SUMITOMO ELECTRIC LIGHTWAVE

SUMITOMO RECOMMENDED PROCEDURE

SRP SP-F04-006

FutureFLEX® AIR-BLOWN FIBER® SOLUTIONS

FIBER BUNDLE STRIPPING PROCEDURE

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1.0 General

1.1 This procedure describes the standard techniques for stripping the jacketing materials from any FutureFLEX fiber bundle so the individual fibers can be spliced or terminated.

1.2 FutureFLEX fiber bundles are available in strand counts of 2, 4, 6, 12, 24, 48 and 72 fibers. Fiber bundles from 2 to 48 fibers have jacketing materials which consist of an outer polyethylene foam jacket (PEF) and an inner nylon colored Sub-Unit.

1.3 The outer foam jacket is a lightweight, aerodynamically designed Polyethylene Extruded Foam (PEF) material. The 2, 4, 6 and 12 fiber bundles have a 2 mm OD outer foam jacket. The 24 fiber bundles have an 3mm OD outer foam jacket. The 48 fiber bundles have a 3.7 mm outer foam jacket. 72 fiber bundles are 4mm OD and are made of PVDF.

1.4 The inner Sub-Units have a colored nylon coating around the optical fiber strands. The Sub-Unit also contains a Polyester ripcord (or ripcords) used to cut through the nylon coating. Some Sub-Unit designs contain more than one (1) ripcord. In these designs, the extra ripcords are used as “fillers” to give each Sub-Unit a consistent diameter.

1.6 FutureFLEX fiber bundles don’t have any tensile strength members (Kevlar) nor contain any waterproofing gels / materials typically found in many conventional fiber optic cables.

2.0 Safety Precautions

2.1 When stripping jacketing materials from fiber bundles, use care and properly dispose of any individual fiber ends that are removed. The fiber ends are easily misplaced and can pierce the skin resulting in splinters that are not easily removed.

2.2 Exercise caution when using tools used to strip the jackets from fiber bundles. They may have sharp blades.

2.3 The use of safety glasses is strongly recommended during this procedure.

3.0 Reference Documents

3.1 Sumitomo Recommended Procedure, *FutureFLEX Field Termination Kit Installation Procedure for 900 µm Sub-Unit Kit,* SRP SP-F04-010.

4.0 Equipment / Tools Required
The following equipment and tools are required to complete this procedure:

4.1 Felt tip pen / marker

4.2 Tape Measure

4.3 Multi-gauge (10-to-20 gauge) wire stripper

4.4 Fiber stripper

4.5 Scissors

4.6 Soft, clean cloth

4.7 utility knife

Note: *This SRP will describe the detailed stripping procedures for 2, 4, 6 & 12 fiber 2mm OD bundles and 24, 48 and 72 strand fiber bundles.*

5.0 General Guidelines for Stripping PEF Jacketed Fiber Bundles – 2 to 48 Fiber Bundles

5.1 Marking Outer Foam Jacket
Generally, at least 6" - 8" of additional fiber bundle needs to stripped beyond the required fiber length should be provided. This is in case any optical fibers are damaged near the end of the bundle during stripping procedures. This should be determined based on the actual fiber splicing / termination hardware used. (Also Consult splicing / termination hardware manufacturer's instructions for recommended strip length.)

5.2 Use a felt tip pen to mark fiber bundle outer foam jacket at appropriate location for jacket removal. **See Fig. 1.**

Note: *Field Termination Kits (FTFLD02, FTFLD04, FTFLD06) have buffer tube lengths of about 24". Fiber bundle strip length should, therefore, be between 30"-32". Field Termination Kit FT12FBK, FT24FBK and FT48FBK have buffer tube lengths of about 36". Fiber bundle strip length should, therefore, be between 42"-44".*

5.3 Stripping Outer Foam Jacket
Use a wire stripper to strip first 3" - 4" of outer foam jacketing. Insert bundle into **10 gauge** notches / cutting blades of wire stripper so bundle lays <u>with</u> the angle of the cutting blades. Use a light touch / squeeze and shear off a portion of outer jacket. *Then put the tool down.* **See Fig. 2 and Fig. 3.**

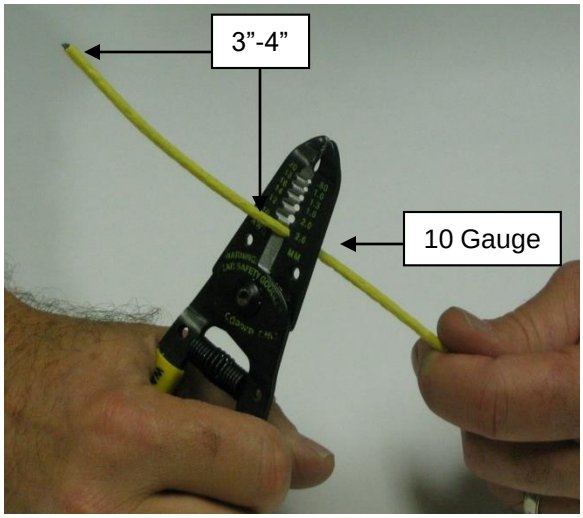

Figure 2
Stripping Foam Jacket with Wire Stripper

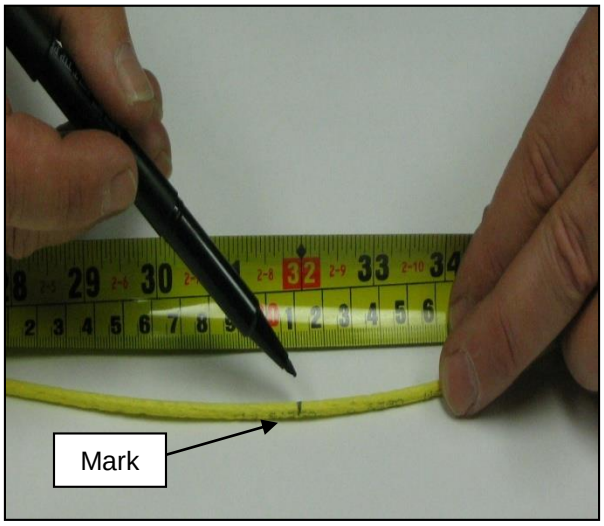

Figure 1
Marking Fiber Bundle Outer Foam Jacket
Between 30" - 32" for 2- thru 12-Fiber Bundles
Between 42" - 44" for 24 and 48 Fiber Bundles
Between 45" - 48" for 72 Fiber Bundles

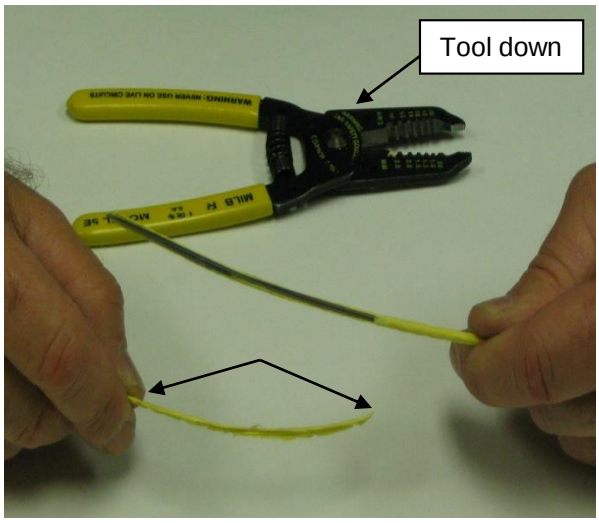

Figure 3
Sheared Piece of Foam Jacket
About 3" - 4"

5.4 Use your fingernails to pull remaining foam back until it reaches point marked on outer jacket. If foam jacketing breaks during this step, re-engage with fingernails and continue. Then use scissors to carefully cut away outer jacket **See Fig. 4.**

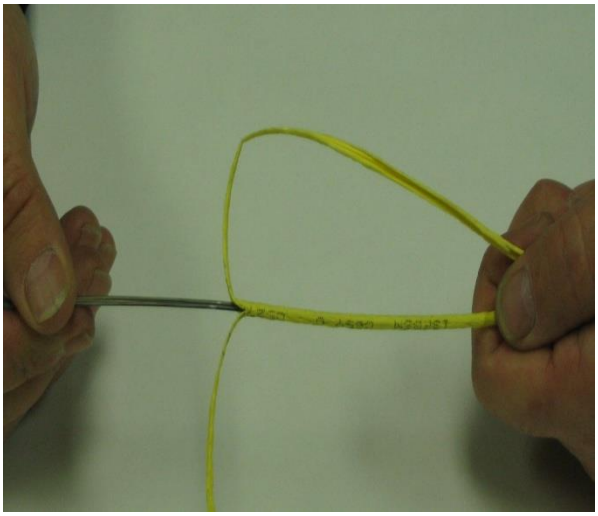

Figure 4
Pull Foam Jacket Back to Marked Point

Note: *The 24-fiber bundle has four (4) colored nylon Sub-Units plus a 360-micron built-up scrap fiber strand. This scrap fiber strand serves as a central member to keep the four nylon Sub-Units in a square pattern. After the nylon jacket is stripped back, cut off the central member at the pre-determined mark.*

5.5 Stripping Inner Nylon Jacket
Use a wire stripper to strip first 3" - 4" of nylon Sub-Unit. Insert first Sub-Unit into **18 gauge** notches / cutting blades of wire stripper so Sub-Unit lays with the angle of the cutting blades. Use a light touch / squeeze lightly and shear off a portion of nylon. *Then put the tool down.* **See Fig.5 and 6.**

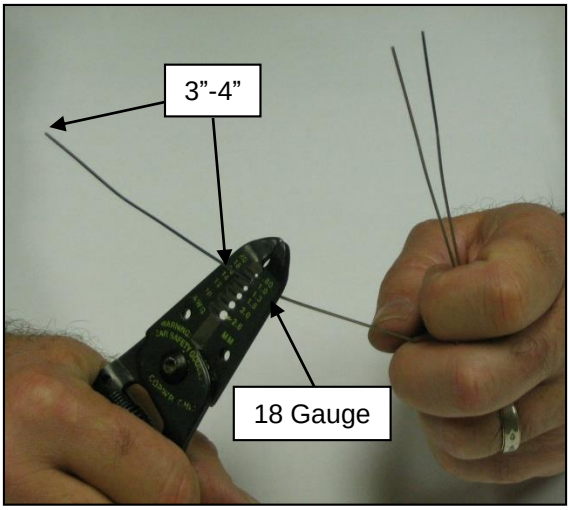

Figure 5
Stripping Nylon Jacket with Wire Stripper

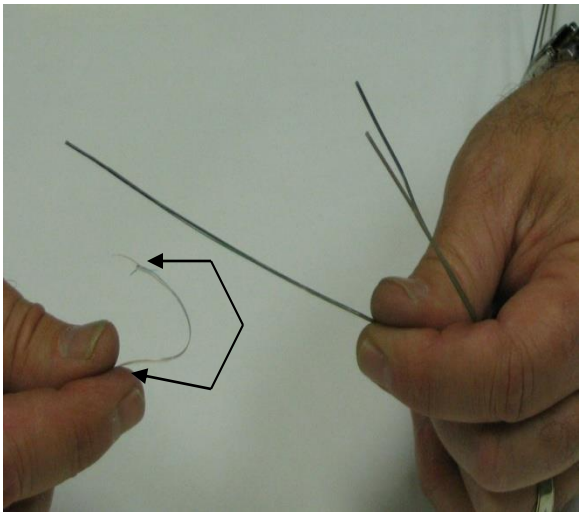

Figure 6
Sheared Piece of Nylon

Note: *Always attempt to strip nylon Sub-Units with 18 gauge wire stripper. However, if 18-gauge slot appears to be too big and cannot strip nylon, move down to smaller 20-gauge. Tool may be getting dull or worn.*

6.0 Stripping 2mm OD 2, 4, 6 and 12 Fiber Bundles

Note: *Stripping techniques for the 2mm OD 2-, 4-, 6-, and 12-fiber bundles are extremely similar to those of the 24 fiber bundles. Only key differences are highlighted below.*

6.1 Marking Outer Foam Jacket -
Same procedure. Mark at 30" - 32". **Refer to Fig. 7.**

6.2 Stripping Outer Foam Jacket
Same procedure but use **12 gauge** of wire stripper. Use **14 gauge** only if required. **Refer to Fig. 2a and Fig. 2b.**

6.3 Stripping Inner Nylon Jacket

Note: *The 4- and 6-fiber bundles have one (1) nylon Sub-Unit.*

6.3.1 Same procedure. Use the **18 gauge** hole in wire stripper. Use **20 gauge hole** only if required. **Refer back to Fig. 4a and Fig. 4b on page 4.**

6.4 Finding Ripcords

Note: The 24 and 48 fiber bundles have one (1) Polyester ripcord in each Sub-Unit.

6.4.1 Access and separate Polyester ripcords from among optical fibers and remaining nylon jacketing.

6.4.2 To help locate ripcord, bend and pinch the first inch of Sub-Unit between thumb and index finger and then let them spring back. **See Fig. 8**.

	2, 4, 6, 12	24	48
Marking Length	30"-32"	42"-44"	42"-44"
Stripping Outer Foam Jacket	12 gauge	12 gauge	12 gauge
Stripping Nylon Sub-unit	18 gauge	18 gauge	18 gauge

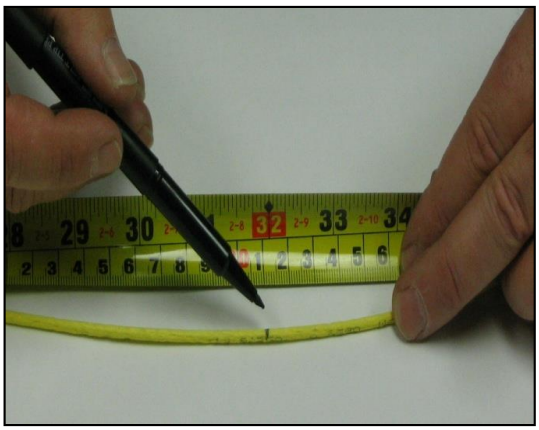

Figure 7
Marking Fiber Bundle Outer Foam Jacket
Between 30" - 32" for 2- thru 6-Fiber Bundles
Between 42" - 44" for 12, 24 and 48 Fiber Bundles

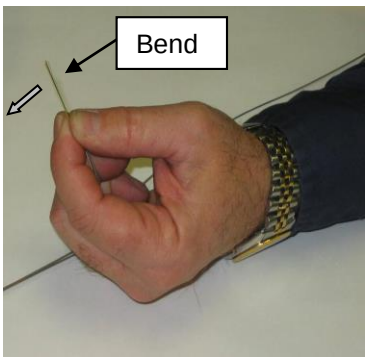

Figure 8

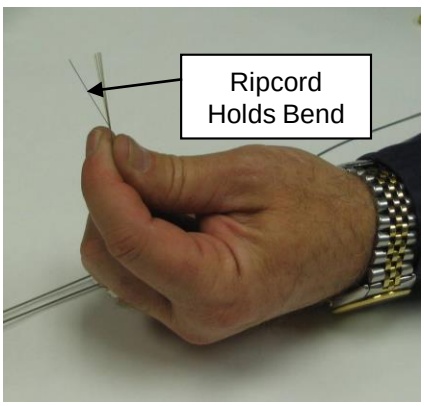

Figure 9

6.4.3 The glass strands will be straight while the Polyester ripcords will hold the bend making them much easier to see. **See Fig. 9.**

Note: *If ripcords were accidentally cut during first stripping procedure, repeat procedure about 3" - 4" back from first attempt. Use less angle and pressure on wire stripper.*

6.4.4 Important Step. Use care when pulling ripcord. If it becomes tangled / twisted within fiber strands, stop. Untangle and then resume pulling operation.

6.4.5 Critical Step. Ensure ripcord in Sub-Unit is positioned next to blue strand fiber. If not, ripcord will be twisted amongst other strands and, when pulled, will break strands.

6.4.6 Key Step. With one hand, hold on to all fiber strands and any remaining nylon jacket. ***Refer to Fig. 10****.*

6.4.7 With other hand, pull ripcord with quick hard pull to get ripcord started and cut the nylon. Then in a slow, steady motion pull the ripcord back until it reaches point marked on outer jacket.

6.4.8 Important Step. Use care when pulling ripcord. If it becomes tangled / twisted within fiber strands, stop. Untangle and then resume pulling operation. A utility knife can be used to cut the end of the colored nylon longitudinally if pulling is difficult.

6.4.9 Important Step. Use care when pulling ripcord. If it becomes tangled / twisted within fiber strands, stop. Untangle and then resume pulling operation. A utility knife can be used to cut the end of the colored nylon longitudinally if pulling is difficult.

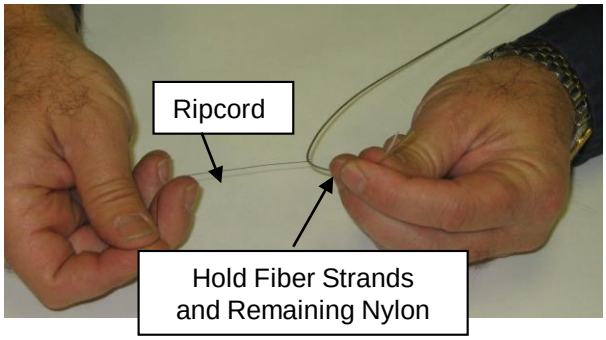

Figure 10

Note: *The 2 fiber bundles have five (5) Polyester ripcords per subunit 4 fiber bundles have three (3) Polyester ripcords per subunit. The 6-fiber bundles have one (1) Polyester ripcord in the Sub-Unit (like the 12, 24, and 48 fiber bundles.)*

6.5 Pulling Ripcords – 2-Fiber Bundles
To remove nylon jacket of 2-fiber bundle, select any one of the five (5) ripcords.

6.6 Pulling Ripcords – 4-Fiber Bundles
To remove nylon jacket of 4-fiber bundle, select any one of the three (3) ripcords.

6.7 Pulling Ripcord – 6-Fiber Bundles
To remove nylon jacket of 6-fiber bundle, there is only one (1) ripcord.

6.7.1 **Critical Step.** Ensure ripcord in Sub-Unit is positioned next to blue strand fiber. If not, ripcord will be twisted among other strands and, when pulled, will break strands.

6.8 For all fiber bundles, carefully separate ripped nylon jacket from fiber strands. Pull nylon jacket back with slow, steady motion until it reaches point marked on outer jacket. Then use scissors to carefully cut away nylon and all ripcords.

6.9 your 2, 4 or 6 fiber bundles are ready to be terminated.

7.0 General

7.1 This next procedure describes the standard techniques for stripping the jacketing materials from the FutureFLEX 12 and 48 fiber bundles whenever the individual fibers are to be spliced or terminated.

7.2 The outer foam jacket is a lightweight, aerodynamically designed Polyethylene Extruded Foam (PEF) material. The 12 fiber bundle has a 2mm O.D. and the 48-fiber bundles have an 3.7mm .O.D.

7.3 The 12 Fiber bundle has one 12 fiber subunit and the 48 fiber bundle has four (4) 12 fiber Sub-Units. Both 12 and 48 fiber bundles have colored nylon coatings around the subunits. Each Sub-Unit has a clear Polyester ripcord used to cut through the colored nylon

8.0 Stripping 12 and 48-Fiber Bundles

8.1 Marking Outer Foam Jacket

Generally, 6" - 8" of additional fiber bundle should be stripped beyond the required length. This is in case any optical fibers are damaged near the end of the bundle during stripping procedures. This point should be determined based on the actual fiber splicing / termination hardware used. (Also Consult splicing / termination hardware manufacturer's instructions for recommended strip length.)

8.2 Use a felt tip pen to mark fiber bundle PEF jacket at appropriate location for jacket removal. **See Fig. 11.**

Note: *Field Termination Kits "FT12FBK" and "FT48FBK" have buffer tube lengths of about 24". Fiber bundle strip length should, therefore, be between 30"-32".*

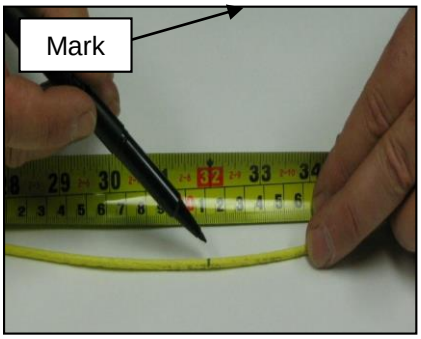

Figure 11
Marking Fiber Bundle Outer Foam Jacket Between 30" - 32" for 48-Fiber Bundles

8.3 Stripping Outer Foam Jacket

Use a wire stripper to strip first 3" - 4" of outer foam jacketing. Insert bundle into **10 gauge** notches / cutting blades of wire stripper so bundle lays with the angle of the cutting blades. Use a light touch / squeeze and shear off a portion of outer jacket or you can strip using your finger nails. *Then put the tool down.* **See Fig. 12a and Fig. 12b.**

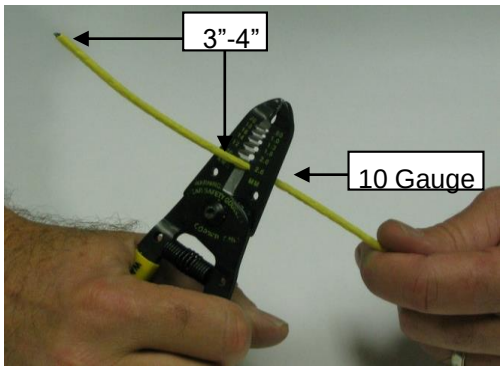

Figure 12a
Stripping Foam Jacket with Wire Stripper

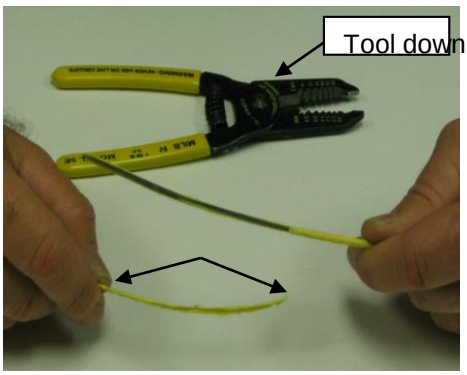

Figure 12b
Sheared Piece of Foam Jacket About 3" - 4"

8.4 Use your fingers to pull the remaining foam back until it reaches point marked on outer jacket. If PEF jacketing breaks during this step, continue to peel the PEF with your fingers. Then use scissors to carefully cut away outer jacket **See Fig. 13.**

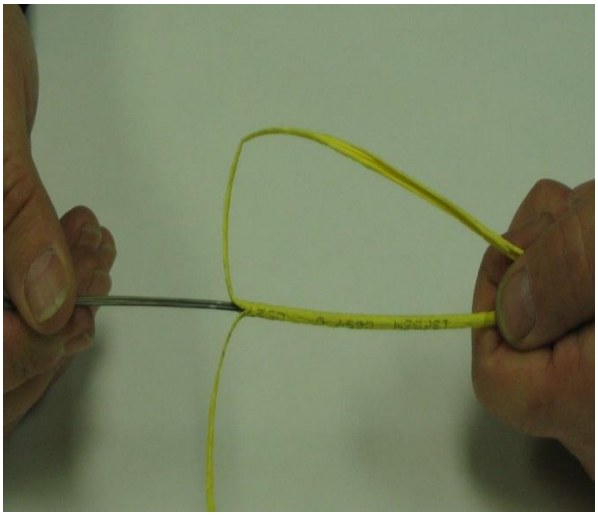

Figure 13
Pull Foam Jacket Back to Marked Point

Note: *The 48-fiber bundle has four (4) colored nylon Sub-Units of 12 fibers plus a UV upcoated center member built-up scrap fiber strand. The central member keeps the four colored nylon Sub-Units in a square pattern. The 12 fiber bundle has one subunit and no central member. After the PEF jacket is stripped back, cut off the central member at the pre-determined mark.*

8.5 Stripping Inner Colored Nylon Jackets
Use a wire stripper to strip first 3" - 4" of nylon Sub-Unit. Insert first Sub-Unit into **18 gauge** notches / cutting blades of wire stripper so Sub-Unit lays with the angle of the cutting blades. Use a light touch / squeeze and shear off a portion of nylon. *Then put the tool down.* **See Fig. 14a and 14b.**

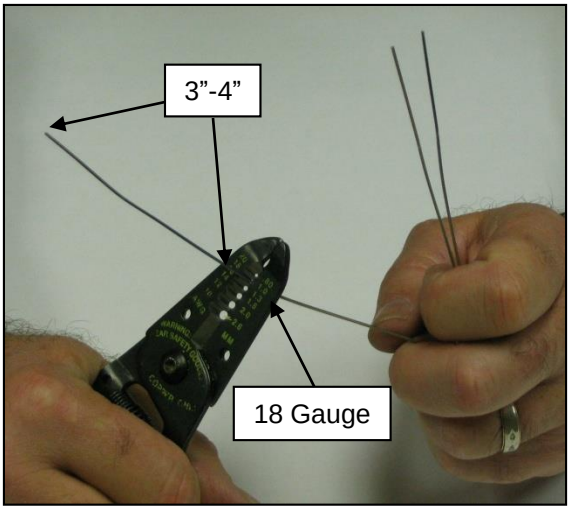

Figure 14a
Stripping Nylon Jacket with Wire Stripper

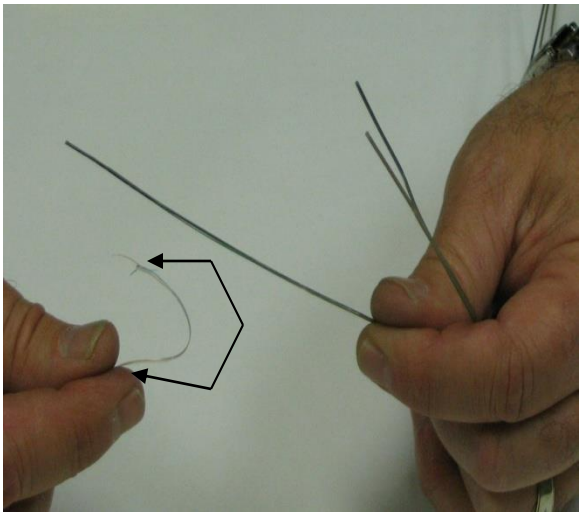

Figure 14b
Sheared Piece of Nylon

Note: *Always attempt to strip nylon Sub-Units with 18 gauge wire stripper. However, if 18-gauge slot appears to be too big and cannot strip nylon, move down to smaller 20-gauge. Tool may be getting dull or worn.*

8.6 Finding Ripcords

Note: *Both the 12 and 48 fiber bundles have one (1) Clear Polyester ripcord in each Sub-Unit. The position of the ripcord can vary between each sub unit.*

8.6.1 Access and separate Polyester ripcord from among optical fibers and remaining nylon jacketing.

8.6.2 To help locate ripcord, pinch first inch of Sub-Unit between thumb and index finger. Gently bend fiber stands and ripcords over and then let them spring back. **See Fig. 15.**

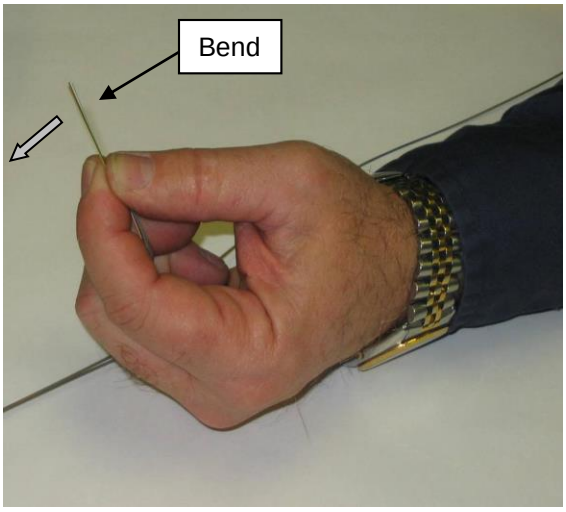

Figure 15
Pinch First Inch of Fiber Strands and Ripcords, Bend Over Gently and Let Spring Back

8.6.3 The glass strands will be straight while the Polyester ripcord will hold the bend making them much easier to see. **See Fig. 16.**

Note: *If ripcords were accidentally cut during first stripping procedure, repeat procedure about 3" - 4" back from first attempt. Use less angle and pressure on wire stripper.*

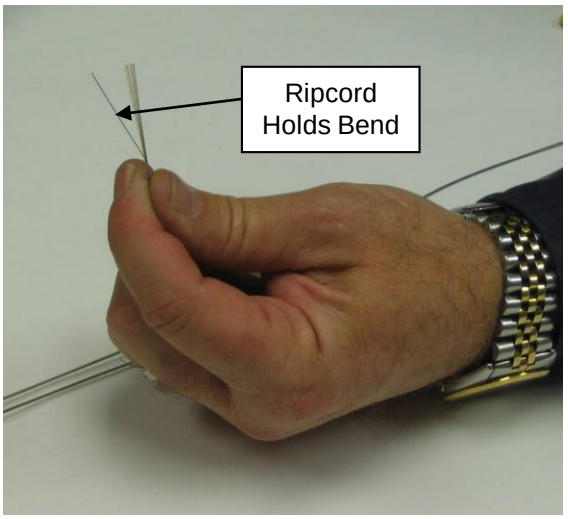

Figure 16
Fiber Strands Stay Straight
Ripcords Hold Bend for Easy Access

8.7 Pulling Ripcord
To remove the nylon jackets of the subunits there is only one (1) clear polyester ripcord per Sub-Unit

8.7.1 Very Critical Step.
Ensure ripcord in Sub-Unit is positioned **next to a fiber strand** and not twisted around any fiber strands.

If the ripcord is twisted around a fiber strand, the colored nylon jacketing will bunch up and will break the fiber strands or the ripcord. Stop when this happens and remove/strip the bunched up colored nylon jacket and reposition the ripcord next to non twisted fiber strand.

TIP: You may need to precut the colored nylon longitudinally to make using the ripcord easier, if you have problems using just the ripcord.

8.7.2 **Key Step.** With one hand, hold on to all fiber strands and any remaining nylon jacket. **Refer to Fig. 17.**

8.7.3 With other hand, pull ripcord with quick hard pull to get ripcord started and cut the nylon. Then in a slow, steady motion pull the ripcord back until it reaches point marked on outer jacket.

TIP: You may need to precut the colored nylon longitudinally to make using the ripcord easier, if you have problems using just the ripcord.

8.7.4 **Important Step.** Use care when pulling ripcord. If it becomes tangled / twisted within fiber strands, *stop*. Untangle and then resume pulling operation.

8.8 For both fiber bundles, carefully separate ripped nylon jacket from fiber strands. Pull nylon jacket back with slow, steady motion until it reaches point marked on outer jacket. Then use scissors to carefully cut away nylon and ripcord.

8.9 Repeat procedure for remaining Sub-Units.

8.10 The fiber bundles are now ready for termination.

1. Hold Fiber Strands and Any Remaining Nylon
2. Gently Pull Ripcord
3. Be Watchful for Ripcord / Fiber Strand Tangling

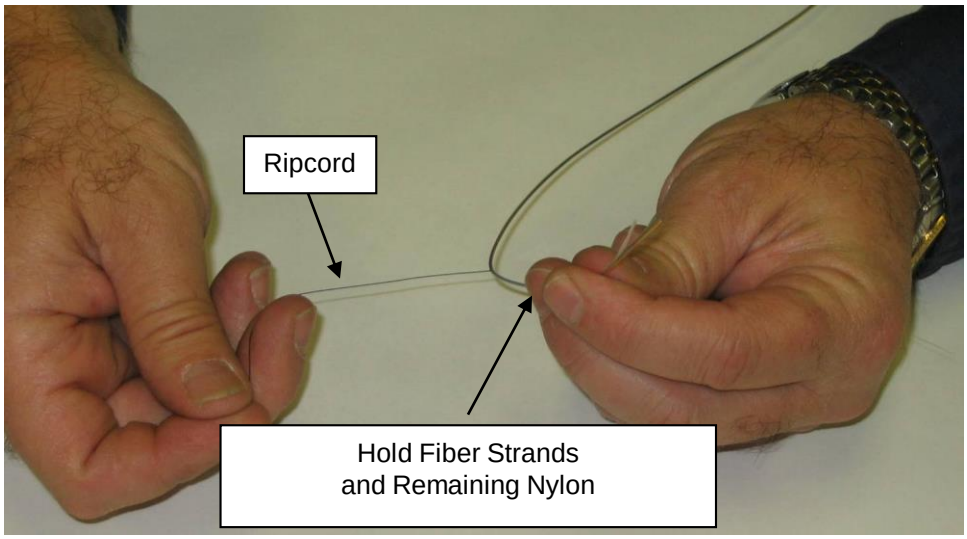

Figure 17

9.0 General

9.1 This procedure describes the standard techniques for stripping the jacketing materials from 48 and 72 air blown fiber bundles whenever the ribbon fibers are to be spliced or terminated.

9.2 The outer jacket is a lightweight, aerodynamically designed Polyvinylidene Fluoride (PVDF) material. The 48 & 72 fiber bundles have a 4.0 mm outer jacket. This requires a slightly different fiber bundle stripping procedure than polyethylene foam referenced previously.

9.3 FutureFLEX fiber bundles do not have tensile strength members (Kevlar) nor contain any waterproofing gels / materials typically found in many conventional fiber optic cables.

9.4 All PVDF outer jacket fiber bundles contain a ripcord for ease in stripping to the bare fiber ribbons.

10.0 Safety Precautions

10.1 When stripping jacketing materials from fiber bundles, use care and properly dispose of any individual fiber ends that are removed. The fiber ends are easily misplaced and can pierce the skin resulting in splinters that are not easily removed. Keep in mind that the 48 fiber bundle consists of 4-12 fiber ribbons and the 72 fiber bundle consists of 6-12 fiber pliable ribbons.

10.1.1. See SRP SP-F04-046 for how to differentiate between the individual 12 fiber ribbons in the fiber bundle. Further identification of individual fibers in each ribbon is based on the standard fiber color code from blue to aqua.

10.2 Exercise caution when using tools used to strip the jackets from fiber bundles. They may have sharp blades.

10.3 The use of safety glasses is strongly recommended during this procedure.

10.4 Make sure you have a clean work area when working with bare fibers.

11**.0 Reference Documents**

11.1 Sumitomo Recommended Procedure, Field Termination Procedure for both SU FB72 Fiber Bundles With FT72FBK-12SU breakout Kit, SRP SP-F04-046.

11.2 Sumitomo Recommended Procedure, FP72PVS Fiber Bundle Procedure for Single Fiber Termination Using a FB72FBK 900µm Breakout Kit, SRP SP-F04-047

12.0 Equipment / Tools Required

The following equipment and tools are required to complete this procedure:

12.1 Felt tip pen / marker

12.2 Tape Measure

12.3 10-20 AWG Wire Strippers

12.4 Soft, clean cloth

12.5 Needle Nose Pliers

Note: *This SRP will describe the detailed stripping procedures for Pliable Freeform 48 or 72 fiber ribbon bundles. This does not include PEF jacketed fiber bundles.*

13.0 Stripping 48 & 72 Fiber Bundle

13.1 Mark Outer Jacket.
Generally, strip 6" - 8" of additional fiber ribbon beyond the actual fiber required length needed. This is in case any optical fibers are damaged near the end of the bundle during stripping procedures. This point should be determined based on the actual fiber splicing or termination hardware used. (Also Consult splicing or termination hardware manufacturer's instructions for recommended strip length.)

13.2 Use a felt tip pen to mark fiber bundle outer foam jacket at appropriate location for jacket removal. **See Fig. 18.**

Note: *Field Termination 48 or 72 Fiber Breakout Kits (FT72FBK) Fiber bundle strip length should be between 42"-44".*

Figure 18
Marking Fiber Bundle Outer Foam Jacket
Between 42" - 44" for Fiber Bundles

13.3 Stripping Outer Jacket.
Use your fingers or wire strippers, break into 1-2" of outer jacketing to expose bundle ripcord. A wire stripper can be used at the very end of the fiber bundle in order to expose the ripcord, but will likely damage the ends of the fiber. Because of this, remember to take that into consideration and cut off damaged end before termination. **See Fig 19.** If you find that identifying the ripcord is difficult you can bend and break the fibers to expose the ripcord which is made of polyester and will not break. To proceed with this method, using the first 1" of stripped/exposed fiber simply bend all fibers/ripcord 180° while firmly pinching at the apex of the bend, this will cause the fibers to break, you may have to roll and reposition the fiber bundle a few times until all of the fibers break. Once you have confirmed that all the fibers have been broken you should be able to identify the clear polyester ripcord. **See Fig 20. Note**: Protective gloves should be worn to prevent any of the broken fiber strands from causing injury and, protective eyewear should also be worn as an added safety precaution.

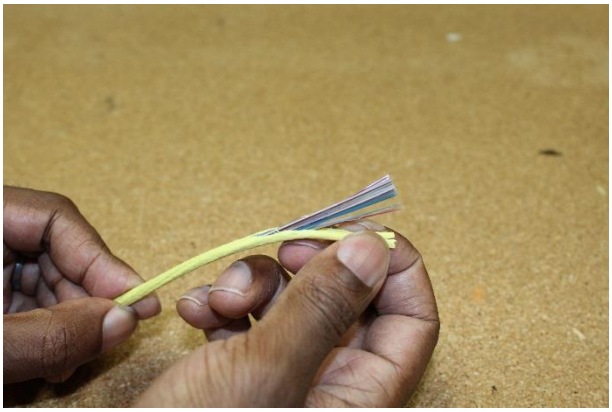

Figure 19
Breaking into a Fiber Jacket by Hand

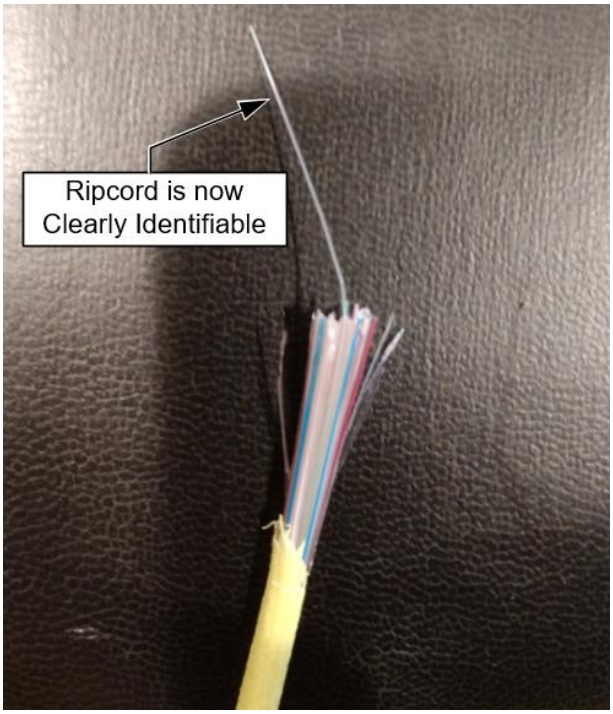

Figure 20
Exposing the Ripcord by bending
and breaking the surrounding fibers

13.4 After breaking into the fiber jacket, pinch the fiber bundle with your fingers or clean cloth and carefully hold it between 30° and 35° from the jacket. Gently pull the ripcord using needle nose pliers (or wire strippers) away from the fiber bundle. The ripcord pulling allows the jacket to peel away from the fiber bundle easily. Continue to peel the PVDF jacket until you have reached the marked location.

Remove any excess jacket filaments until only the exposed ribbons remain. **See Fig 21.**

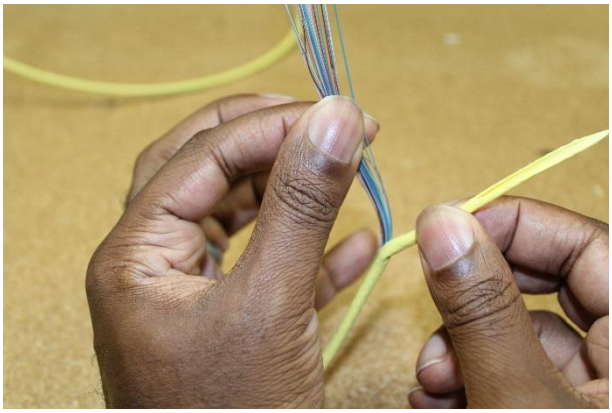

Figure 21
Peal Fiber Bundle and Jacket Back to Marked Point