

## SUMITOMO RECOMMENDED PROCEDURE

### SRP SP-F04-015



## SPLICE CASE KIT INSTALLATION PROCEDURES

<u>PARA.</u>	<u>CONTENTS</u>
1.0 2.0 3.0 4.0 5.0	General Safety Precautions Reference Documents Equipment / Tools Required Equipment Layout
6.0 7.0 8.0	Preparing the Tube Cables Cutting the Tubes Installing the Tube Couplings
9.0 10.0 11.0 12.0 13.0 14.0	Splice Case Assembly End Plate Assembly - Standard Procedures End Plate Assembly - Special 2- and 4-Tube Cable Procedures Sealing Between Tubes Testing Tubes Shell Kit Assembly
15.0 16.0	Encapsulating Splice Cases Re-Entering Splice Cases

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## 1.0 General

1.1 This procedure describes the standard techniques for installing FutureFLEX outdoor rated dielectric and metallic / armored tube cables in Splice Case Kits.

1.2 The key components of a Splice Case Kit are a Preformed Line Products (PLP) Armadillo Stainless Steel Shell Assembly and two (2) field-drillable 3-section End Plates. When properly assembled in accordance with this SRP and PLP standard recommended procedures, the kit provides a watertight, re-enterable tube distribution enclosure.

1.3 Splice Case Kits are used in any outside plant location (underground, buried, or aerial application) where tube interconnection is desired or required and the tube cables must be installed in wet or flooded environments. The finished Case is designed to remain watertight for water depth up to 10 feet. Each closure is also designed to meet or exceed the industry standards for fire retardant cables.

1.4 After the individual tubes are coupled, the tube spans should be pressure and obstruction tested before the Splice Case is closed and waterproofed.

## 2.0 Safety Precautions

2.1 The use of safety equipment is strongly recommended while cutting and stripping the tube cable ends and drilling end plates. This includes the use of cut-resistant Kevlar gloves and eye wear.

## 3.0 Reference Documents

3.1 Sumitomo Recommended Procedure, *FutureFlex Tube Pressure Testing Procedure*, SRP SP-F04-003.

3.2 Sumitomo Recommended Procedure, *FutureFlex Tube Obstruction Testing Procedure*, SRP SP-F04-004.

3.3 Sumitomo Recommended Procedure, *FutureFlex Tube Cable Installation Procedures*, SRP SP-F04-008.

3.4 Sumitomo Recommended Procedure, *FutureFlex Tube & Tube Cable Sealing Procedures*, SRP SP-F04-019.

3.5 Sumitomo Recommended Procedure, *FutureFlex Grounding & Bonding Metallic Tube Cable Procedures*, SRP SP-F04-030.

3.6 Sumitomo Recommended Procedure, *FutureFlex Tube Cable Splicing Procedure*, SRP SP-F04-031.

## 4.0 Equipment / Tools Required

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

4.1 Splice Case Kit (DE09SPC) (9.5" D x 28" L)

4.2 Splice Case Kit (DE12SPC) (12.5" D x 38" L)

4.3 Power End Plate Cutter Kit (includes Metal Carrying Case, Power End Plate Cutter, and Blade Kit (DEEPCCK-RW available as a Weekly Rental from SEL)

4.4 3/8" Electric Drill Motor

4.5 Tube Cable Cutter (BETL03)

4.6 Hacksaw or equal

4.7 Tubing Cutter (BETC001).

4.8 Utility Knife with Hook Blade

4.9 Tube Couplings (DE08MC2)

4.10 Electricians Scissors

4.11 Vinyl Electricians Tape

4.12 Caulking Gun with Silicone sealant

4.13 Bonding Kit (DE09SBK) for DE09SPC Splice Case; required if installing armored tube cables

4.14 Bonding Kit (DE12SBK) for DE12SPC Splice Case; required if installing armored tube cables

4.15 (DE02EPA) for installing 2-tube cables  
(DE04EPA) for 4 tube cables

(DE12EPA) for 12 tube cables

(DE24EPA) for 24 tube cables

4.17 Water-based liquid cable lubricant; Polywater A or equal recommended

4.17 Wrench Set with Deep Well Sockets 7/16", 1/2", and 7/8"

4.18 Torque Wrench (250 in/lbs)

## 5.0 Equipment Layout

5.1 See **Fig. 1A through Fig. 1D** for DE09SPC (shown) and DE12SPC Splice Case Kits.

5.2 Key components of Armadillo Stainless Shell Kit:

- One (1) Top Shell Half with integral air flange and grounding lead
- One (1) Bottom Shell Half

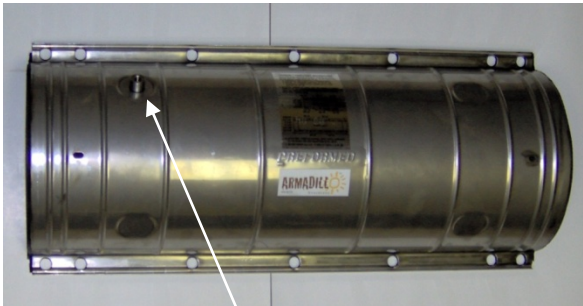
- Two (2) Lockbar Assemblies
- Two (2) Torque Bars (See Fig. 1B)
- One (1) Plug to seal integral air flange and grounding lead threaded hole (not shown)
- Armadillo Stainless Shell Kit Assembly Instructions; PLP SP 2918-1

5.3 Key components of each End Plate Assembly (two provided):

- Three (3) Section Field Drillable End Plate
- LOCK-TAPE™ Sealant Strips
- LOCK-TAPE™ Sealant Roll
- Emery Cloth
- Cable Mea-Sure Tape™
- Armadillo Drillable End Plate Kit Assembly Instructions; PLP SP2919-1
- Material Safety Data Sheet (MSDS) – LOCK-TAPE™ Sealant

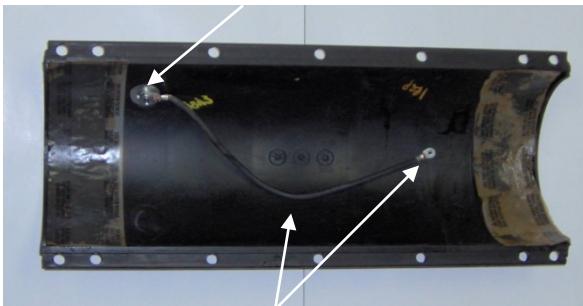
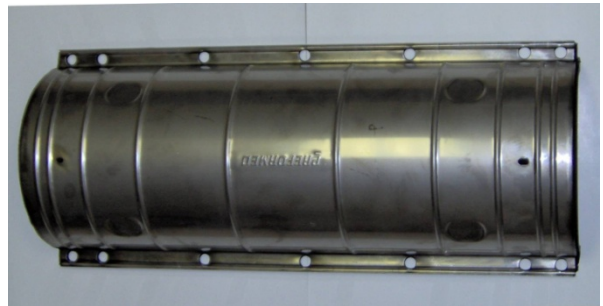
5.4 One (1) 4 fluid oz. can of C-Cement provided in each Kit along with Material Safety Data Sheet (MSDS)

Top Shell



Integral Air Valve and Grounding Lead

Bottom Shell



#6 Bonding Wire & Lug

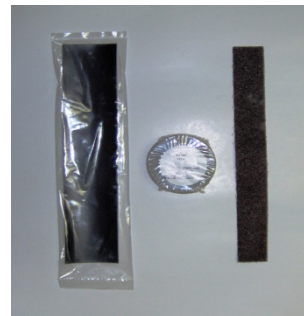
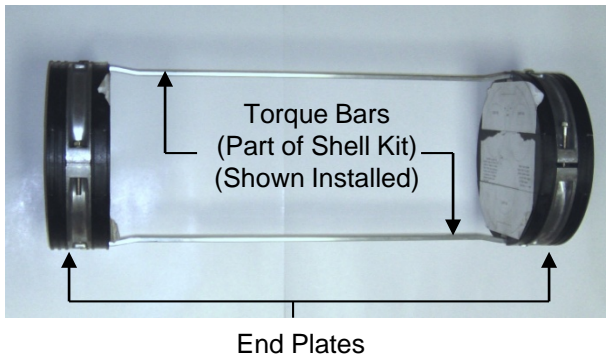


Lockbar Assemblies (2)

**Figure 1A**  
Armadillo Stainless Shell Kit

DE09SPC Splice Case Kit  
Shell Dimensions = 9.5" x 28" L  
Tube Capacity = 52 tubes; 2 (19) plus 2 (7)

DE12SPC Splice Case Kit  
Shell Dimensions = 12.5" x 38" L  
Tube Capacity = 95 tubes; 5 (19)



LOCK-TAPE™  
Sealant Strips

LOCK-TAPE™  
Sealant Roll

Emery Cloth



Cable Mea-Sure™ Tape

**Figure 1B**

Three (3) Section End Plate Assembly  
{Two (2) Assemblies Provided}

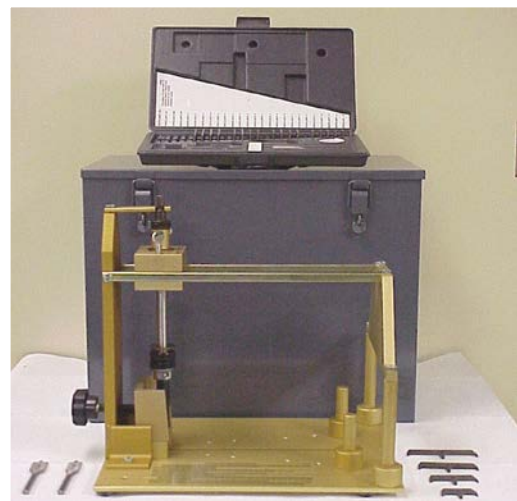


4 Fluid Oz. Can  
C-Cement

**Figure 1C**  
C-Cement

**Note:** For additional information on Armadillo Stainless Splice Case Kits, consult Performed Line Products web site and download copies of:

- Armadillo Stainless Shell Kit (PLP SP 2918-1) Assembly Instructions
- Armadillo Drillable End Plate Kit (PLP SP2919-1) Assembly Instructions
- Material Safety Data Sheet (MSDS) – “C” Cement
- Material Safety Data Sheet (MSDS) – LOCK-TAPE Sealant



**Figure 1D**

Power End Plate Cutter Kit includes Metal Carrying Case, Power End Plate Cutter, and Blade Kit (Blade Sizes A thru Z)  
DEEPC-KRW Weekly Rental from SEL

## 6.0 Preparing the Tube Cables

**6.1 Key Step.** Before installing a Splice Case Kit, verify that both tube cable ends will mate properly so that their tubes will not be crossed or twisted when coupled. See Sumitomo Recommended Procedure SRP SP-F04-008.

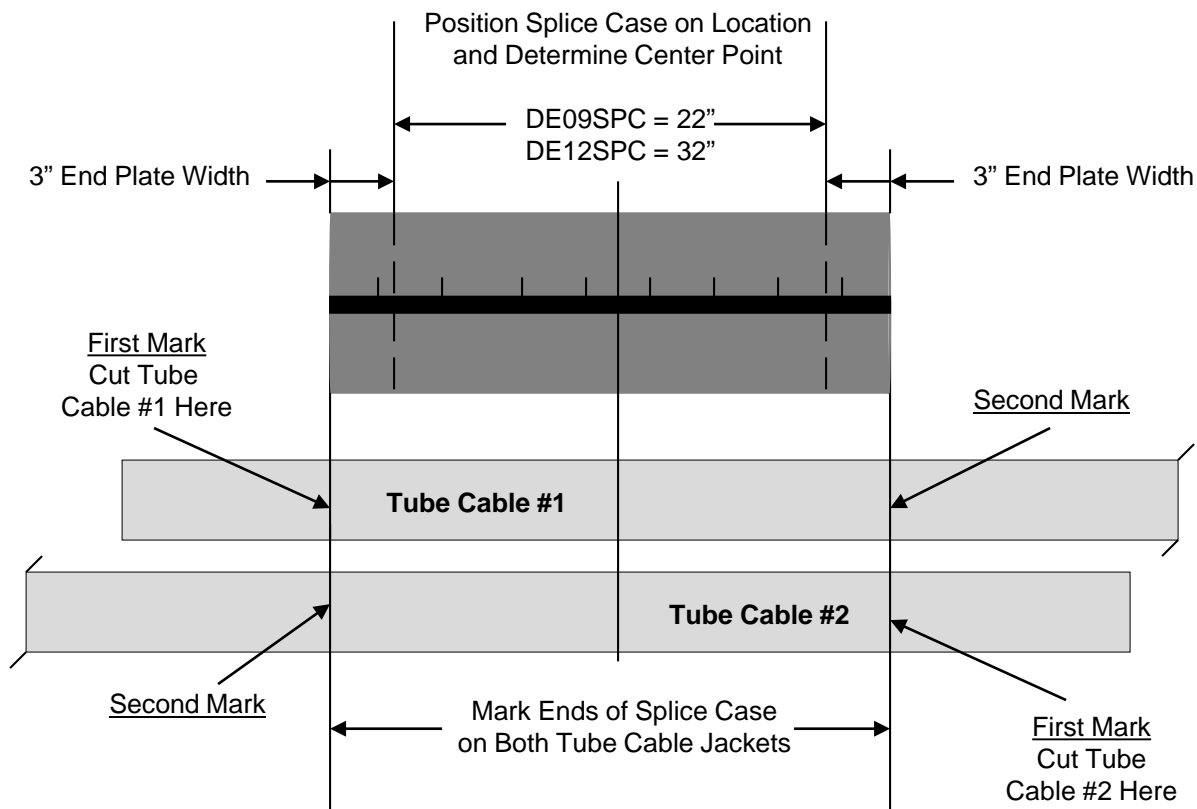
6.2 Determine final installed location of Splice Case. Splice Cases should be installed in a straight section of the tube cable route; not in a bend / curve.

6.3 Position both tube cables and Splice Case side-by-side and hold in place. Ensure tube cables overlap each other.

6.4 Mark both tube cable jackets to coincide with left and right ends of Splice Case. **See Fig. 2.**

6.5 Use Tube Cable Cutter (BETL03) or hacksaw and cut each tube cable to length at its First Mark.

6.6 Measure in 3" from Second Mark to account for End Plate Width on each tube cable and mark jacket.



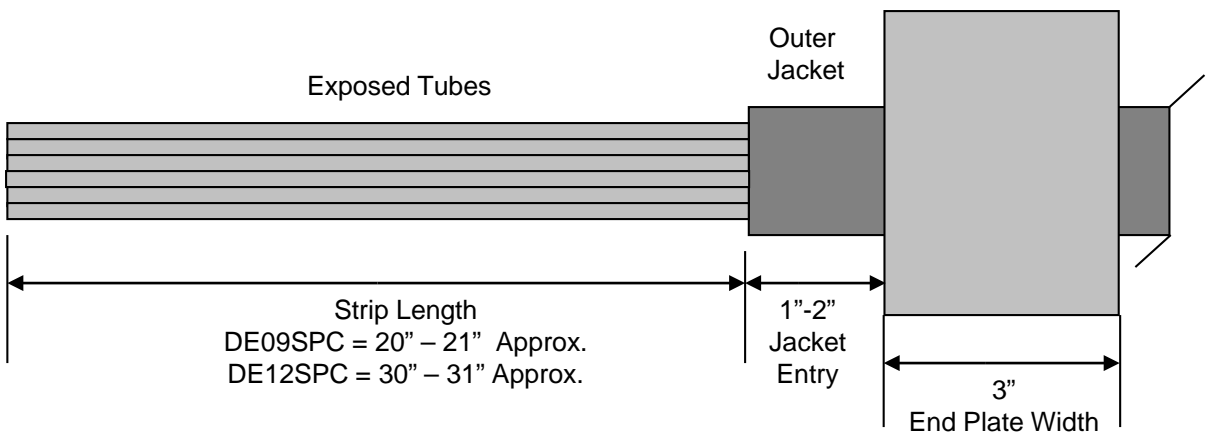
**Figure 2**  
Preparing Tube Cables

6.6.1 If installing dielectric tube cables, see **Fig. 3**. Allow for about 1" - 2" of outer jacket beyond the End Plate inside the Splice Case and mark jacket.

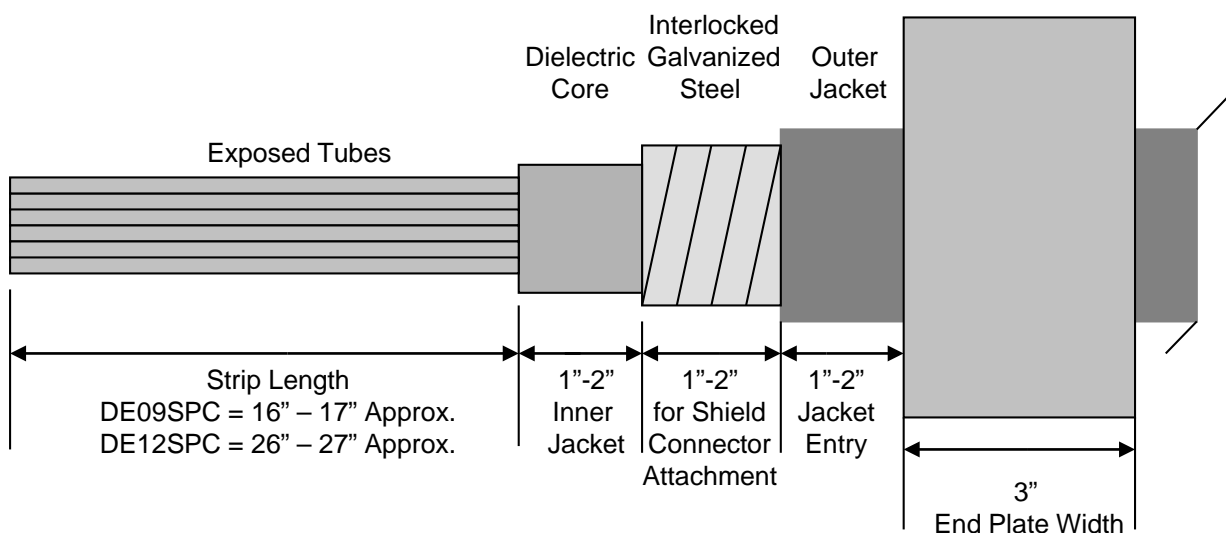
6.6.2 If installing metallic / armored tube cables, see **Fig. 4**. Allow for about 1" - 2" of outer jacket beyond the End Plate inside the Splice Case and mark jacket. Also allow additional jacketing material for attachment of Grounding & Bonding

hardware. Mark inner and outer jackets accordingly. Also refer to Sumitomo Recommended Procedure SRP SP-F04-030.

6.7 Use Hook Blade Knife to lightly score each tube cable jacket at its jacket strip point / mark. Pull ripcord and strip jackets away to expose individual tubes. Refer to Sumitomo Recommended Procedure SRP SP-F04-031.



**Figure 3**  
Jacket and Strip Lengths for Dielectric Tube Cable



**Figure 4**  
Jacket and Strip Lengths for Dielectric Core / Interlocked Galvanized Steel Tube Cable

## 7.0 Cutting the Tubes

**7.1 Important Point:** The recommended Tube Coupling pattern to use when making a tube cable splice within a Splice Case Kit is a “Unique” stagger arrangement that places the plastic shoulder of one Tube Coupling against the plastic shoulder of an adjacent Tube Coupling.

**7.2 Important Point:** Many times the available space within a Splice Case may be less than desired. On-site adjustments to tube cut lengths and Tube Coupling spacing will have to be made to suit installation conditions.

**Note:** The following procedure assumes a 7-tube cable is being prepared.

**7.3** On first tube cable, locate Tube #1. Measure 4” in from stripped end of tube cable jacket and mark Tube #1. Use Tubing Cutter (BETC001) to cut Tube #1 at this mark. **See Fig. 5.**

**7.4** Locate Tube #2. Measure 1-1/8” from the previous cut tube (Tube #1) and mark Tube #2. Use Tubing Cutter (BETC001) to cut Tube #2 at this mark. **Refer to Fig. 5.**

**7.5** Repeat above step for remaining Tubes #3 through #7.

**7.6 Important Step.** The tubes of the first tube cable must be cut as described in **ascending numerical sequence** in order to correctly stagger individual Tube Couplings.

**7.7** On second tube cable, locate Tube #7. Measure 4” in from stripped end of tube cable jacket and mark Tube #7. Use Tubing Cutter (BETC001) to cut Tube #7 at this mark. **Refer to Fig. 5.**

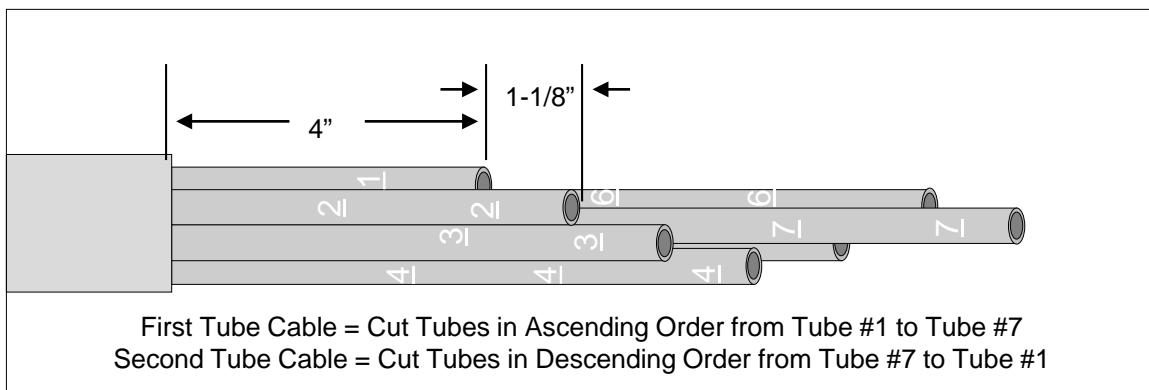
**7.8** Locate Tube #6. Measure 1-1/8” from the previous cut tube (Tube #7) and mark Tube #6. Use Tubing Cutter (BETC001) to cut Tube #6 at this mark. **Refer to Fig. 5.**

**7.9** Repeat above step for remaining Tubes #5 through #1.

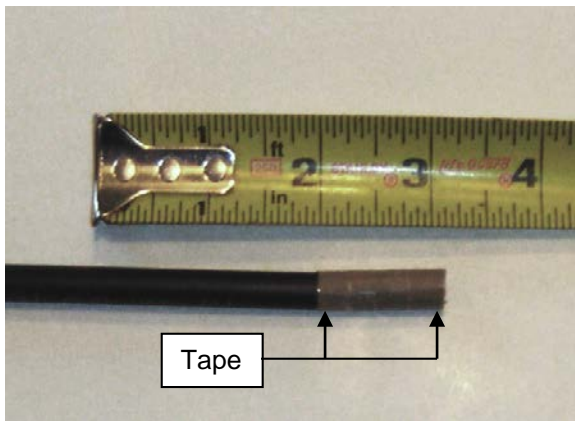
**7.10 Important Step.** The tubes of the second tube cable must be cut as described in **descending numerical sequence** in order to correctly stagger individual Tube Couplings.

**Note:** For a 19-tube cable splice, cut tubes of first tube cable starting with Tube #1 and, in ascending numerical sequence, end with Tube #19. Cut tubes of second tube cable starting with Tube #19 and, in descending numerical sequence, end with Tube #1.

**Tip:** Make a “Measuring Aid” to help measure 1-1/8” dimension. Wrap tape around end of scrap tubing and trim to 1-1/8” length to create an easy to use measuring aid. **See Fig. 6.**



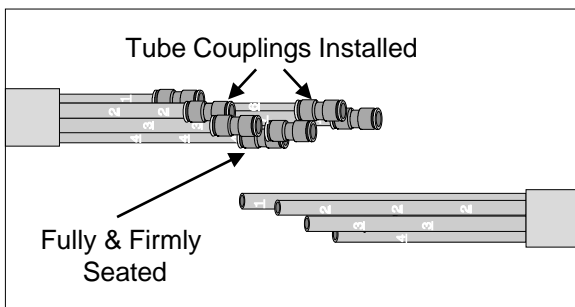
**Figure 5**  
 Correct Technique for Cutting Tubes



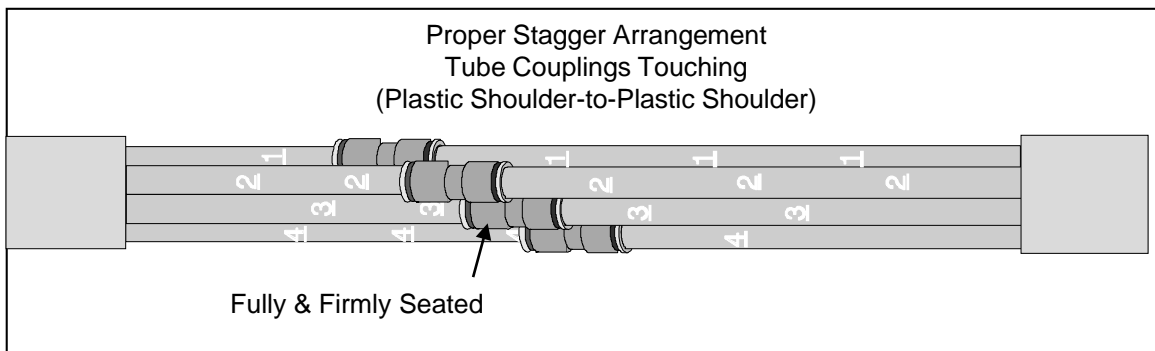
**Figure 6**  
"Measuring Aid"

## 8.0 Installing the Tube Couplings

8.1 Choose either tube cable and install a Tube Coupling on each tube. Be sure each tube is pushed all the way into its coupling and fully and firmly seated. **See Fig. 7.**



**Figure 7**  
All Tube Couplings Installed  
on One Tube Cable



**Figure 8**  
All Tubes Coupled in Proper Stagger Arrangement

8.2 Connect tube cable ends together by first coupling tube with highest number to its mate. Then continue coupling tubes in descending numerical sequence. Be sure each tube is pushed all the way into its coupling and fully and firmly seated. **See Fig. 8.**

8.3 Installed Grounding and Bonding hardware to metallic tube cables. See Sumitomo Recommended Procedure SRP SP-F04-030.

## 9.0 Splice Case Assembly

9.1 **Very Important Note.** The key to accomplishing a watertight PLP Splice Case installation is to drill clean, precise, and correct size holes for tube cable entry through the End Plates.

9.2 The correct tool to do this work is the Power End Plate Cutter with Case and Blade Kit which is available from SEL as a Weekly Rental.

9.3 Attempts to manually drill cable entry holes (typically with Hole Saws) are often not successful and result in case leakage later.

9.4 With one exception, Splice Case installation procedures for all FutureFLEX outside plant tube cables follow PLP standard recommended procedures.

9.5 The "exception" applies to the unique shaped FutureFLEX 2-and 4-tube cables. Special steps must be followed during the End Plate Assembly process and they are explained separately in this SRP.



## 10.0 End Plate Assembly – Standard Procedures

10.1 Use Cable Mea-Sure Tape to measure each tube cable outside diameter. The readings obtained will determine correct blade size and the number of LOCK-TAPE Sealant tape layers to wrap around the cable jacket. Consult PLP End Plate Assembly instruction sheet on how to interpret Cable Mea-Sure Tape readings.

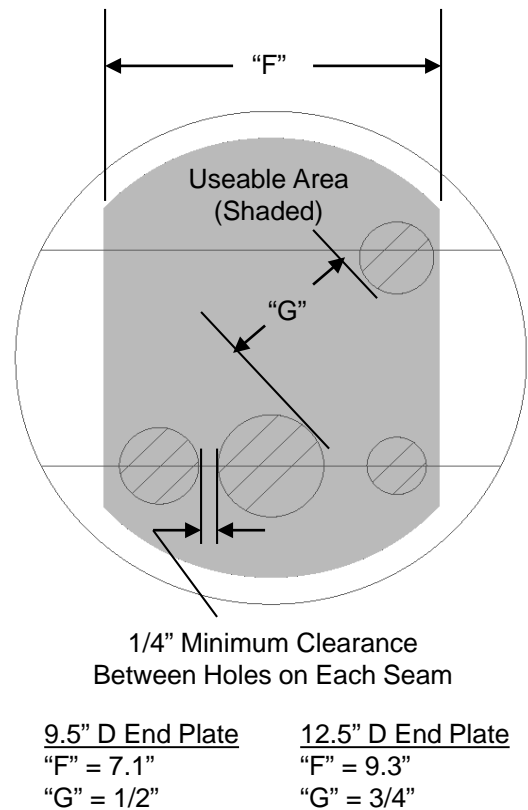
**Note:** The following information should be used for guidance only. It is strongly recommended to always perform field measurements with the Cable Mea-Sure Tape when determining blade size and number of LOCK-TAPE Sealant wraps to account for any minor differences in tube cable jacket diameters.

Tube Cable	PLP Blade Size	Half Lap Layers of Lock-Tape Sealant tape
TC02TOX	H	Use DE02EPA
TC02MSOS	H	Use DE02EPA
TC02TOX-2	H	1
TC04TOX	K	Use DE04EPA
TC04MSOS	K	Use DE04EPA
TC04TOD-2	I	2
TC07TOX	G	1
TC07MSOS	G	1
TC07TOX-2	J	1
TC12TOX	O	Use DE12EPA
TC12MSOS	O	Use DE12EPA
TC12TOX-2	K	1
TC19TOX	L	1
TC19MSOS	L	2
TC19TOX-2	P	2
TC24TOX	U	Use DE24EPA
TC24MSOS	U	Use DE24EPA

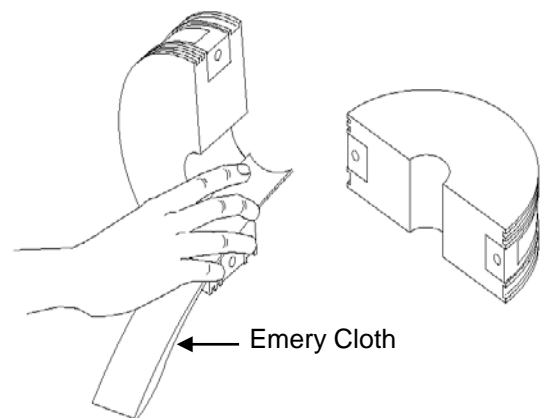
10.2 Determine tube cable entry points and hole locations on End Plate. **See Fig. 9** for PLP recommended hole clearance dimensions.

10.3 Drill cable entry holes using Power End Plate Cutter and Blade Kit per PLP standard recommended procedures. Consult PLP End Plate Assembly instruction sheet.

10.4 Use Emery Cloth to lightly scuff edges of drilled hole and remove any burrs on edges and corners only. **See Fig. 10.**



**Figure 9**  
Three-Section End Plate  
Hole Spacing Requirements



**Figure 10**  
Lightly Scuff and Remove Burrs  
from Drilled Hole Edges and Corners Only

10.5 Install two (2) Torque Bars on top and bottom sections of End Plates. Be sure offset in bars face in toward Splice Case interior (not outward).

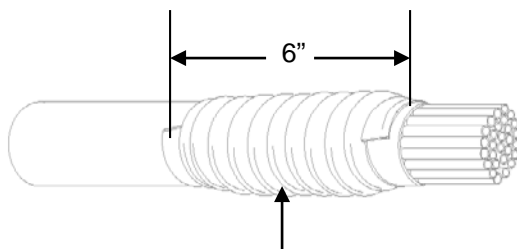
10.6 Thoroughly clean all contamination from first 6" of tube cable jacket. Use Emery Cloth to lightly scuff this area.

10.7 Coat cleaned / scuffed 6" of tube cable jacket with C-Cement and allow to dry to a tacky base.

10.8 Half-lap LOCK-TAPE Sealant tape around 6" cleaned area of tube cable jacket. Apply the number of layers determined earlier when cable outside diameter was measured with Cable Mea-Sure Tape. **See Fig. 11.**

10.8.1 While applying LOCK-TAPE Sealant tape, pull and stretch tape to reduce its original width from 1-1/2" to finished width of 1-1/8".

10.8.2 Keep LOCK-TAPE Sealant tape dry and free from dirt and grease.

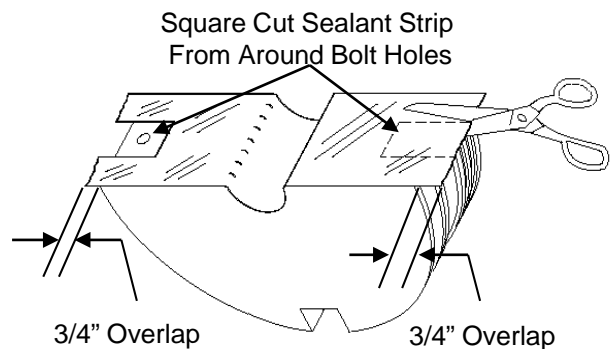


Number of Layers Determined  
with Cable Mea-Sure Tape

**Figure 11**  
LOCK-TAPE Sealant Tape  
Applied in Half-Laps

10.9 Apply a coat of C-Cement to End Plate mating surfaces.

10.10 Apply LOCK-TAPE Sealant Strips (about 3" W x 14" L) to End Plate mating surfaces. Apply strips without stretching. **See Fig. 12.**

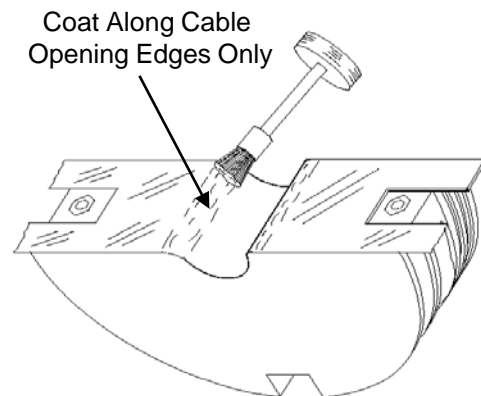


**Figure 12**  
Applying LOCK-TAPE Sealant Strip  
to End Plate Sections

10.10.1 Leave 3/4" of strip extending beyond End Plate on both sides.

10.10.2 Square cut strips away from bolt holes.

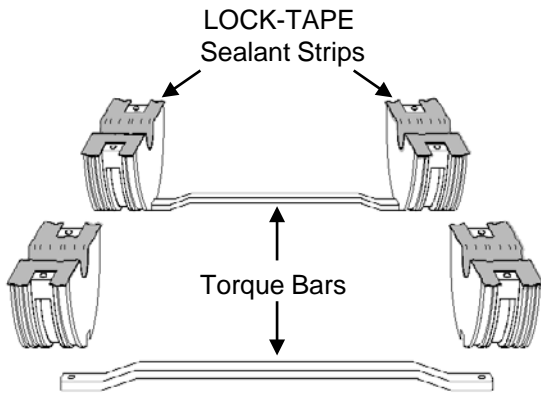
10.11 Paint a strip of C-Cement over LOCK-TAPE Sealant along edges of cable openings only. **See Fig. 13.**



**Figure 13**  
Applying C-Cement Over  
LOCK-TAPE Sealant Strip

10.12 At this point, preparation work on the End Plate Sections is complete and ready for tube cable installation. **See Fig. 14.**

10.13 Install tube cables in End Plates. Do not compress / re-shape tube cables. Simply place into cable openings and carefully join End Plate sections together.

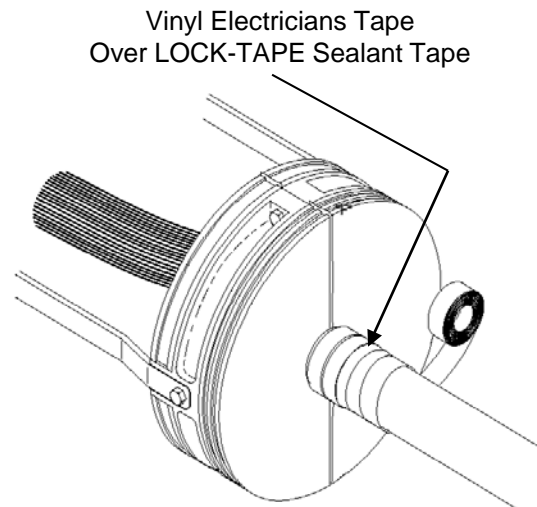
**Figure 14**

Completed Preparation of End Plate Halves

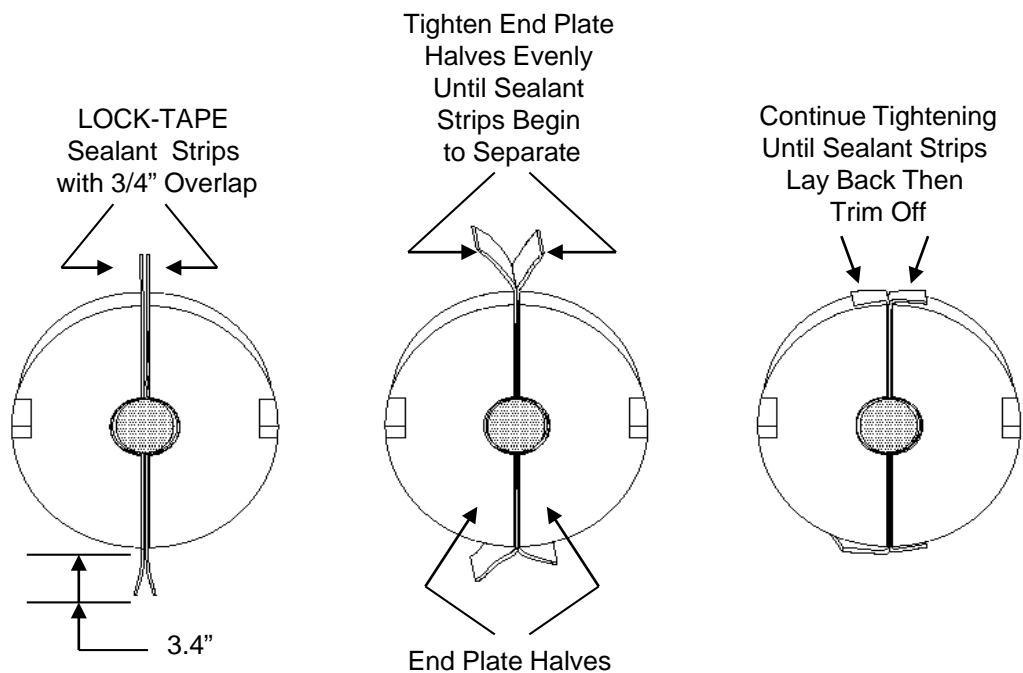
10.14 Use socket wrench to draw End Plate sections together evenly. Continue tightening until LOCK-TAPE Sealant Strip pieces separate and lay back. **See Fig. 15.**

10.15 Trim LOCK-TAPE Sealant end pieces flush with End Plate. Do not pull on sealant tape.

10.16 Apply two (2) wraps of vinyl Electricians tape around LOCK-TAPE Sealant tape outside End Plates. **See Fig. 16.**

**Figure 16**

Completing End Plate Assembly

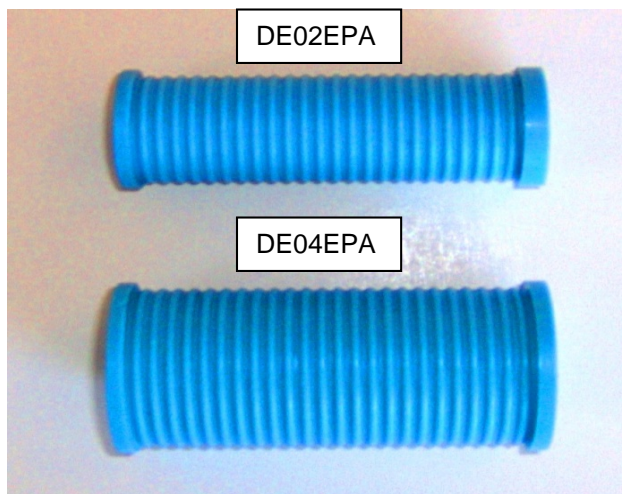
**Figure 15**

Joining End Plate Halves Properly

## 11.0 End Plate Assembly - Special 2- and 4-Tube Cable Procedures

11.1 Due to their unique shapes, installation of FutureFLEX 2-tube and 4-tube cables through Splice Case End Plate Assemblies requires the use of special End Plate Adapters to establish an effective seal around the oblong- and square-shaped tube cables.

11.2 Use 2-Tube End Plate Adapter (DE02EPA) for oblong 2-tube cables. Use 4-Tube End Plate Adapter (DE04EPA) for square 4-tube cables, (DE12EPA for 12 tube cables and (DE24EPA for our 24 tube cables. **See Fig. 17.**



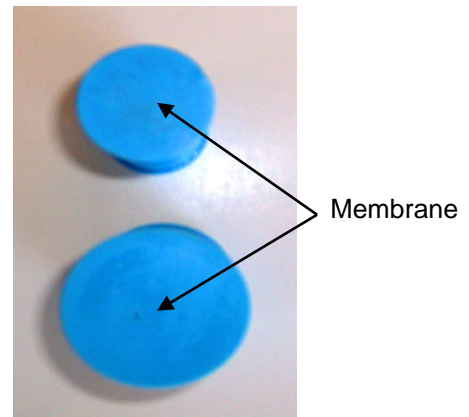
**Figure 17**  
2-Tube and 4-Tube End Plate Adapters  
DE12EPA & DE24EPA not shown

11.2.1 One end of the End Plate Adapter is open and goes inside the Splice Case End Plate. **See Fig. 18.**

11.2.2 The other end of the End Plate Adapter is closed (covered with a thin membrane of material) and goes outside the Splice Case End Plate. **See Fig. 19.**



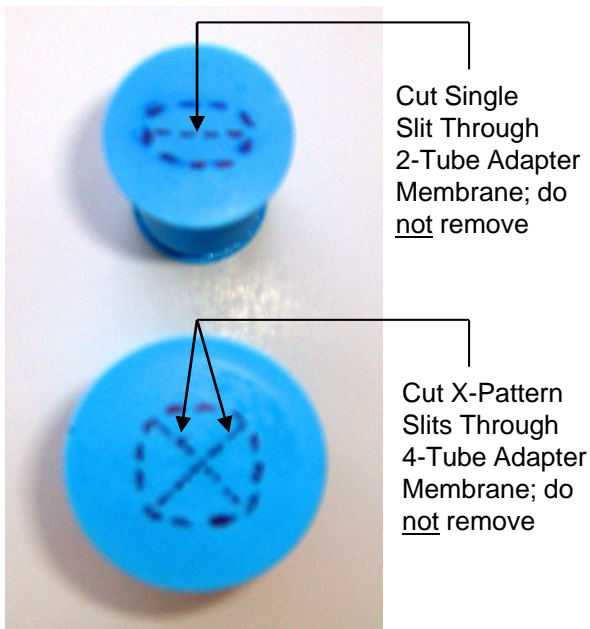
**Figure 18**  
Open End of Adapter Goes  
Inside Splice Case



**Figure 19**  
Closed End of Adapter Goes  
Outside Splice Case

11.3 Prepare tube cable to be installed (strip jacketing and expose tubes) per standard techniques / steps described in this SRP before installing cable through End Plate Adapter.

11.4 Carefully cut a slit through outer membrane of Adapter. Do not remove or totally cut out the membrane. Take care not to cut into body of Adapter. **See Fig. 20.**

**Figure 20**

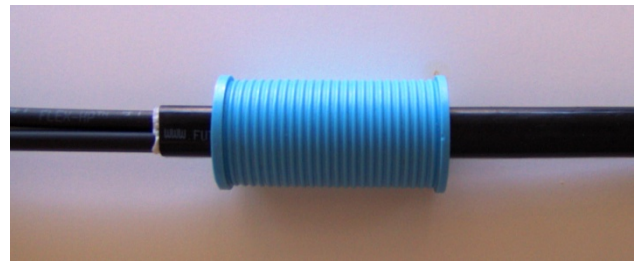
Cutting End Plate Adapter Membranes

**Important Note:** To help Adapter slide on to tube cable jacket, use a water-based liquid lubricant such Polywater A lubricant or equal. Water-based lubricant dries quickly, will not degrade the holding power of the Adapter / tube cable interface, and future removal of Adapter is easier. Do not lubricate tube cable jacket with a silicone-based lubricant. Silicone lubricant remains “slippery,” can degrade the holding power of the Adapter / tube cable interface (tube cable could pull out), and future removal of Adapter will be extremely difficult.

11.5 Push exposed tubes and tube cable through End Plate Adapter (starting from outside membrane end). Slide tube cable through Adapter until about 1” - 2” of jacket material extends past the open end of the Adapter. **See Fig. 21.**

11.6 Locate and drill tube cable entry holes in End Plate Assemblies using following PLP Blade sizes.

Tube Cable Part Number	PLP Blade Size
TC02TOX	G
TC02MSOS	G
TC04TOD	K
TC04MSOS	K

**Figure 21**

Tube Cable Installed through End Plate Adapter

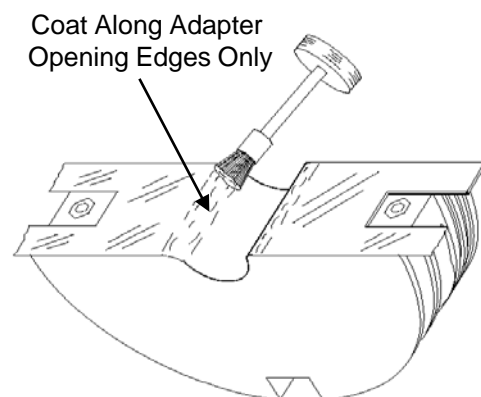
11.7 Continue preparing End Plate Assemblies per standard techniques / steps described in this SRP and PLP recommended procedures.

11.7.1 Lightly scuff / clean edges of drilled holes with Emory Cloth.

11.7.2 Apply C-Cement and LOCK-TAPE Sealant Strips to End Plate Sections.

**Note:** The use of LOCK-TAPE Sealant Tape wrapped around the End Plate Adapter is not required.

11.8 Paint a strip of C-Cement over LOCK-TAPE Sealant Strips along edges of Adapter openings only and allow to dry. **See Fig. 22.**

**Figure 22**

Applying C-Cement Over LOCK-TAPE Sealant Strip

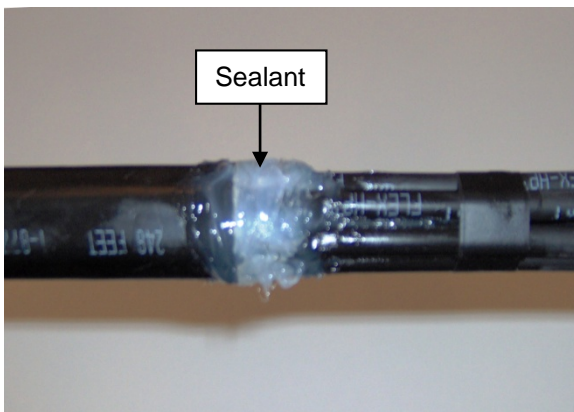
11.9 Continue with installation per standard techniques / steps described in this SRP and PLP recommended procedures.

## 12.0 Sealing Between Tubes

12.1 Since Splice Case Kits are often installed in harsh environments, it is advisable to seal the open spaces between the tubes to prevent any possibility of water intrusion; i.e.: waterproofing.

12.2 Sealing between tubes can be accomplished using approved silicone sealants, foams, or caulks. Use a method that complies with local code requirements and always follow specific manufacturer's recommended installation instructions.

12.3 Refer to Sumitomo Recommended Procedure SRP SP-F04-019 for detailed procedures. **See Fig. 23.**



**Figure 23**  
Sealing Between Tube and  
Tube / Jacket Interface

## 13.0 Testing Tubes

13.1 Once all the tubes are coupled and the End Plate Assemblies joined, each tube in the span should be tested before the Splice Case is waterproofed and closed.

13.2 Perform Pressure and Obstruction Test Procedures per Sumitomo Recommended Procedures SRP SP-F04-003 and SRP SP-F04-004.

13.2.1 If pressure test problems are detected, the Tube Couplings are still exposed and accessible for troubleshooting and repair.

13.2.2 If obstruction test problems are detected, one of the most logical places to look for a compressed tube is at the End Plate Assembly area.

## 14.0 Shell Kit Assembly

14.1 If installing dielectric tube cables, wrap Shell Kit's #6 bonding wire lug with vinyl Electricians tape; do not cut off or remove. Then install Plug to seal integral air flange and grounding lead threaded hole located on outside of shell.

14.2 If installing metallic tube cables, attach Shell Kit's #6 internal bonding wire lug to one of the tube cable shield connector assemblies. Then, using Installer provided hardware, connect a grounding wire from the Splice Case's integral air flange and grounding lead threaded hole to common earth ground.

14.3 Carefully bring shell halves together and install Lockbar Assemblies per PLP standard recommended procedures.

14.4 **Important Step** - Following Lockbar tightening instructions carefully. Lockbar nuts must be tightened in a specific sequence and torqued to specific values.

14.5 When Shell Kit assembly procedures have been completed, position Splice Case in its pre-determined location and secure in place. Exercise care in maneuvering Splice Case and attached tube cables. Do not damage or force tube cables into tight bends.

## 15.0 Encapsulating Splice Cases

15.1 The interior of the Armadillo Stainless Splice Case is capable of being gravity- and / or pressured-filled with an encapsulant.

15.2 Unless specifically required by Contract Specifications, encapsulating the interior of the Splice Case is not recommended as it makes future access to Tube Couplings difficult, time-consuming, and could result in tube / Tube Coupling damage as encapsulant is attempted to be removed.

## **16.0 Re-Entering Splice Cases**

16.1 The Armadillo Stainless Splice Case is designed for numerous re-entries. However, certain precautions must be taken prior to re-application.

16.2 Shells and End Plates must be cleaned thoroughly.

16.3 Any bent or stripped studs or nuts should be replaced.

16.4 After 2 or 3 re-entries, apply shell lubricant (PLP 80801566) to Lockbar threaded studs for continued ease of re-entry.

16.5 Discard and replace any bent or distorted shell halves.

16.6 Inspect End Plate sections carefully. Replace if any cracks or other damage are noted.