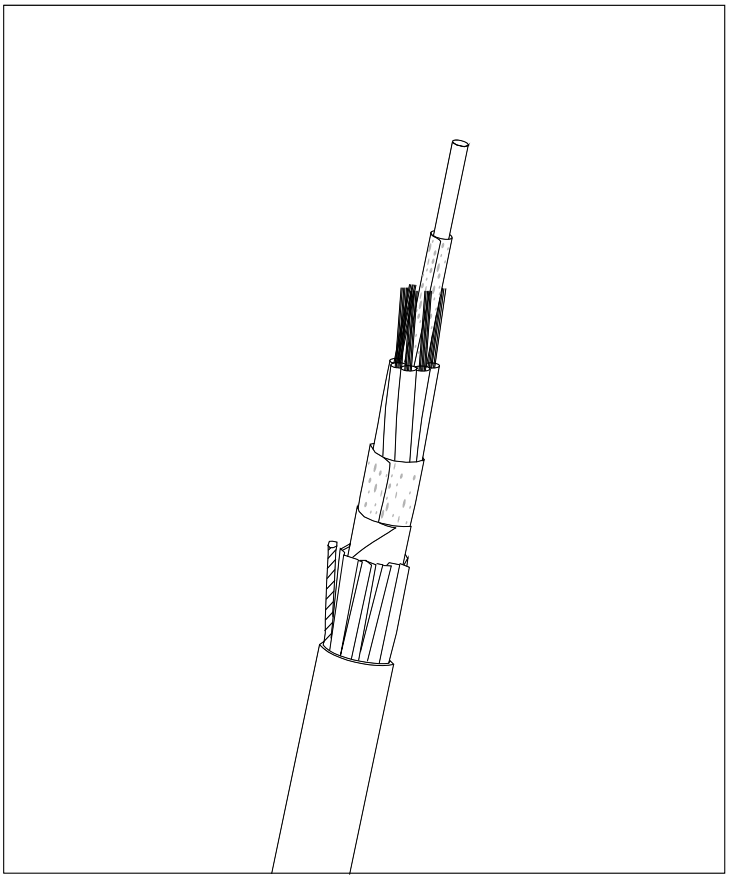
Cable Preparation Best Practices for Fiber Optic Indoor/Outdoor Stranded Loose Tube Cable



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In addition, the materials and hardware referenced herein appear as examples, but in no way reflect the only tools and materials available to perform these installations.

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1.0 GENERAL INFORMATION

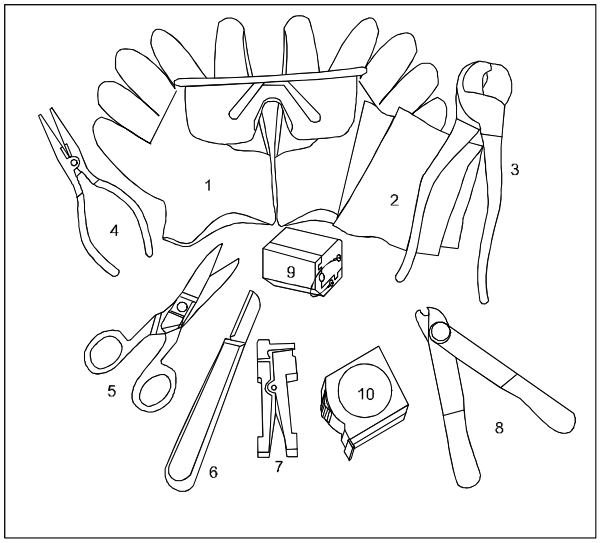
This best practices document is a step-by-step guide for end and midspan access of loose tube optical cable, including sheath removal, core preparation, and fiber preparation. Local company practices and/or vendor specifications may be in place concerning cable access and how it relates to a specific product or application. Modifications that do not exceed the cable's optical and mechanical performance specifications may be made to accommodate local company practices and specifications. These modifications should be made at the discretion of local company users.

Step-by-step illustrations have been provided for your reference and orientation as you follow the procedures.

2.0 PREPARATION NOTES

Gather the tools and materials to be used for the job and make sure they are approved by your company for use in the field and are in good working order.

Record for future reference the cable identification markings, which consist of sheath number, footage, and cable description codes printed on the cable outer sheath.

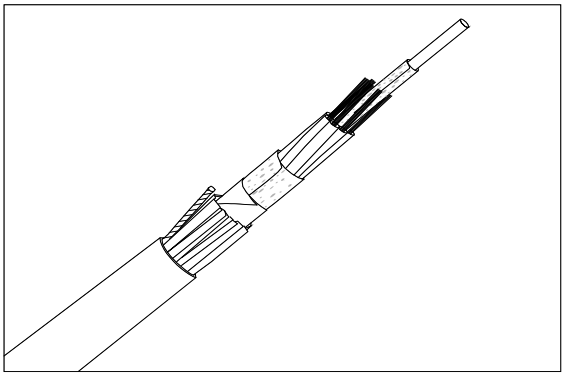


Tools and Materials

1. Eye and Hand Protection
2. Clean Cotton Cloths
3. Approved Cable Cutters
4. Needle Nose Pliers
5. Scissors/Snips
6. Sheath Knife
7. Buffer Tube Removal Tool
8. Primary Coating Stripping Tool
9. Buffer Tube Slitter
10. Tape Measure

3.0 END ACCESS CABLE SHEATH REMOVAL PROCEDURES

This procedure is intended for cable end access of optical cable with loose tube dry core construction. This design utilizes a single polyvinyl chloride (PVC) sheath applied directly over the cable core.



Typical indoor/outdoor stranded loose tube cable

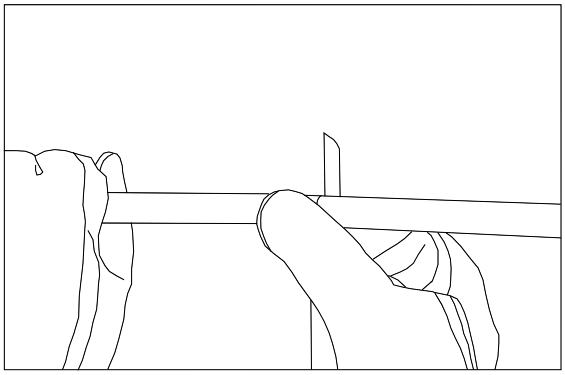
3.1 Sheath Removal

The length of the cable sheath to be removed will depend on local company practices and termination equipment. If not otherwise specified, six (6) feet (2 meters) should be sufficient. Mark this distance from the end of the cable on the outer sheath. With the sheath knife, “ring” the circumference of the sheath at this mark.

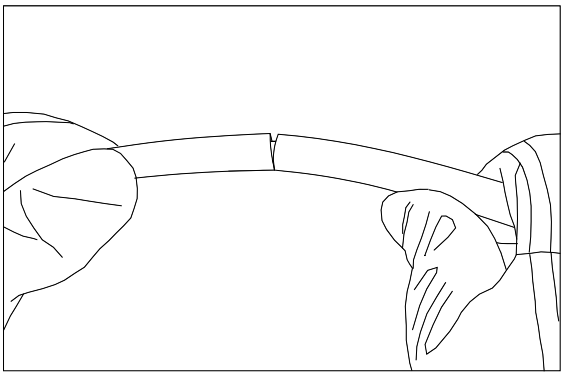
Ring the outer sheath, with the sheath knife, four (4) to six (6) inches from the cable end. Use caution to avoid cutting the ripcord and outer strength members under the cable sheath.

Gently flex the cable at the ring cut to separate the sheath.

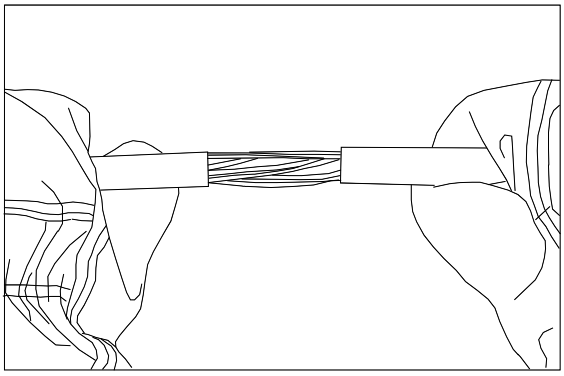
Remove and discard the cable end sheath section to expose the ripcord and cable core.



Ringing the outer sheath with a sheath knife



Flexing the cable at the ring cut

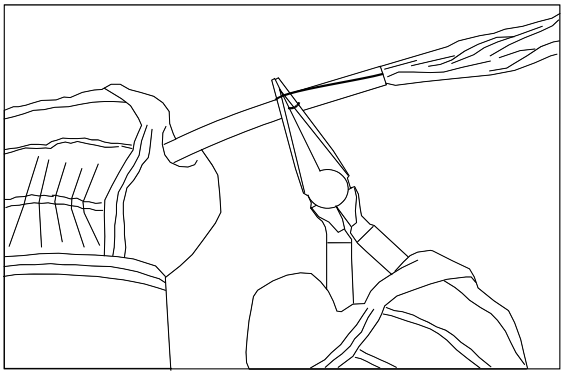


Removing the cable end sheath section

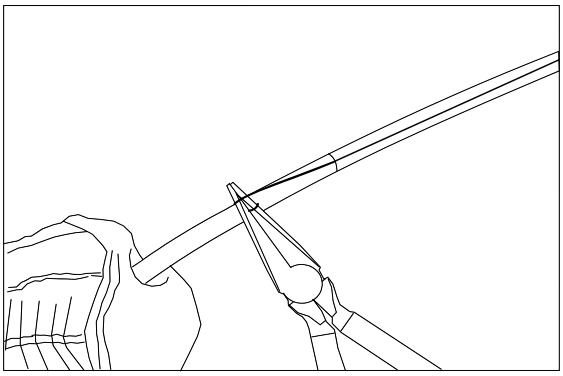
Grasp and wrap the ripcord around the needle nose pliers and pull back to the first ring-cut.

Remove the split sheath from the cable by holding the cable straight and pulling on the sheath. Discard the sheath.

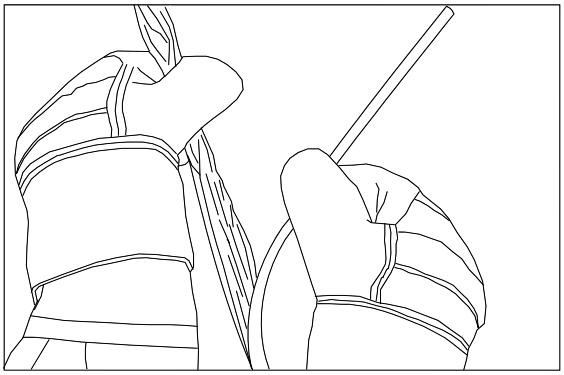
The cable core is now exposed.



Grasp and pull ripcord with needle nose pliers



Pull back ripcord to the first ring cut



Remove split cable sheath

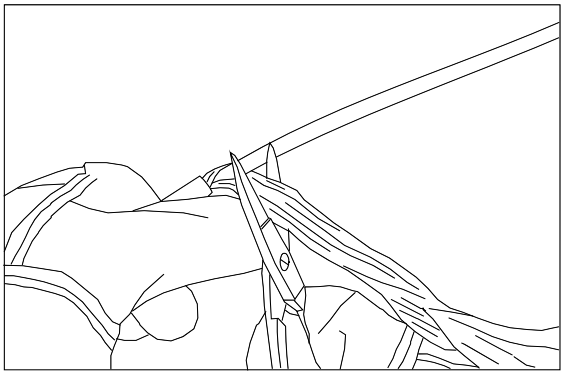
3.2 Cable Core Preparation

Once the outer sheath has been removed, the cable core is exposed. The cable core consists of color-coded buffer tubes stranded around a dielectric central strength member. The buffer tubes are secured by binder strings. Water absorbent tape or yarn encloses the buffer tubes and the central strength member. Layers of flame barrier tape and fiberglass outer strength members complete the assembly.

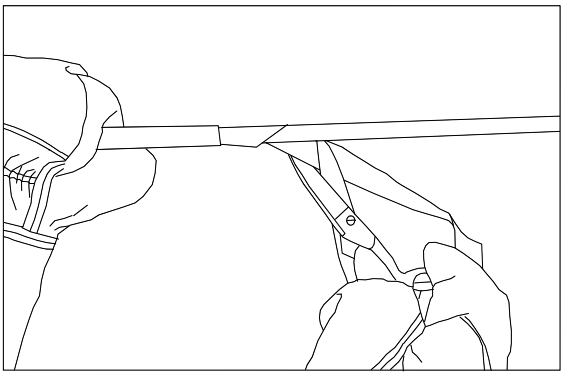
Cut the ripcord now that the proper length of tubes are exposed. Unwrap and cut the outer strength members according to local company practices and compatible with the termination closure being used.

Unwrap and cut the flame barrier tape and water absorbent tape. Remove the binder strings from around the buffer tubes. Discard these materials.

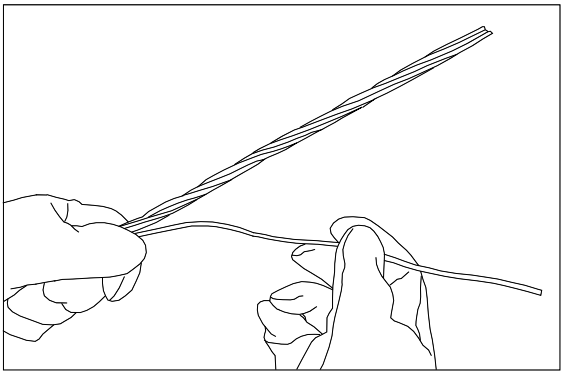
Separate the color-coded buffer tubes from the central strength member. Starting from the end of the exposed cable core, unwrap the tubes one at a time. Remove any water absorbing tapes or yarns from around the central member. Using approved cutters cut the central strength member to the proper length for the type of closure being used.



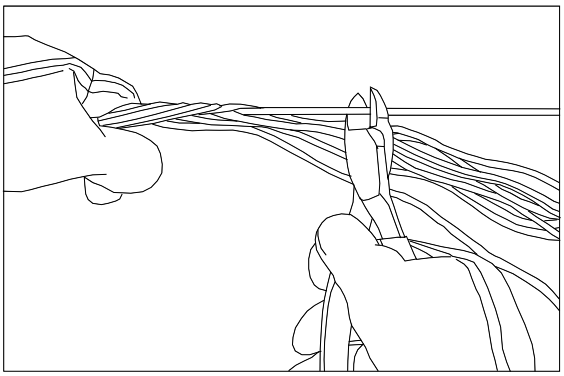
Unwrap and cut outer strength members



Unwrap and cut the flame barrier tape and water absorbent tape

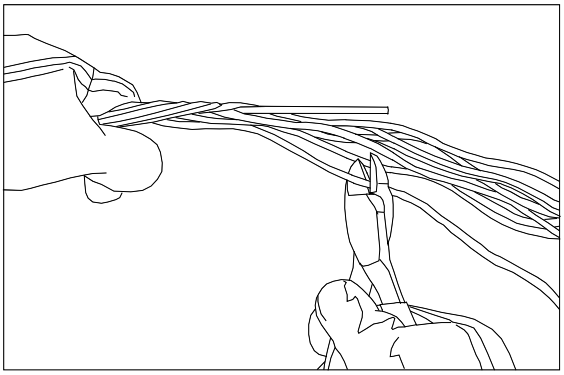


Separating buffer tubes from the central strength member



Cutting the central strength member to proper length with cable cutters

The central member may be covered with a plastic coating. This coating may be removed, if necessary, for a proper fit in the closure securing mechanism. To remove the coating, ring it with a sheath knife at the required distance from the end of the strength member. Do not cut into the underlying dielectric member. Using needle nose pliers, pull on the coating to separate it from the central member. It may be necessary to make a longitudinal cut in the coating from the ring cut to the end to facilitate the removal process.



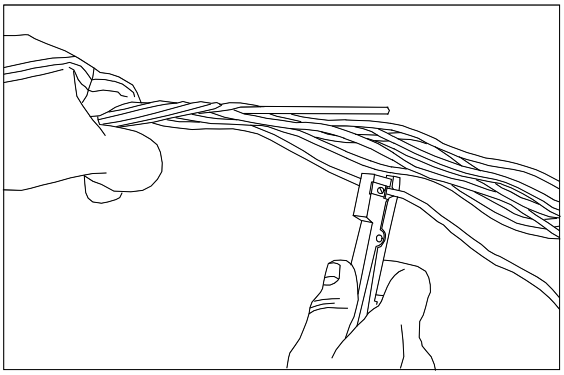
Cutting the spacer tubes

If the cable contains spacer tubes, separate and cut them near the cable ring cut. (Spacer tubes are solid round elements that do not contain fibers.)

The cable core for high fiber count cables (greater than 144 fibers) may contain two layers of buffer tubes. Remove any additional water absorbent tapes/yarns and binders from between the buffer tube layers. Separate the inner layer of buffer tubes from the central strength member in the same manner as the outer layer.

3.3 Buffer Tube Preparation

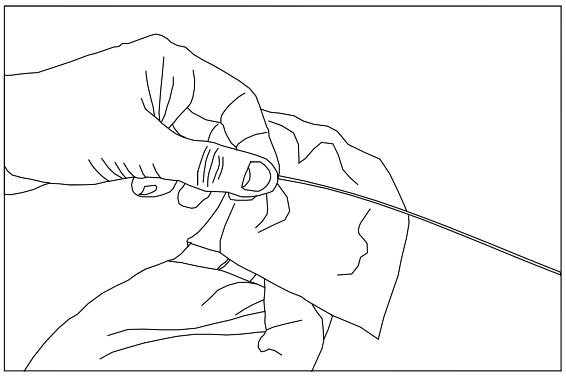
Following the core preparation, check the blade setting on the buffer tube removal tool by "ringing" a small section near the end of the tube.



Scoring the buffer tubes with a buffer tube removal tool

A proper depth setting will score the buffer tube, which when gently flexed, will break at this point, thus allowing safe and easy access to the coated fibers.

Measure the length of the tube to be removed and mark each tube. Ring the tube in 1-2 ft sections and remove them until the desired amount of fiber is available.



Wiping excess thixotropic gel from exposed fibers with a clean cloth

Gently wipe the excess thixotropic gel from the exposed fiber with a soft cotton cloth. Repeat for the remaining tubes.

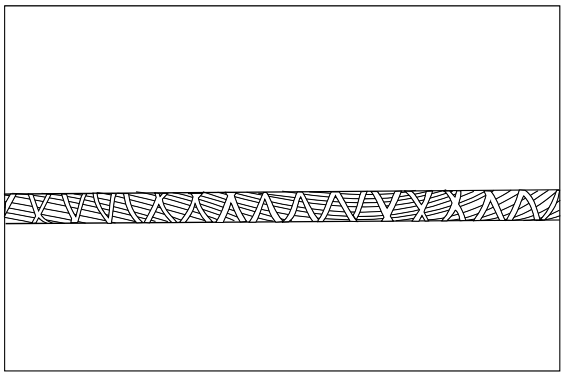
Proceed to section 5.0 Fiber Preparation.

4.0 MID-SPAN ACCESS CABLE SHEATH REMOVAL PROCEDURES

This procedure is intended for cable mid-span access of optical cable with loose tube dry core construction. This design utilizes a single polyvinyl chloride (PVC) sheath applied directly over the cable core.

4.1 Location of Midspan at Buffer Tube Reversal Point

A buffer tube reversal point is the location at which the helical twist of the buffer tubes change direction. Centering the mid-span at this point allows the buffer tubes to be easily and safely unwound.



Buffer tube reversal point

By accessing a 40-inch (100 cm) section of the cable core, a reversal point can be found on nearly all loose tube cable products. Once this reversal point is found, the cable can be measured and marked from this point for the proper amount of cable core to be accessed.

High fiber count cables (greater than 144 fibers) may be constructed with two layers of buffer tubes. Removal of the outer layer of tubes will expose the inner layer. Prepare and handle the inner layer in the same manner as the outer. Additional lengths of sheath may need to be removed to center a reversal point for the inner layer of buffer tubes.

Where mid-span access points are known before cable installation, slack loops may be left to facilitate cable entry. Slack loop lengths of 96 inches (244 cm) should be sufficient in most cases for proper routing and storage of the buffer tubes within the closure.

4.2 Sheath Removal Procedures

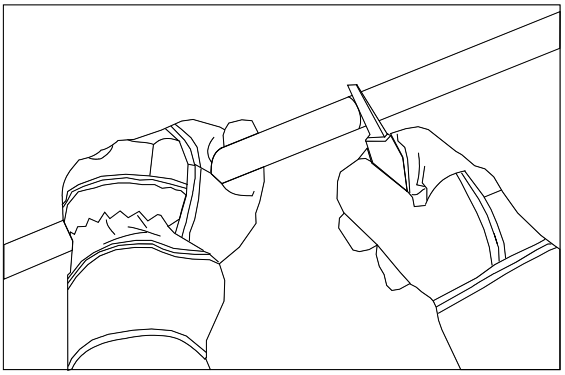
Place tape markers 40 inches (100 cm) apart from each other on the cable section to be accessed. With the sheath knife, “ring” the circumference of the sheath at both marks.

In the center of the 40 inch (100 cm) section, measure and mark off a 3-5 inch (8-13 cm) span of the outer sheath. Ring the cable with the sheath knife at each mark.

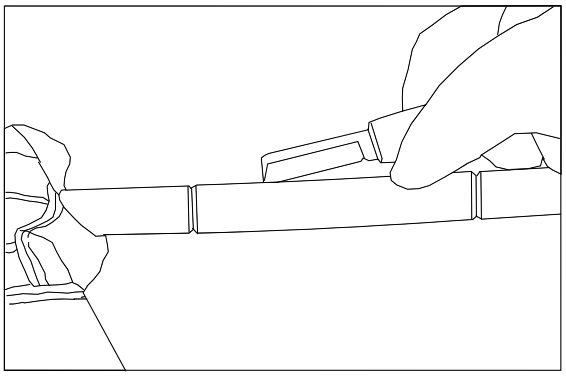
With the sheath knife, gently shave or cut away a small channel of outer sheath along the 3-5 inch (8-13 cm) section from one ring cut to the other. Care must be taken to not damage the underlying buffer tubes. The section can now be separated from the cable core and discarded.

With the outer sheath removed, the ripcord and cable core are exposed.

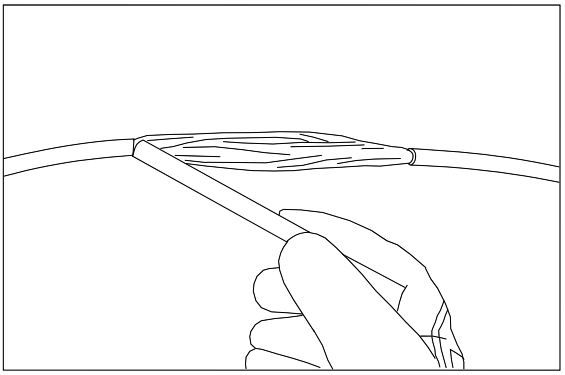
Cut the ripcord in the center of the exposed section.



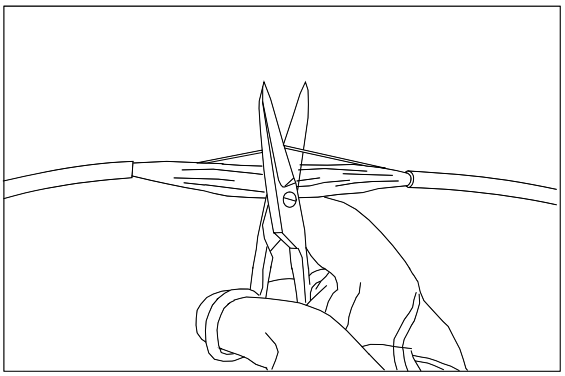
Ringing the outer sheath with a sheath knife



Shaving a small channel in the sheath with a sheath knife



Removing the sheath section



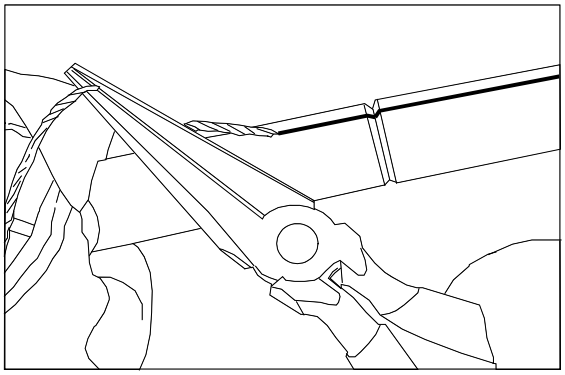
Cutting the ripcord

Grasp and wrap the ripcord around the needle nose pliers and pull back to the outside ring cut. Do this in both directions.

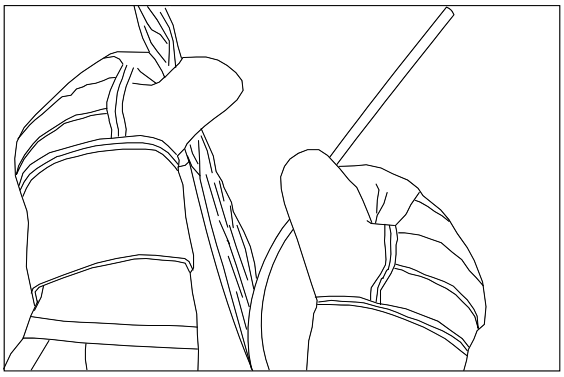
Remove the split sheaths from the cable by holding the exposed cable end straight and pulling on the sheath. Discard the sheath.

Note: Leave the ripcord intact; it will be used again for additional sheath removal.

The cable core is now exposed.



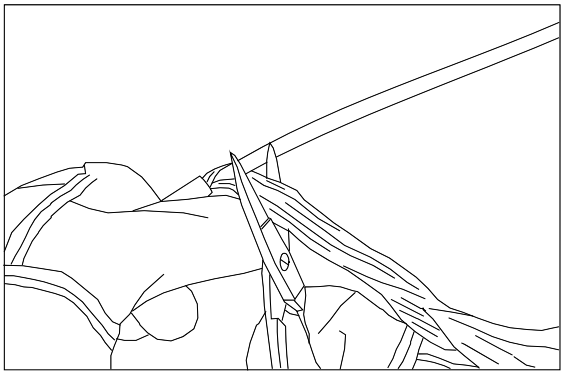
Pull back the ripcord to the outside ring cut



Removing the split cable sheath

4.3 Locating the Reversal Point

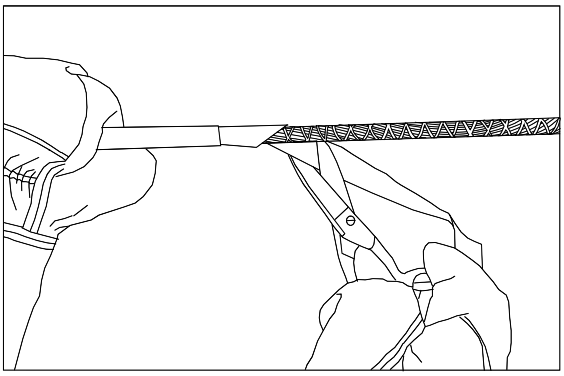
Once the outer sheath has been removed the cable core is exposed. The cable core consists of color-coded buffer tubes stranded around a dielectric central strength member. The buffer tubes are secured by binder strings. Water absorbent tape or yarn encloses the buffer tubes and the central strength member. Layers of flame barrier tape and fiberglass outer strength members complete the assembly.



Cut the outer strength members

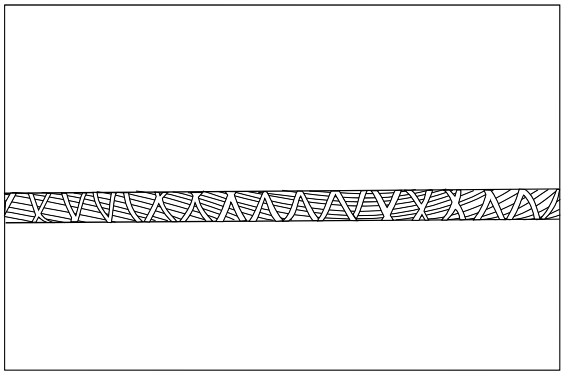
Cut the outer strength members at the center of the section and secure them away from the core.

Unwrap, cut, and discard the flame barrier tape and water absorbent tape. Leave the binder strings intact at this time.



Unwrap and cut the flame barrier tape and water absorbent tape

Locate the buffer tube reversal point by scanning the exposed cable core. Once the reversal is found the location of the midspan length can be determined. Refer to manufacturer's closure documentation for specific lengths of cable to be accessed. For most applications, an 80 inch (200 cm) section of exposed cable core should be sufficient. Measure off half of the recommended distance or 40 inches (100 cm) in each direction from the reversal point and mark the cable. By orienting the reversal point at the center of midspan of the cable, the buffer tubes can be properly unwound. Remove the sections of cable sheath between these marks. Refer back to section 4.2 for sheath removal procedures.



Cable core reversal point

4.4 Cable Core Preparation

Cut, unwrap, and discard the buffer tube binder strings.

Starting at the center buffer tube reversal point, separate the color-coded buffer tubes one at a time from the central strength member. Remove any water absorbing tapes from around the central member.

Using approved cutters cut the central strength member at both ends to the proper length for the type of closure being used.

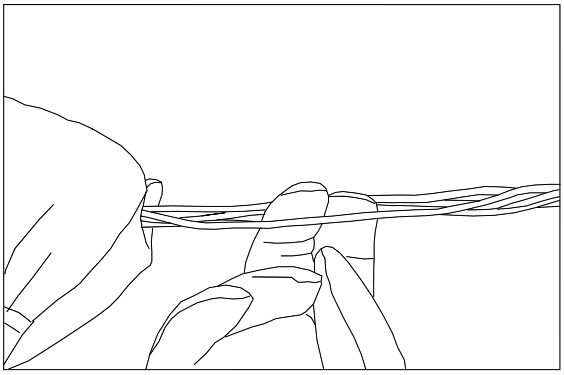
The central member may be covered with a plastic coating. This coating may be removed, if necessary, for a proper fit in the closure securing mechanism. To remove the coating, ring it with a sheath knife at the required distance from the end of the strength member. Do not cut into the underlying dielectric strength member. Using needle nose pliers, pull on the coating to separate it from the central member. It may be necessary to make a longitudinal cut in the coating from the ring cut to the end to facilitate the removal process.

If the cable contains spacer tubes, separate and cut them near the cable ring cut. (Spacer tubes are solid round elements that do not contain fibers.)

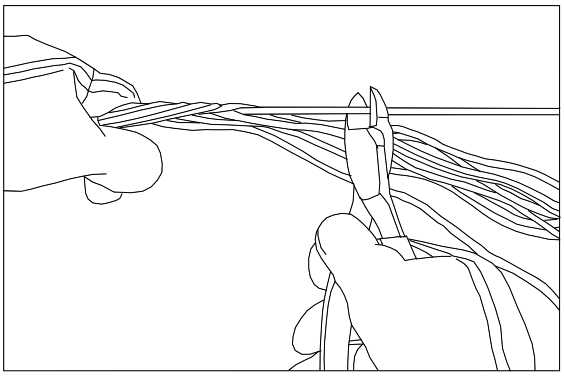
The cable core for high fiber count cables (greater than 144 fibers) may contain two layers of buffer tubes. Remove any additional water absorbent tapes/yarns and binders from between the buffer tube layers. Separate the inner layer of buffer tubes from the central member in the same manner.

It may be necessary to remove more of the cable sheath to properly access the reversal point for the inner layer. Refer back to the appropriate section for sheath removal procedures for the type of cable being accessed.

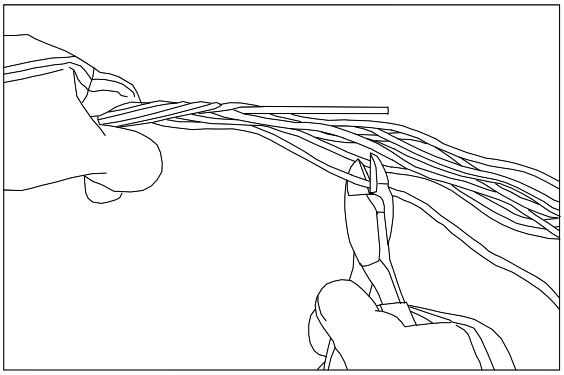
Cut the ripcord now that the proper length of tubes are exposed.



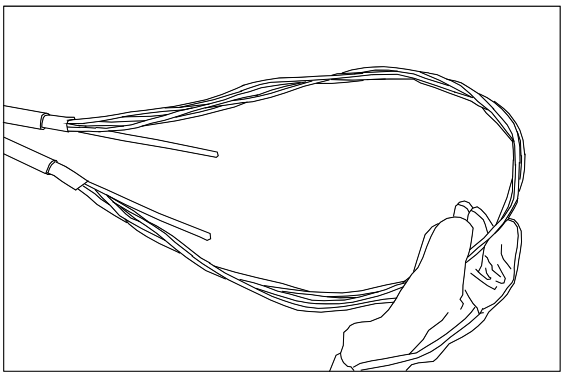
Separating the buffer tubes from the central strength member



Cutting the central strength member to the proper length with cable cutters



Cutting the spacer tubes



Completed core preparation

4.5 Buffer Tube Preparation

Determine how many fibers are to be accessed and from which tube(s) they will come. Mark the tube(s) and record this data for future reference. All other tubes are to be left intact. Optical fibers are ready to be accessed.

Before attempting to access the fibers, check the blade setting on the buffer tube slitting tool to be used by testing it on a section of scrap tube. Commercially available buffer tube slitters have been successfully used on loose tube optical cable. A proper depth setting for slitting will cut a small channel in the wall of the tube without touching the underlying fibers.

Measure and mark the buffer tubes at the length to be removed. After checking the blade depth, use the tube slitting tool to carefully cut the buffer tube in between the two marks.

With the buffer tube now slit, but still intact, final removal can take place.

Peel the small slit section of the tube away and cut at both ends. Remove the fibers from the remaining split section of the tube.

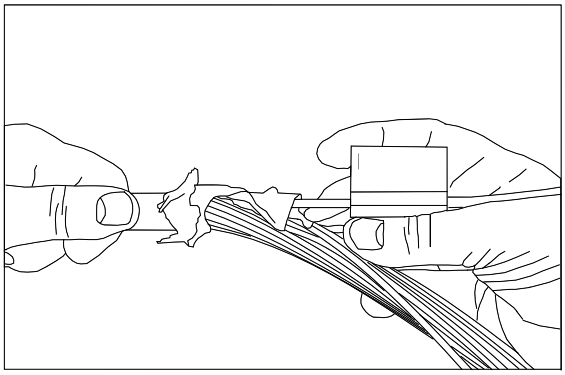
Cut the remaining section of the tube at both ends and remove.

Repeat this procedure for each tube to be accessed.

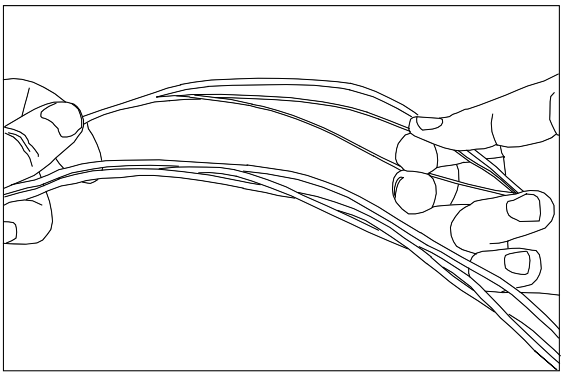
The optical fibers are now exposed and accessible for termination. Extreme care must be taken after this point when handling the cable.

Gently wipe the excess thixotropic gel from the exposed fibers with a soft dry cloth.

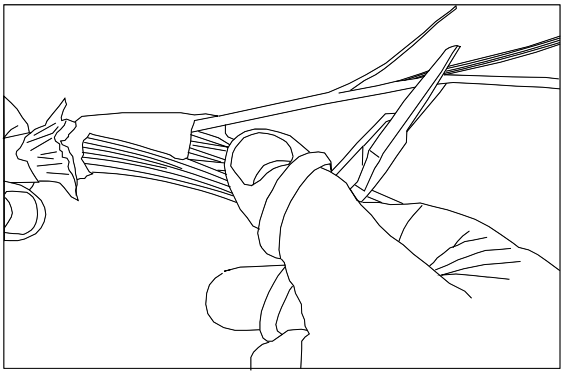
Proceed to section 5.0 Fiber Preparation.



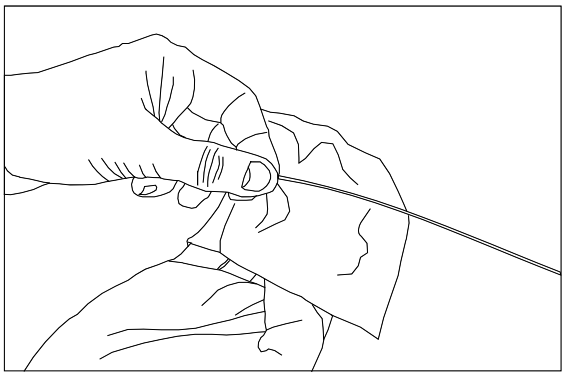
Slitting the buffer tube



Opening the slit buffer tube and exposing the optical fibers



Cut and remove the slit buffer tube



Wiping excess thixotropic gel from the fibers

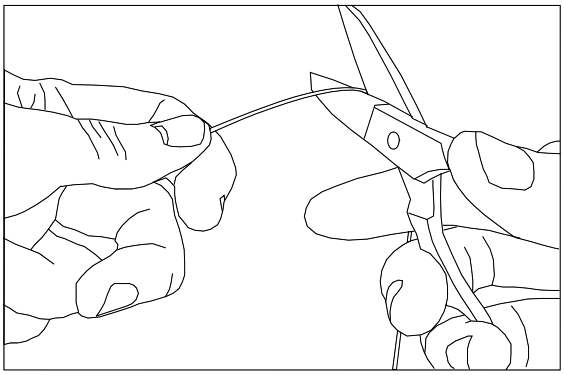
5.0 FIBER PREPARATION

For midspan access, use scissors to cut the fibers to be terminated at the appropriate length. This is generally the midpoint of the exposed fibers.

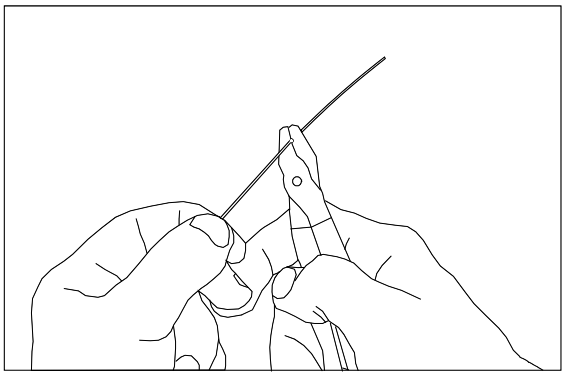
The optical fibers are coated with an acrylate finish known as the primary coating and a final colored coating.

Using the primary coating stripping tool, remove the 250 μm diameter coating from the fiber. Follow with a single wipe of an alcohol-dampened cloth to remove any residual debris.

Refer to local splicing and termination guidelines.



Cutting the optical fibers (midspan access)



Stripping the primary coating from the fibers with stripping tool