Sheath Removal and Mid-Span Access for MiDia® Microduct cables – 192f MiDia Micro EX

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1. General

1.1 The following procedure describes sheath removal and mid-span access for LIGHTERA 192f MiDia Micro EX optical fibre microduct cable.

1.2 LIGHTERA *MiDia* microduct cables are single sheath, reduced diameter microduct cables. The cable specification is summarised in Table 1. This cable design can contain up to 8 tube positions. Therefore, this 192f count cable contains 8 buffer tubes. The gel-filled buffer tubes each contain 24 fibres. *MiDia* microduct cables are optimised for air-blown microduct applications. Please refer to LIGHTERA *Microduct cable Guidance & Installation*, for details regarding cable installation.

Table 1 - LIGHTERA 192f MiDia Micro EX cable

Cable Type	OD mm (in.)	Tensile Performance	Minimum Bend Diameter		
		Short Term N (lb)	Static Handling mm (in.)	Dynamic (During Installation) (Under Load) mm (in.)	Storage Coil (Minimum) mm (in.)
MiDia Micro EX 192 fibres	7.9 (0.31)	1175 (264)	320 (12.6)	640 (25.19)	460 (18)

2. Precautions

2.1 Please refer to Table 1 for the Tensile Performance where the short-term load (dynamic condition) applies during cable installation and the long-term load (static condition) applies during operation i.e. after installation is completed.

2.2 LIGHTERA microduct cables are designed for blown cable installation and should not be installed using cable winches. If hand pulling is required, breakaway pulling swivels should be used to assure that the short-term load is not exceeded. Cable lubricants are recommended for use in both air-blown and hand-pulling applications.

2.3 Care must be exercised during cable installation to ensure that the cable's minimum bend diameter is not violated. The cable Bending Performance is shown in Table 1 for both dynamic (during installation) and static (installed) conditions. In addition, the minimum storage coil diameter for all *MiDia* cables is 460 mm (18 in.).

3. Recommended Tools

3.1 The following tools and supplies are recommended for end-prep and mid-span cable access.
Caution: Safety glasses should always be worn when working with optical fibre cables.

- Cable Slitter Tool - Miller MB02 (MB02-7005)
  - With Ø5-12mm insert at 0.6mm Depth for this 7.9mm Diameter Cable (MB02-7-1200060)
- Buffer Tube Scoring Tool - Miller Red FTS-005 (80990)
- Buffer Tube Midspan Tool - Miller MSAT-X (MB10-7000) / Miller MSAT-16 (MB01-7000)
- Kevlar Scissors
- Cable shears
- Diagonal cutters (side cutters)
- Pliers
- Tape measure
- Lint free wipes
- 99% Isopropyl alcohol
- Cable Stripping Gloves
- Safety glasses
- Fibre Bin
- Fibre Pick Tool
- White Permanent Marker Pen
  - MB02 Replacement Blade Set (MB02-7500)
  - MSAT-X Replacement Blade Set (MB10-7500)

The above recommended tools are available to order from *Mills Ltd* with the part numbers underlined in the list.

4. End Prep Sheath Removal for *MiDia* Microduct Cables

4.1 Consult the splice closure instructions for the required length of cable sheath that must be removed. Measure and mark the cable with Sharpie or tape at the appropriate stripping length (Figure 1).

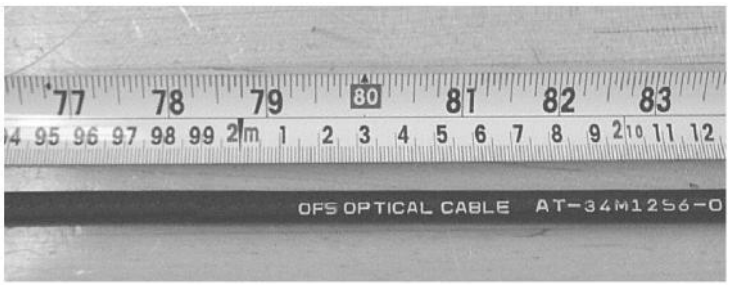


Figure 1 - Measure and mark the cable.

4.2 Use the Miller MB02 to ring cut the cable at the measured mark, by lightly scoring rather than cutting all the way through the cable sheath (Figure 2).

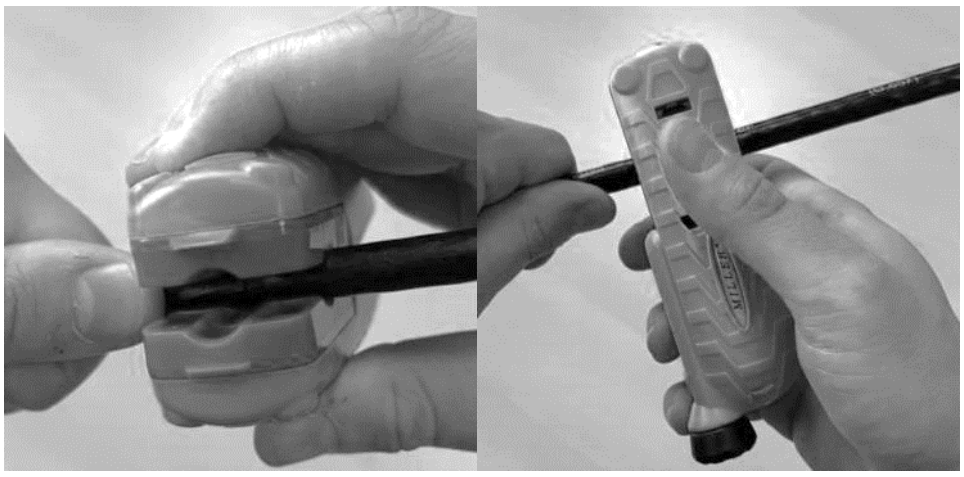


Figure 2 - Ring cut the cable sheath

4.3 Gently flex the cable at the ring cut with a circular motion, being careful not to breach the minimum bend diameter. The cable sheath will separate at this point (Figure 3).

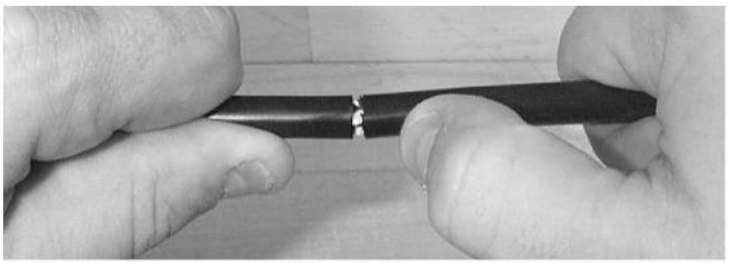


Figure 3 - Flex the cable to separate the sheath

4.4 Make a second ring cut approximately 130 mm from the cable end. As in the previous step, gently flex the cable in a circular motion to separate the cable sheath at the ring cut.

4.5 Generally, the 130 mm section of outer sheath can be removed by sliding it over the end of the cable. If not, use the Miller MB02 in its longitudinal slot to make a cut between the ring cut and the end of the cable (Figure 4).

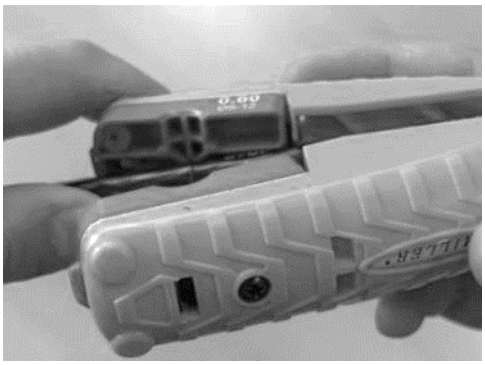


Figure 4 - If necessary, cut the cable sheath longitudinally before removal

4.6 Remove the 130mm section to expose the rip cord (Figure 5).

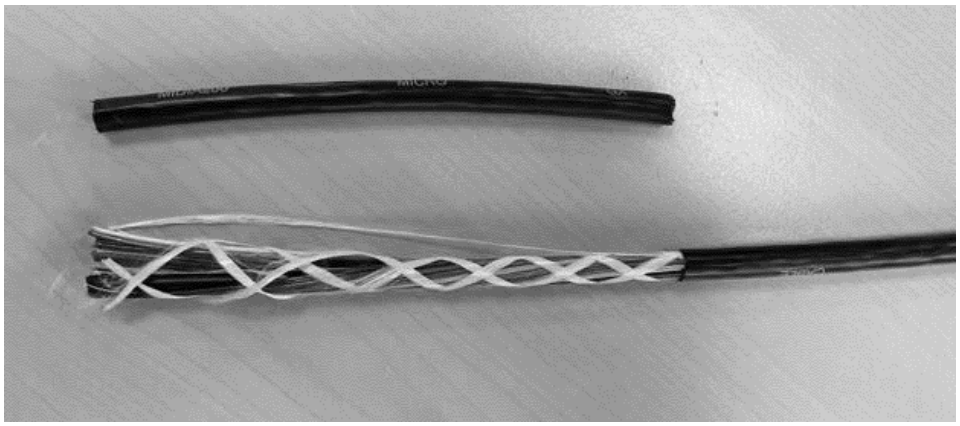


Figure 5 - Remove the 130 mm section to expose the ripcord

4.7 Locate and pull the ripcord to the next ring cut (Figure 6). Sometimes a small starter slit is needed to start the ripcord. If desired, wrap the ripcord around a pair of pliers to grip the ripcord.

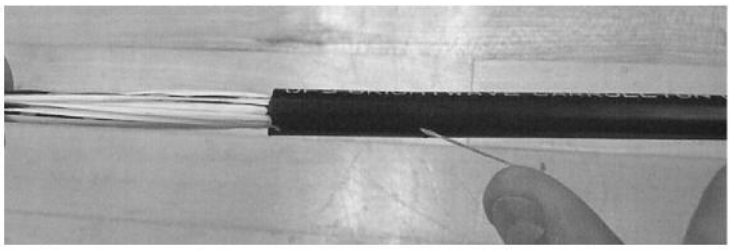


Figure 6 - Pull the ripcord to the next ring cut

4.8 Remove the cable outer sheath to expose the core of the cable (Figure 7)

Figure 7 - Remove the outer sheath

4.9 Buffer Tube Preparation: Carefully use Kevlar scissors to remove any binder threads and/or water blocking tape from the 8 buffer tubes core and cut them flush with the outer sheath (Figure 8).

Figure 8 - Remove and cut the binder threads

4.10 Carefully unwrap the 8 buffer tubes from each other and remove any threads from between the buffer tubes. (Figure 9)

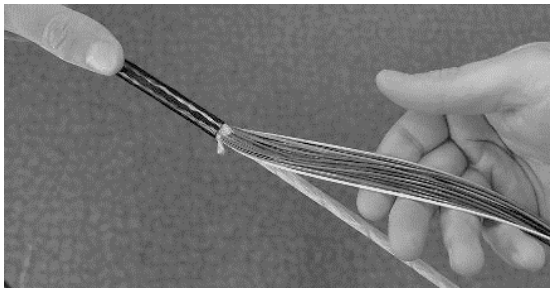


Figure 9 - Unwrap the buffer tubes

4.11 Central Strength Member (CSM): After carefully unwrapping the buffer tubes from the central strength member, consult splice closure instructions to cut to required length. (Figure 10)

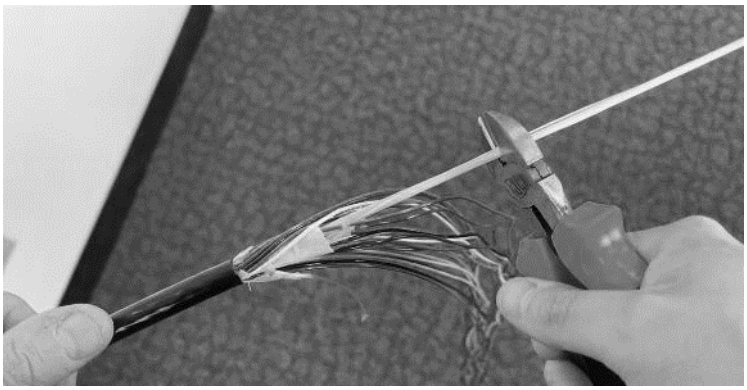


Figure 10 - Cut the central strength member to the required length

4.12 Consult the splice closure instructions to determine the length of fibre that must be exposed. Use the recommended Miller FTS buffer tube scorer to score the buffer tubes (Figure 11) at the required length. **Make only one revolution around the tube**. The tube should be scored rather than cut. When removing a long length of tube, it is necessary to remove the tube in 300 mm to 400 mm sections. Do not remove sections greater than 400mm as this may result in fibre damage.

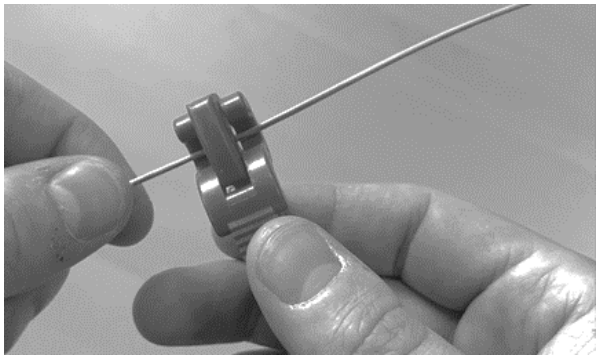


Figure 11 - Score the buffer tubes

4.13 Grasp the tube on both sides of the score mark and gently flex to separate the tube (Figure 12).

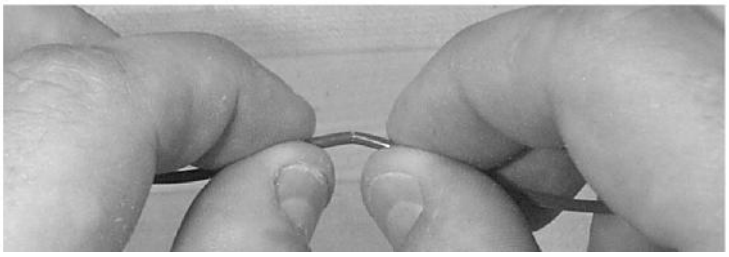


Figure 12 - Flex and separate the tube at the score mark

4.14 Remove the buffer tube segment with steady pulling force to expose the fibres, repeat until correct length is exposed. (Figure 14)

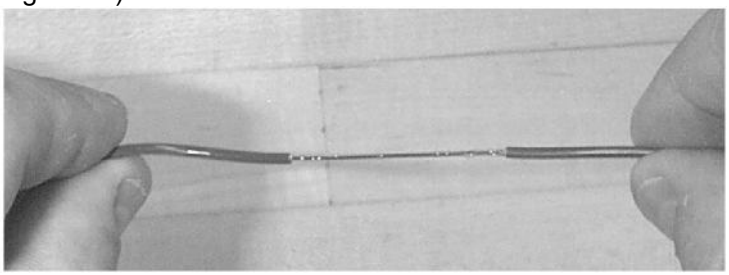


Figure 14 - Remove the buffer tube from the fibres

4.15 Carefully clean the exposed fibres using a lint-free wipe soaked with isopropyl alcohol (Figure 15).

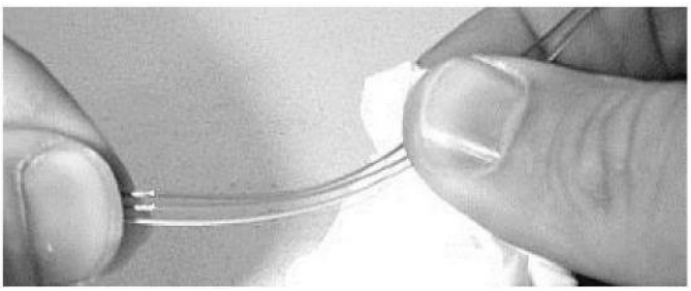


Figure 15 - Carefully clean the fibres

4.16 The cable is now ready for testing and/or splice closure preparation.

5. Mid-Span Sheath Removal for *MiDia* Microduct Cables

Note: Before any Mid-span preparations please consult splice closure to determine span length requirements. Keeping in mind where the reversal point can be located inside the cable.

5.1 To begin Mid-span procedure, measure and mark two points 300mm apart on the area of sheath to be removed for the reversal point of the buffer tubes to later be identified. (Figure 16).

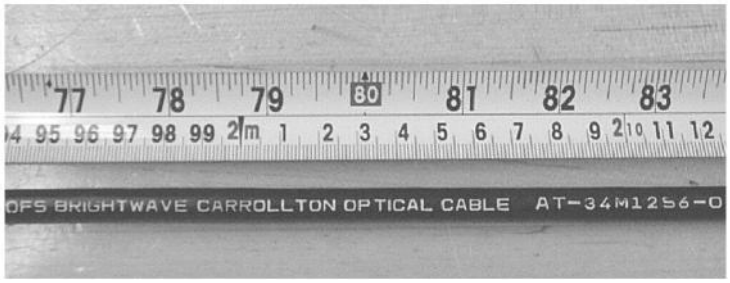


Figure 16 - Measure and mark the cable.

5.2 Use the Miller MB02 to ring cut around the cable at one of the measured marks. Lightly score the cable sheath rather than cut all the way through (Figure 17).

Figure 17 - Ring cut the cable sheath

5.3 Using a circular motion, gently flex the cable at the score mark to separate the outer sheath (Figure 18). Be careful not to breach the minimum bend diameter of the cable.

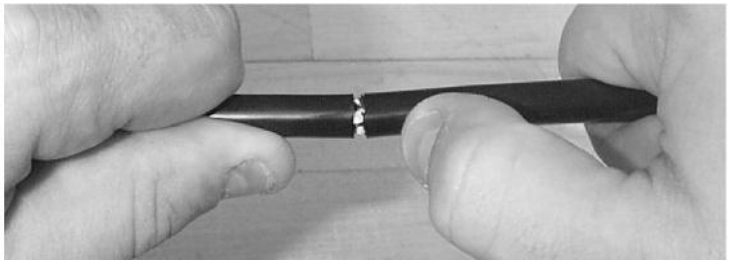


Figure 18 - Flex the cable at the score mark to separate the outer sheath

5.4 Repeat steps 5.2 and 5.3 at the other measured mark.

5.5 Use the Miller MB02 to make a longitudinal cut between the two ring cuts (Figure 19).

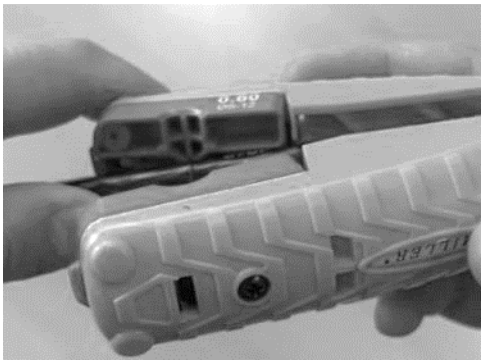


Figure 19 - Make a longitudinal cut between the two ring cuts

5.6 Remove the 300mm outer sheath section to expose the inside elements and the cable cores. (Figure 20).

Figure 20 - Remove the 300mm section of outer sheath

5.7 Locate the cable ripcord and cut it in the middle to allow for sheath removal later (Figure 21).

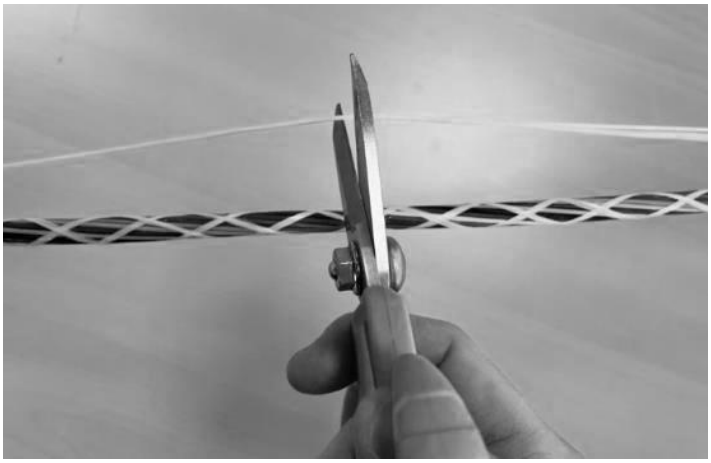


Figure 21 - Cut the ripcord

5.8 Locate a buffer tube reversal point **(where the buffer tubes change direction)** by removing the outer cable sheath in 300 mm sections. The reversal point is where the twist of the buffer tubes changes direction (Figure 22) If reversal point hasn't been located fully within the first sheath removal, carefully remove (to the left and right) 300mm sections of the outer cable sheath until the reversal point is located making sure not to puncture existing exposed buffer tubes.

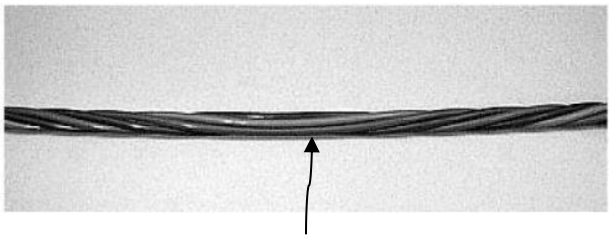


Figure 22 - Reversal Point

5.9 Consult the splice closure instructions to determine the length of outer cable sheath that must be removed for the mid-span splice. Centre the sheath opening at the reversal point. Measure equal distances from the reversal point and mark the sheath opening with Sharpie Pen (Figure 23).

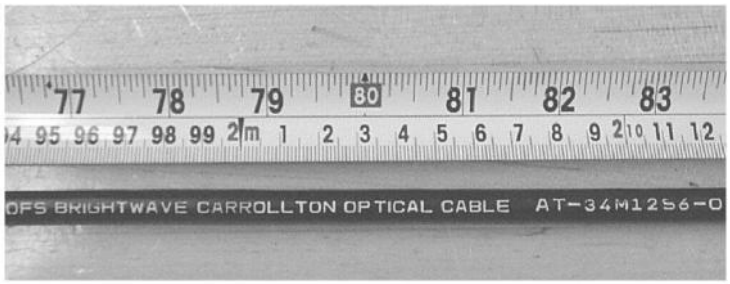


Figure 23 - Measure and mark the mid-span sheath opening

5.10 Again, use the Miller MB02 to ring cut the cable at one of the measured marks. Lightly score the outer cable sheath rather than cut all the way through (Figure 24).

Figure 24 - Ring cut the outer cable sheath

5.11 Gently flex the cable at the score mark to separate the cable sheath (Figure 25). Be careful not to breach the minimum bend diameter.

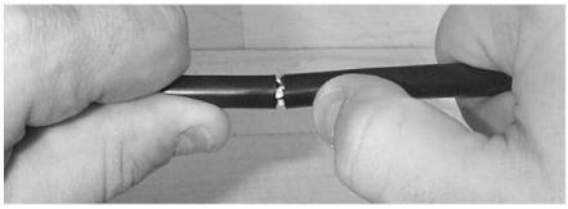


Figure 25 - Flex the cable to separate the sheath

5.12 Repeat steps 5.10 and 5.11 at the other measured mark.

5.13 Locate and pull each ripcord to the ring cut (Figure 26). Sometimes a small starter slit is needed to start the ripcord. If desired, wrap the ripcord around a pair of pliers to grip the ripcord. Remove the outer cable sheath.

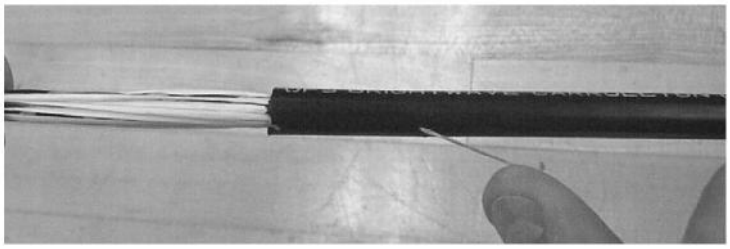


Figure 26 - Pull the ripcord to open the outer cable sheath#

5.14 Use Kevlar Scissors and gently flex the cable, being careful not to breach the minimum bend radius, to create an opening under the aramid binders and begin to remove small sections (300mm) to free the buffer tubes. Repeat the small section cuts until both ends of the mid-span section are free of binders (Figure 27).

Figure 27 - Remove and cut the binder threads

5.15 Unwrap the 8 buffer tubes of the cable whilst splitting the central strength member in the middle i.e. the reversal point (Figure 28).

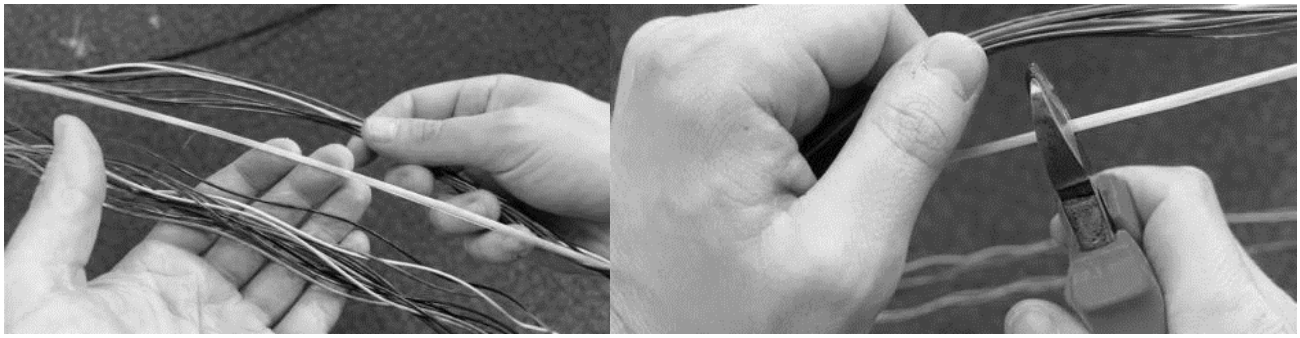


Figure 28 - Unwrap the 8 buffer tubes from the CSM at the reversal point.

5.16 Consult the splice closure instructions to determine the length of central strength member that is required for strain relief. With the separated strength member, it is now appropriate to cut it to the required length on both sides of the original split location. (Figure 29).

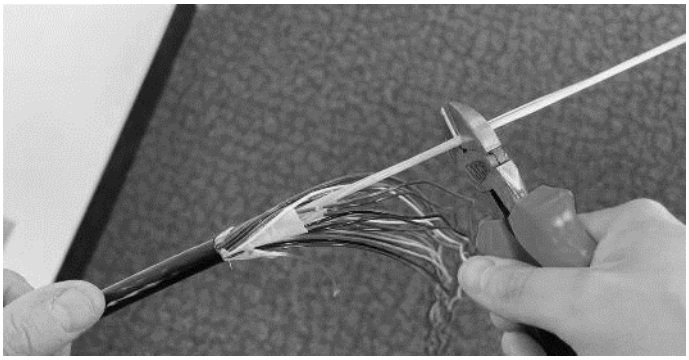


Figure 29 - Cut the central strength member

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

5.18 If all fibres in a particular tube are to be spliced, **cut the tube free at the appropriate location.**

5.19 Use a buffer tube stripper to score the buffer tube (Figure 30). Make only **one** revolution around the tube. The tube should be scored rather than cut.

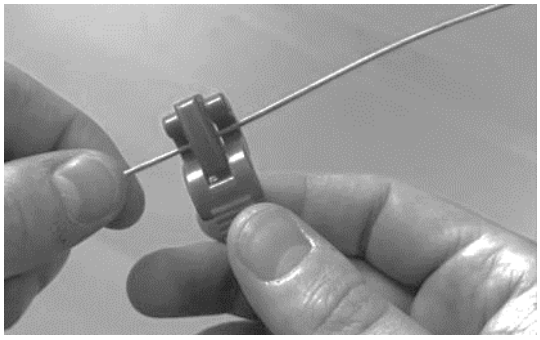


Figure 30 - Score the buffer tube

5.20 Grasp the tube on both sides of the score mark and gently flex the tube to separate it (Figure 31). Remove the buffer tube to expose the fibres. If a long section of buffer tube must be removed, it is recommended that the tube be removed in several short pieces about 300 mm to 400 mm in length.

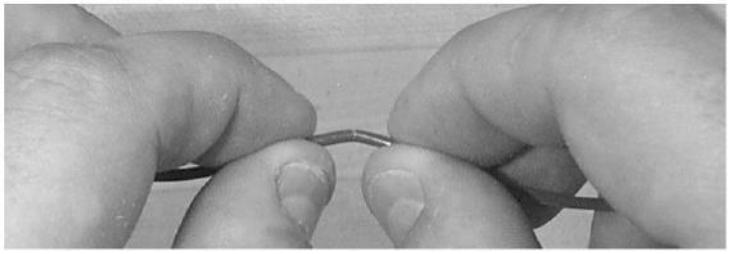


Figure 31 - Separate the buffer tube

5.21 Clean the exposed fibres using a lint free wipe soaked with isopropyl alcohol (Figure 32). Fasten the tube(s) to their corresponding splice organizing tray.

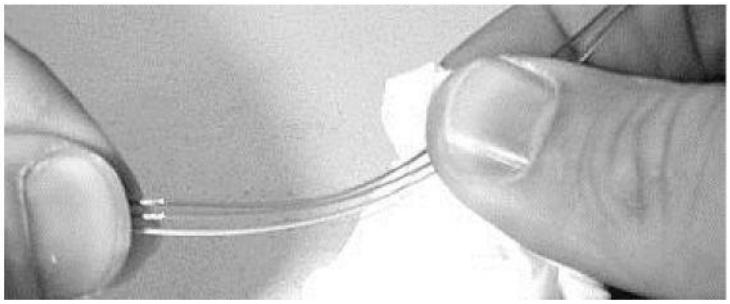
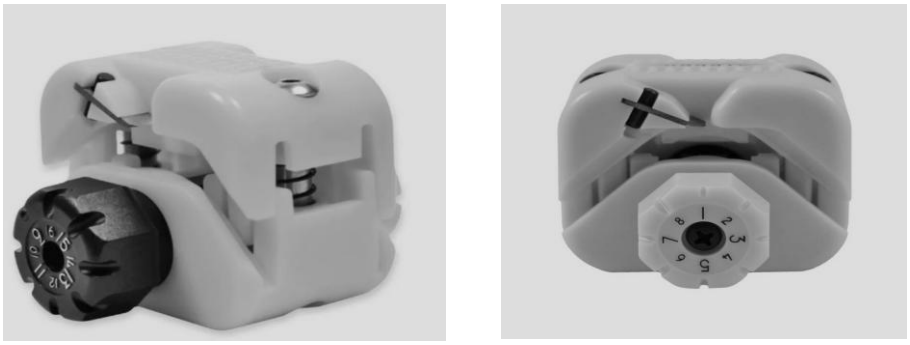


Figure 32 - Clean the optical fibres

5.22 The fibres are now ready for splicing.

5.23 If fibres in a particular tube are to be spliced to a mid-span tap or select fibres in the same tube are to remain continuous, a mid-span access tool is required to open the buffer tube. Refer to Figure 33 for Miller MSAT X Shaver tool or Figure 34 for Miller MSAT 16 Shaver tool on these 1.9 mm buffer tube.

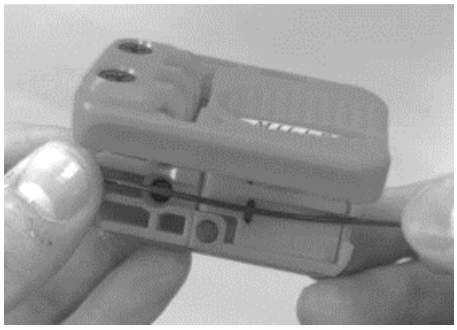
Figures 33 - Miller MSAT X Shave tool

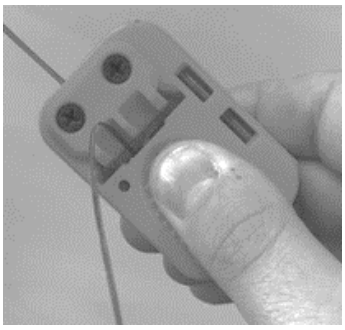


Figures 34 - Miller MSAT 16 Shave tool

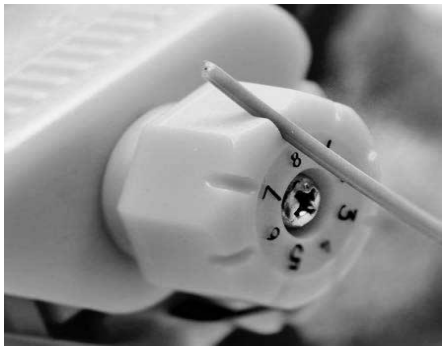
5.24 To use the Miller MSAT X, insert buffer tube to **'Shallow'** (Green) slot to begin to shave, making sure to pull towards you with thumb pressing down firm on 'miller' groove. Extract fibres using appropriate fibre picking tool and always clean using lint free wipes soaked with isopropyl alcohol. If required, fasten the buffer tube(s) to their appropriate splice organising tray. Refer to Figures 35 & 36.

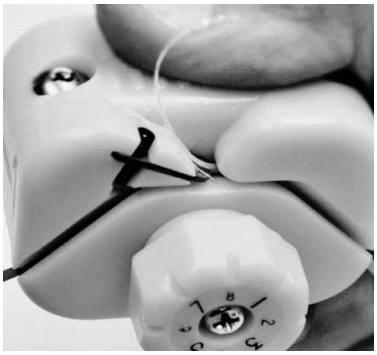
To use the Miller MSAT® 16, select the correct setting for the buffer tube diameter using the knob, then load the buffer tube into the tool; simply squeeze the tool to engage the blade and pull along the tube to shave a window of the desired length, then release to remove the tube, Refer to Figures 37 & 38





Figures 35 & 36 – Buffer tube inserted into ‘Shallow’ (Green) insert slot





Figures 37 & 38 –Buffer tube sizing and shaving operation

For additional information please visit our website at www.lightera.com