Splicing OFS PowerGuide® ShortSpan DT Cable in a Tyco FOSC 450BS Splice Closure

1. General

1.1 This document describes the cable splicing procedure for OFS PowerGuide® ShortSpan DT cable using a Tyco FOSC 450BS splice closure[1]. This practice is intended for personnel with prior cable splicing experience. A working familiarity with cable and fiber splicing procedures is necessary as this guide does not cover all details of cable prep, closure assembly, and fusion splicing techniques.

1.2 PowerGuide ShortSpan DT cable is an all-dielectric self-supporting (ADSS) cable that is designed to meet specific customer requirements for loading, span length, and cable-sag requirements. PowerGuide ShortSpan DT cable is a single-jacket loose-tube design and is available with a maximum of 144 optical fibers. The cable is completely dry and contains no filling compounds. Depending on the installation conditions and expected loading, the maximum span length of PowerGuide ShortSpan DT cable ranges from 400 to 1150 feet (120 - 350 m).

1.3 The Tyco FOSC 450BS fiber optic splice closure uses compressed-gel cable seals to environmentally seal the cable splice point. The maximum splice capacity of the FOSC 450BS closure is 144 single or 288 mass fusion splices. The maximum cable diameter is 1 inch (25 mm).

1.4 This document describes two splicing applications – (1) an end splice of two PowerGuide ShortSpan DT cables and (2) a mid-span splice of the PowerGuide ShortSpan DT cable to fiber drop cables.

2. Precautions

2.1 The maximum rated cable load (MRCL) of PowerGuide ShortSpan DT cable depends on the specific customer application and expected loading conditions. Please refer to the documentation provided with your cable for the MRCL. You may also contact OFS Customer Support at 888-FIBER-HELP (888-342-3743), or 1-770-798-5555 from outside the USA, for further information.

2.2 The minimum recommended bend diameters of PowerGuide ShortSpan DT cable are defined for both dynamic and static conditions. For dynamic conditions (during installation), the minimum recommended bend diameter is 30 × cable outside diameter (OD). For static conditions (after installation), the minimum recommended bend diameter is 20 × OD. Specific dimensions for the 96-fiber cable are listed in Table 1.

[1] FOSC 450 is a trademark of Tyco Electronics Corporation, Fuquay Varina, NC.

Table 1 – Minimum Recommended Bend Diameters for 96-Fiber PowerGuide ShortSpan DT Cable	
Condition	Minimum Bend Diameter
Dynamic (during installation)	18 in. (46 cm)
Static (after installation)	12 in. (31 cm)
Storage Coils	12 in. (31 cm)

3. Tyco FOSC 450BS Splice Kit Components

3.1 A Tyco FOSC 450 splice closure is shown in Figure 1. The following components are included in the closure kit. ***Note:*** *Depending on the splicing application, extra splice trays and sealing kits for small diameter drop cables may be needed and must be ordered separately.*

- Dome and clamp
- Base and o-ring
- Metal slack basket
- Gel end-piece
- Hook and loop fastener strap
- 4 gel end-piece plugs
- 6 cable strain relief holders and clips
- Hose clamps
- 6 strength member attachment brackets
- 12 small tie-wraps
- 1/4” nut driver to install hose clamps
- Installation instructions

Other Accessory Kits:
- FOSC-ACC-A-Tray-24 (Extra tray kits)
- FOSC 450 Small/Seal-4 Cable Kit (Sealing kit for small-diameter or flat drop-cables)

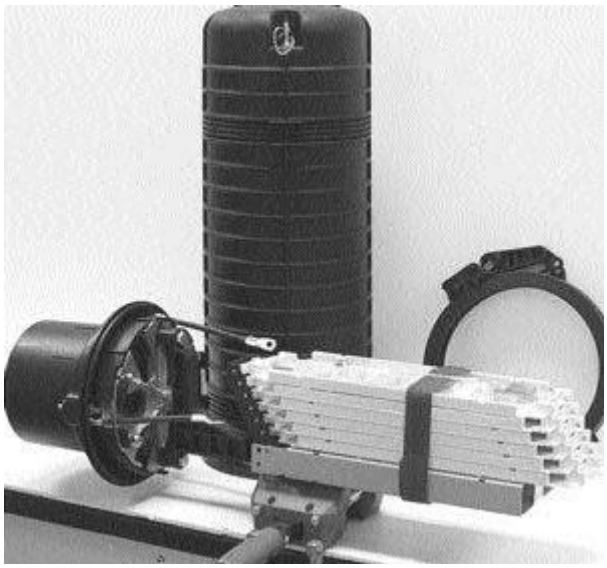


Figure 1 – Tyco FOSC 450 Splice Closure

4. End Splice (Cable to Cable)

4.1 The “end splice” or “cable to cable” splice technique is used to splice together two separate cables. In this application, the outer jackets of both cables are removed and the cable ends are prepped and terminated in the closure. All fibers in the cable are routed to the splice trays and fusion spliced. Depending on the location of the end splice, drop cables may also be terminated and spliced in the closure. The following section describes a splice between two 96-fiber distribution cables. Drop cables are covered in Section 5 of this document.

4.2 ***Closure Prep:*** Release the clamp handle to remove the dome from the closure (Figure 2). Apply slight pressure to the side of the handle to disengage the locking tab. Hook the handle on the two posts and pull back until the clamp releases from the closure. Keep the o-ring, clamp, and dome clean and dry.

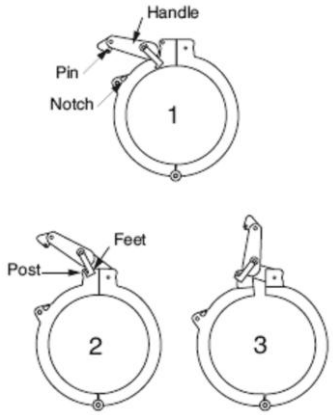


Figure 2 – Release the clamp handle to open the closure.

4.3 Remove the dome from the closure base. Separate the metal frame from the closure base.

4.4 ***Cable Prep:*** Ring cut and remove the outer jacket of the PowerGuide ShortSpan DT cable. Refer to OFS IP-011A, *Sheath Removal and Mid-Span Access – Single Jacket, Option1, and AccuTube Cables,* for detailed sheath removal instructions. The recommended cable prep length for the end-splice application is 48 in. (120 cm). Note that this length is based on full capacity of the Tyco FOSC 450BS closure (144 fibers) and that a longer prep length may be possible for the 96-fiber cable.

4.5 Trim the aramid strength members and binder yarns even with the ring cut. Measure, mark, and trim the center strength member 2 in. (5 cm) from the end of the cable jacket.

4.6 ***Install Cable Retention Hardware:*** Determine the position in the metal frame where the cable will be installed (Figure 3). Mid-span and/or main cables are typically installed in the lower ports. Branch or drop cables are typically installed in the upper ports of the closure. Note the orientation of the cable port. The cable retention hardware must slide into the port after it is installed on the cable. Position the cable retention hardware on the cable to allow installation in the metal frame without twisting the cable.

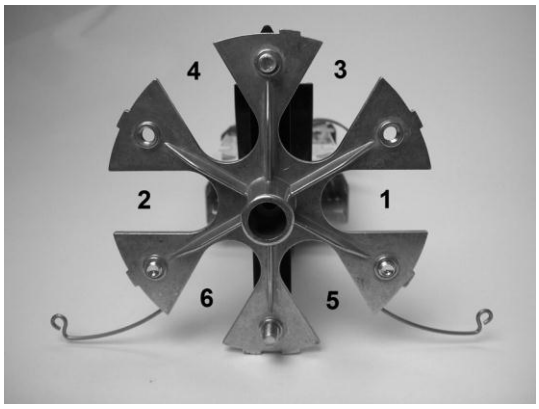


Figure 3 – Select the cable position and observe the required orientation of the cable retention hardware.

4.7 Orient the buffer tubes away from the center strength member and insert the center strength member into the strength member lug. Tighten the screw to fasten the center strength member between the strength member lug and bracket. ***Note:*** *The screw should push against the strength member bracket – not against the strength member itself (Figure 4).*

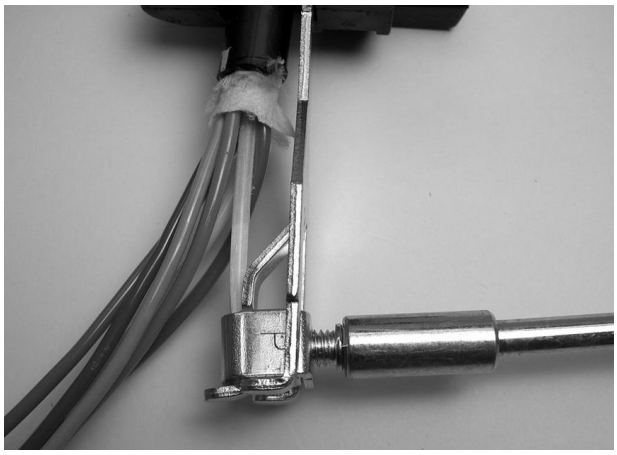


Figure 4 – Attach the center strength member to the strength member bracket.

4.8 Install the cable attachment bracket onto the cable as shown in Figures 5a and 5b. The slot in the smaller section of the cable attachment bracket must be aligned and installed over the tab of the strength member bracket. Assemble the two sections of the cable attachment bracket and install the hose clamp to fasten the bracket to the cable. Use the 1/4" nut driver supplied in the closure kit to tighten the hose clamp. Don't over tighten the hose clamp to the point that it deforms.

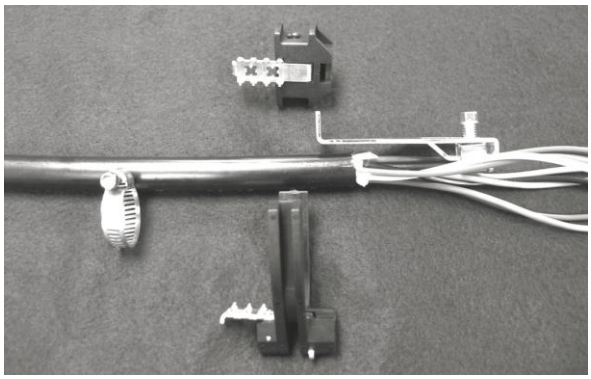


Figure 5(a)

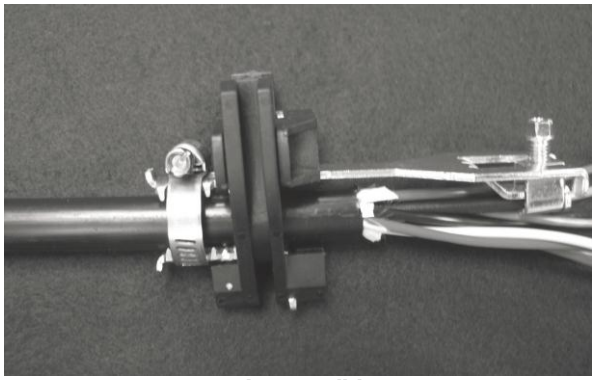


Figure 5(b)

Figures 5a and 5b – Install the cable attachment bracket on the cable.

4.9 Repeat steps 4.4 – 4.8 for each cable installed in the closure.

4.10 Slide the closure base (small end first) over the ends of the cables and move it out of the way (Figure 6).

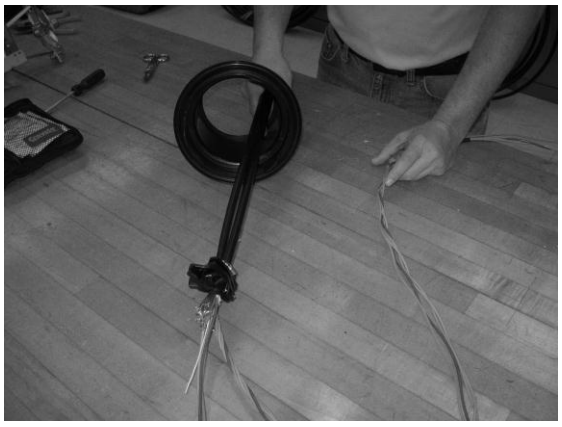


Figure 6 – Slide closure base over the ends of the cables.

4.11 Insert the cable attachment bracket and cable into the appropriate slot of the metal frame until it locks in place (Figure 7). If required, loosen and reposition the cable attachment bracket for better alignment to the cable port. Repeat for the second cable. ***Note:*** *Mid-span and/or main cables are typically installed in the lower ports. Branch or drop cables are typically installed in the upper ports of the closure.*

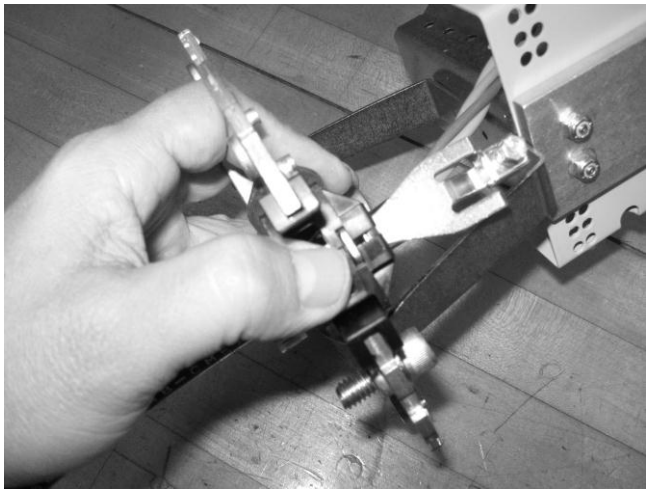


Figure 7 – Insert cable attachment bracket into the appropriate port of the metal frame.

4.12 ***Route Buffer Tubes and Fibers:*** Route the loose buffer tubes into the slack storage basket. Store about two wraps of buffer tube from each cable in the slack storage basket (Figure 8).

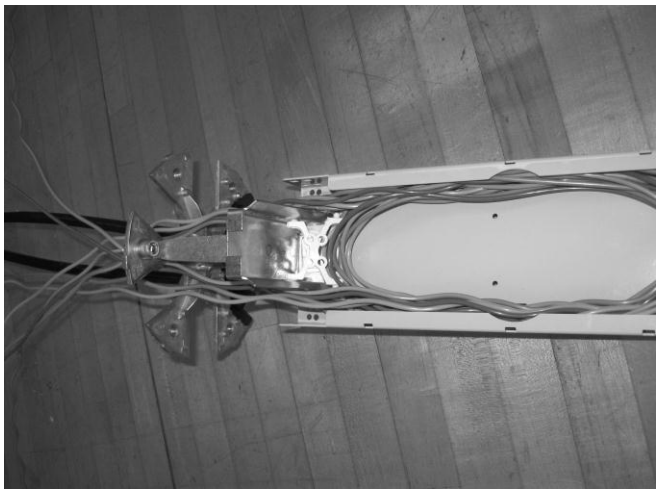


Figure 8 – Store buffer tubes in slack storage basket.

4.13 A maximum of six splice trays can be installed in the Tyco 450BS closure. Each tray has a capacity of 24 single-fiber splices. Four splice trays are required for the end splice of the 96-fiber PowerGuide ShortSpan DT cable.

4.14 Starting with the last two buffer tubes (tubes 7 and 8) of each cable, route the tubes from the slack storage basket to the bottom splice tray. Mark each buffer tube about 1 in. (25 cm) past the edge of the tray as shown in Figure 9. Ring cut and remove the buffer tubes at the mark.

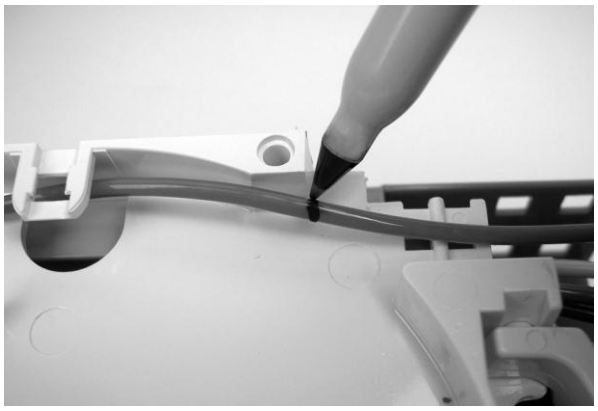


Figure 9 – Mark the buffer tube for the ring cut.

4.15 Wrap the ends of the buffer tubes with felt tape and fasten to the splice tray using the small cable ties as shown in Figure 10.

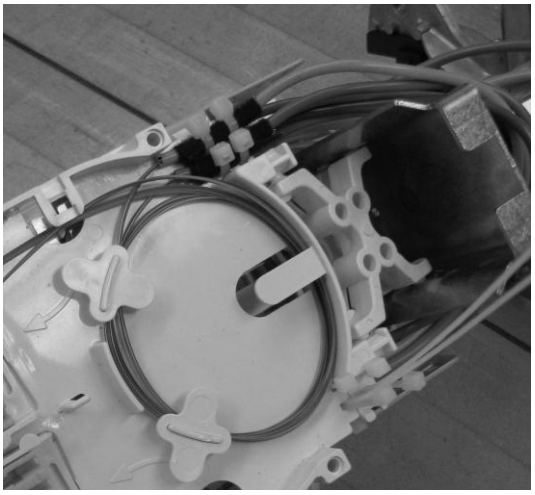


Figure 10 – Fasten the buffer tubes to the splice tray.

4.16 Route the fiber slack into the splice tray as shown in Figure 11. Individual fibers can be routed into the splice organizer on the splice tray.

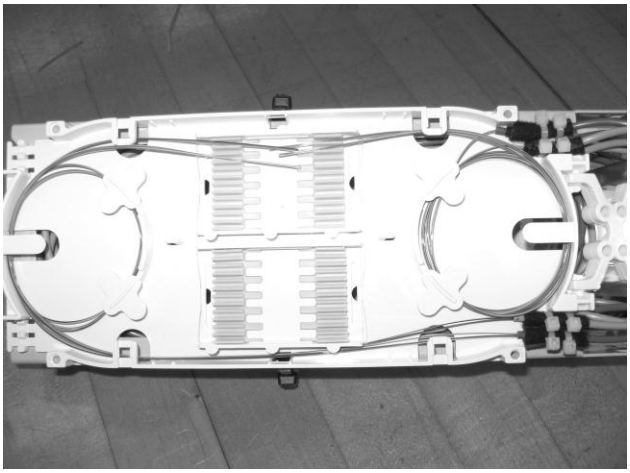


Figure 11 – Route the fiber slack into the splice tray.

4.17 Repeat steps 4.14 – 4.16 for the remaining buffer tubes. Continue in reverse sequential order by routing and storing the higher numbered fibers in the lower trays and finishing with fibers 1 - 24 (buffer tubes 1 and 2) in the top tray. Route and store all buffer tubes and fibers before beginning to splice fibers.

4.18 Once all buffer tubes and fibers have been routed, fastened, and organized on the splice trays, fiber splicing may begin. Alternatively, the remaining closure assembly may be completed before splicing the fibers.

4.19 ***Assemble Gel End-Piece:*** Before installing the gel end-piece, turn the "tail" of the end piece counter-clockwise until it stops. This will ensure that the cable openings are in the open position. Squeeze the gel end-piece to unlatch and open. (Figure 12)

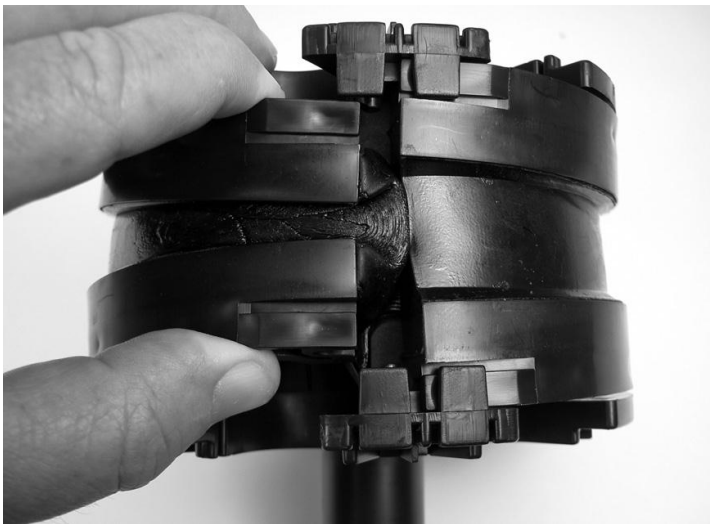


Figure 12 – Squeeze the gel end-piece to open it.

4.20 Position the gel end-piece against the spacer on the metal frame. Position the cables and snap together the two halves of the gel end-piece. (Figure 13). ***Note:*** *If the gel end piece collects dirt, it should be washed off with water only.*

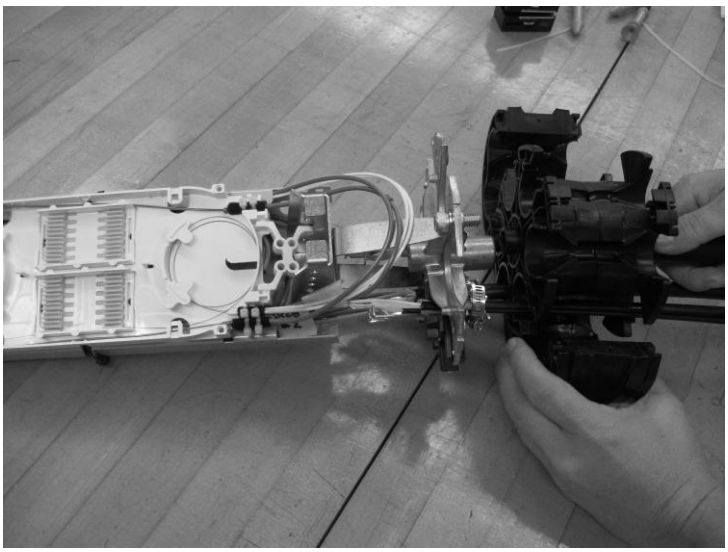


Figure 13 – Install gel end-piece.

4.21 Important: Insert an end-piece plug into each unused cable port. (Figure 14)

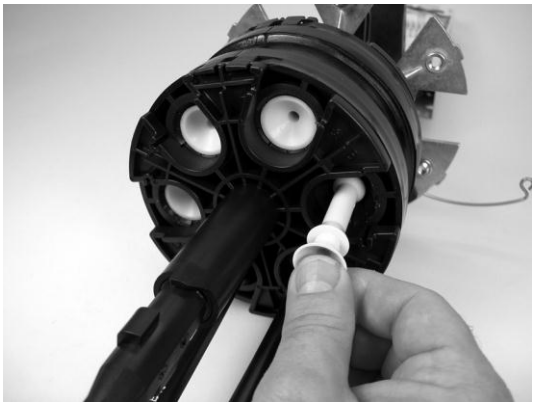
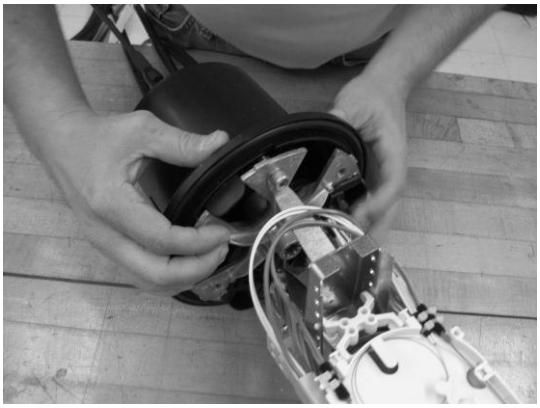


Figure 14 – Insert plugs into unused cable ports.

4.22 Slide the closure base over the gel end-piece. Align the tabs of the metal frame with the slots in the closure base and slide together to seat (Figure 15).



Figures 15 – Assemble the closure base and gel end-piece.

4.23 Turn the "tail" of the gel end-piece clockwise to seal the cables and plugs (Figure 16). Turn the tail until it stops at the physical dead-end or becomes tight. ***Note:*** *Do not use a drill to turn the tail as this will damage the gel end-piece.*

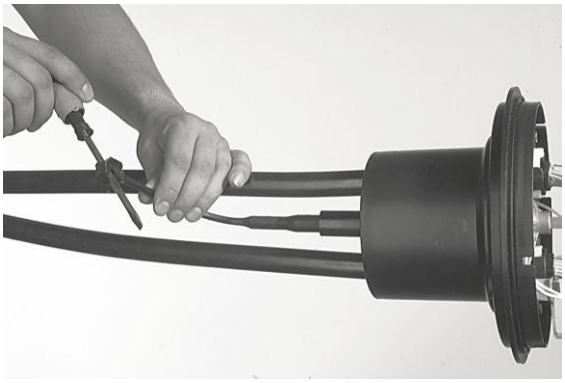


Figure 16 – Turn the "tail" to compress the gel seal around the cables

4.24 Place a large tie wrap around all the cables near the end of the tail.

4.25 ***Fiber Splicing:*** If not already done, fusion splice all fibers. Position the fusion splicer near the top of the closure and route the individual fibers from the splice tray to the fusion splicer (Figure 17).

Figure 17 – Splice the fibers.

4.26 After splicing the fibers, return them to the splice tray, organize the fiber slack, and insert the heat shrink sleeve into the splice organizer (Figure 18). Once the splicing is complete, secure the hook and loop fastener straps around the splice trays and basket.

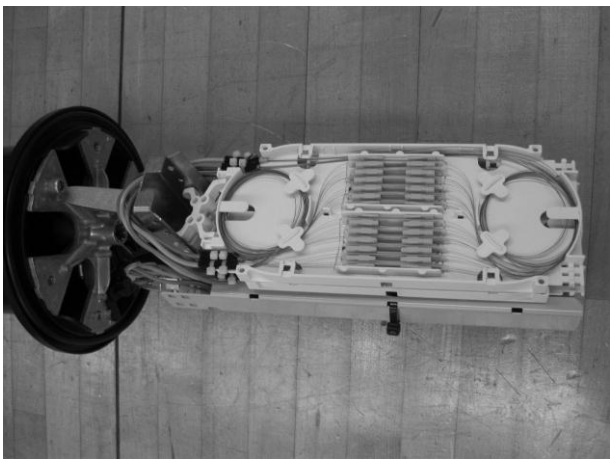


Figure 18 – Completed splice tray.

4.27 ***Assemble the Closure Dome:*** Position the O-ring on the rim of the closure base and assemble the dome and base sections. Align the tabs on the closure base with the slots in the dome (Figure 19). Slide together to seat. ***Note:*** *Place all unused cable termination hardware in a bag and in store in the closure for future cable terminations.*

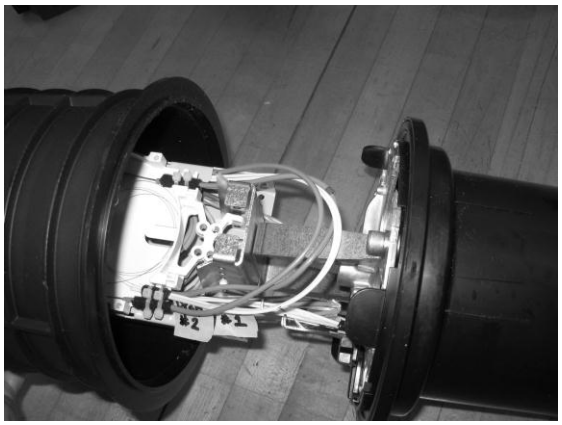


Figure 19 – Assemble the dome and closure base.

4.28 Install the clamp around the dome/base interface. Position feet of handle in front of the two posts and push down on the handle to pull the two halves of the clamp together (Figure 20). Continue to push the handle down until the small pin on the handle snaps into the triangular hole in the clamp.

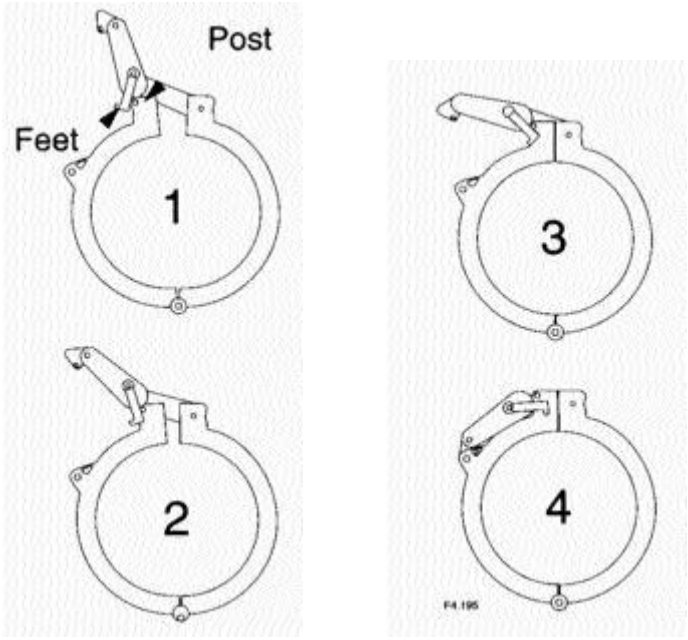


Figure 20 – Install clamp onto closure.

4.29 A security lock or tie wrap may be inserted through the round holes in the handle and clamp to lock the closure.

4.30 Flash test the closure to 5 psi. Thoroughly soap the seals and check for air leaks. After flash testing, bleed all pressure from the closure through the valve.

5. Mid-Span Splice

5.1 Mid-span splicing is a technique that is used to splice one or more fiber drop-cables to the 96-fiber distribution cable. In this application, the outer jacket of the PowerGuide ShortSpan DT cable is removed at a midpoint of the cable, the buffer tubes are exposed, but only a few fibers in the cable are cut and spliced to the drop cables. The majority of the fibers in the distribution cable are “expressed” through the closure without being cut or spliced.

5.2 Many of the steps for the mid-span splice are identical to the end-splice application and the reader is referred to Section 4 for those instructions. The primary differences for the mid-span splice involve termination of the drop cables, mid-span cable prep of the PowerGuide ShortSpan DT cable, and storage of the express buffer tubes and fibers. Only those steps that differ from the end splice are described here.

5.3 ***Closure Prep:*** Refer to Sections 4.2 – 4.3.

5.4 ***Cable Prep:*** For the mid-span splice, the outer jacket or the PowerGuide ShortSpan DT cable is removed at a mid-point location rather than at the cable end. Detailed instructions for mid-span sheath removal are provided in OFS IP-011A, *Sheath Removal and Mid-Span Access – Single Jacket, Option1, and AccuTube Cables.*

5.5 For the fiber drop cables, the cable jacket is removed at the end of the cable. Refer to the manufacturer's documentation for sheath removal instructions for the drop cables. ***Important: For flat drop-cables, or small-diameter drop cables < 0.25 in. (< 6.4 mm) diameter, a small cable sealing kit must be used to seal up to four cables in one port of the closure. Refer to Tyco Electronics for installation instructions for the small cable sealing kit.***

5.6 Ring cut, slit, and remove the outer jacket of the PowerGuide ShortSpan DT cable. The recommended cable prep length for the mid-span splice application is 72 in. (180 cm). Note that this length is based on full capacity of the Tyco FOSC 450BS closure (144 fibers) and that a longer prep length may be possible for the 96-fiber cable.

5.7 Trim the aramid strength members and binder yarns even with the ring cut. Measure, mark, and trim the center strength member 2 in. (5 cm) from the end of the cable jacket on both ends of the mid-span opening.

5.8 The express buffer tubes, i.e., the tubes that will not be cut or spliced in the closure, are stored in the slack storage basket. The active buffer tube must be separated from the express tubes so that it can be routed to the splice tray. Identify the active buffer tube and separate it from the remaining tubes.

5.9 ***Install Cable Retention Hardware:*** The cable retention hardware is installed as described in Sections 4.6 – 4.11. However, note that in Step 4.10, the closure base must be installed over the express buffer tubes as shown in Figure 21. Use caution to avoid kinking the buffer tubes when sliding the closure base (small end first) over the tubes and onto the cables.

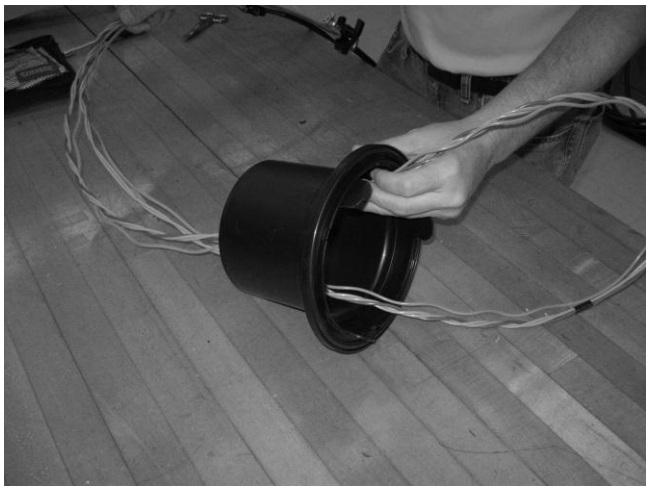


Figure 21 – Use caution when installing the closure base over the express buffer tubes.

5.10 ***Route Buffer Tubes and Fibers:*** Route and store the express buffer tubes in the slack storage basket. Do not cut or slit the express buffer tubes and do not route them to the splice tray. Note that the active buffer tube has been separated from the express tubes as shown in Figure 22.

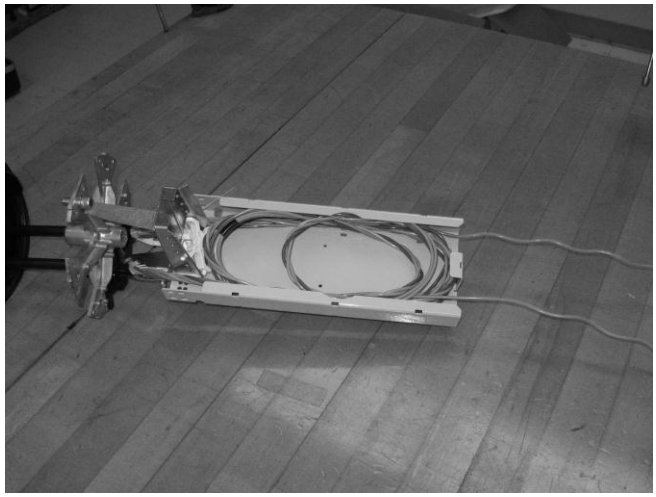


Figure 22 – Store the express tubes in the slack storage basket.

5.11 Store one wrap of the active buffer tube and one wrap for each of the drop-cable buffer tubes in the slack storage basket (Figure 23).

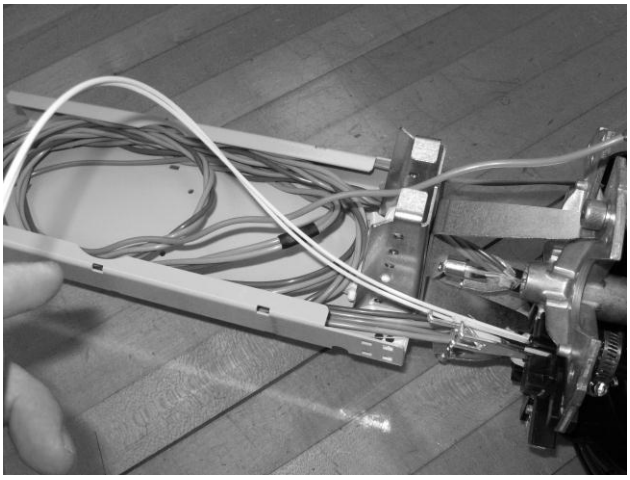


Figure 23 – Store the active tubes in the slack storage basket.

5.12 Typically, only a few fibers will be spliced at a fiber-drop location; therefore, only one splice tray is required in the mid-span splice closure.

5.13 Route the active buffer tube to the splice tray. The mid-span buffer tube will be secured on both sides of the splice tray. Mark each side of the buffer tube about 1 in. (2.5 cm) past the edge of the tray as shown in Figure 24. Slit, ring cut, and remove the section of buffer tube between the marks.

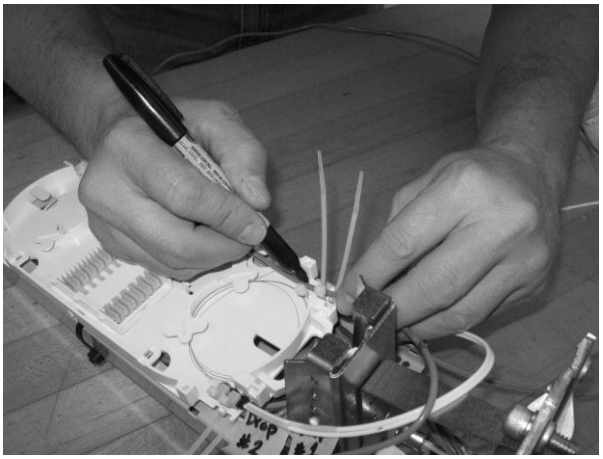


Figure 24 – Mark the buffer tube for the ring cut.

5.14 Wrap the ends of the buffer tubes with felt tape and fasten them to the splice tray using the small cable ties as shown in Figure 25.

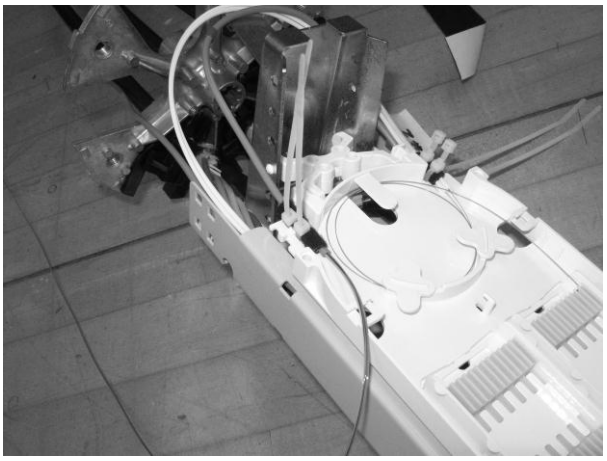


Figure 25 – Fasten the buffer tubes to the splice tray.

5.15 Identify the express fibers and set them aside. These fibers will be stored last so that they are easier to access during future splicing activity.

5.16 Identify the fibers that will be cut and spliced to the drop cables. Cut the fibers at the mid-point between the buffer tube opening leaving slack fiber on both sides of the cut for future rearrangements and splicing activity. Store the "field side" of the cut fiber in the splice tray and route the "office side" of the cut fiber into the splice organizer.

5.17 Store the drop-cable fiber in the splice tray. Route the fiber ends into the splice organizer (Figure 26).

Figure 26 – Route the active fibers into the splice organizer.

5.18 Store the express fibers in the splice tray so that they are on top of the other fibers.

5.19 Fiber splicing may begin once all buffer tubes and fibers have been routed, fastened, and organized in the splice tray. Refer to Sections 4.25 – 4.26. Alternatively, the remaining closure assembly may be completed before splicing the fibers.

5.20 ***Assemble Gel End-Piece:*** Refer to Sections 4.19 – 4.24.

5.21 ***Assemble Closure Dome:*** Refer to Sections 4.27 – 4.30.

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