area. Expose the ripcords. Cut off RSM's.
6. Notch jacket/sheath (and armor) near the ripcords.
8. Pull the yellow ripcords to Ring Cut #1. Pull each yellow ripcord separately.
9. Remove jacket (and armor).
10. Cut and remove yarns.
11. Cut off excess length of RSM. When in doubt, leave 12".
12. Clean the tube.
13. Determine length of fibers to be accessed and open the central tube. Use Ideal® ring cutter to open the central tube. Pull off tube in 12" sections.
14. Clean ribbons.

## Step-by-Step: Open End of the Cable

### 7.1 Measure and Ring Cut #1

Refer to the procedure of the closure, cabinet, pedestal, or hardware manufacturer to determine the length of cable needed to access. At this distance from the end of the cable, make a Ring Cut #1.

**CAUTION:** Cutting too deeply through the jacket could damage the ripcords, armor or central tube. Only a shallow cut is necessary to allow the jacket to be removed.

For non-armored designs with optional tone-wires, care should be taken not to cut the insulated tone-wire located next to the radial strength member.

### 7.2 Ring Cut #2

Make Ring Cut #2 six (6) inches from the end of the cable.

### 7.3 Locate RSM's

Look at the end of the cable to locate the Radial Strength Members (RSM). Radial Strength Members are located on opposite sides of the cable.

### 7.4 Shave The Jacket over the RSM's

Beginning 6 inches from the end of the cable (Ring Cut #2), use a utility knife to shave-off the black jacket/sheath over the RSM's. Shave in the direction towards the end of the cable. Repeat over both RSM's. Peel back the jacket.

### 7.5 Cut RSM's, Open Armor, Locate Ripcords

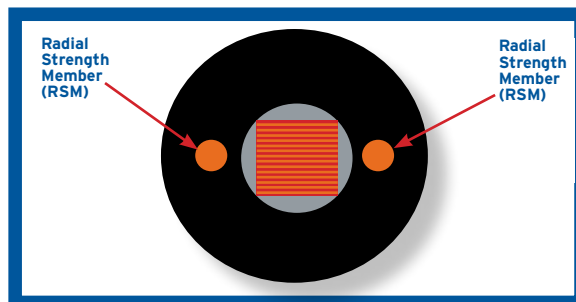
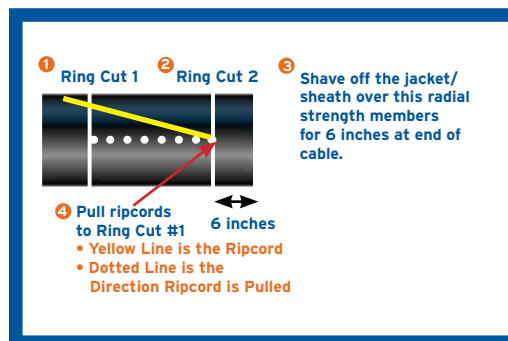
- > Bend back the RSM's and cut off both RSM's.
- > Open up the armor at the seam. Pry open. (if applicable)
- > Cut away the armor.
- > Locate the 2 yellow ripcords.

### 7.6 Ripcord Notches

Use diagonal cutters to notch the jacket (and armor, if applicable) near the ripcords. This helps start the pull of the ripcords and prevents breaking ripcord.

### 7.7 Knot the Ripcords

Tie a knot in the end of each ripcord. This will help hold the ripcord in the jaws of the pliers.

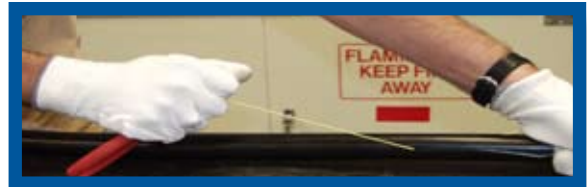
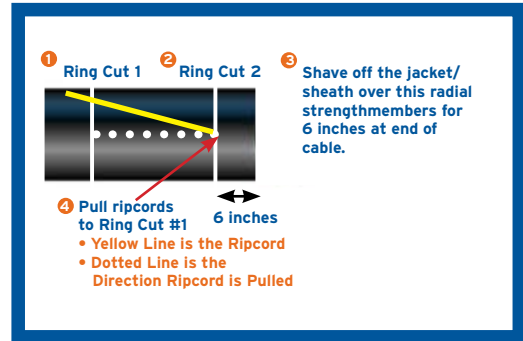


### 7.8 Pull Ripcords

Grasp one end of a ripcord in the jaws of needle nose pliers. Twist the pliers to wrap the ripcord around them, pull the ripcord through the jacket to Ring Cut #1. Cut the ripcords, leaving 1 inch exposed.

**NOTE:**

For armored cable, consult the closure, pedestal, cabinets, or hardware manufacturer procedure and make sure to leave enough armor in front of the ring-cut to be used for grounding. You may need to pull the ripcord several more inches to leave adequate armor for grounding.



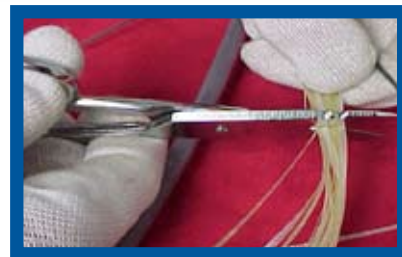
7.9 Peel the sheath and armor away from the cable core. Cut and discard. You may need to score the armor with a utility knife at Ring Cut #1.



7.10 Determine the required length of yarns that need to be left for anchoring. Refer to the closure, cabinet, pedestal manufacturer procedure. Use snips to cut and remove all excess length of yarns and tape from the cable core.

**Note:**

It is CRITICAL to tightly secure the radial strength members inside the closure, cabinet, pedestal or hardware. This prevents retraction, piston effect, and attenuation increases.



7.11 Determine the required length of Radial Strength Members ( RSM ) that need to be left for anchoring. Refer to the closure, cabinet, or pedestal manufacturer procedure. Cut and remove excess length. When in doubt, leave 12" of RSM's.



**7.12** Clean the exposed buffer tube.

**CAUTION:**

Calibrate or test the depth of your coaxial ring cutter before performing step 14. Failure to do so could result in cutting to deep an inadvertent cutting of fibers.



**7.13** Determine the length of central tube that is required. Refer to the procedure from the closure, cabinet, pedestal manufacturer. Do not expose more central tube than necessary.

**CAUTION:**

Do not route the tube inside the closure. Bending the tube inside the closure may kink the tube causing fiber damage.

**7.14** To remove the tube, score the buffer tube with rotation(s) of the coaxial ring cutter. Do not remove more than 48" at a time.

**7.15** Grasp the tube on each side of the score. Flex the central tube in all directions to separate the tube at the score mark. Pull the tube off of the fibers. Repeat removal of tubes in 48 inch sections until the desired length of fiber is exposed.



**7.16** For Gel Free Cable, cut away the water swellable tape inside the core tube. Clean the ribbons with isopropyl alcohol and lint free wipes.

**7.17** For Gel filled tubes, clean the ribbons with isopropyl alcohol and lint free wipes. Remove gel filling compound at the open end of the central tube using a Q-tip or similar swabbing tool. Remove gel from 1 inch inside the central tube. Apply B-sealants, RTV sealants, etc. to seal off the end of the buffer tube to contain future leakage of gel from filling compound.



## 8.0 Midspan Access Procedure

### Quick Reference Checklist

1. Determine length of cable to be stripped and make two ring cuts to define "access window".
2. Make a third ring cut 8 to 12 inches (20 to 30 cm) from the first.
3. Shave off outer jacket over RSMs between ringcuts 1 and 3.
4. Remove jacket between ring cuts 1 and 3, and cut RSMs.
5. Cut armor (if applicable) pry it away to expose the ripcords.
6. Notch sheath and armor near ripcords.
7. Cut both ripcords near the ring cut 1 and tie a knot in the end of each.
8. Wrap ripcord around needle nose pliers and pull to expose cable core.
9. Pull ripcords remaining length, cut jacket and armor.
10. Peel sheath and armor away from the cable core.
11. Cut and remove strength yarns from cable core.
12. Clean the exposed buffer tube.
13. Select the appropriate UniShaver™ insert.
14. Position blade in the UniShaver™.
15. Calibrate the blade position in the UniShaver™.
16. Score the buffer tube near ring cuts 1 and 2.
17. Position UniShaver™ on the buffer tube.
18. Pull UniShaver™ down the tube.
19. Snip off sliver of stripped buffer tube.
20. Remove the UniShaver™ from the buffer tube.
21. Flex and remove the stripped buffer tube.
22. Clean the ribbons.
23. Prepare for anchoring and splicing.

## 8.0 Midspan Access Procedure

**8.1** Refer to the procedure of the closure, cabinet, pedestal, or hardware manufacturer to determine the length of cable needed to access (the "open window").

### 8.2 Ring Cut #1 and #2

Make two ring cuts the recommended distance apart (Ring Cut #1 and #2). Ensure your splice point is centered between the ring cuts. Measure twice and cut once.

**CAUTION:**

Cutting too deeply through the jacket could result in unintentional damage to the ripcords, armor or buffer tube.

For non armored designs with optional tone-wires, care should be taken not to cut the insulated tone-wire located next to the RSM.

### 8.3 Ring Cut #3

Make a third ring cut ( Ring Cut #3 ) 8 inches from Ring Cut #1. (Located in the Access window zone)

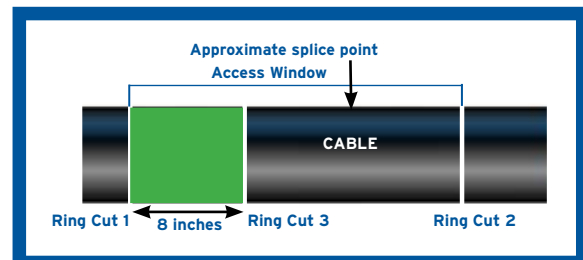
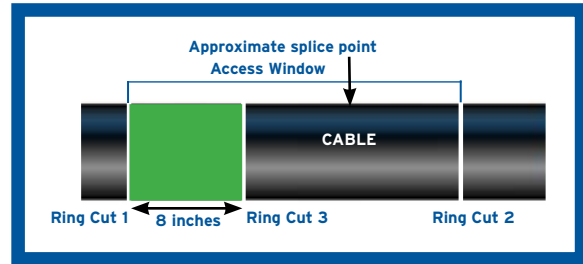
### 8.4 Locate RSM and Shave off Jacket

Locate the radial strength members (RSM) inside of the cable. You will be able to find the RSM's by looking at the Ring Cut locations. The RSM's will be on opposite sides ( 180 degrees apart ). Using a sheath or utility knife, shave off the jacket over both the RSMs in the eight inch section between Ring Cut #1 and #3.

**Note:**

An Alternate method is to carefully slit the jacket using a utility knife.

**8.5** Remove the jacket between ring cuts 1 and 3. Use linesman pliers. Cut the RSM's at Ring Cut #3 and bend back.



### 8.6 Open Armor and Locate Ripcords

Open up the armor (if applicable) between Ring Cut #1 and #3 and locate the yellow ripcords.



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### 8.7 Ripcord Preparation

Using diagonal cutters, cut a small notch into the sheath and armor (if applicable) near the two ripcords to help start the pull of the ripcords. This prevents breaking of the ripcord.



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**8.8** Cut the ripcords equally between Ring Cut #1 and #3. Tie a knot at the end of both ripcords. This knot prevents the ripcord from slipping through the plier jaws.



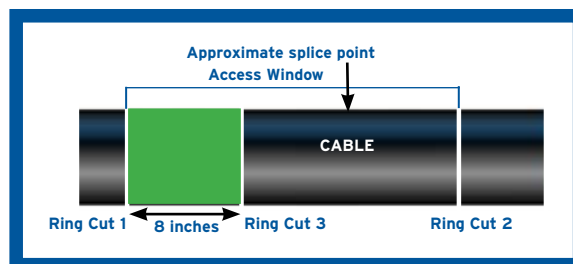
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**8.9** Grasp the end of the ripcord in the jaws of needle nose pliers. Turn the closed pliers to wrap the ripcord around them. This will be the ripcord located nearest the center of the desired access window.



### 8.10 Pull Ripcord to Ring Cut #2

Pull ripcords and open the jacket to ring cut #2. Peel the jacket and armor (if applicable) away from the cable core, then discard it.



8.11 Use snips to cut all yarns and tapes from the cable core.

#### CAUTION:

Refer to the - closure, cabinet, pedestal, or hardware manufacture's procedure to determine how much strength yarn or RMS to leave exposure for anchoring. Cut the yarns and RSM's at those locations. When in doubt, leave 12".



8.12 Thoroughly clean the exposed buffer tube and strength members. Using Isopropyl Alcohol.



## 9.0 Prepare to Open The Central Tube

### 9.1 Prepare to Open The Central Tube

Select the proper Draka UniShaver™ tool size needed to access the tube. Open the tool to verify the engraved number matches the proper size of the tube being opened.

9.2 Ensure the blade is correctly positioned in the tool, with the curved side of the blade facing “downhill” in the blade slot. Do not tighten blade at this point.

9.3 Calibrate the blade setting in UniShaver™. Each UniShaver™ insert is color coded to indicate size. Use the calibration standard of the same color to perform these steps.

- A. Insert the calibration standard into the center groove from either side of the tool. The flat edge of the standard should be facing up.
- B. Set the blade to rest on the calibration standard and tighten blade’s security screw.
- C. Remove the calibration standard.



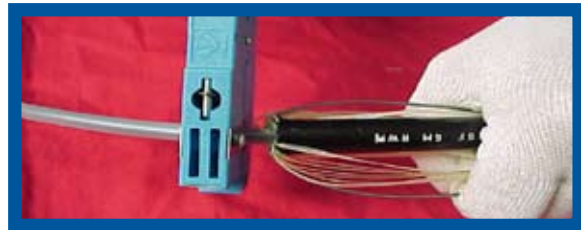
#### CAUTION:

Calibrate or test the depth of your coaxial ring cutter before performing step 16. Failure to do so could result in cutting of fibers. Draka recommends a shallow cut requiring multiple rotations.

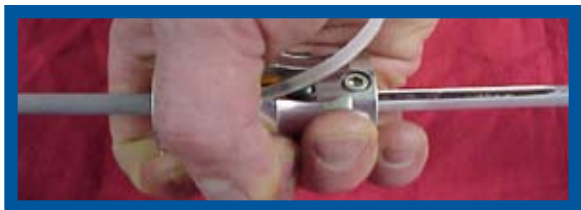
9.4 Two inches (5cm) from the cable jacket ring cut #1 and #2, use a coaxial ring cutter to carefully score the tube.

#### CAUTION:

Do not route the tube inside the closure. Bending the tube inside the closure may kink the tube causing fiber damage.



9.5 Open the UniShaver™ and position the tube in the center channel. Start the Unishaver near the black jacket. Ensure the shaved area passes over the ring cut.



### 9.6 Open the Central Tube

Grasp the UniShaver™ firmly and pull from Ring Cut #1 to Ring Cut # 2.

9.7 Use snips to carefully cut off the stripped buffer tube



**9.8** Remove the UniShaver™ from the tube by backing it off 2 inches, then opening it up.

**9.9** Flex the tube at the scored points at ring cut #1 and #2 to snap the opened tube from the intact core tube. Separate the opened shaved tube from the ribbons and removed it.



---

**9.10** For Gel Free Cable, cut away the water swellable tape inside the core tube. Using lint-free wipes and isopropyl alcohol, clean the ribbons.

**9.11** For Gel-filled Ribbon Cable clean the ribbons with isopropyl alcohol and lint free wipes. Remove gel filling compound at the central tube using a Q-tip or similar swabbing tool. Remove gel 1 inch inside the central tube. Apply B-sealants, RTV sealants, etc. to seal off the end of the buffer tube to contain future leakage of gel filling compound.

**9.12** The cable is now ready for ribbon breakout and/or anchoring. Refer to that procedure.

## 10.0 Gel-Free Ribbon Aerial Coupling Procedure

**10.1** Coupling coils are required on each side of a splice closure in aerial applications. A coupling coil consists of a minimum of 4 cable loops. The loops must have a diameter of at least 20 times the cable diameter. For example, a 0.73" cable will need a minimum coil diameter of 15 inches, resulting in minimum of 48 inches of cable for each loop.

**10.2** Required Materials for Aerial Coupling Coils  
[+] 5 or more tie wraps

**10.3** Tie wrap all the loops together at the in inlet and exit end as well as a minimum of 3 places evenly spaced around the coil.



## 11.0 Gel-Free Ribbon Aerial Slack Loop Procedure for Future Splice Points

**11.1** When storing cable slack loops for future mid sheath aerial splice points, enough cable length must be stored to accommodate the coupling loops on each side of the closure and the ribbon/fiber length stored inside the closure. Since the cable bending diameter varies with cable size, the minimum length required for slack loop storage will vary. The minimum loop diameter should be at least 20 times the cable outside diameter.

The below chart provides the minimum length for slack loop storage in aerial applications. Based on this chart and the variability in the slack loop diameters and closure routing needs, 75 feet of cable is recommended for aerial slack loop storage. Longer lengths may be desired if splicing is to be performed on the ground.

**This chart is based on:**

- Enough cable to place two coupling coils on each side of the closure, each to contain a minimum of 4 cable loops. Example: a cable with a diameter of 0.76" will require a minimum of 48 inches of cable in each cable loop. With a minimum of 4 loops per coil, a minimum of 16 feet of cable is required in each coupling coil. Two coupling coils will require a minimum of 32 feet.
- Closure routing length: This length will vary depending on closure manufacturer recommendations. It will also vary depending on where the fiber will be entered. If the fiber opening is in the center of the fiber routed in the closure, more storage length will likely be needed. For the chart below, Draka uses 15 feet for routing.

Dielectric						
Fiber Count	Cable Diameter (in)	Minimum Loop Diameter (in)	Minimum Cable Length for 1 Loop (in)	Minimum Cable Length for 4 Loops (ft)	Minimum Cable Length for 2 Coupling Coils (ft)	Minimum Slack Loop Cable Length with *15 ft for Closure Routing (ft)
12 to 48	0.53	11	34	12	24	39
60 to 144	0.63	13	41	14	28	43
156 to 216	0.73	15	48	16	32	47
240 to 432	0.79	16	50	17	34	49
Armored						
Fiber Count	Cable Diameter inches	Minimum Loop Diameter (in)	Minimum Cable Length for 1 Loop (in)	Minimum Cable Length for 4 Loops (ft)	Minimum Cable Length for 2 Coupling Coils (ft)	Minimum Slack Loop Cable Length with *15 ft for Closure Routing (ft)
12 to 48	0.58	12	38	13	26	41
60 to 144	0.68	14	44	15	30	45
156 to 216	0.79	16	50	17	34	49
240 to 432	0.87	17	55	19	38	53

\*Consider the closure recommendations for storage and routing length of fibers and ribbons. Note that cable diameters are subject to change, consult the latest cable data sheet for cable OD.

The above chart shows that the slack loop length can exceed 53 feet. Based on these results and the variability in the slack loop diameters and closure routing needs, **at least 75 feet of cable is recommended for slack loop storage.**

**11.3** When coiling the cable in the slack loop, the “Reverse Figure 8 Method” is recommended (see section 12).

**11.4** Tie wrap all of the loops together at the inlet and exit end as well as a minimum of 3 places evenly spaced around the coil.

**11.5** When a mid sheath splice point is inserted into this loop, the splice point should be placed in the center of the cable slack loop. Coupling coils as described in Section 10 shall be placed on each side of the closure. Note that with a butt splice closure, the two cables exiting the end of the closure can be coiled together.

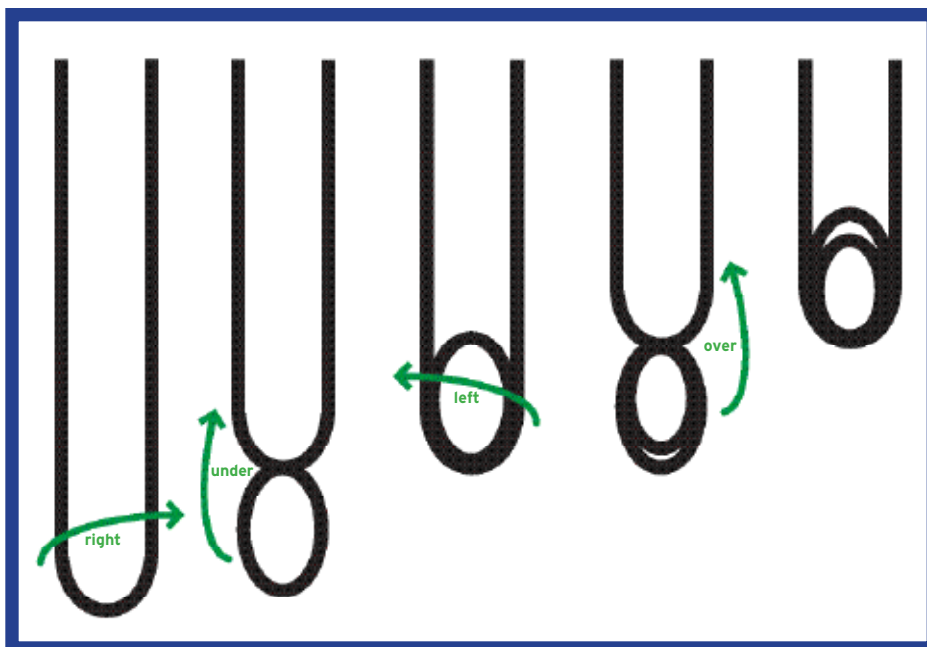
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## 12.0 “Reverse Figure 8 Method” for cable storing.

**12.1** This is a method that allows coiling the cable without accumulating twist in the cable

### 12.2 Step by step.

1. Cross the cable to make a figure 8 shape, cross left over right.
2. Tuck/fold the coil under.
3. Next cross the cable in the opposite direction, right over left.
4. Fold the cable over the top.
5. Repeat this process until a minimum of 4 loops of cable is coiled and stored.
6. Secure coil with tie wraps.



## 13.0 Gel Free Ribbon Pulling Installation Blocking Procedure

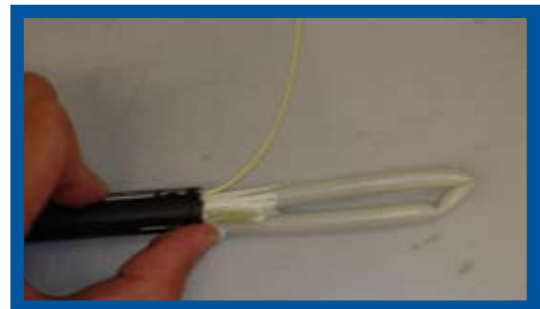
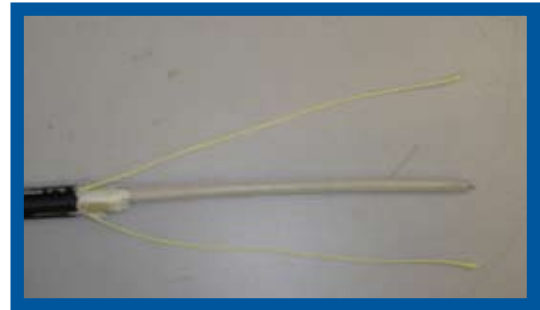
This procedure is required to prevent retraction of the ribbons during pulling.

### 13.1 Required Materials for Aerial Coupling

- [+] Vinyl tape
- [+] Pulling Grip

13.2 Expose 8" of buffer tube from the end of the cable. Cut away strength members, tape and yarns. It is recommended to keep the ripcords for future cable access.

13.3 Fold over half of the buffer tube (4") such that the end of the tube is flush with the end of the jacket.



13.4 Use vinyl tape to secure the folded over tube to the rest of the cable. The transition between the cable and folded tube should be flush such that a pulling grip can be applied over the cable end.



13.5 Place pulling grip over the end of the folded tube and cable for installation requiring the cable to be pulled.



**END OF PROCEDURE**

