Instructions for Preparing

AFL OPTICAL GROUND WIRE CABLE

IN THE OPTI-GUARD™ SPLICE ENCLOSURE

(ALUMACORE CABLE DESIGNS)

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 Revision 1, 5.18.2021

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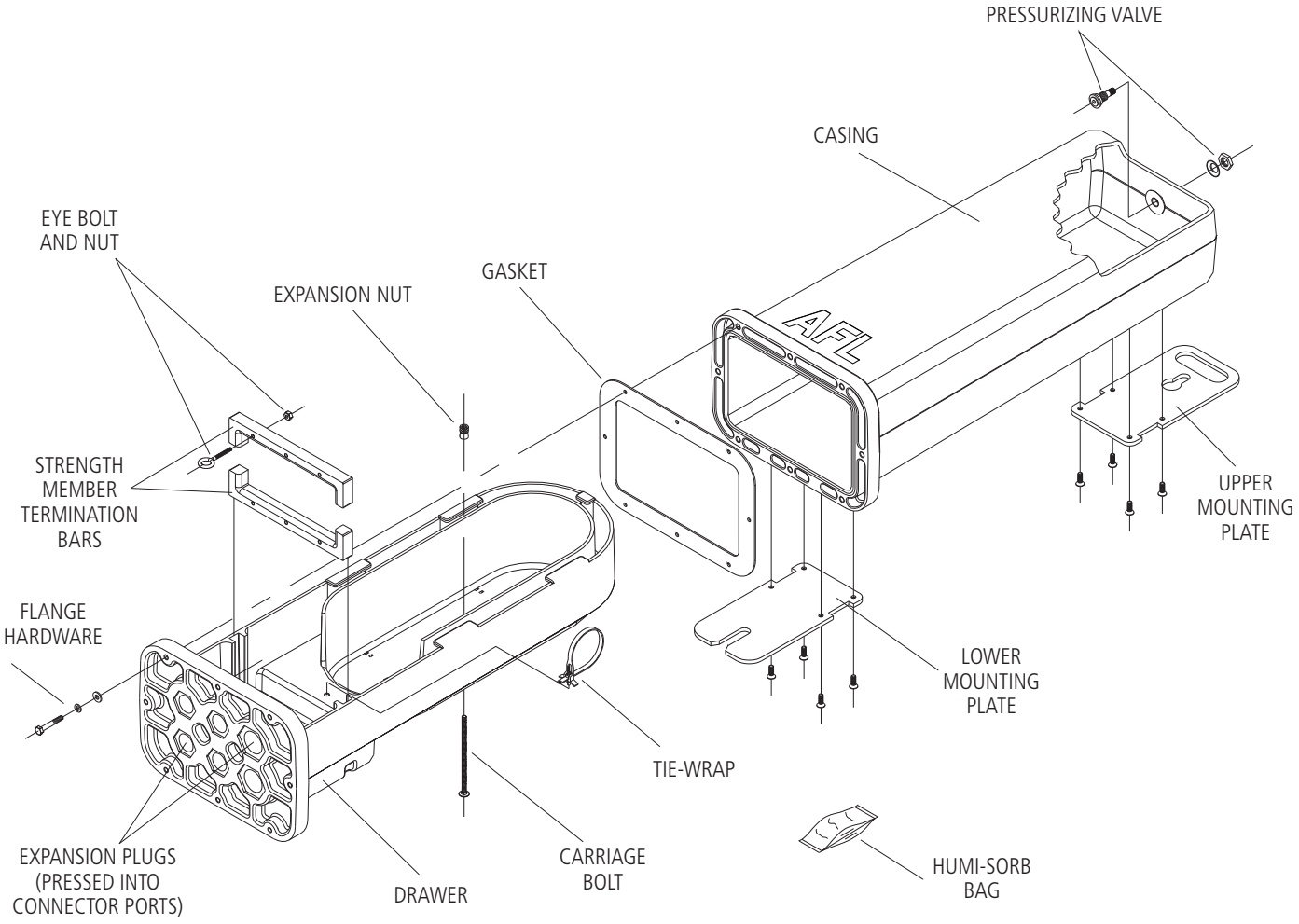
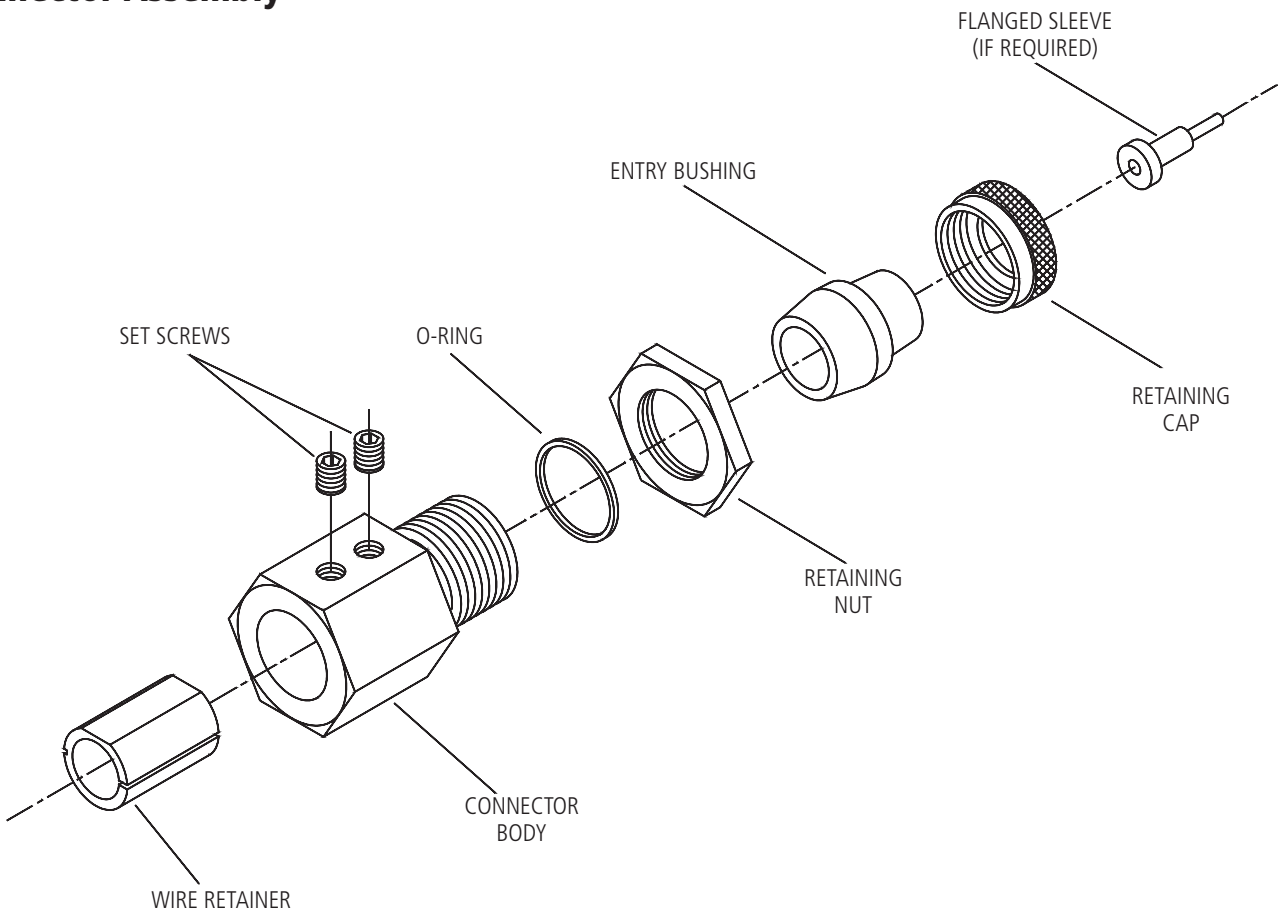
List of Materials

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

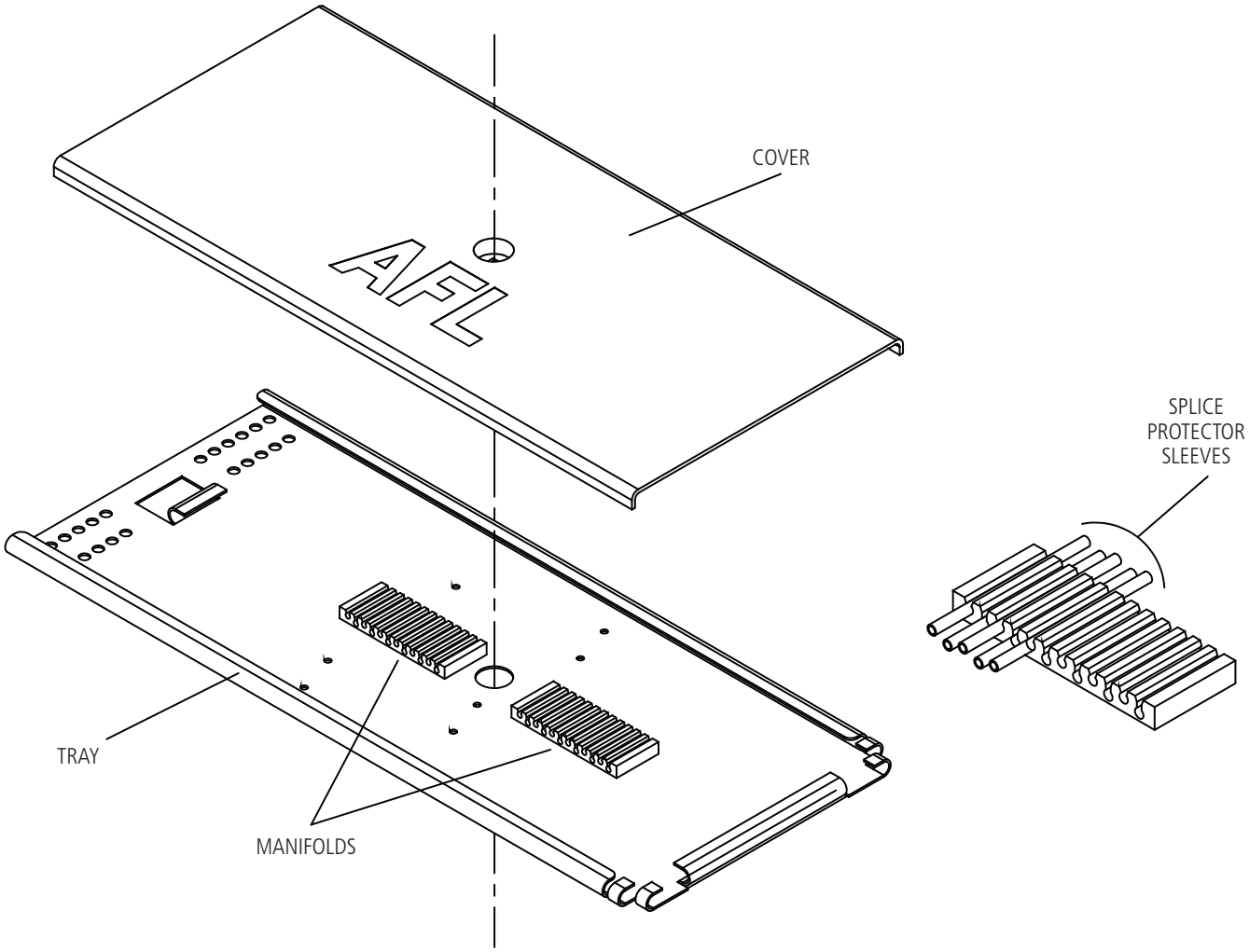
Opti-Guard™ Splice Enclosure Assembly



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 After the stringing procedure, the ends of the optical unit(s) must be located. It is recommended that this occur prior to the cable being cut free from the payoff to ensure proper length remains for splicing. In some OPGW designs there could be some pull back of the optical unit(s) during the stringing installation. "Pullback" is a term used when the optical unit(s) or core appears to migrate inside the pipe due to elongation of the metallic components during the stringing procedure. When this happens, the core must be located so that the proper amount of optical unit(s) is available for the installation. Cut back 3-5 feet at a time until the optical unit(s) is found.

4.2 **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.

4.3 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.

4.4 From the free end of the cable, cut back in 2-foot increments until the optical units are located. Once the units are visible, unlay the outer wire strands from the free end about one foot back. Then score the pipe with a tubing cutter. Do not score completely through the pipe. Gently flex the pipe until it breaks and remove the pipe, exposing the optical units.

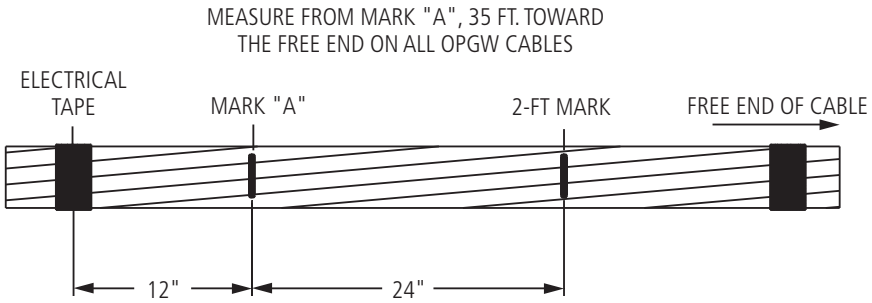
4.5 From Mark A, measure 11.5 feet toward the free end and cut the cable at this point.

4.6 Place a hose clamp or electrical tape around the cable approximately 12 inches behind Mark A. 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. 2

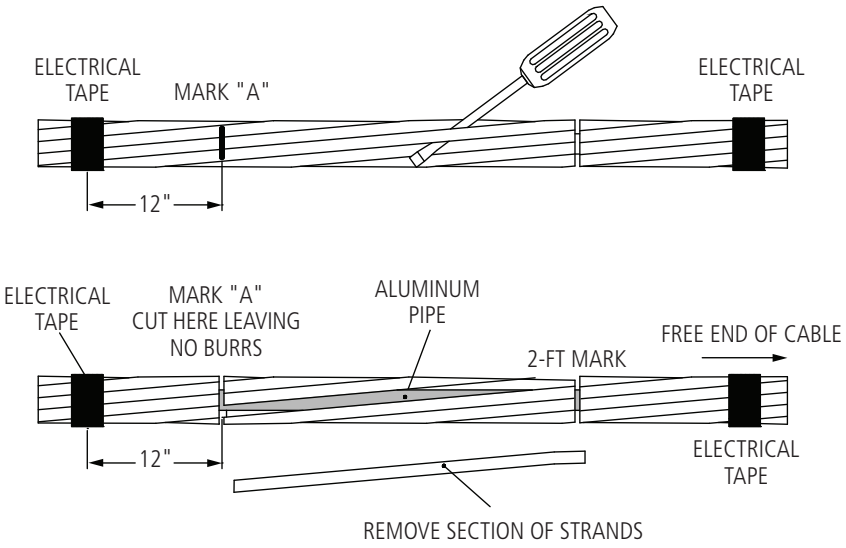
4.7 Make another mark 2 feet from Mark A toward the free end. Secure the wires beyond the 2-foot mark with tape to prevent the wires from un-stranding once cut. See Fig. 3.

Fig. 3



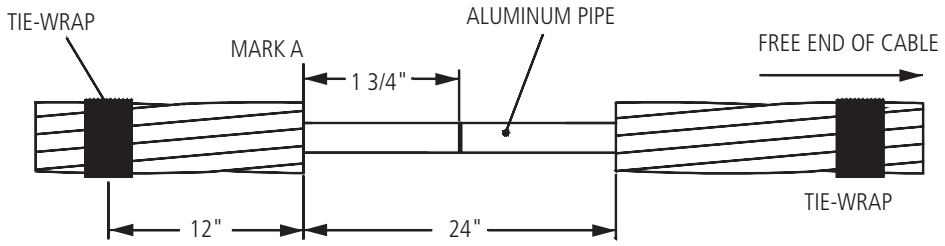
4.8 Once all of the marks have been established, insert a screwdriver between the outer strands of wire at the 2-foot mark. Be careful not to indent the pipe with the screwdriver. Pry up one strand at a time and cut each one. Then unlay each strand to the electrical tape, cutting each wire again at Mark A (see Fig. 4).

Fig. 4



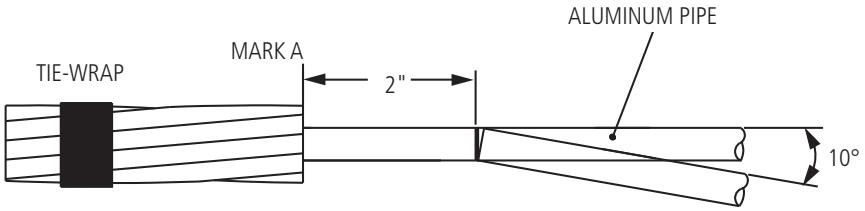
4.9 Measure two inches from Mark A, and using a felt marker pen, make a mark on the aluminum pipe. Then score the aluminum pipe with small pipe cutter at the mark. Try 2 or 3 rotational passes around the pipe first. Then try to bend the pipe back and forth. If the pipe does not give easily, try a few more passes. Do not score too deeply or cut completely through the pipe. If unsure about this step, cut a small piece of pipe, about 2 feet, from the free end of the cable and practice cutting the pipe. The number of rotational passes will vary depending on the pipe size and design of the cable (see Fig. 5).

Fig. 5



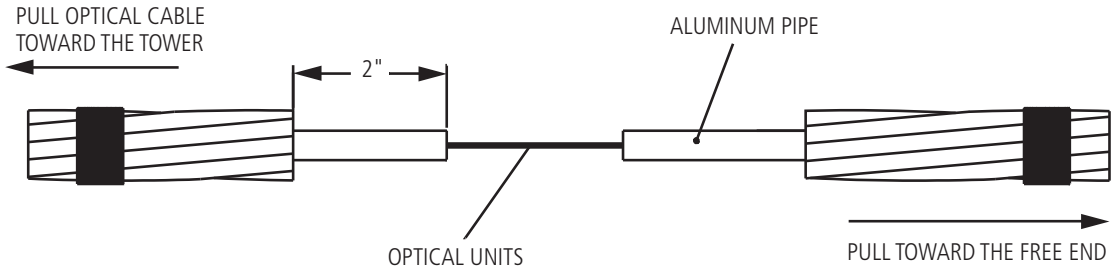
4.10 The pipe may now be broken by bending it gently back and forth—not more than 10 degrees (see Fig. 6).

Fig. 6



4.11 After breaking the pipe, slowly slide the bare pipe about 6 feet toward the free end of the cable. While holding the cable, pull the optical units completely out of the pipe by pulling toward the tower. Be careful not to kink the optical units especially where the unit(s) exits the pipe (see Fig. 7). Immediately tape the ends of the optical units where the end clears the aluminum pipe. This will hold the core wrap tape intact for ease in performing the next step.

Fig. 7



4.12 The minimum amount of optical unit required for splicing is 134 inches. This allows for one complete loop around the raceway plus 6 feet of fiber for splicing in the trays. If additional optical unit lengths are desired, note that 50 inches is required for a full loop around the raceway. **NOTE:** If additional loops of optical unit are being considered, AFL recommends ensuring that all optical units will fit securely into the raceway prior to splicing.

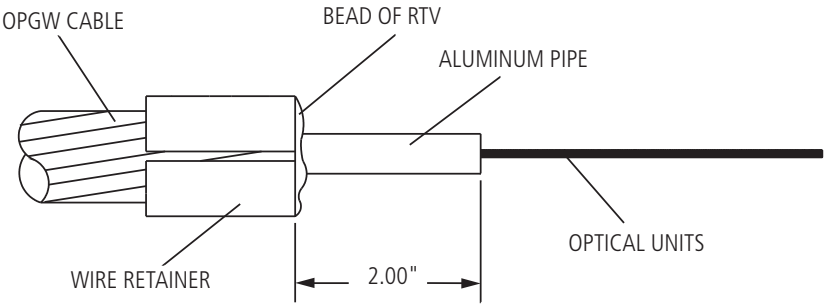
4.13 From the end of the pipe, measure and cut the optical units at 134 inches. If additional loops are planned, add the required length prior to cutting. A minimum of 134 inches is required.

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 optical units and over all the outer-strands of wire. Place a bead of RTV silicone on the wire tips and around the pipe (see Fig. 8)

Fig. 8

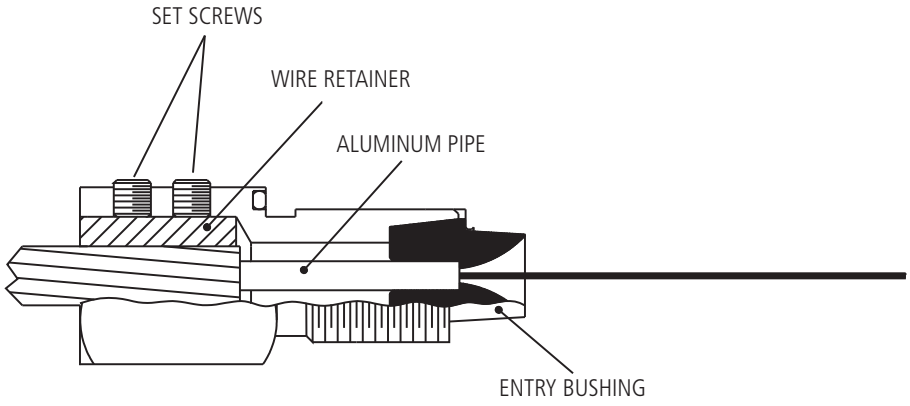


5.2 Slide the connector body over the optical units until the wire retainer is seated. The flat surface of the wire retainer should be perpendicular to the setscrews before tightening the wire retainer.

5.3 Slide the entry bushing over the optical units. Ensure that the bushing is oriented correctly by referring to the drawing on page 3 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. 9).

Fig. 9

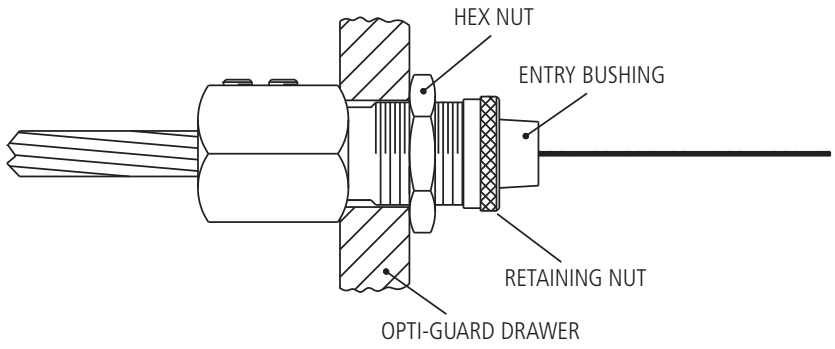


5.5 Locate the cable port into which the cable is to be installed. Remove the appropriate port plug by knocking the plug out of the splice enclosure drawer from the inside outward using a hammer, punch, or screwdriver. An alternative method for removing the plug is to drill a 1/4" hole in the approximate 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 optical units 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.

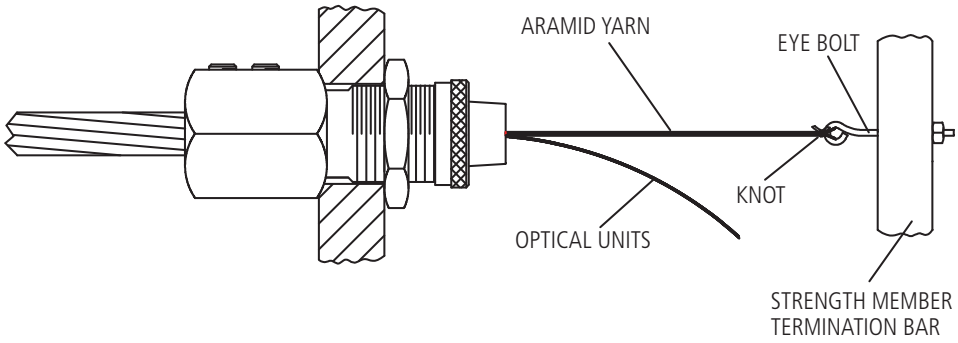
5.7 Tighten the hex nut onto the body against the inside of the drawer. Tighten the retaining nut over the silicone bushing (see Fig. 10).

Fig. 10



5.8 Wrap a piece of electrical tape on each optical unit 8 to 10 inches from the entry bushing of the enclosure. Working with one cable's optical unit at a time, cut and remove the 8 to 10 inches of polyimide tape. REMOVE ONLY THE TAPE AT THIS POINT! Cut the aramid yarn at the electrical tape mark. Thread the free end of yarn coming from the connector body through the strength member termination eyebolt. Pull the yarn tight to eliminate any slack. Additional tensioning may be acquired by tightening the nut of the eyebolt. Wrap the yarn around the eyebolt twice then tie a knot. Trim excess yarn. Make sure that the yarn is tied off in a straight line to the eyebolt (see Fig. 11). Repeat the preceding steps for the remaining optical units. Tape each cable's individual optical units together after the yarn has been secured to the eyebolt.

Fig. 11



5.9 After all cables have been attached to the strength member termination bar, tape the optical units together every two feet excluding the last six feet.

6.0 Optical Unit Preparation

6.1 Starting at the free end of one of the optical units, separate the individual colored units one at a time by unlaying them back to the 6-foot mark.

6.2 Mark each individual colored unit 6 feet from the free end with a permanent marker. Pair the like colored units together, blue to blue, orange to orange, etc.

For tight structure type AlumaCore, follow steps 6.3 to 6.4.
For loose tube type AlumaCore, follow steps 6.5 to 6.7.

6.3 Place the AFL sheath stripper on one of the blue units at the 6-foot mark with the arrow on the sheath stripper pointing toward the free end. Grip down tightly and pull the sheath stripper in one continuous motion toward the free end. Remove the colored sheath.

6.4 Carefully remove the clear epoxy coating from the entire 6 feet by starting at the free end and peeling back. Slowly remove the fibers from the fiberglass reinforced plastic central member (FRP). Count the fibers to make sure that all the fibers are identified before proceeding. Continue separating the fibers for the remainder of the 6 feet. Cut the FRP as close as possible to the core of the optical unit without damaging any fibers. Clean and remove the silicone from all the fibers. Proceed to step 6.8.

6.5 For loose tube units, make another mark at the 3 feet from the end of the optical units.

6.6 Using a buffer tube cutter, carefully score and snap the buffer tubes at the 3-foot mark, and then gently pull the tube straight away from the fibers. Repeat this step for the remaining 3 feet.

6.7 If the buffer tubes contain 12 fibers or less, gently wipe them with a clean towel to remove the excess gel. Then clean them with an approved gel-removing solvent. The fibers are ready to be loaded into the splice tray(s). Proceed to step 6.8.

If the buffer tubes contain more than 12 fibers each, follow the below instructions pertaining to the colored thread binders.

6.7.1 Starting at the end closest to the stainless steel tube, separate the fibers until you identify one of the colored string binders (See Fig. 12).

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

6.7.3 Once a single bundle has been identified, inspect the bundle for the matching color prior to separating 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. 13).

Fig. 12

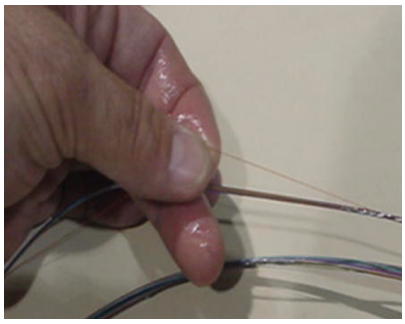
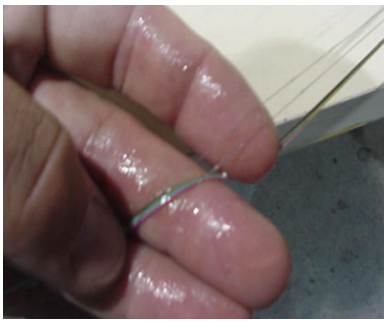


Fig. 13



6.7.4 Repeat steps 6.7.1 through 6.7.2 on each of the fiber bundles. Separate each group of bundled fibers to assure easy identification (see Fig. 14).

6.7.5 On each of the fiber bundles, confirm that the fibers meet the proper color code and specified fiber amount (see Fig. 15).

Fig. 14

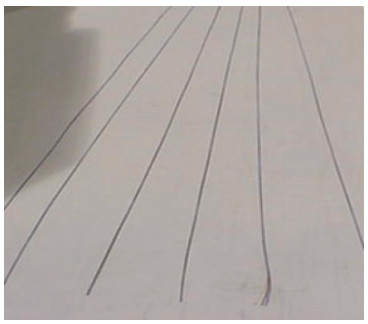
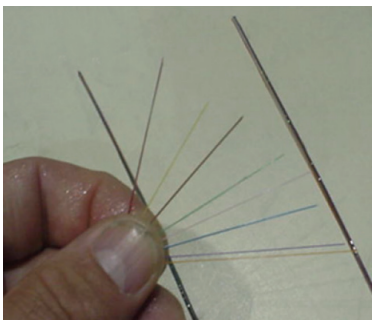


Fig. 15



6.7.6 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. 16). 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. 17).

Fig. 16

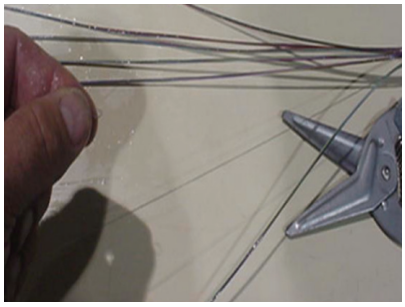
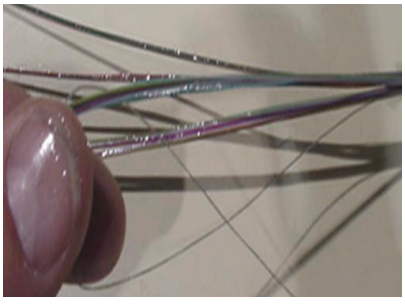


Fig. 17



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

6.7.8 After all fiber bundles have been identified, clean each individual fiber group with a standard gel removal cleaner (see Figs. 18 and 19).

Fig. 18

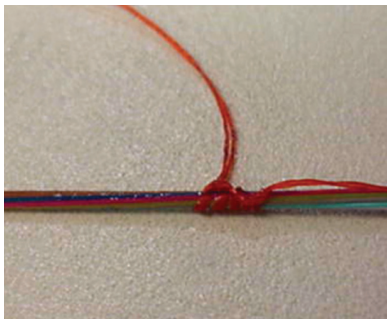
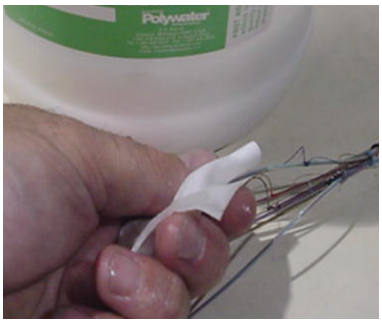
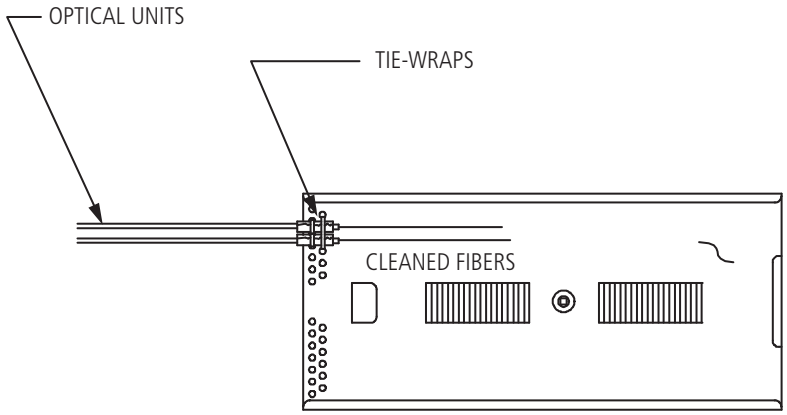


Fig. 19



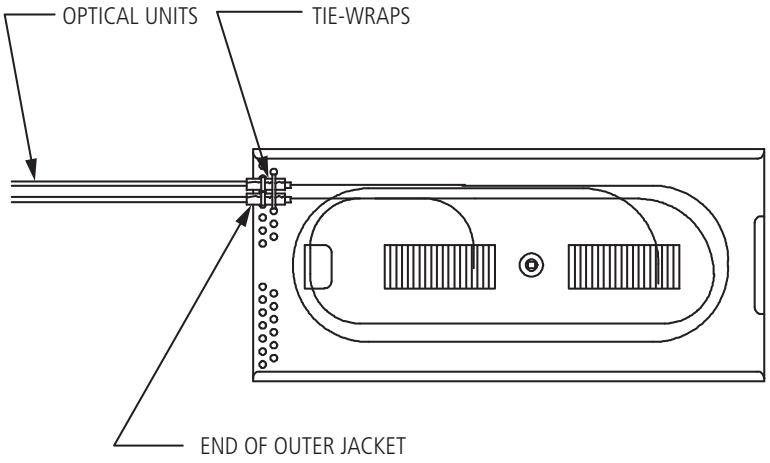
6.8 After same color optical units have been stripped, cleaned, and separated, tape the like units together by placing a piece of double-back tape ¼ inch from the end of the outer jacket material of the optical units. Place the double-back tape units onto the splice tray and secure them to the tray with tie wraps (see Fig. 20).

Fig. 20



6.9 When cutting fibers to length, wrap the 6 feet of fibers of the inside units around the tray in a clockwise direction. Cut the fibers so that the spliced section will fit into the splice protector sleeve holders. Be sure that the fibers are cut and positioned in color code order. Prepare the outside unit in the same manner. The first six fibers will be shorter than the last six fibers in the outside unit. In the inside unit, the first six fibers will be longer than the last six fibers, based on a 12-fiber unit design. Place the cover onto the splice tray making sure that all of the fibers are wrapped inside the tray (see Fig. 21).

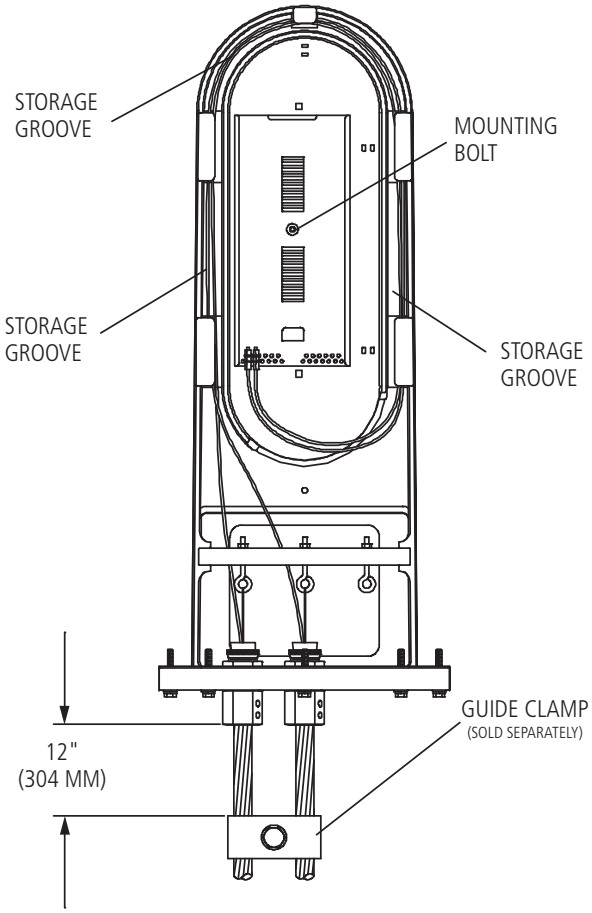
Fig. 21



7.0 Splicing and Final Assembly

7.1 Follow the standard procedure for splicing optical fibers in the splice trays. After the splicing has been completed, make sure that all the fibers are captured within each tray before replacing the cover. Wrap the bundles of fiber optical units into the raceway in a clockwise direction and position the splice tray, clear side up, onto the mounting bolt. Repeat this procedure until all trays have been place inside the enclosure. Place the tension nut on the bolt and tighten until snug (see Fig. 22).

Fig. 22

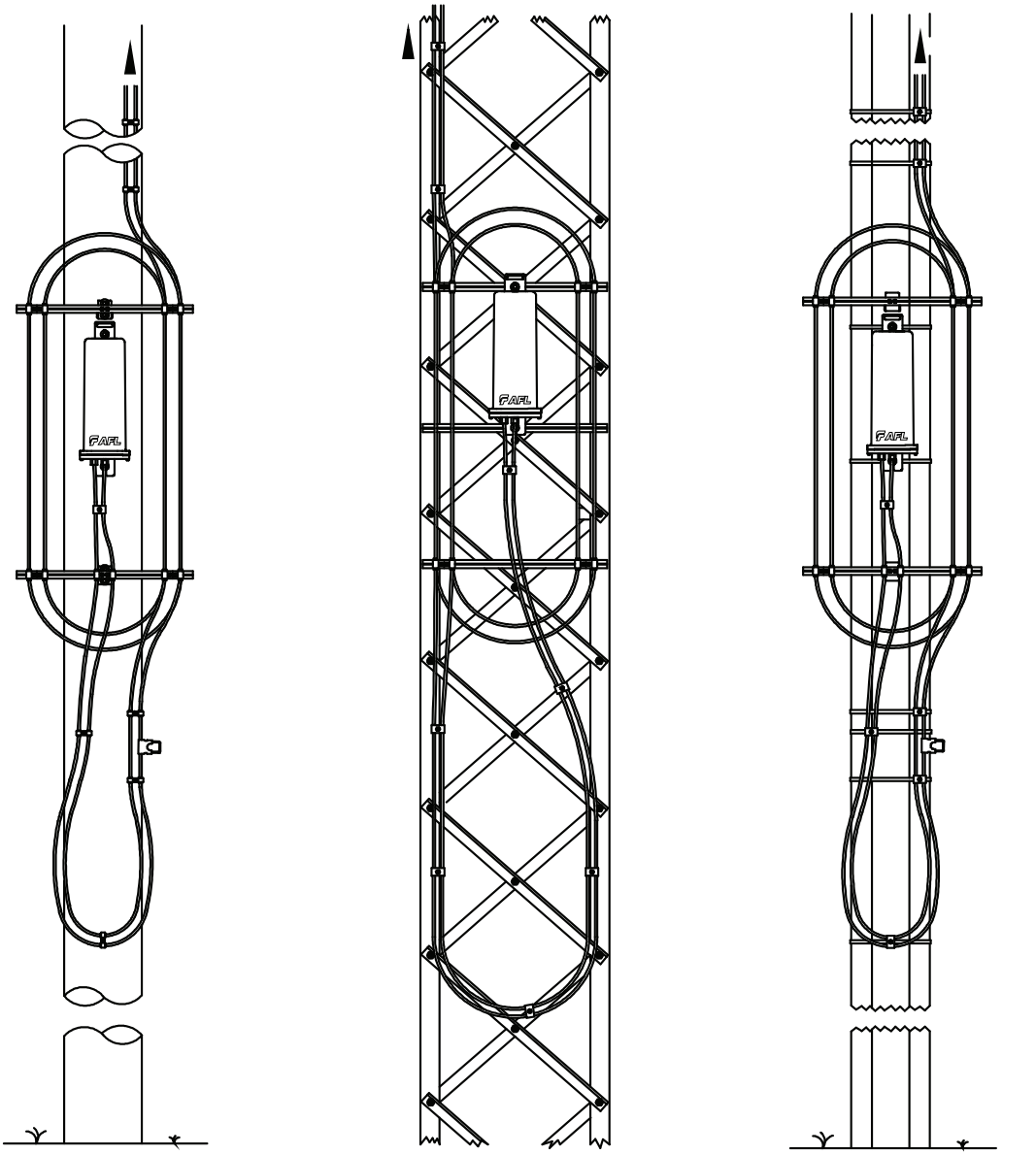


7.2 The drawer assembly is now complete and ready to install into the casing. A pressure valve has been provided to purge the enclosure of moisture (if required) and to pressurize the seal to 10 psi maximum. Torque the bolts to 35 in-lbs. This will cause a visual protrusion of the gasket approximately 1/64 inch to 1/32 inch from the original position.

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. 22).

7.3 Secure the loose cable to the structure to complete installation. See Fig. 23 below for typical installations.

Fig. 23



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