Instructions for Preparing

AFL OPTICAL GROUND WIRE CABLE

IN THE OPTI-GUARD™ SPLICE ENCLOSURE

(CENTRACORE CABLE DESIGNS)

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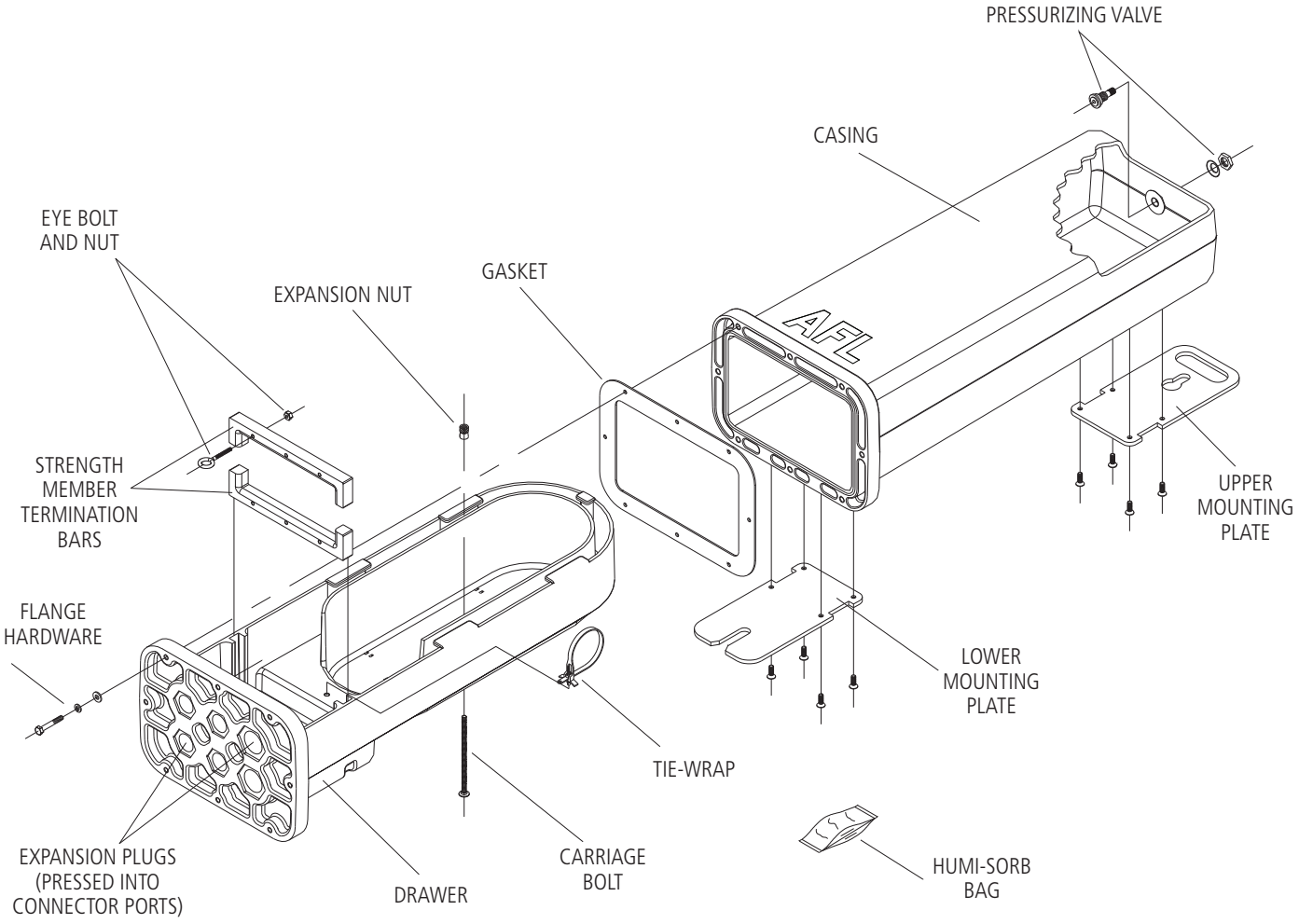
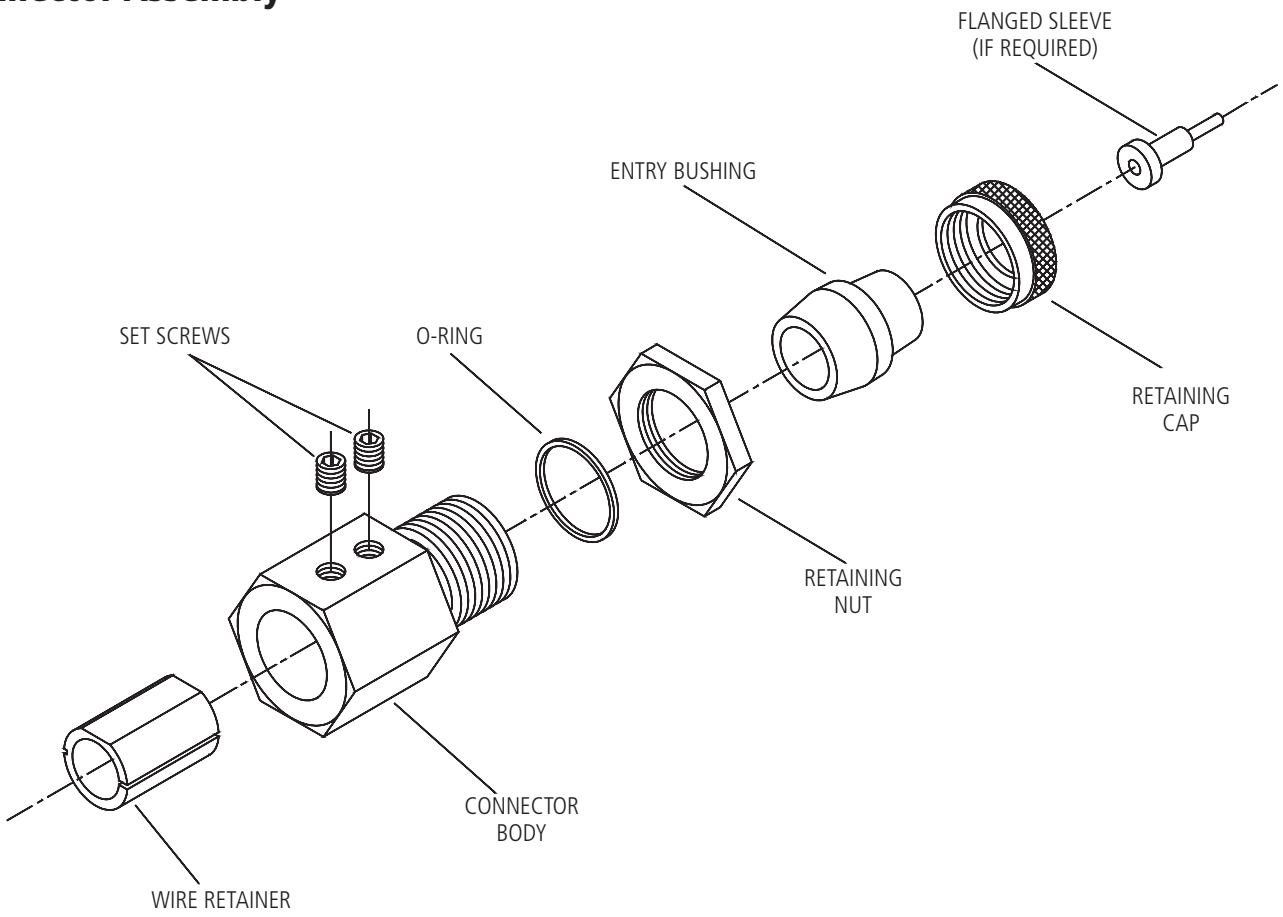
List of Materials

ITEM	DESCRIPTION	QTY
1	Splice Enclosure Assembly (consisting of the Casing, Drawer and related parts)	
	Casing (NOTE: Parts listed below are factory assembled on casing):	
	Upper Mounting Plate	1
	Lower Mounting Plate	1
	Flat Socket Head Cap Screw	8
	Pressurizing Valve	1
	Drawer (NOTE: Parts listed below are factory assembled on drawer):	
	Adhesive Backed Gasket	1
	Tie Wrap Retainer	1
	(NOTE: Parts listed below are removable from drawer):	
	Expansion Plugs	6
	Strength Member Termination Bars	2
	Eye Bolt (part of Termination Bar)	6
	Lock Nut (part of Termination Bar)	6
	Carriage Bolt (for Splice Tray retaining)	1
	Extension Nut (for Splice Tray retaining)	1
	Hex. Head Bolt (flange hardware)	8
	Lock Washer (flange hardware)	8
	Flat Washer (flange hardware)	8
	Humi-Sorb Bag	1
2	Connector Assemblies (the following comprise one connector):	
	Connector Body	1
	Retainer Nut	1
	Entry Bushing	1
	O-Ring	1
	Retaining Cap	1
	Wire Retainer	1
	Set Screws	2
3	Splice Tray Assembly	
	Tray	1
	Cover	1
	Manifold	2
4	Splice Protector Sleeves	Order separately based on actual fiber count
5	Furcation Kit (AFL Part No. OGFK01) includes:	1
	Fiber Protection Tubing	
	Heat Shrink Tubing	
	Primary Transition Tubing	
	Secondary Transition Tubing	
	Labels	
	Cushion Tape	
	Tie Wraps	
6	Stainless Steel Tubing Cutter (AFL Part No. SSCUTTER)	1
7	Small Hose Clamps	2
8	D-Gel or Other Approved Gel Remover	1
9	Small Circular Pan (e.g. 8" cake pan)	2
10	RTV-108 Adhesive	1

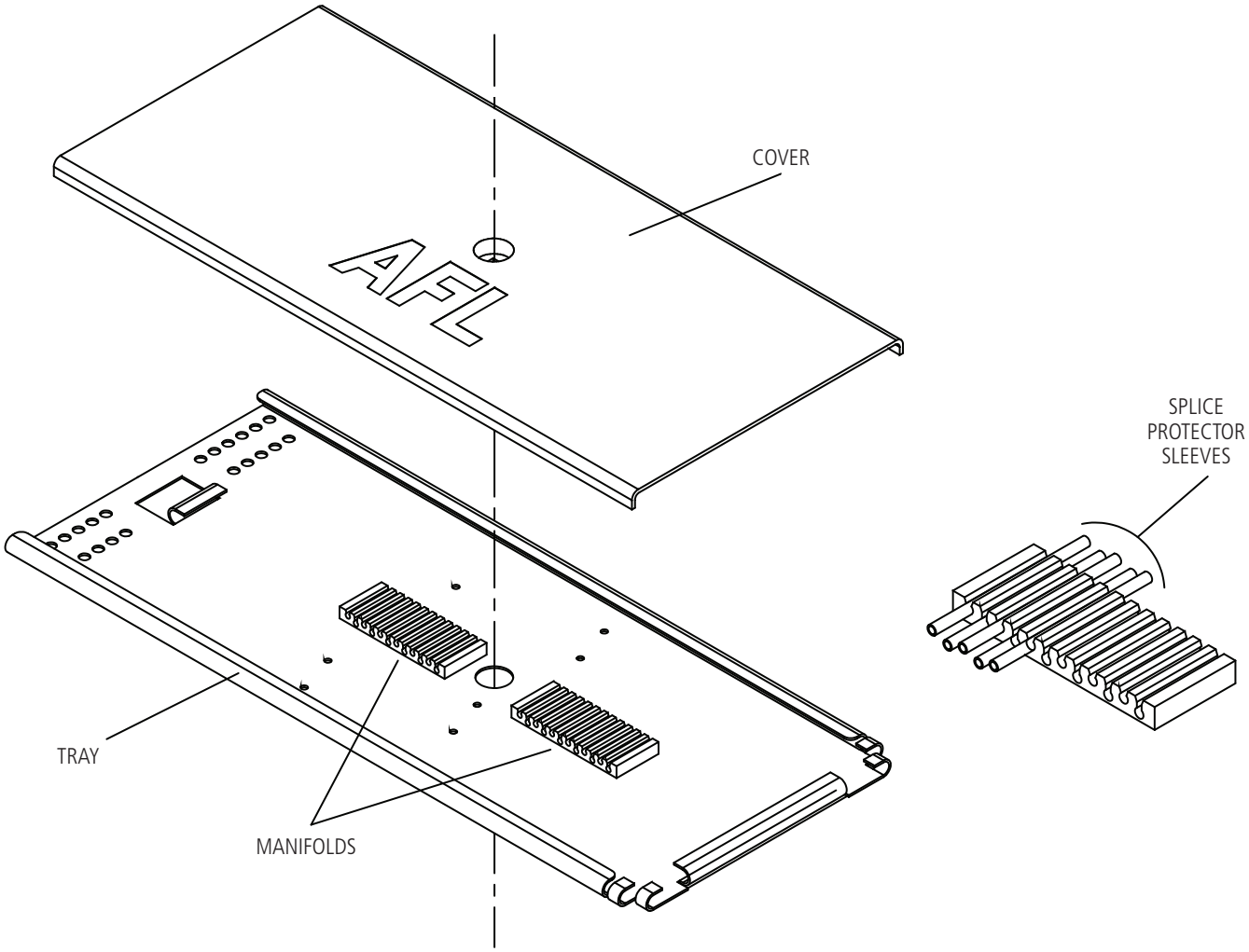
Opti-Guard™ Splice Enclosure Assembly



Connector Assembly



Splice Tray Assembly



1.0 Purpose of Installation

The purpose of installing optical cables into a splice enclosure is to connect the individual fibers of the cables providing a continuous light path while protecting the connection in a sealed enclosure.

2.0 Scope

This document describes and illustrates the installation of Optical Ground Wire into the AFL Opti-Guard™ splice enclosure. This enclosure has the following advantages:

1. Light weight;
2. No sealers or tapes required;
3. Maintenance friendly (no re-entry kits required);
4. Standard capacity of up to 360 single-fusion fiber splices;
5. Accepts various splice tray types; and
6. Accepts up to 6 cables.

3.0 Precautions

3.1 Health

Optical fibers are very thin, fragile and sharp. Therefore, careful handling is required to avoid either damage to the delicate glass fibers, or more importantly, injury to the technician or bystander. Small fiber scraps should be deposited on strips of adhesive tape, placed in a bottle or vinyl bag and properly disposed. Do not eat or drink when working with optical fibers as small pieces of glass may inadvertently be ingested. Never look directly at the end of a fiber unless certain that no laser light is being transmitted through the fiber.

3.2 Work Environment

Handle optical fiber and cable carefully, taking care to impose no damage by physical shock or sharp bends. During the actual splicing, care must be taken to keep hands and work area clean in order that the fibers may be kept clean. Keep all tools and equipment in their proper cases or storage pouches when not in use. Consideration should be given to the work area in which the enclosure will be organized. A clean, snag-free horizontal surface protected from the wind is necessary.

4.0 Cable Preparation at Towers

4.1 The Opti-Guard splice enclosure is designed to allow the splice drawer to be removed and lowered to the ground while leaving the casing intact on the structure. The first step is to determine the amount of cable needed to take advantage of this feature. This amount of cable includes the distance from the splice enclosure mounting position on the tower to the ground plus any additional length desired to transport the splice drawer to a suitable workstation once on the ground. AFL recommends that this extra length of cable be stored using a large drip loop(s) prior to entering the enclosure. **NOTE:** The diameter of this drip loop(s) must be a minimum of 40 inches, regardless of the diameter of the cable. **IMPORTANT:** The coil of cable must be stored on structure prior to preparing the enclosure. Only uncoil the amount of cable used for preparation of the enclosure.

4.2 Once the extra length of cable discussed in section 4.1 has been determined, mark each cable using electrical tape at the point where the cables will enter the enclosure. This will be referred to as Mark "A".

4.3 From the free end of the cable, cut back in 2-foot increments until the optical fibers are located.

4.4 From Mark A, measure 14 feet towards the free end and cut the cable at this point. This length allows for furcation of the tubes (see Section 8.0 for explanation of furcation) and 6 feet of fiber in the splice trays.

4.5 Place a hose clamp or electrical tape around the cable approximately 2 feet behind Mark A (see Fig. 1). This secures the outer strands from unlaying during subsequent handling of the cable. Secure both cables to a workbench or table so that they are held rigidly in place (see Fig. 2). The use of a tower guide clamp attached to a workbench is an adequate means of stabilizing the cable.

Fig. 1

Fig. 2

4.6 Unlay the outer strands from the free end back to Mark "A" and cut (see Figs. 3 and 4).

Fig. 3

Fig. 4

4.7 After all outer wires have been cut at Mark A; secure the wires with a tie wrap.

4.8 With the use of tubing cutter, ring cut and remove approximately 2 inches of aluminum pipe from around the stainless steel tube. This procedure will provide a clean cut for the movement of the remaining aluminum tube (see Figs. 5 and 6).

Fig. 5

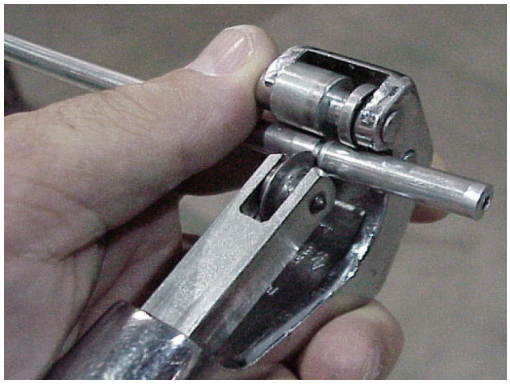
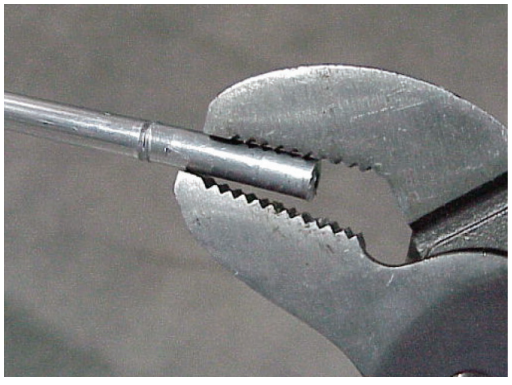


Fig. 6



4.9 Cut, lightly bend and remove 6 to 10 inches of aluminum pipe from the stainless steel tube (see Figs. 7A, 7B and 7C).

Fig. 7A

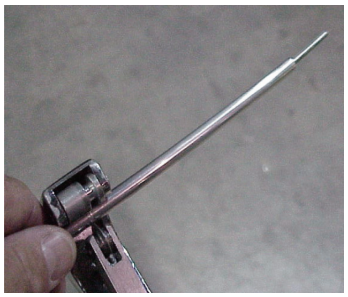
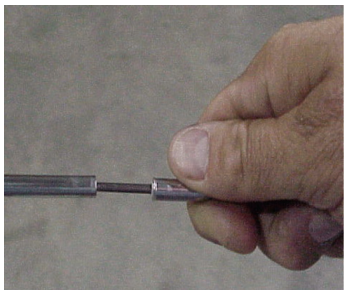


Fig. 7B

Fig. 7C



4.10 All remaining aluminum pipe sections except for a 2" portion shall be ring cut and slid to the end of the stainless steel tube in 6 to 10 inch sections (see Figs. 8 and 9). Always maintain control of the sample to prevent kinking of the stainless steel tube.

Fig. 8

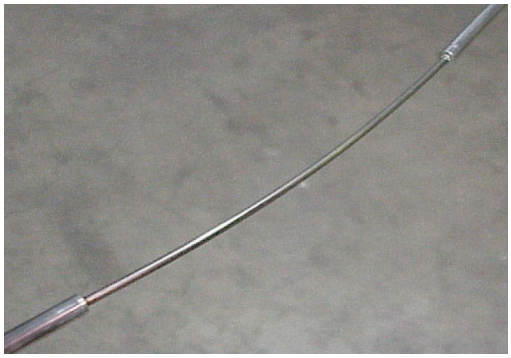
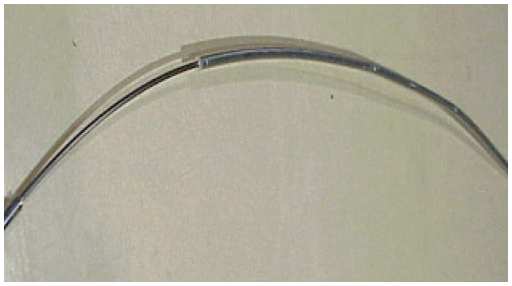
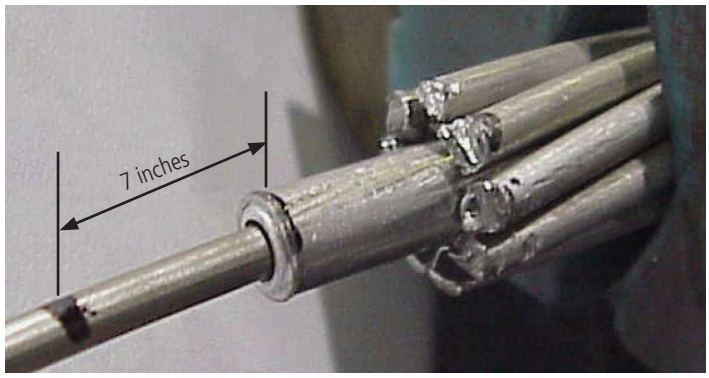


Fig. 9



4.11 Place a mark on the stainless steel tube 7" outside of the aluminum pipe. This mark represents the removal location of the stainless steel tube (see Fig. 10).

Fig. 10



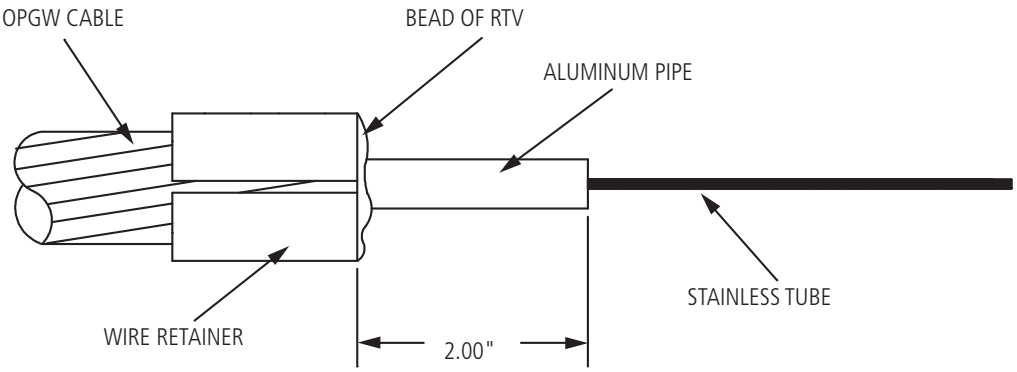
(NOT TO SCALE)

5.0 Cable Preparation into Splice Enclosure

The following instructions can be supplemented by referring to the drawings on pages 4, 5 and 6.

5.1 After the individual OPGW end has been prepared, slide the cable retainer over the stainless tube and over all the outer-strands of wire. Place a bead of RTV silicone on the wire tips and around the pipe (see Fig. 11)

Fig. 11

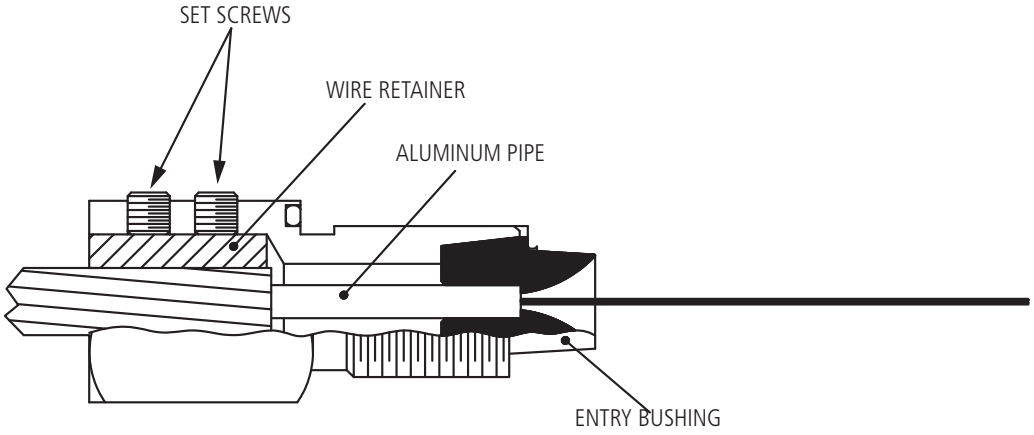


5.2 Slide the connector body over the stainless steel tube until the wire retainer is seated. The flat surface of the wire retainer should be perpendicular to the setscrews before tightening the wire retainer.

5.3 Slide the entry bushing over the stainless steel tube. Ensure that the bushing is oriented correctly by referring to the drawing on page 5 of this document for clarification. Position the bushing in the connector body. Ensure that the bushing is firmly seated into the connector body.

5.4 Tighten the setscrews to lock the wire retainer and cable into position (see Fig. 12).

Fig. 12

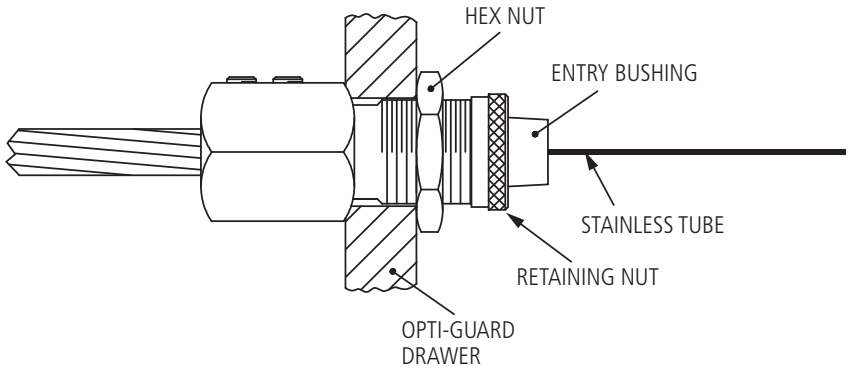


5.5 Locate the cable port into which the cable is to be installed. Remove the appropriate port plug by knocking the plug out of the splice enclosure drawer from the inside outward using a hammer, punch, or screwdriver. An alternative method for removing the plug is to drill a 1/4" hole in the approximate center of the plug, then use the tip of a screwdriver to "lever-out" the plug. Take care not to damage the cable port during plug removal – particularly the outer surface, since the connector's "O"-ring will seal against the bottom of the port hex. **NOTE:** Do not remove a plug unless a connector will be installed in that port!

5.6 Slide the stainless steel tube and connector body through the port. Position the connector body in the enclosure – making certain that the O-ring is clean and is properly in position – and slide the hex nut and retaining nut over the optical units.

5.7 Tighten the hex nut onto the body against the inside of the drawer. Tighten the retaining nut over the silicone bushing (see Fig. 13).

Fig. 13

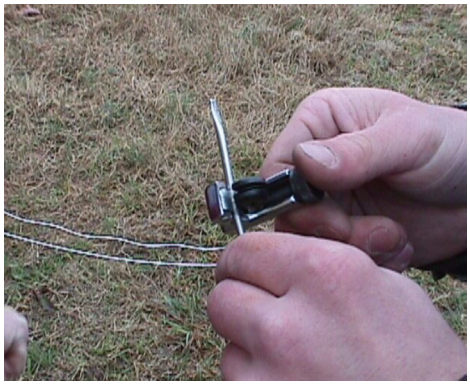


6.0 Removal of Stainless Steel Tubes

NOTE: Certain required components listed in these instructions, such as heat shrink, protection tubing and splitter, are sold separately through AFL.

6.1 This step involves scoring the stainless steel tube. Prior to preparing the actual sample, practice scoring, flexing, and breaking the stainless steel tube on a scrap piece of cable. Practicing this procedure helps ensure that the optical fibers are not damaged during tube removal (see Fig. 14).

Fig. 14



6.2 Examine the end of the stainless steel tube prior to its removal. If the tube is damaged in any way, cut and remove approximately 2" with the tubing cutter to ensure a smooth edge during the removal process. Continue to score and remove the stainless steel tube in approximate 4-foot sections until the tube is removed (Reference section 4.7 before cutting).

NOTE: Special care should be taken to ensure that the fibers do not scrape against the ends of the tubes during removal.

6.3 It is optional at this point to lightly wipe the excess gel from the fibers. It is crucial that the colored thread binders not be disturbed as to maintain each bundle identity for later separation.

6.4 Cut a 2" length of the heat shrink tubing for each stainless steel tube. Slide the heat shrink tubing over the fibers and 1" over the stainless steel tube.

6.5 Using a heat gun, shrink the tubing around the stainless steel tube and fibers. Special care should be taken to ensure that the hot air blast does not remain on the optical fibers for an extended period. Allow the tubing to cool for approximately 10 minutes.

7.0 Separation of String Binders/Cleaning Optical Units

7.1 Starting at the end closest to the stainless steel tube, separate the fibers until you identify one of the colored string binders (see Fig. 15).

7.2 Lightly pull on the binder until the bundle starts to separate from the other fibers.

NOTE: AFL optical ground wires use two colored thread binders to identify each group of twelve fibers in a buffer tube. This built-in redundancy makes for a fail-safe method to identify fiber groups in the unlikely event that any binders should break.

7.3 After a single bundle has been identified, inspect the bundle for the matching color prior to seperating the fibers from the other bundles. Once you have identified that both binders are around the same fiber group, separate the unit from the other fibers (see Fig. 16).

Fig. 15

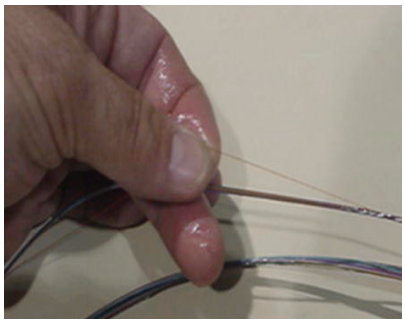
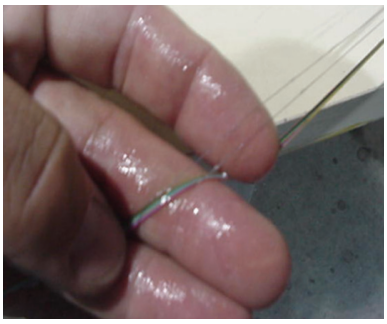


Fig. 16



7.4 Repeat steps 7.2 through 7.3 on each of the fiber bundles. Separate each group of bundled fibers to assure easy identification (see Fig. 15).

7.5 On each of the fiber bundles, confirm that the fibers meet the proper color code and specified fiber amount (see Fig. 16).

Fig. 17

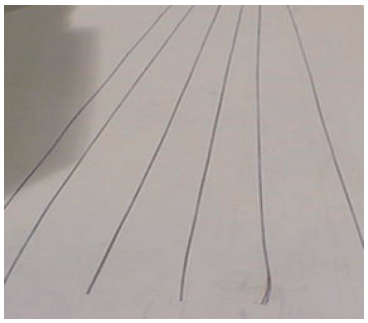
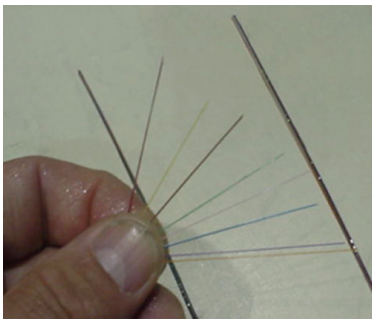


Fig. 18



7.6 After all of the fiber bundles have been checked, return to the fiber end closest to the buffer tube. Separate and cut both string binders approximately 12 inches from the buffer tube. Remove and dispose of the excess binder from the optical fibers (see Fig. 19). Take both remaining binders and loosely loop it through itself to form a small slipknot around the bundle they mark. Repeat this process 4 to 5 times. Cut the excess binder, approximately 1.5 inches above the knot (see Fig. 20).

Fig. 19

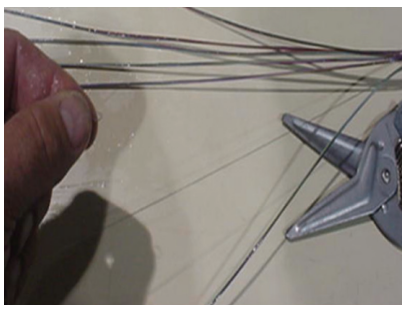
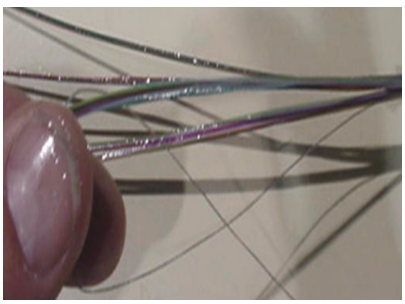


Fig. 20



7.7 Ensure that each bundle is identifiable before continuing on to the to the next.

7.8 After all fiber bundles have been identified, clean each individual fiber group with a standard gel removal cleaner (see Figs. 21 and 22).

Fig. 21

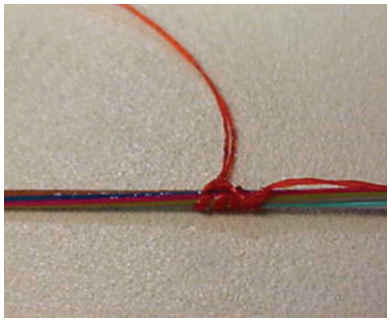
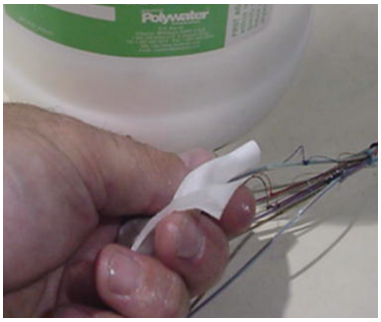


Fig. 22

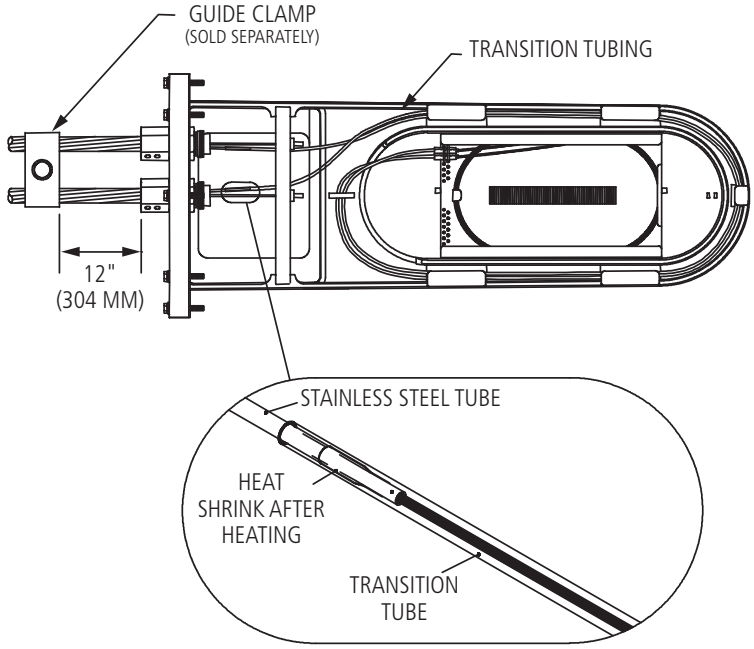


8.0 Placement of Optical Fibers in Transition Tubing / Trays

NOTE: If planning to use the AFL 48 Fiber Splice Tray, refer to Addendum A in lieu of Steps 8.1 and 8.2.

8.1 In order to protect the fiber as it is routed from the end of the stainless steel tube to a splice or transition tray, measure and cut a piece of primary transition tubing long enough to reach from the end of the stainless steel tube to the tray. Slide this primary transition tubing over the fibers, fitting it snugly around the heat shrink tubing at the mouth of the stainless steel tube. Route the primary transition tubing to a splice/transition tray and secure the tubing to the tray. In the case of two optical ground wire cables being spliced together as shown in Fig. 23, it is advisable to use the same transition tray for the two stainless steel tubes being spliced. Ensure that all tubing is clearly marked for ease of identification.

Fig. 23



8.2 If furcation (subdividing a large group of fibers into smaller groups) is required, use the transition tray to segregate the fibers into smaller bundles (see Fig. 23). A length of secondary transition tubing sufficient to route the fiber from the transition tray, around the enclosure drawer raceway, and into the actual splice tray will be needed for each sub-group of fibers. Slide the secondary transition tubing over the sub-group of fibers. Secure the end of the tubing to the transition tray.

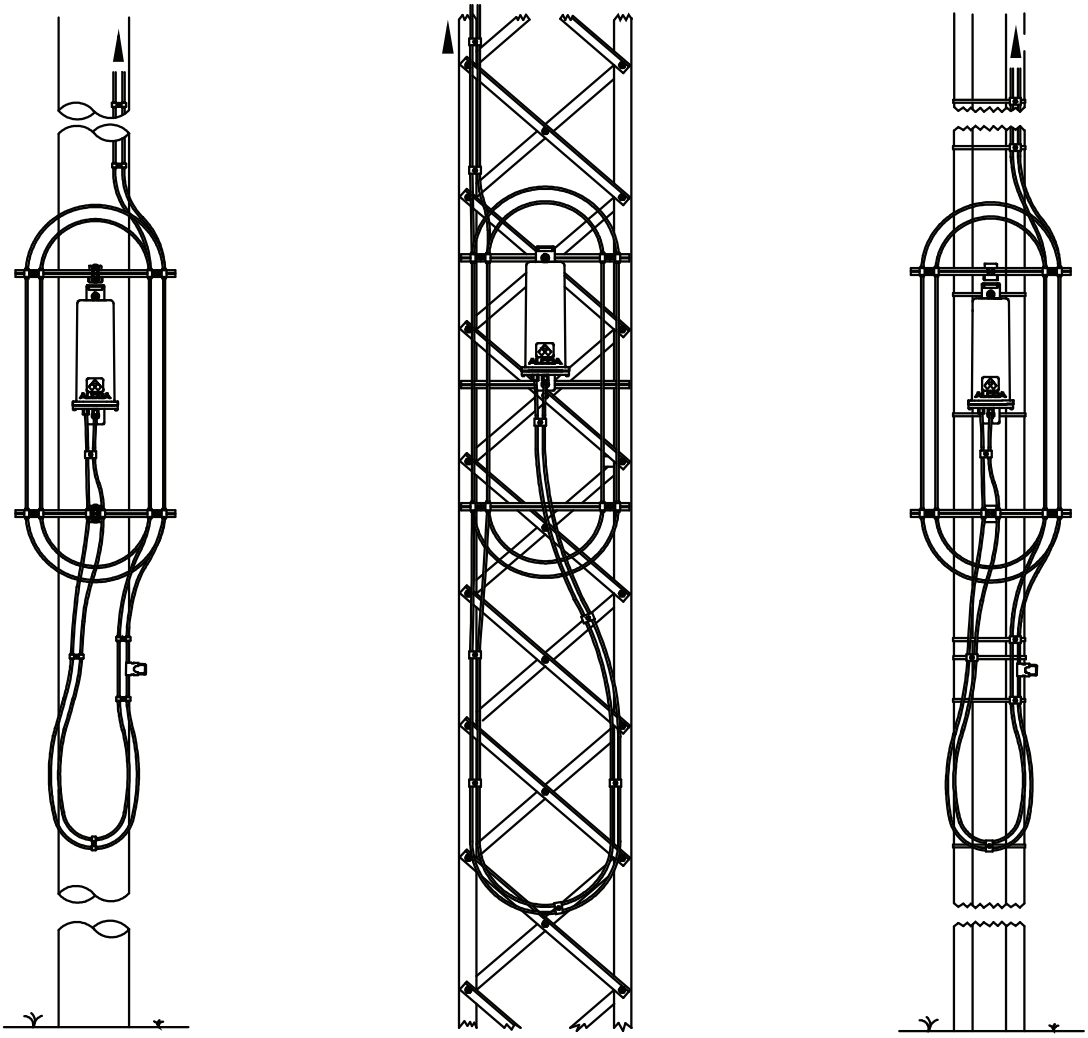
8.3 Once the fibers have been spliced, protected, and positioned, replace the lid on the tray. Ensure that no fibers are protruding from the tray and in danger of being damaged when the lid is replaced. Wrap the transition tubing around the drawer raceway in a clockwise direction and position the tray onto the mounting bolt. Repeat until all trays are in place. Place the tension nut on the bolt and tighten until snug. Use the tie-wrap to secure the transition tubing.

8.4 The drawer assembly is now complete and ready to install into the casing. Torque the bolts to 35 in-lbs. This will cause a visual protrusion of the gasket approximately 1/64" to 1/32" from its original position. A pressure valve has been provided to pressurize the seal to 10 psi maximum.

IMPORTANT: Attach a guide clamp (sold separately) to each pair of cables approx. 12 inch (304 mm) from the bottom of the connector assembly before transporting the prepared enclosure. This will help prevent the cables from twisting inside the enclosure while transporting (see Fig. 23 on previous page).

8.5 Secure the loose cable to the structure to complete installation. see Fig. 24 below for typical installations.

Fig. 24



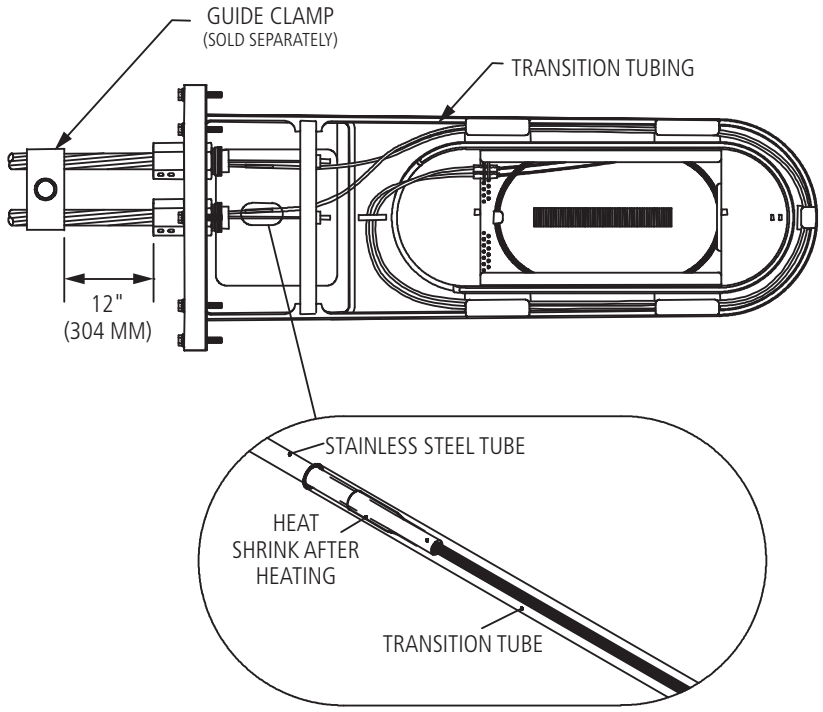
WOOD POLE STRUCTURE | LATTICE TOWER STRUCTURE | CONCRETE OR STEEL STRUCTURE

Addendum A

For some applications, it may be preferable to utilize the AFL OGBT-01 (high capacity splice tray) to avoid the process of fiber furcation as described in Section 8 of this document. For splicing cables with ultra high fiber counts (>144 fibers), the high capacity splice tray is required to maximize splicing space within the Opti-Guard splice enclosure. This addendum is intended for use once all steps through section 7.0 have been completed.

A.1 In order to protect the fiber as it is routed from the end of the stainless steel tube to the splice tray, use a piece of the clear primary transition tubing supplied with the tray. Slide the primary transition tubing over the fibers, fitting it snugly around the heat shrink tubing at the mouth of the stainless steel tube. Route the primary transition tubing around the raceway once and into the splice tray, securing the tubing to the tray. This loop of tubing around the raceway will allow the splice tray to be removed from the drawer. Ensure that all tubing is clearly marked for ease of identification.

Fig. 25

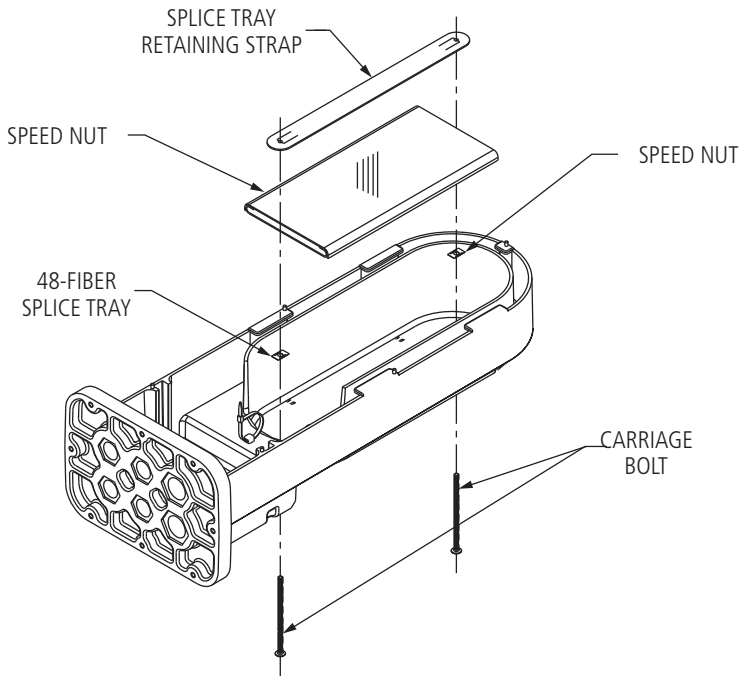


A.2 Proceed with splicing the fibers and mounting the fusion protection sleeves into the rigid manifolds supplied with the tray. To accommodate 48 fibers, the manifolds can be mounted in a single file line down the middle of the tray, allowing room for the excess fiber to route around the perimeter of the tray.

A.3 Once the fibers have been spliced, protected, and positioned, replace the lid on the tray. Ensure that no fibers are protruding from the tray and in danger of being damaged when the lid is replaced.

A.4 Once the splicing is complete and the trays are ready to be mounted into the drawer, position the two bolts (5" in length) up through the bottom of the drawer in the holes as shown below. Two black, flat speed nuts are provided with the box. Use a nut, concave side facing downward, to secure each bolt to the drawer. Lower the trays between the bolts. Once all trays are in the drawer, place the black strap across the trays and press down onto the bolts.

Fig. 26



B.5 The drawer assembly is now complete and ready to install into the casing. Torque the bolts to 35 in-lbs. This will cause a visual protrusion of the gasket approximately 1/64" to 1/32" from its original position. A pressure valve has been provided to pressurize the seal to 10 psi maximum.

IMPORTANT: Attach a guide clamp (sold separately) to each pair of cables approximately 12 inch (304 mm) from the bottom of the connector assembly before transporting the prepared enclosure. This will help prevent the cables from twisting inside the enclosure while transporting.

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