

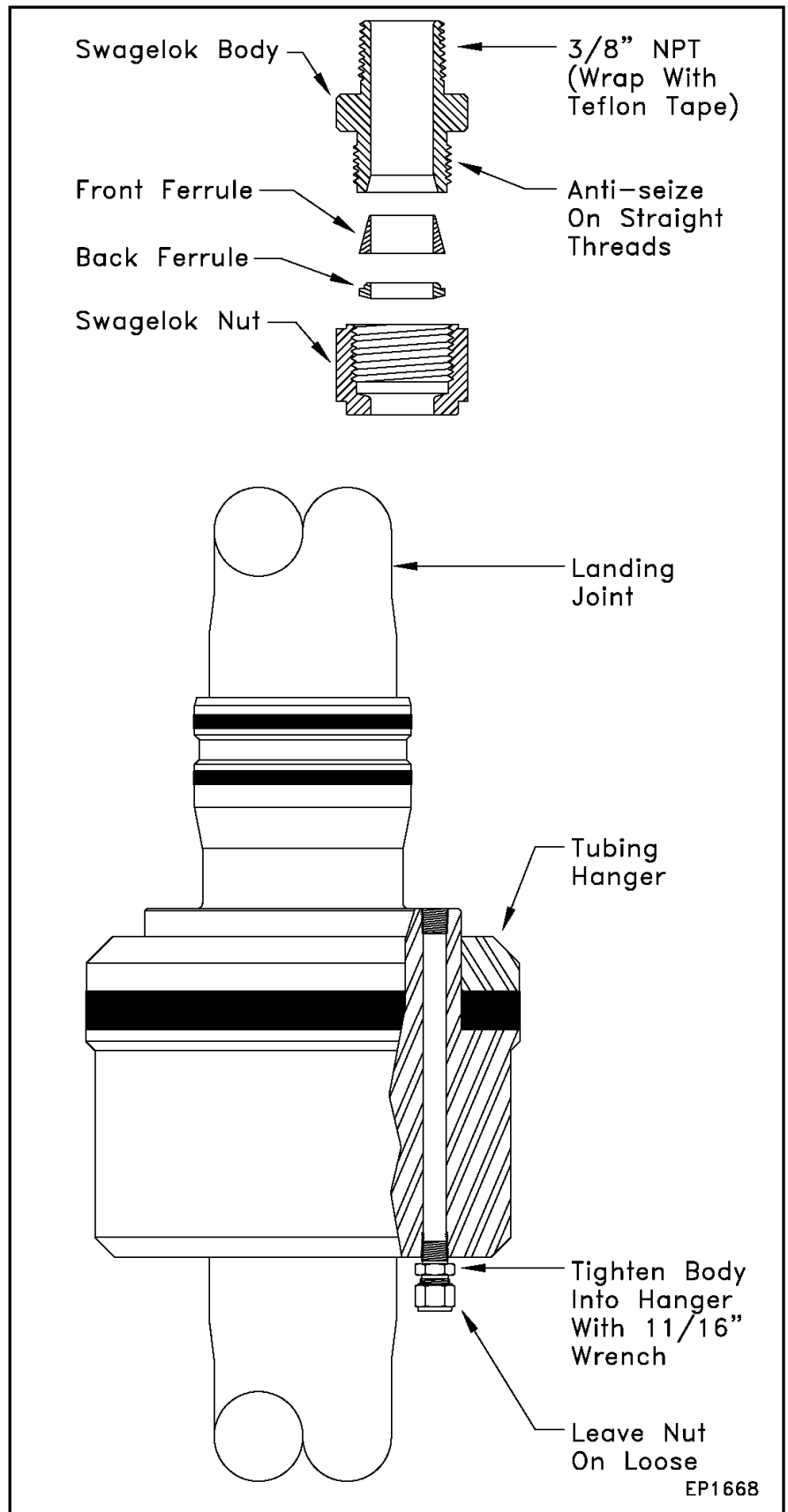
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P5000 PENETRATOR INSTALLATION
Generic For Flat Leaded Pump Cable

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2. Bottom Seal Installation

- A. Install the tubing hanger and landing joint into the string.
- B. Remove a Bottom Seal Fitting (Swagelok) from one of the Penetrator Assemblies.
- C. Remove the nut from the body portion of the fitting. Make sure that the two ferrules are installed correctly as shown.
- D. Wrap Teflon tape on the 3/8" NPT pipe threads of the fitting.
- E. Apply anti-seize compound to the straight threads of the fitting.
- F. Reinstall the nut onto the body portion of the fitting.
- G. Starting with the middle port first, use an 11/16" wrench to tighten the body portion of the Bottom Seal Fitting into the bottom of the tubing hanger.
- H. **DO NOT** tighten the Swagelok nut at this time.
- I. Repeat the above for the other 2 fittings.



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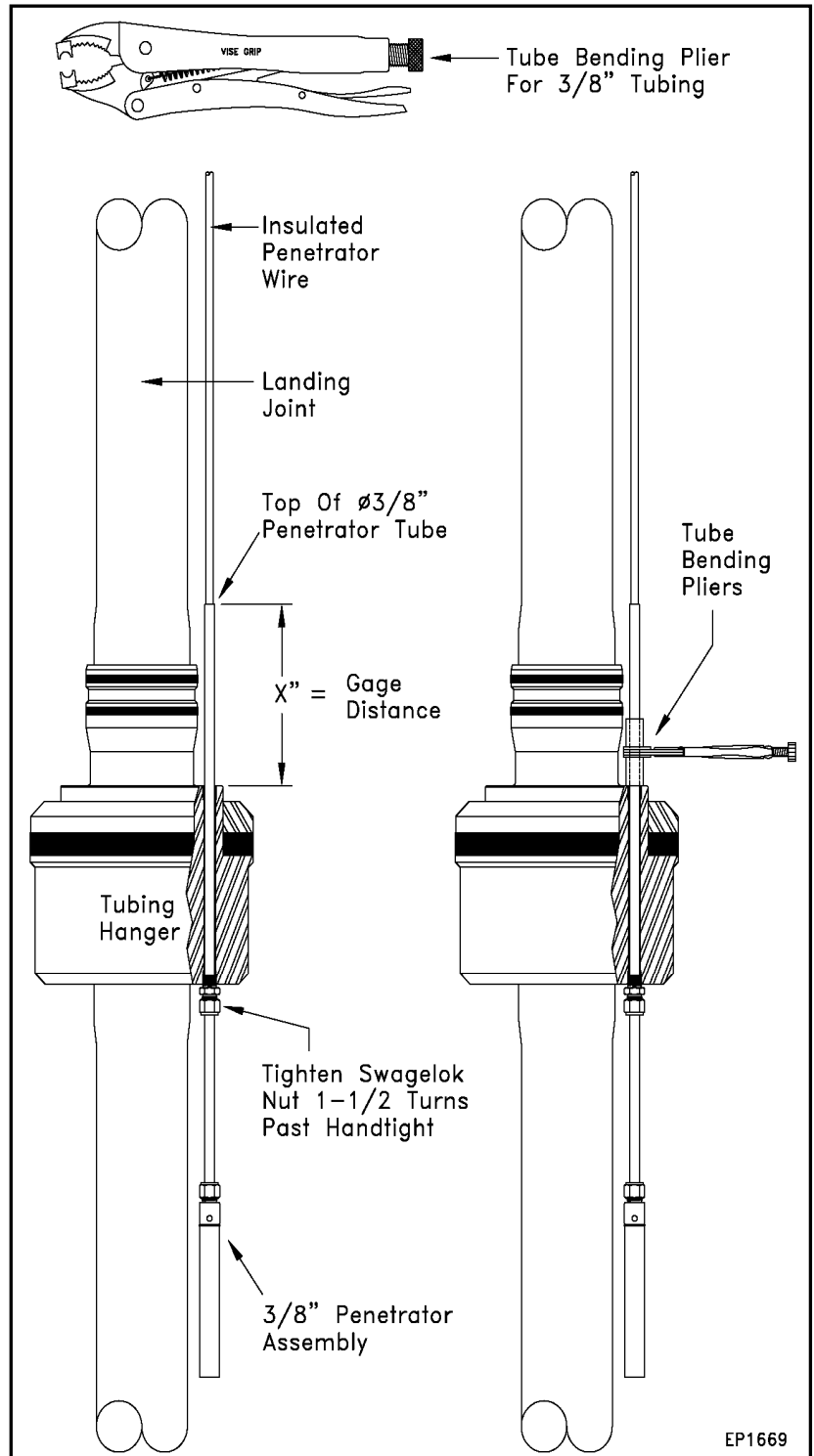
3. Penetrator Installation

- A. Push a Penetrator up through the tubing hanger so that the distance from the top of the 3/8" Penetrator tube to the top of the tubing hanger (at the 3/8" NPT ports) is exactly X".

X" = Gage Distance. This distance can vary depending on the wellhead dimensions. It is provided by Q.C.I. to allow 1-3/4" of Penetrator tubing to stick up above the Tubing Head Adaptor after the adaptor is made up tight to the Tubing Head. **SEE NEXT PROCEDURE FOR GAGE DISTANCE CALCULATION.**

The 3/8" Tube Bending Pliers can be used to temporarily hold the Penetrator in place while the Swagelok nut is tightened.

- B. Tighten the nut on the Bottom Seal fitting 1-1/2 turns past hand tight. This will lock the Penetrator in place and seal it. Place a mark on the Swagelok Nut and body to ensure the correct number of turns.
- C. Repeat this procedure for the remaining Penetrators.



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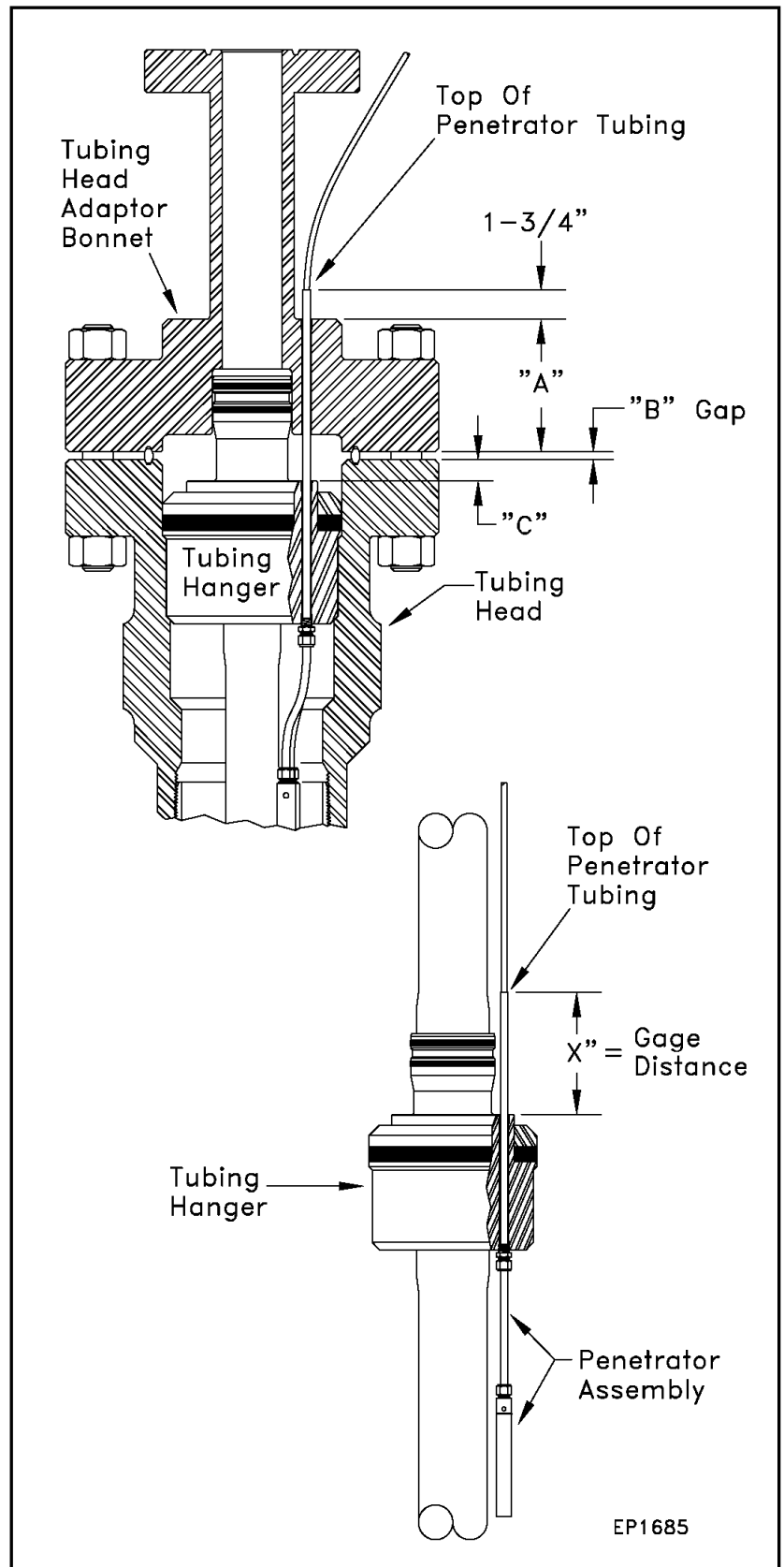
4. Gage Distance

Definition/Calculation – *The distance from the top of the tubing hanger (at the 3/8" NPT ports) to the top of the Penetrator Tube when the Penetrators are installed in the Tubing Hanger.*

- A. This distance can vary depending on the wellhead dimensions. It is provided by Q.C.I. to allow 1-3/4" of Penetrator tubing to stick up above the Tubing Head Adaptor after the adaptor is made up tight to the Tubing Head.
- B. Measure the total distance the Penetrator Tube must pass through the Tubing Head Adaptor Bonnet (from bottom of the flange to the exit point at the 3/8" NPT Ports) = "A"
- C. Measure the ring gap distance between the two flanges (Tubing Head and Tubing Head Adaptor Bonnet) = "B"
- D. Measure the distance from the top flange of the Tubing Head to the top of the Tubing Hanger (at the 3/8" NPT ports) after the Tubing Hanger is landed. = "C"

NOTE: This dimension can sometimes be = 0". Some wellhead designs have the top of the Tubing Hanger Flush with the top of the Tubing Head Flange after landing.

$$\text{GAGE DISTANCE} = \text{A} + \text{B} + \text{C} + 1\text{-}3/4 = \text{X}$$



EP1685

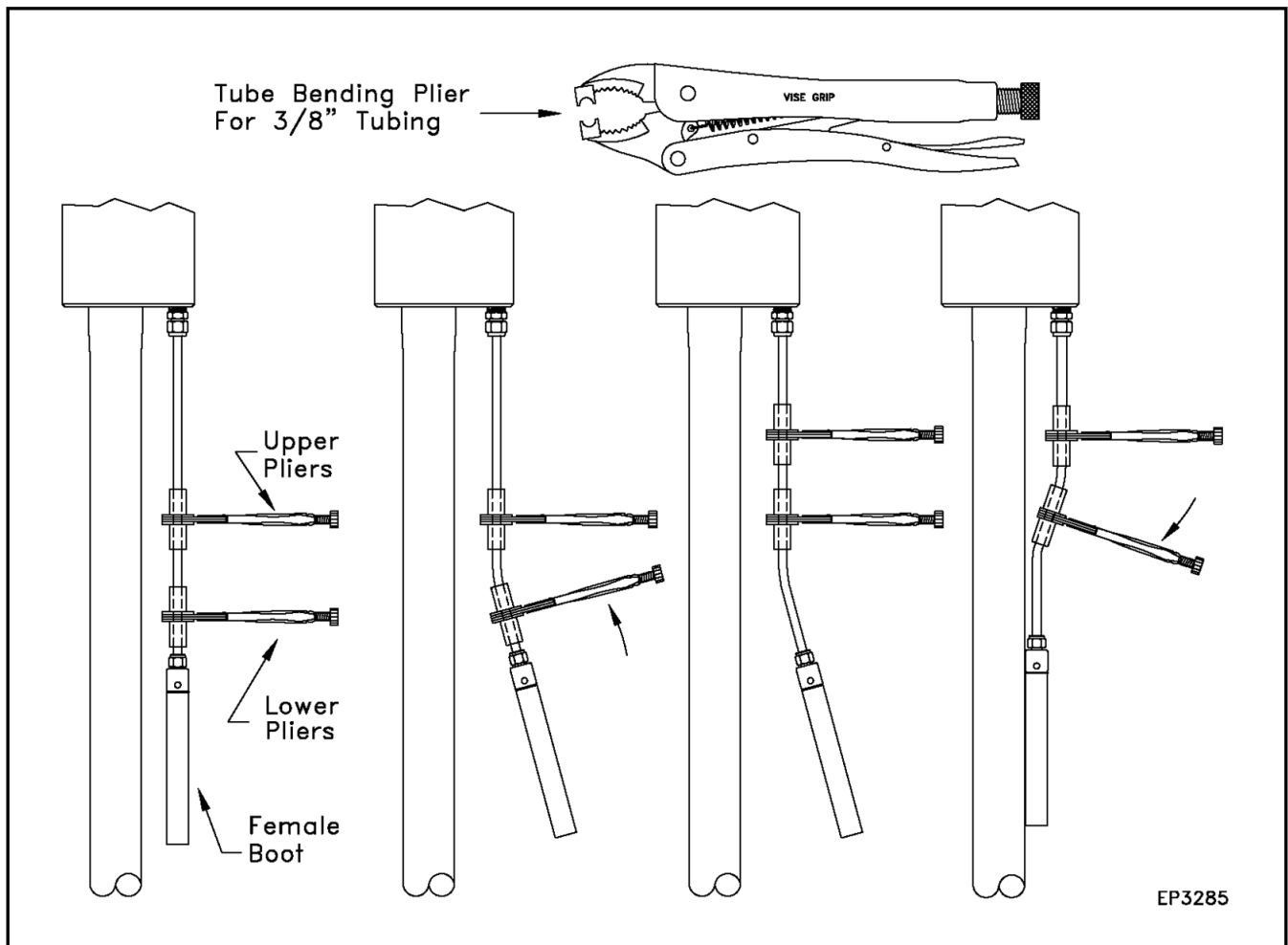
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5. Penetrator Tube Bending

- A. It is important for the Female Boots on the Penetrators to be up against the tubing and parallel with the tubing. This will prevent them from being hung up when going through the BOP. The Female Boots should be next to each other. Bend the Penetrator Tubing as follows to accomplish this.
- B. Take one of the Tube Bending Pliers (modified Vise Grips) and clamp it to the Penetrator Tubing, about $\frac{2}{3}$ of the way down the tube.
- C. Take a second Tube Bending Pliers, and clamp them about 2" above the first one.
- D. Hold the upper pliers stationary, while pushing up on the handle of the lower pliers. This should bend the tubing so that the Female Boot is at about a 20 degree angle from straight. **DO NOT bend the rubber Female Boot (the Green Hooter inside could crack).**
- E. Remove the Lower Pliers from the tube and re-position them above the upper set.
- F. Push down on the lower set of Pliers to complete the "S-Bend" in the tubing. The Female Boot should be up against the tubing, and parallel with it.
- G. Repeat steps B-F for the remaining 2 Penetrators.



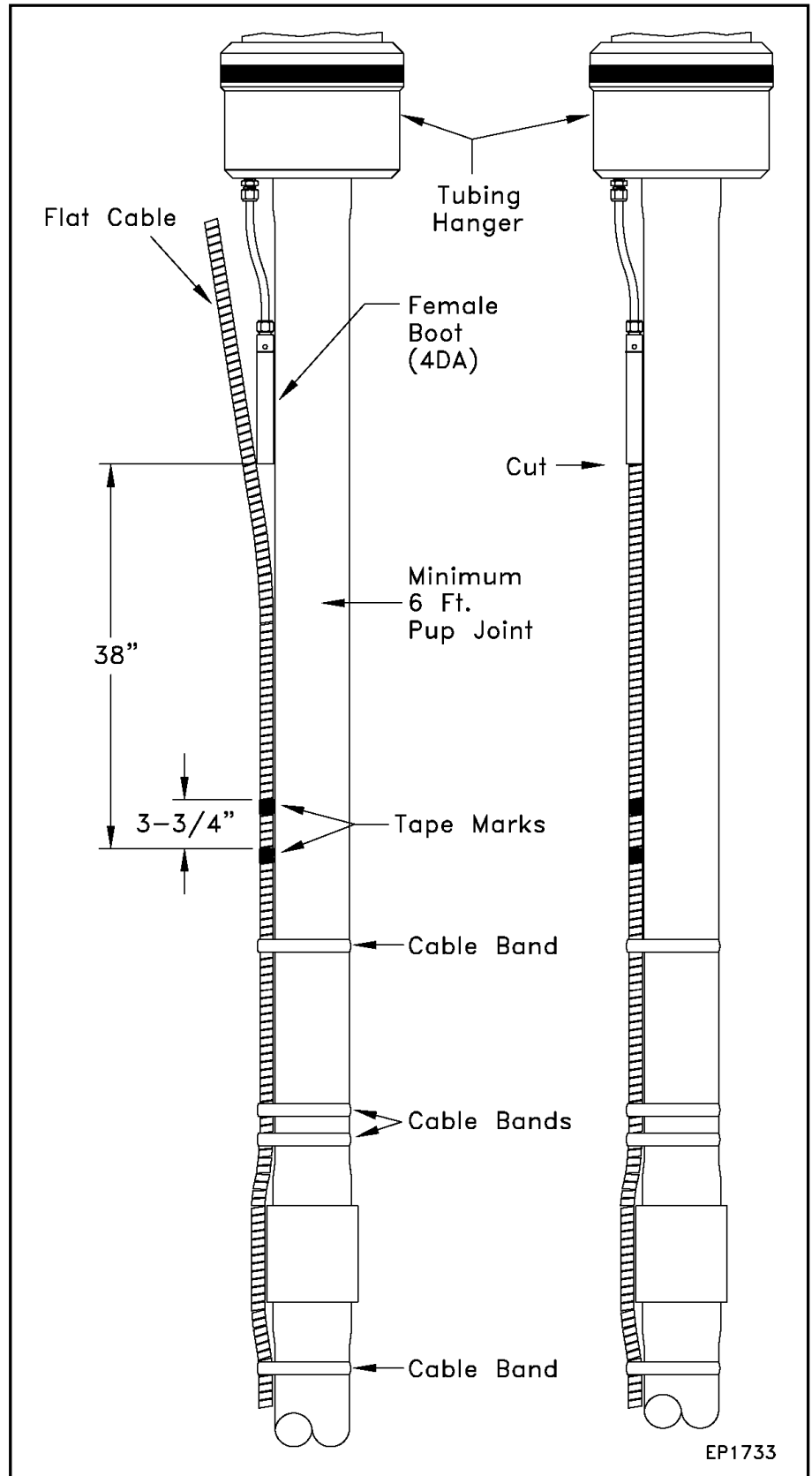
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6. Cutting Pump Cable

- A. Ensure the pump cable is banded straight and in line with the middle Female Boot. Apply the last cable band **4'** down from the middle Female Boot.
- B. Measure down **38"** from middle Female Boot and mark the pump cable.
- C. Tape mark the pump cable a second time **3-3/4"** up from the **38"** mark.
- D. Cut the pump cable off with a hacksaw even with the middle Female Boot.



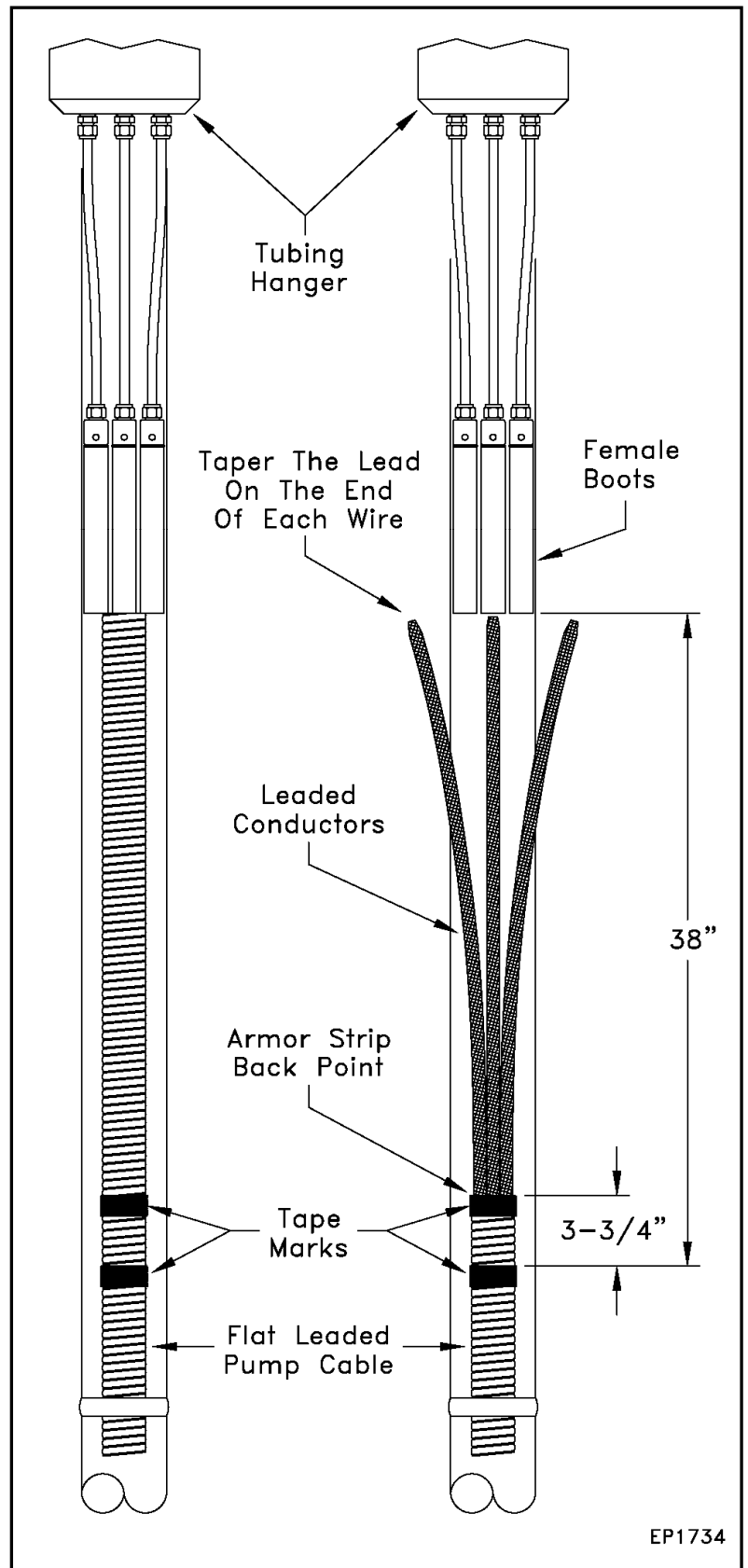
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7. Removing Armor & Braid

- A. Remove the exterior metal armor from the pump cable to the top of the upper tape mark.
- B. Tape the end of the armor on the pump cable with fiberglass tape so that it will not unwind.
- C. Remove any tape or braid which covers the leaded conductors back to the armor strip back point.
- D. Leave the lead on the wires. Separate the (3) individual wires and straighten them. Clean each of the wires with Contact Cleaner.
- E. Taper the lead on the end of each wire with a knife down to conductor.



EP1734

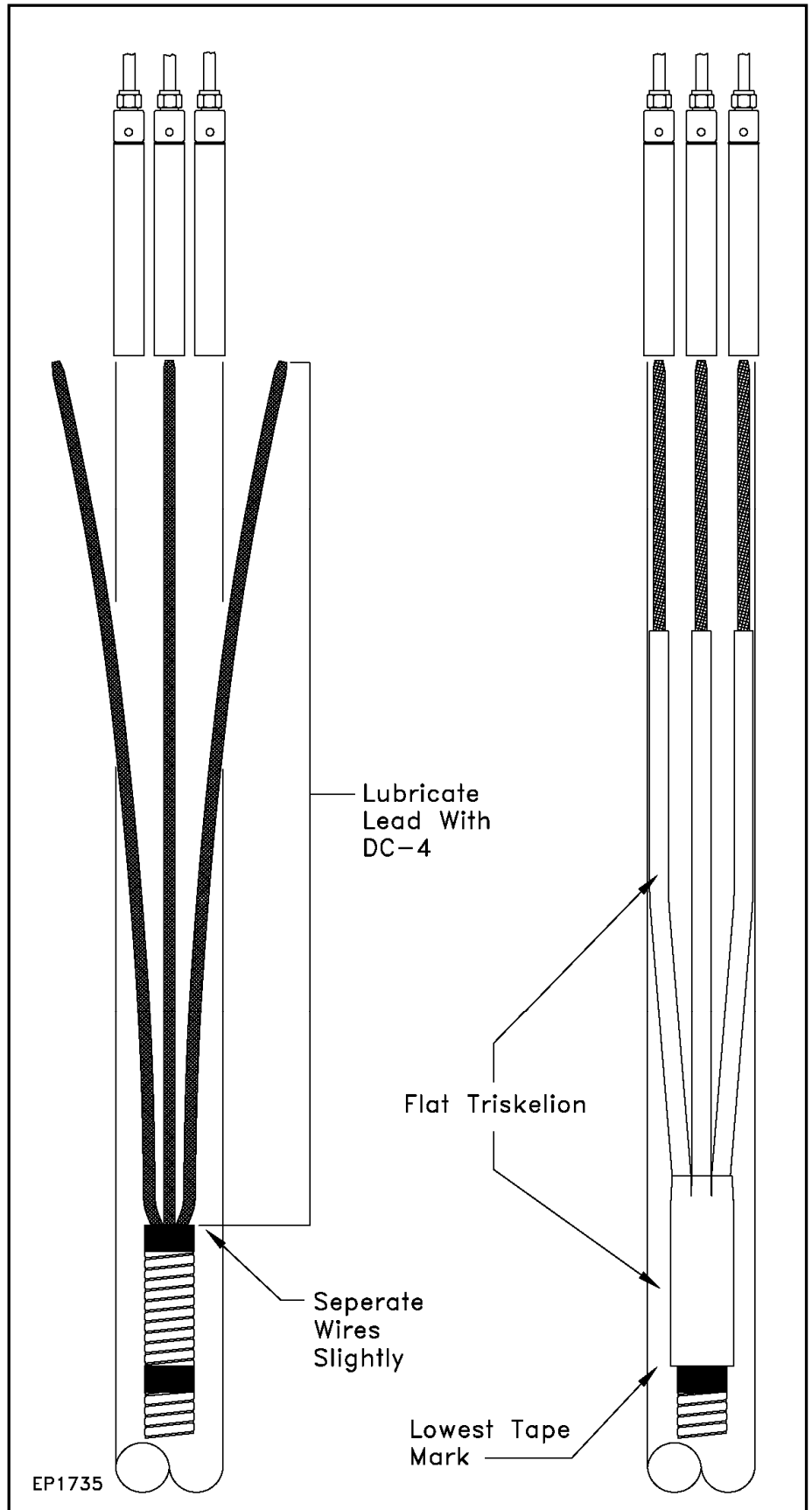
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8. Pre-fitting Triskelion –
Triskelion part numbers are scribed on their collars.

- A. Separate each of the 3 leaded wires slightly at the armor strip back point.
- B. Lightly lubricate each of the leaded wires with DC-4 Silicone Compound.
- C. Install the Flat Triskelion over the wires and run it over the armor on the pump cable (if necessary, open the Triskelion Collar further using channel lock pliers). Stop when the bottom of the Triskelion Collar reaches the top of the lowest tape mark.



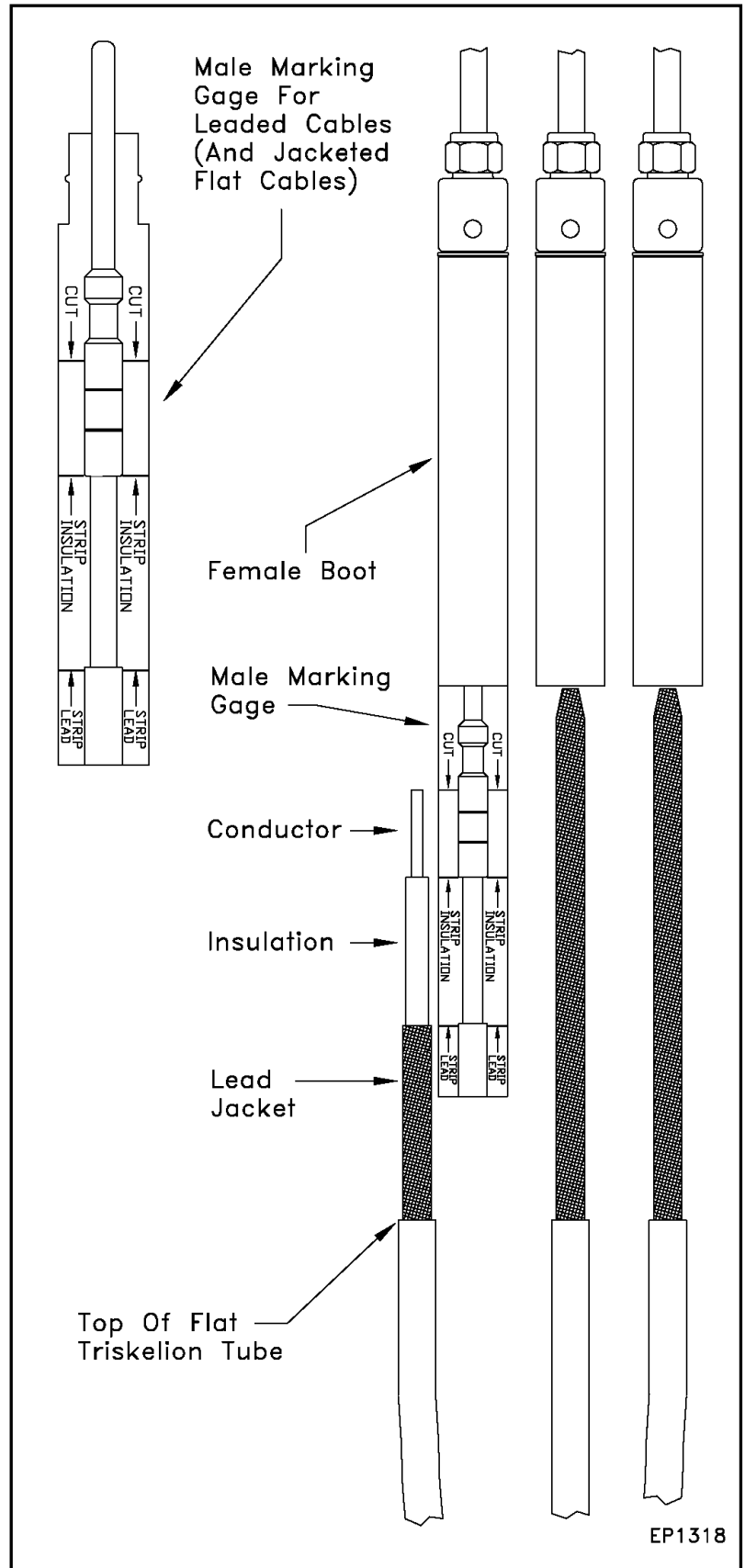
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9. Male Marking Gage – *Note:* *The lead must extend 1” inside the male boot.*

- A. Clean off any DC-4 Silicone Compound from the end of the wires.
- B. Insert the Male Marking Gage for Leaded Cables (11FB) into one of the Female Boots. Place the appropriate conductor along side the Male Marking Gage. **Each wire must be with the gage in its appropriate boot. Do not mark all three wires with the gage only in one boot.**
- C. Strip the lead back to the **lead strip back point**.
- D. Cut the wire off at the marked **cut point**.
- E. Strip the insulation back to the marked **strip insulation point**.
- F. Sand the exposed conductor with 320-grit emery paper and clean with heavy-duty Contact Cleaner. Take one of the male pins and slide it over the conductor so that the butt end of the pin shoulders evenly on the insulation. If the pin does not shoulder evenly, continue to sand, and/or file the copper conductor. Remove the pin and do not crimp it at this time.
- G. Carefully sand the exposed lead into a round shape with 320 grit emery paper.
- H. Repeat above steps for the remaining conductors.



EP1318

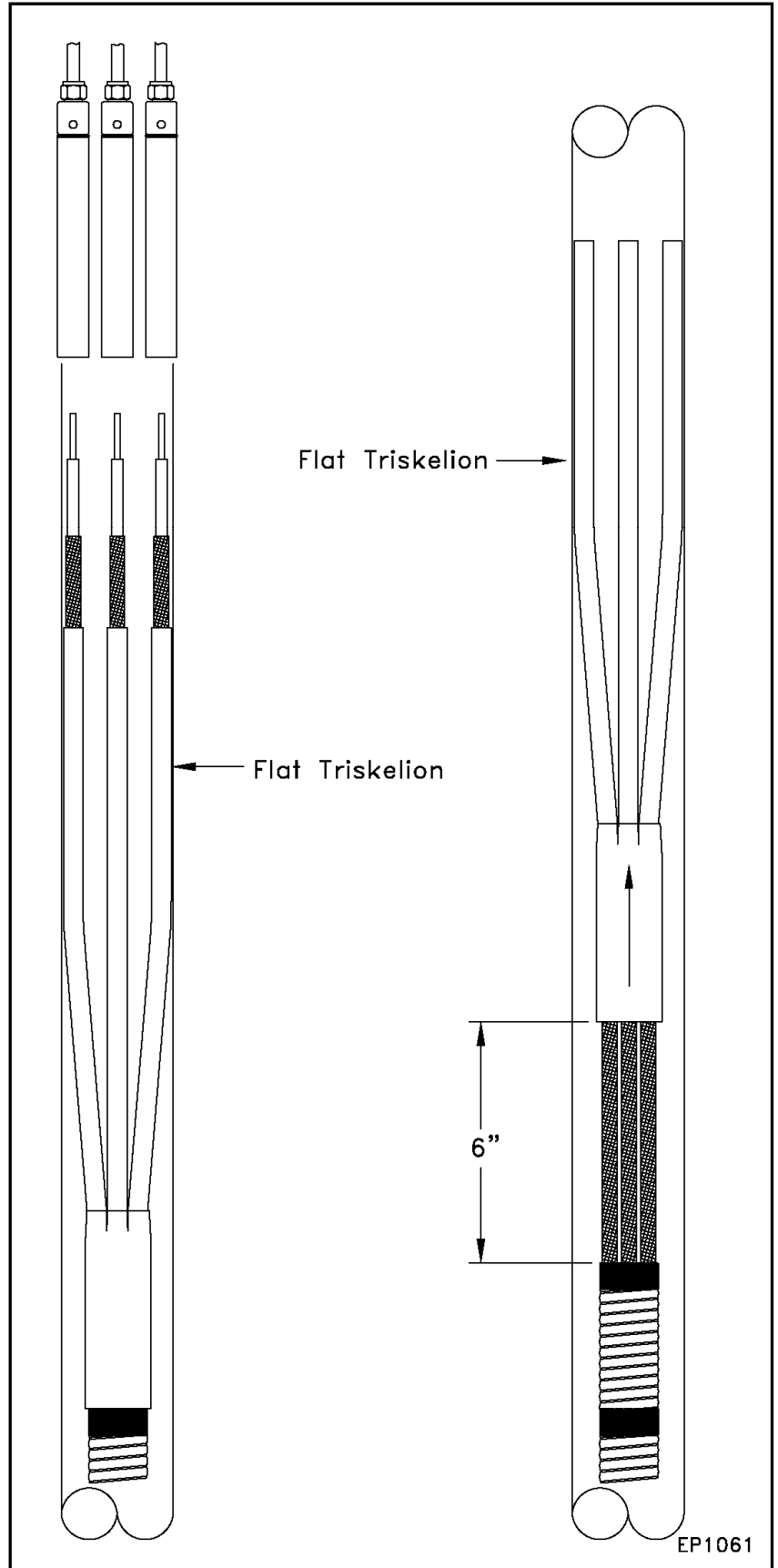
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10. Sliding Back Triskelion

- A. Slide the Flat Triskelion up so that the bottom of the collar is about 6" from the armor strip back point (tape mark). **Do not remove the Triskelion from the wires.**
- B. This exposed 6" of wire should be enough to apply the epoxy (refer to **Applying Epoxy** procedure).
- C. Remove excess silicone grease with Contact Cleaner about 1" above armor strip back point.



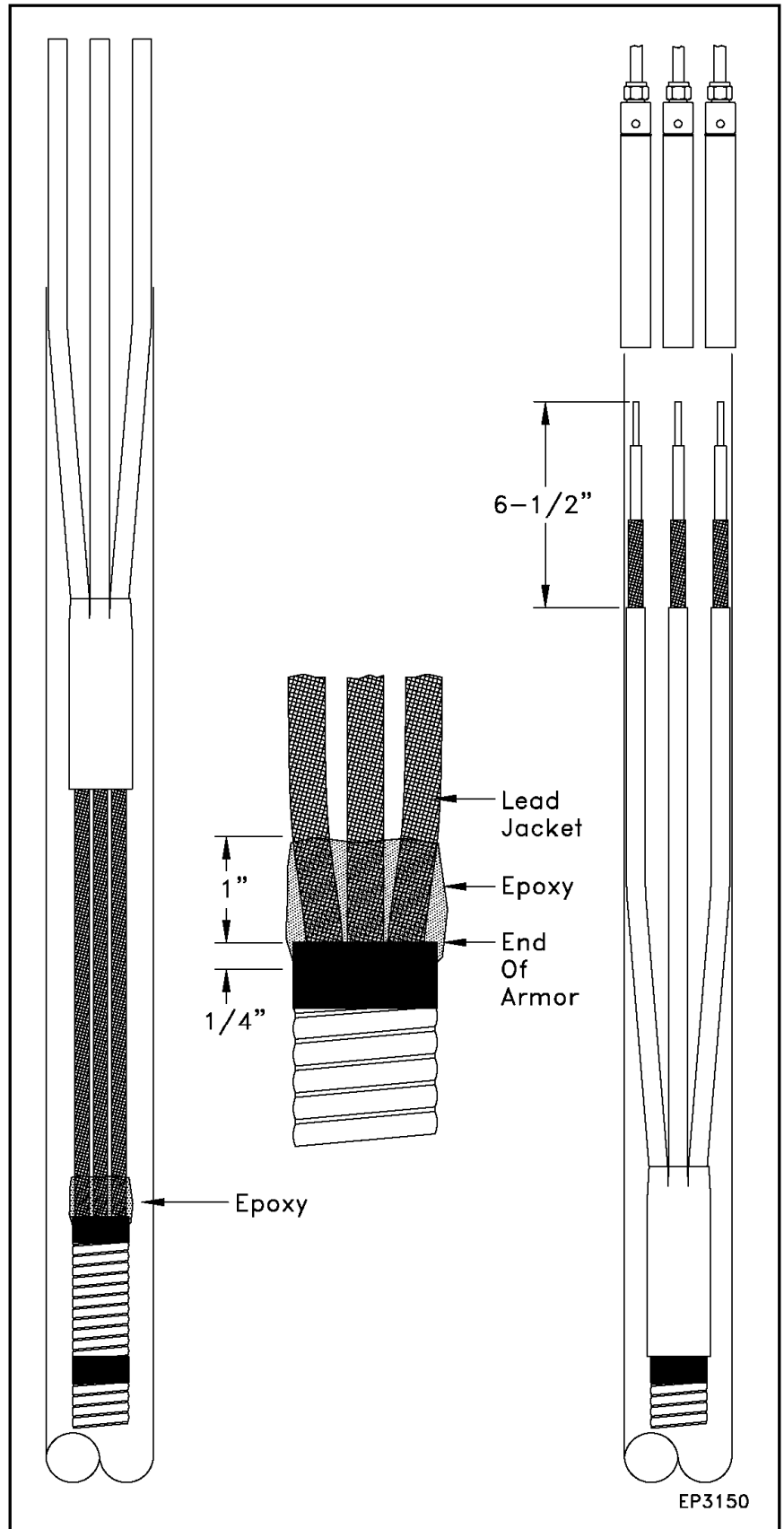
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11. Applying Epoxy

- A. Spread the three wires apart slightly at the armor strip back point.
- B. Take the stick of two-part epoxy and knead it together so that the two parts mix and become a uniform color. Apply the epoxy in between all (3) leaded wires (using most of the epoxy) into a flat oval shape – ensure the epoxy is smooth and even. The epoxy should overlap the armor $1/4"$, and extend $1"$ above the end of the armor.
- C. Apply a liberal amount of DC-111 to the epoxy. Completely cover all of the epoxy with DC-111. The DC-111 will keep the epoxy from hardening to the Triskelion so that it can be reused. However, the epoxy will harden to the wires and offer them support.
- D. Slide the Triskelion back down over the armor so that the **distance from the shortest wire to the top of the Triskelion tubes is exactly $6-1/2"$** . Remove any excess epoxy from the outside of the Triskelion.



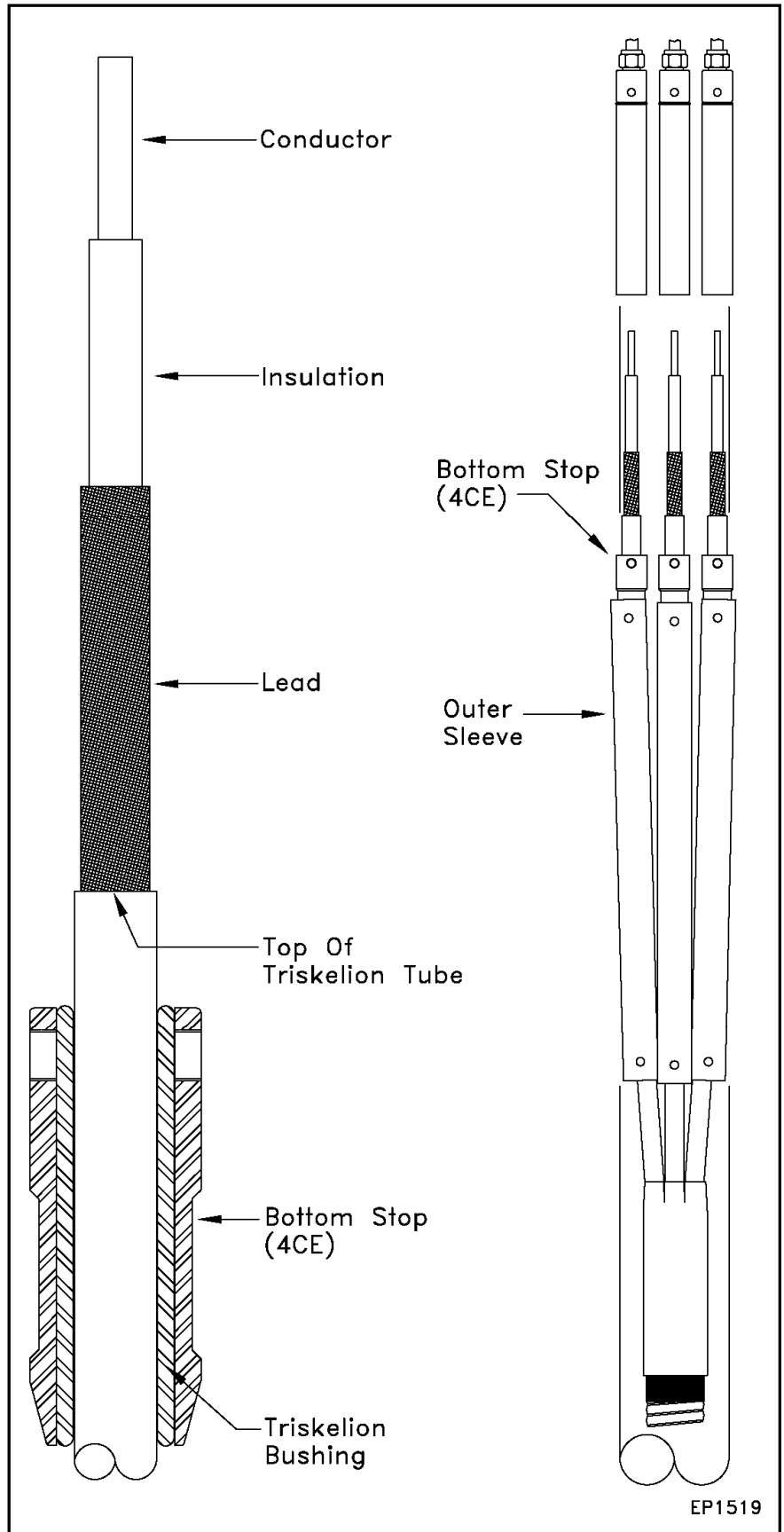
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12. Installing Bottom Stops & Outer Sleeves

- A. Locate the three Bottom Stops (4CE).
- B. A white Triskelion Bushing should be pressed into the Bottom Stop.
- C. Slide a Bottom Stop (4CE) over each Triskelion Tube. The Stops will rest temporarily toward the bottom of the Triskelion Tubes.
- D. Slide an Outer Sleeve over each Triskelion Tube.



EP1519

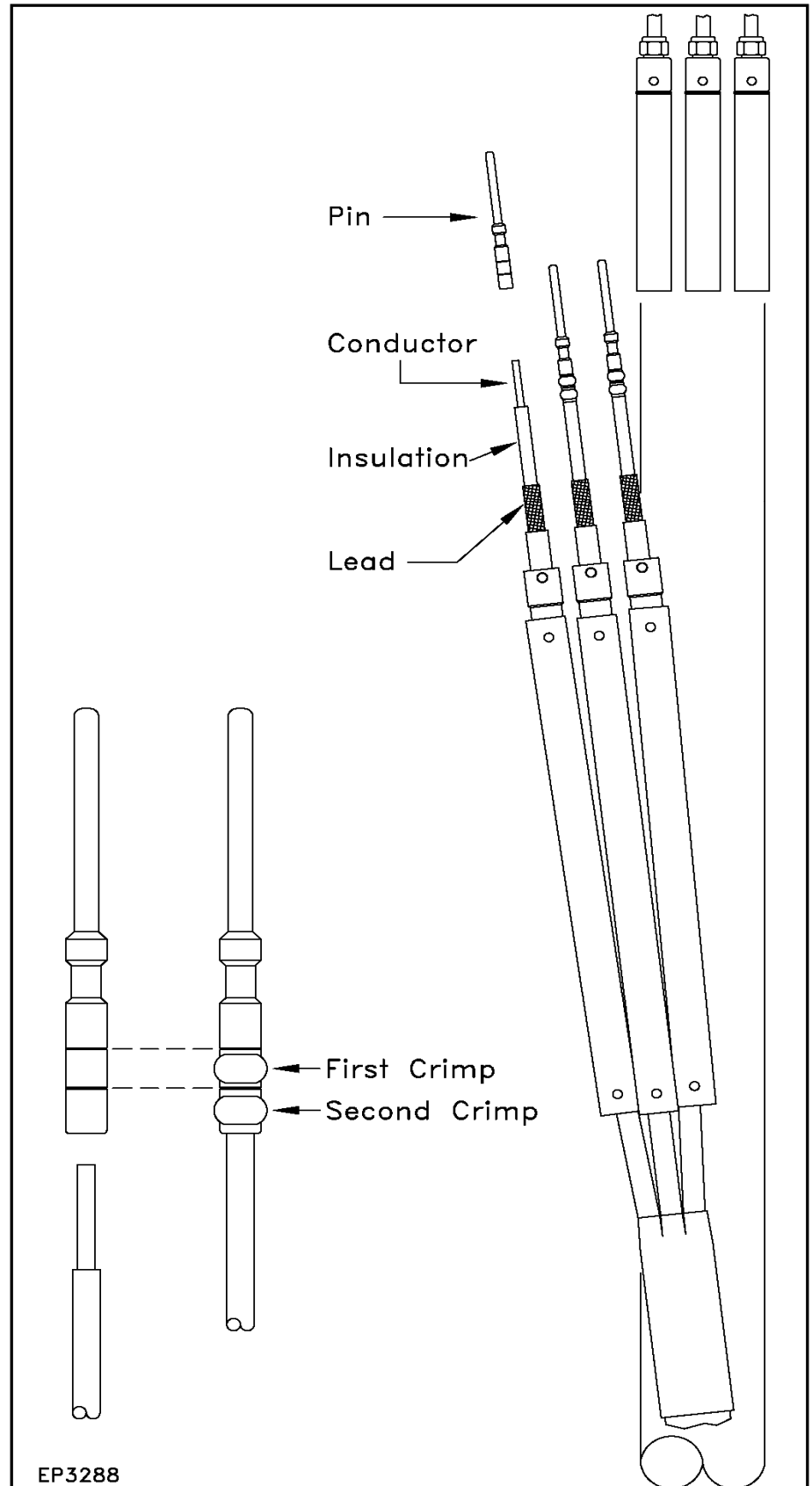
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13. Pin Installation

- A. Install a Pin over a clean exposed copper conductor. The bottom of the Pin should shoulder on the insulation. (Additional sanding of the conductor might be necessary if the Pin will not shoulder on the insulation).
- B. The Pin has two crimping grooves machined around the outside of the conductor end. Ensure the Pin is seated all the way down.
- C. Use the Burndy Crimping Tool (11DA) and make the first crimp on the Pin between the two grooves.
- D. Make the second crimp in between the second groove and the butt end of the Pin.
- E. The second crimp should be in line with the first crimp.
- F. The crimping tool will sometimes bend the wire slightly. If the Pin and wire are not straight after crimping, bend them back straight.
- G. Repeat for each conductor.



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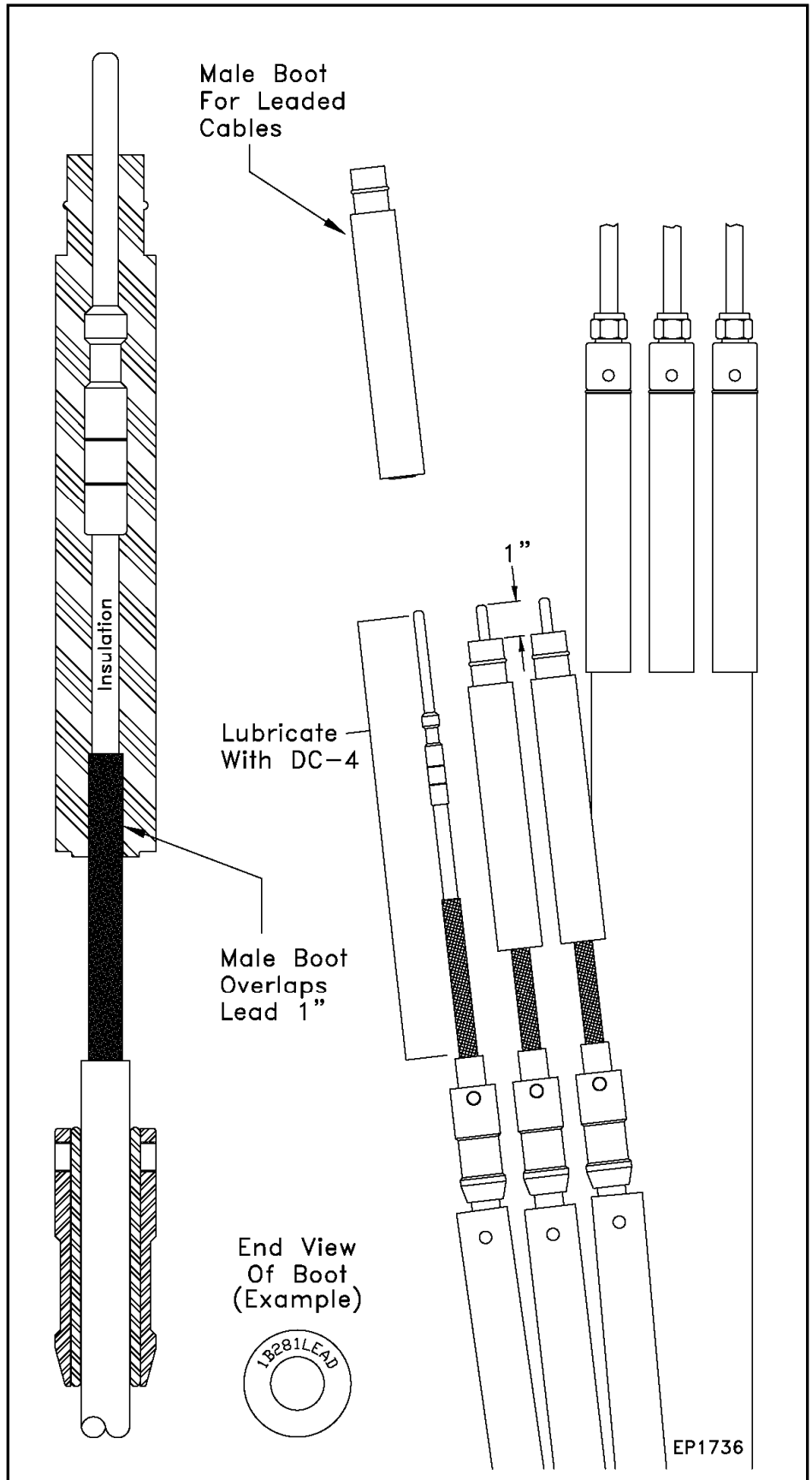
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14. Male Boot Installation

– *One end of the boot has its part number molded into it.*

- A. Clean the Pins, insulation and lead with contact cleaner and then apply a light film of DC-4 Silicone Compound.
- B. Push the Male Boot for leaded cables over the Pin, insulation, and lead until it seats. The Male Boot should be a tight fit on the Pin, insulation, and lead.
- C. Rotate the Male Boot on the Pin to confirm seating and to expel excess silicone compound.
- D. The Pin should protrude approximately 1" past the outside of the Male Boot.
- E. Repeat for each conductor.



EP1736

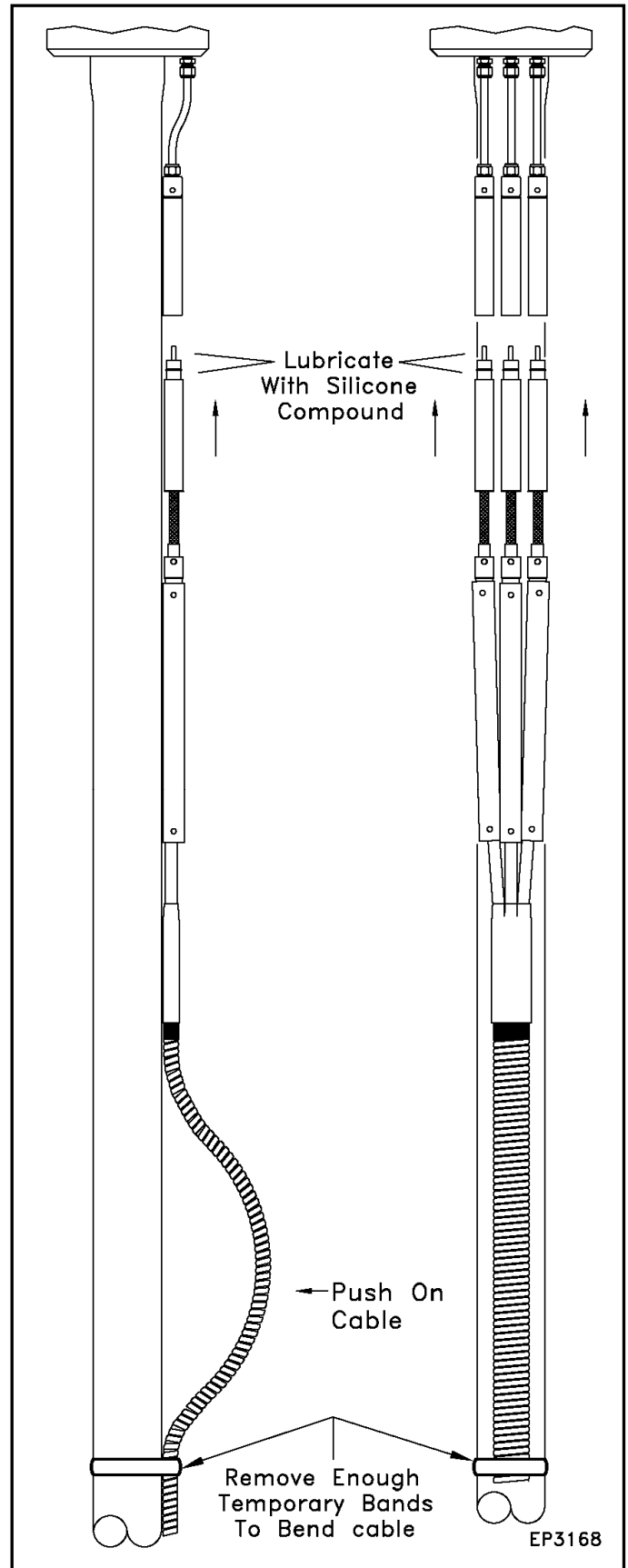
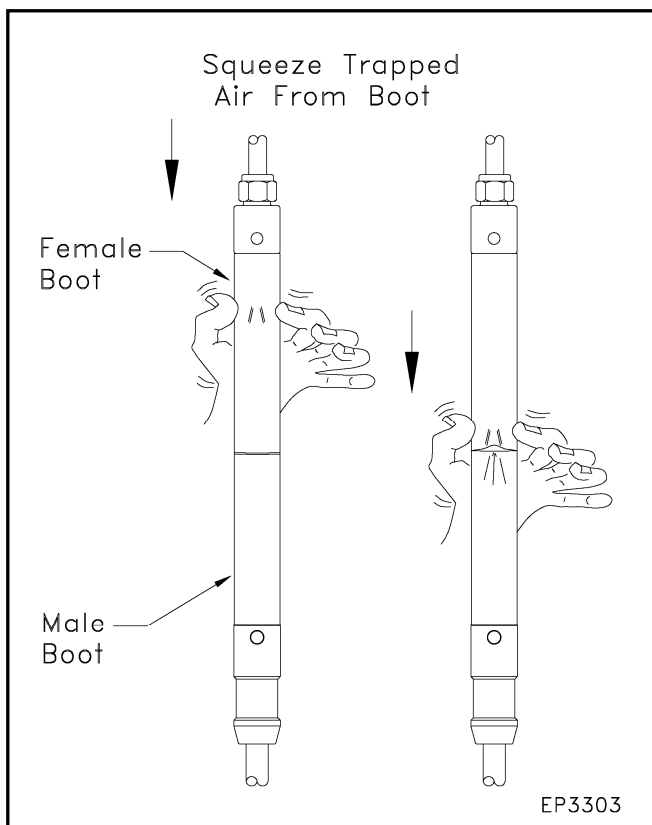
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15. Alignment, Joining of Connections

- Clean the interior of the Female Boots by inserting a Split Male Boot (11LA) and rotating it. The Split Male Boot will scoop up any dirt and debris from inside the Female Boot.
- Apply a light coat of silicone compound to the outside of the small end of the Male Boot. The Silicone will allow for easy sliding into the Female Boot.
- Remove enough cable bands from below the Triskelion so that the pump cable can be pulled outward and away from the tubing.
- Align all three Pins and sockets and push on the bowed portion of the armored cable forcing the Male Boots upward until the boots seat.
- Squeeze in a downward motion the Female Boot at the connection until all the trapped air is worked out of the boot. A snapping sound will be heard indicating a tight connection.



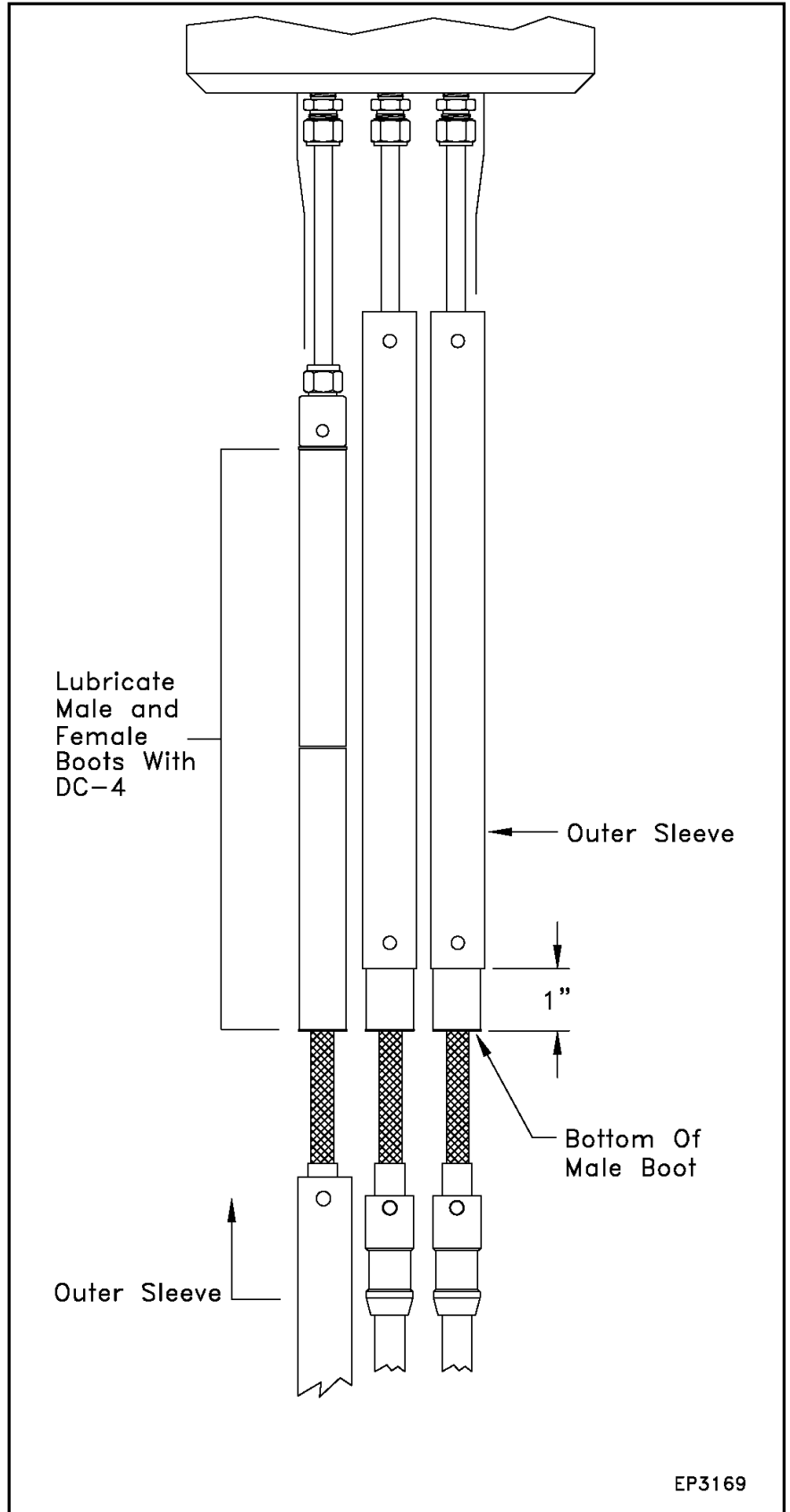
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16. Sliding Up Outer Sleeves

- A. Lightly lubricate the outside of each Male and Female Boot with DC-4 Silicone Compound.
- B. Slide each of the (3) Outer Sleeves upward over the Male and Female Boots so that about 1" of the bottom of the Male Boot is exposed.



EP3169

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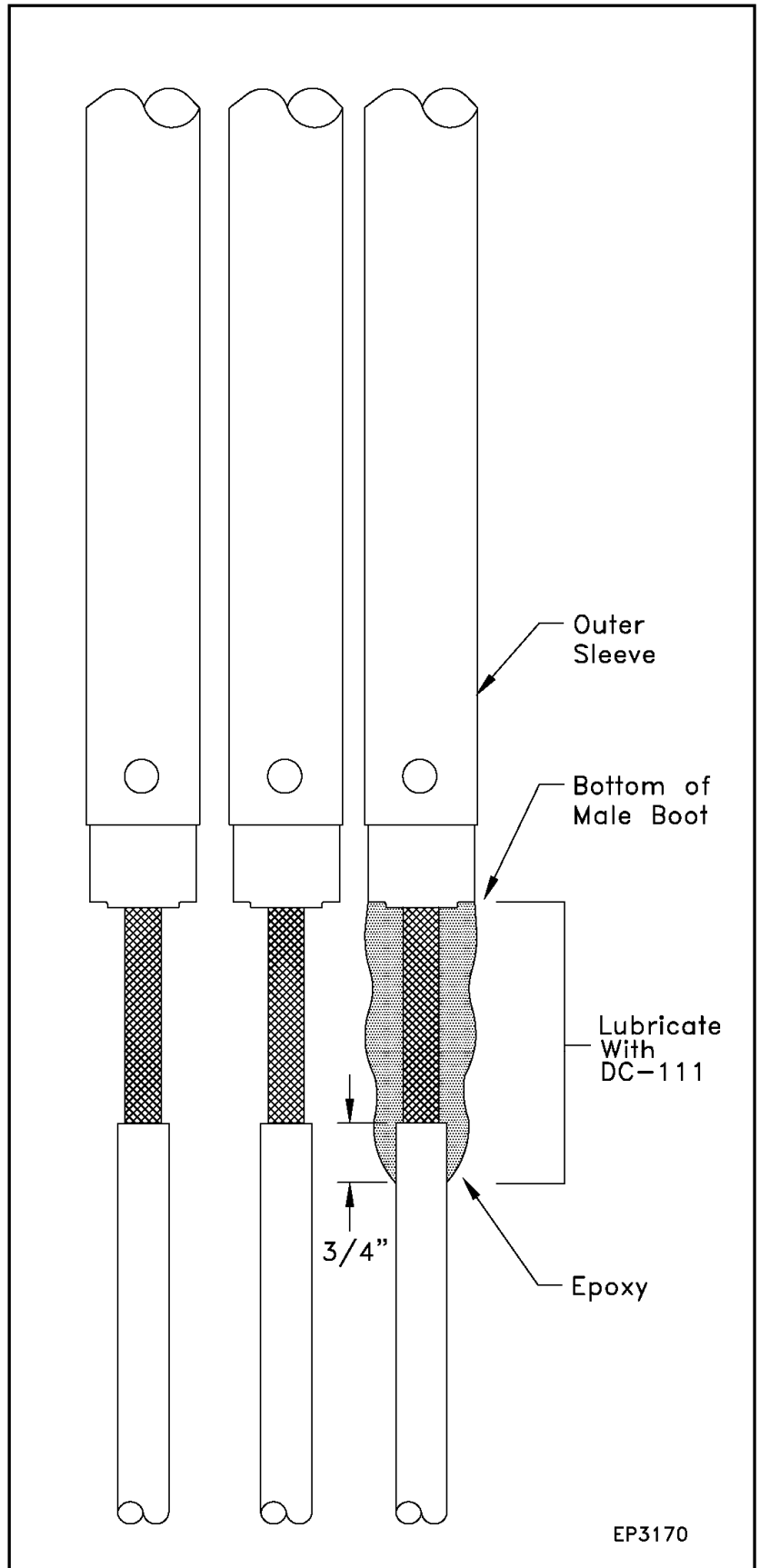
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17. Applying Epoxy Behind Male Boot

Apply epoxy behind 1 male boot at a time! Do not apply epoxy to all 3 legs at once.

- A. Mix a $\frac{1}{2}$ stick of epoxy (approximately 3-1/2" length) by hand until it becomes a uniform color.
- B. Apply epoxy to one of the leaded wires up to the back of the Male Boot. Overlap the end of the Triskelion Tube about 3/4". Form the epoxy into a round shape, but do not let the diameter get larger than the OD of the Male Boot.
- C. Lubricate the epoxy with DC-111.



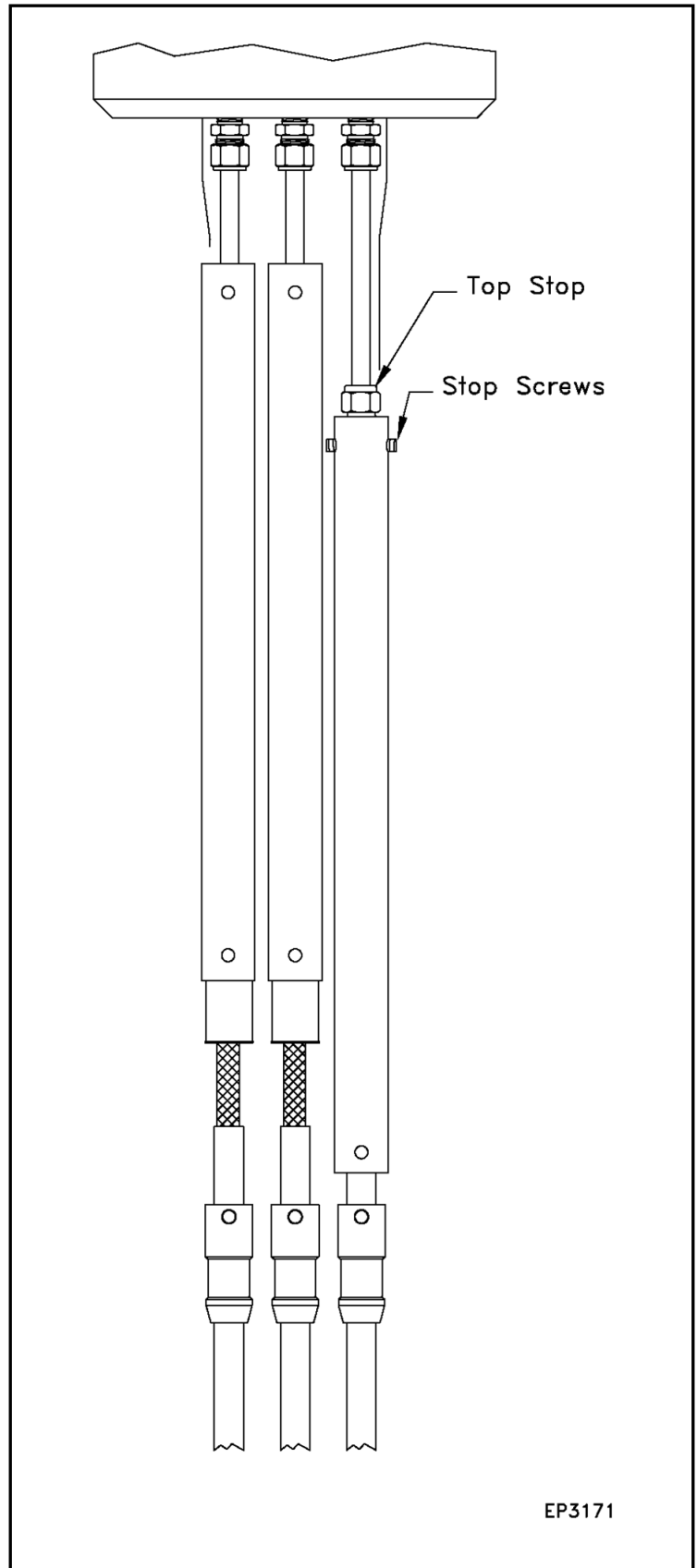
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18. Installing Upper Stop Screws

- A. Slide the Outer Sleeve downward over the epoxy, and align the holes in the Outer Sleeve with the holes in the Top Stop.
- B. Install (2) Stop Screws into the Top Stop using the 5/32" Ball Driver. (The Top Stop can be rotated to access the holes).



EP3171

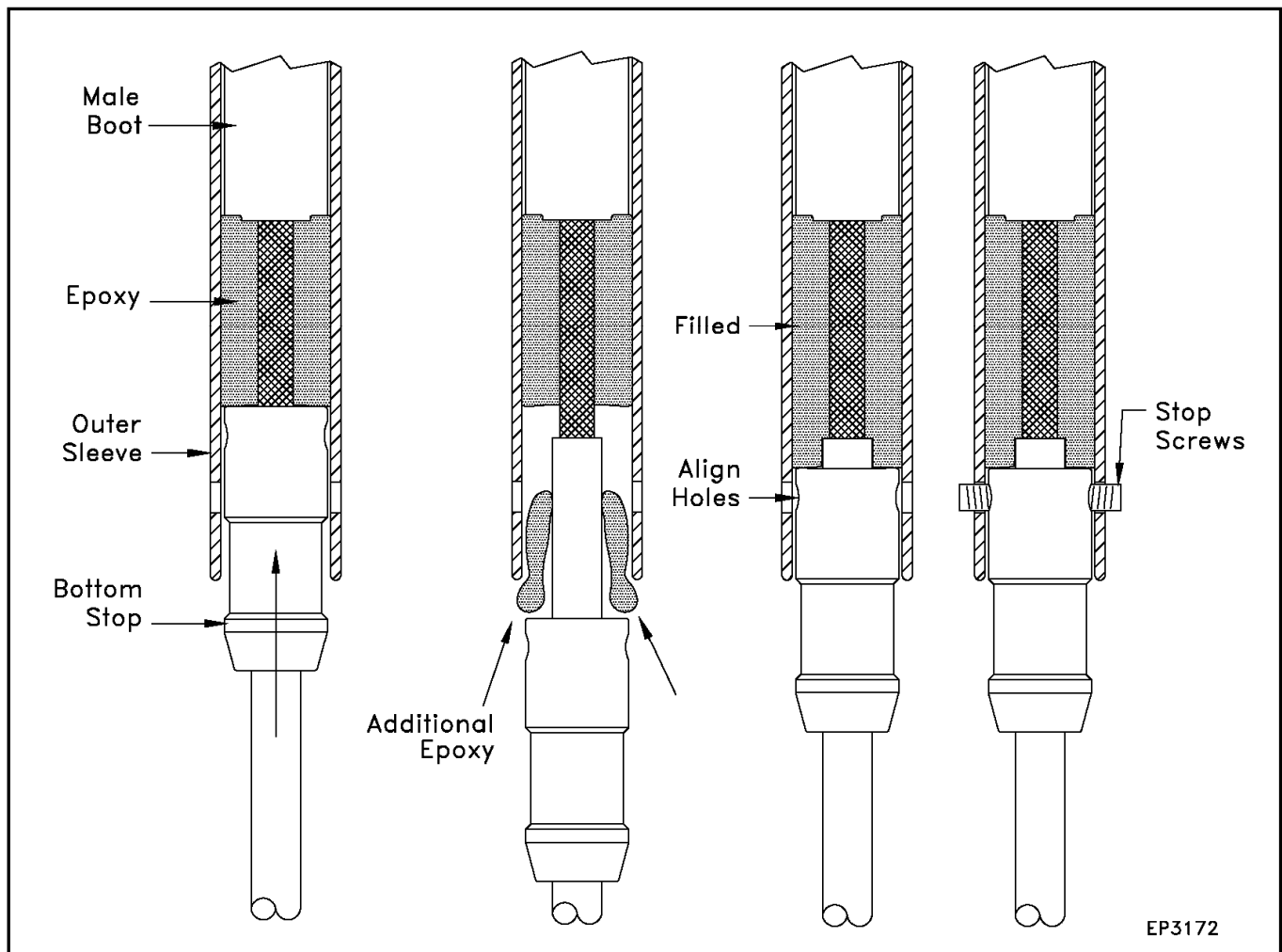
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19. Installing Bottom Stops

- A. Slide the Bottom Stop upward into the Outer Sleeve so that it compresses the epoxy inside (do not use too much force, just enough for the epoxy to flow). If the threaded holes in the Bottom Stops are above the holes in the Outer Sleeves, then more epoxy is necessary. If the holes align, proceed to step D.
- B. Slide the Bottom Stop down, and add a small quantity of epoxy to the inside of the sleeve.
- C. Slide the Bottom Stop back up again (to compress the epoxy) and check for alignment of the holes. Repeat steps B and C until enough epoxy is installed to have this alignment.
- D. Install (2) Stop Screws using the $5/32$ " Ball Driver.
- E. Repeat the **Epoxy Procedure** for the remaining 2 connectors.



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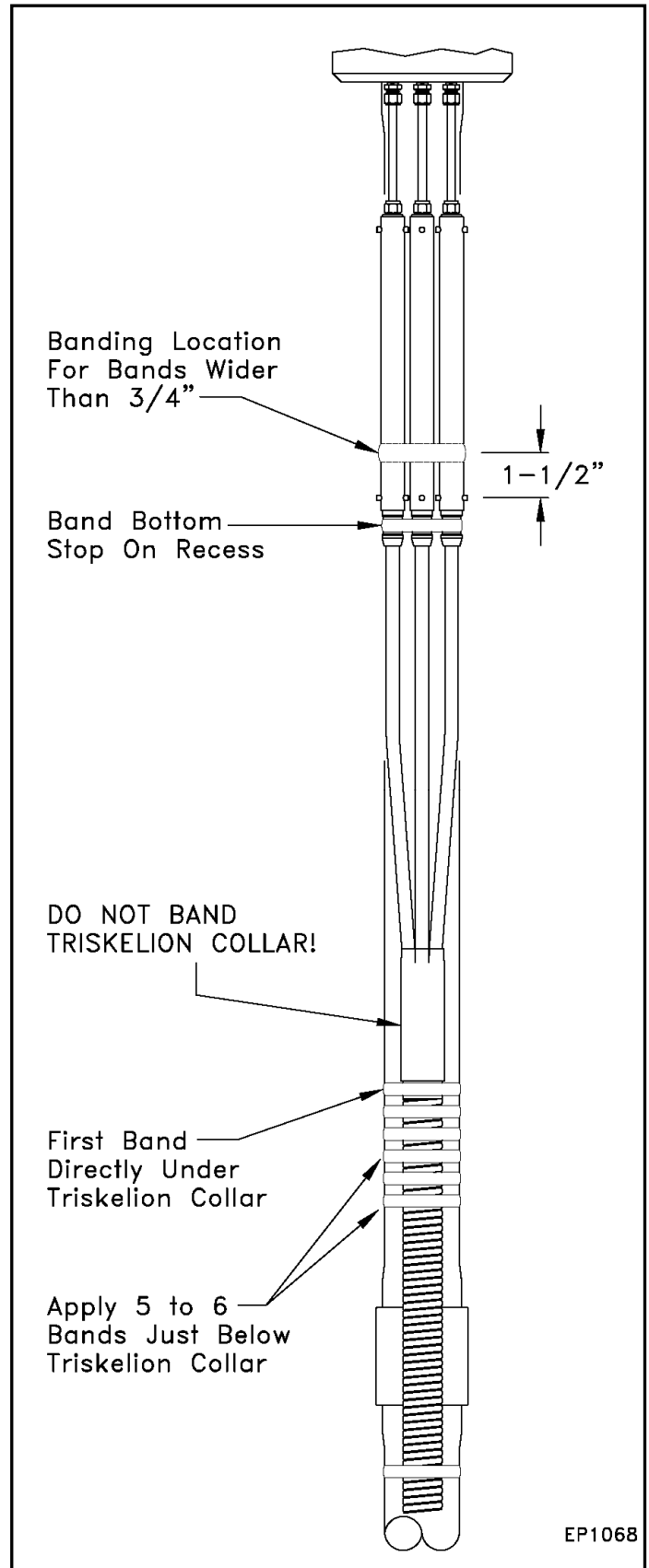
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20. Banding

- A. Install and tighten 6 stainless steel retaining bands over the armored cable just below the Triskelion.

DO NOT PLACE BANDS ON THE TRISKELION!

- B. Place one band over the recess of the Bottom Stop (for 3/4" wide bands).
- C. If wider bands are used, place one band approximately 1-1/2" above the Stop Screws on the Outer Sleeve. **Tighten the Band carefully to avoid damage to the Outer Sleeves.**
- D. After applying bands under the Triskelion, lift the tubing 15 ft. and add bands to unsupported pump cable from the **TOP** down. **NEVER** from the bottom up toward the connectors.



EP1068

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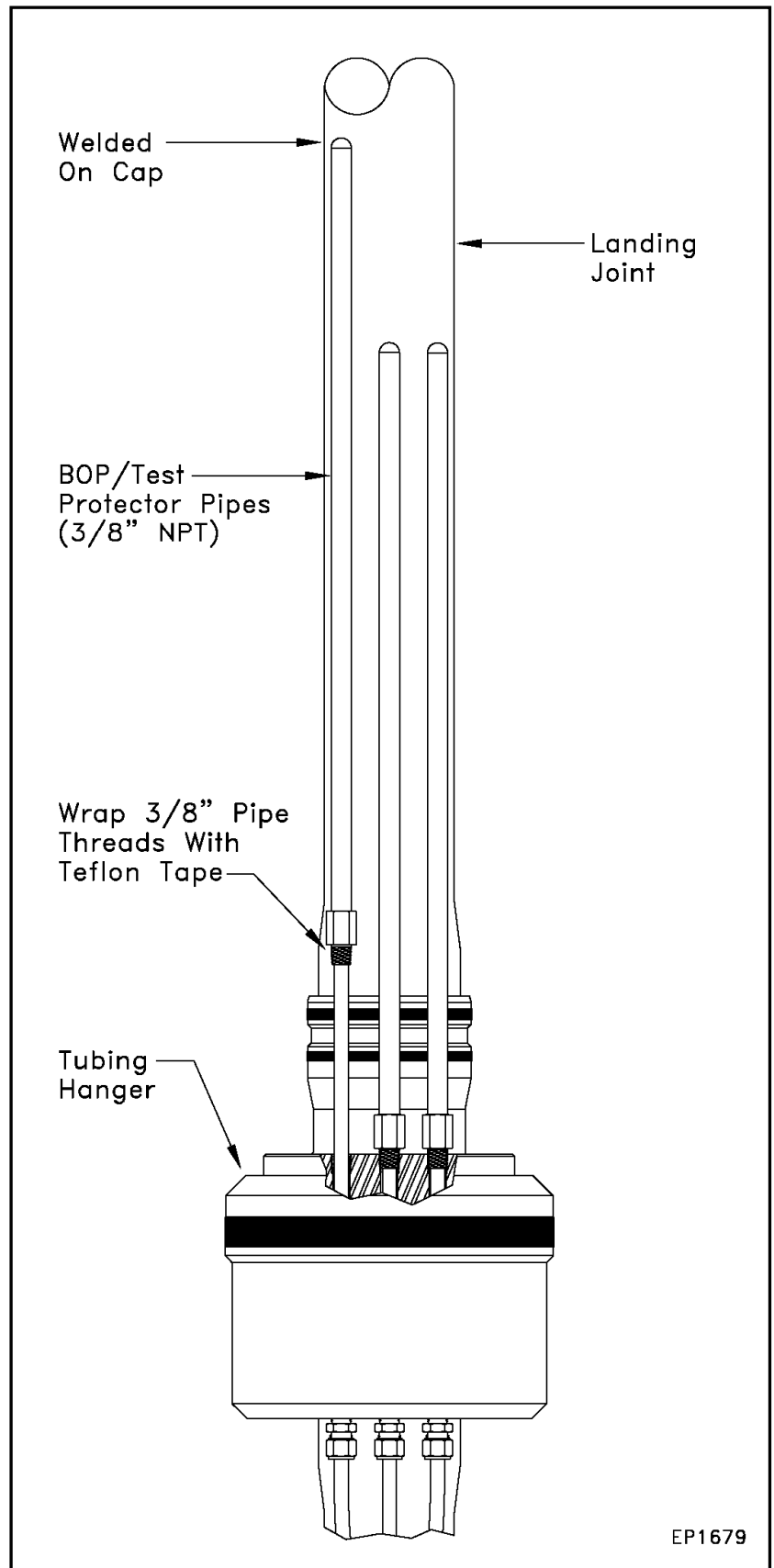
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21. Installing BOP/Test Protector Pipes (Or Hydraulic Hoses)

- A. Check resistance with highest ohmmeter scale, from one phase to ground, and from phase to phase between conductors. Record data.
- B. Apply anti-seize compound to the threads on top of the tubing hanger.
- C. Wrap the pipe threads of the BOP/Test Protectors with Teflon tape.
- D. Slide a BOP/Test Protector over each of the wires and Penetrator tubes and make them up tight into the top of the tubing hanger.
Flexible BOP/Test Protector Hydraulic Hoses may also be provided which will slide over each individual wire and thread into the top of the Tubing Hanger.
- E. The Rigid Pipes or Hoses will serve to protect the insulation on the Penetrator Wires and seal them off while the Tubing Hanger is run through the BOP Stack.

DO NOT TAPE OR TIE HOSES OR PIPES TO THE LANDING JOINT!



EP1679

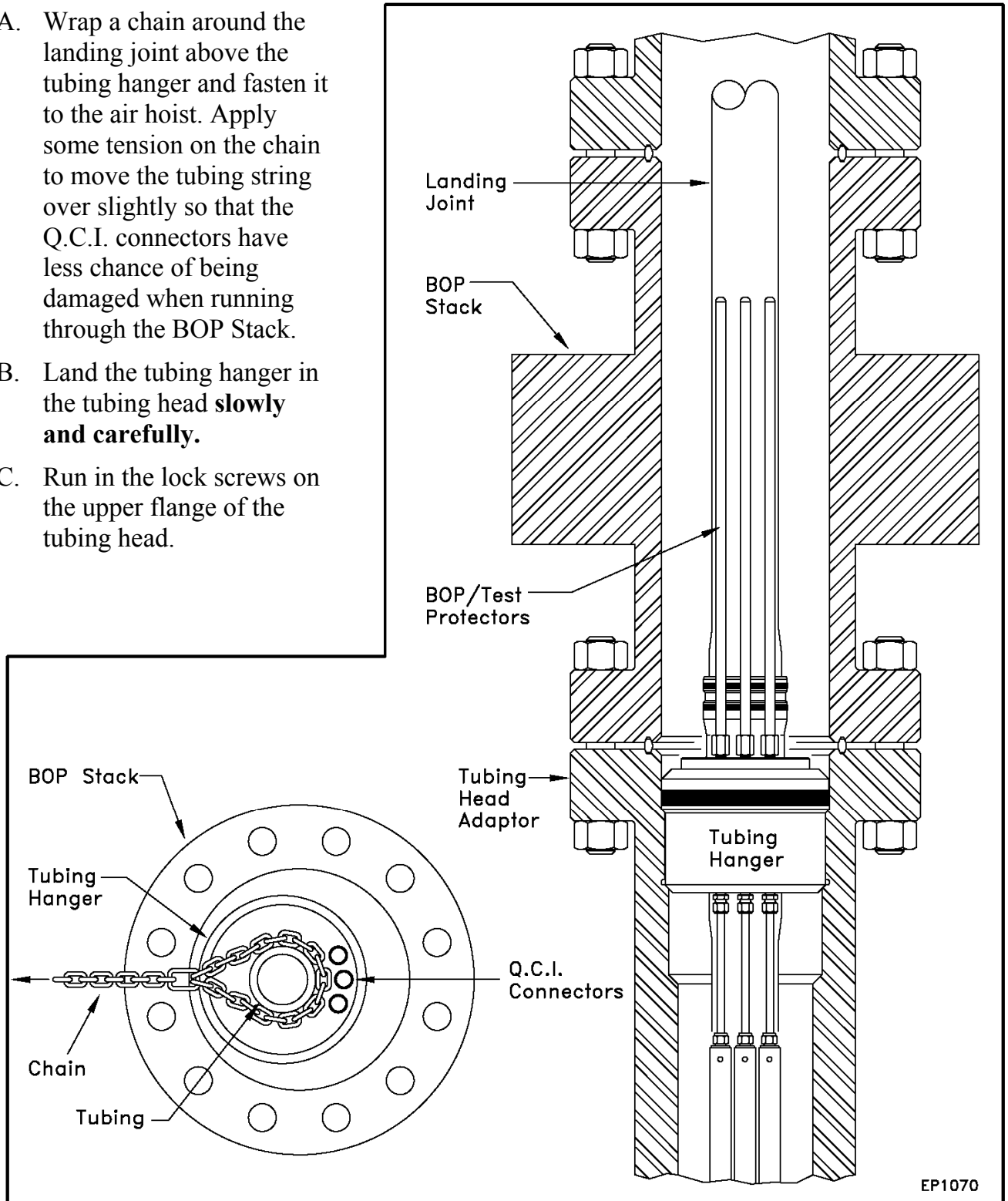
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22. Landing Hanger

- A. Wrap a chain around the landing joint above the tubing hanger and fasten it to the air hoist. Apply some tension on the chain to move the tubing string over slightly so that the Q.C.I. connectors have less chance of being damaged when running through the BOP Stack.
- B. Land the tubing hanger in the tubing head **slowly and carefully**.
- C. Run in the lock screws on the upper flange of the tubing head.



EP1070

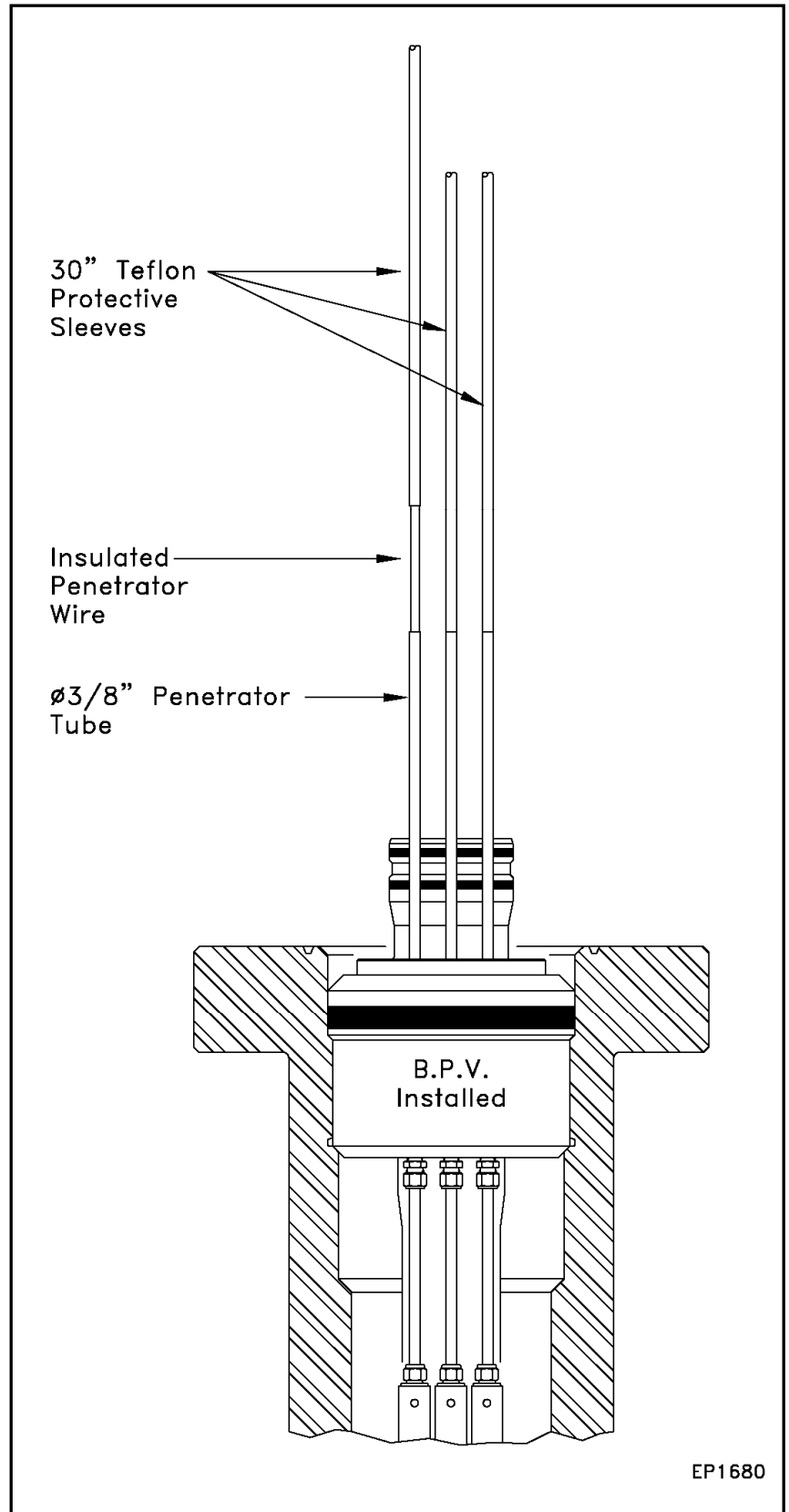
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23. Nipple Down BOP – Remove Protector Pipes

- A. Nipple down the BOP stack.
- B. Remove the BOP/Protector Pipes from the top of the tubing hanger.
- C. Install a 3/8" diameter x 30" long Teflon Sleeve over each of the Penetrator wires and shoulder them on top of the Penetrator Tube. These sleeves will protect the wire insulation while the Tubing Head is installed.



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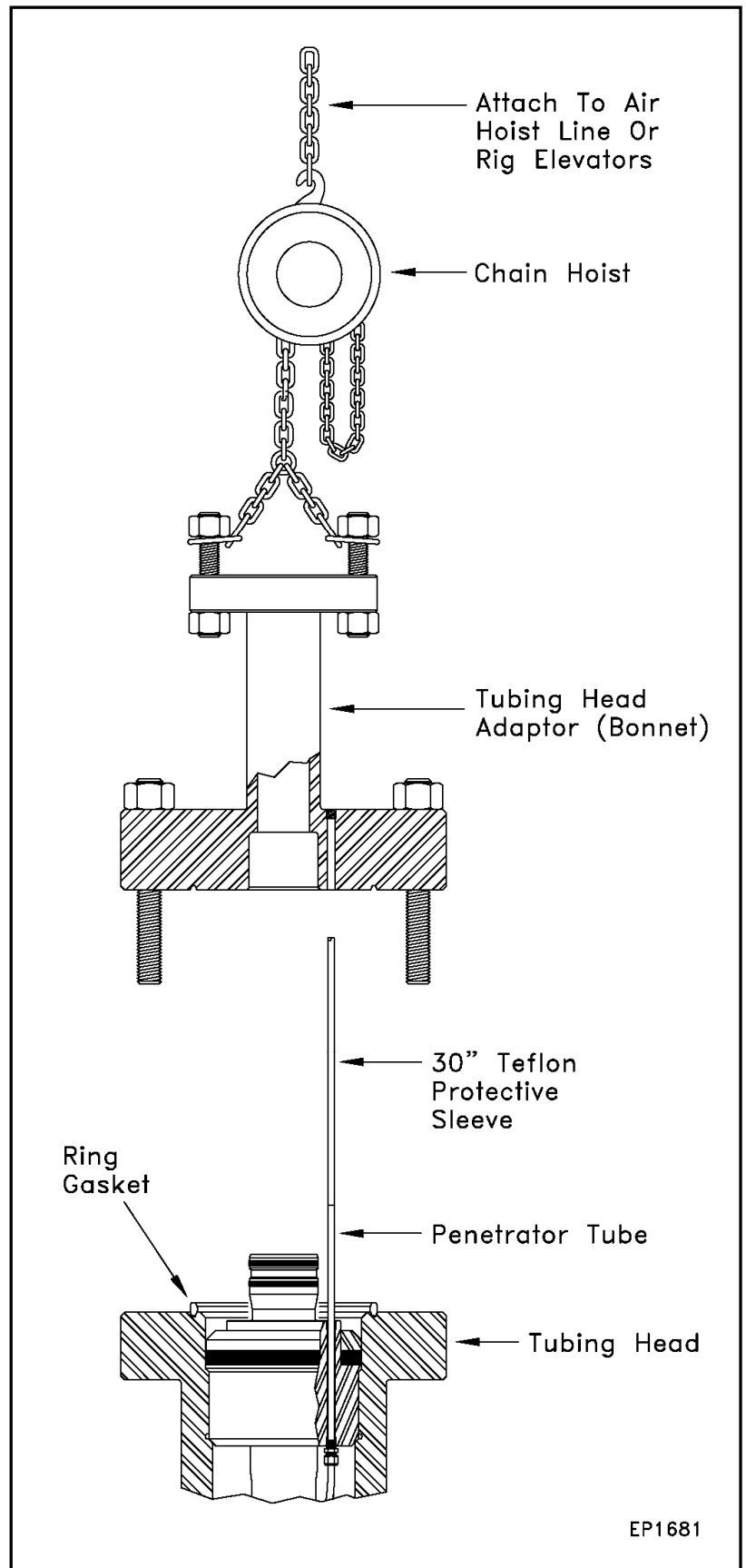
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24. Attach Chain Hoist

- A. Break off the bonnet adaptor from the Christmas Tree.
- B. Rig up a chain hoist to the bolts on top of the tubing head adaptor. Attach the other end of the chain hoist to the rig elevators or to an air hoist line.
- C. Pick up the tubing head adaptor (make sure it hangs straight) and position it above the end of all three Penetrator wires.
- D. Carefully feed the (3) wires through the tapped holes in the tubing head adaptor while lowering it with the chain hoist.
- E. Pull the wires outward slightly as they exit the flange to miss the upper flange of the tubing head adaptor.
- F. Land the adaptor and tighten all of the stud bolts tight. **BE CAREFULL NOT TO DAMAGE THE PENETRATOR WIRES WHILE TIGHTENING THE FLANGE!**

Note: Above is strongly recommended because of difficulty in controlling the lowering of the total tree assembly. Loss of control in lowering can cause damage to penetrators requiring complete replacement.

- G. Remove and save all (3) 30" Teflon sleeves.



EP1681

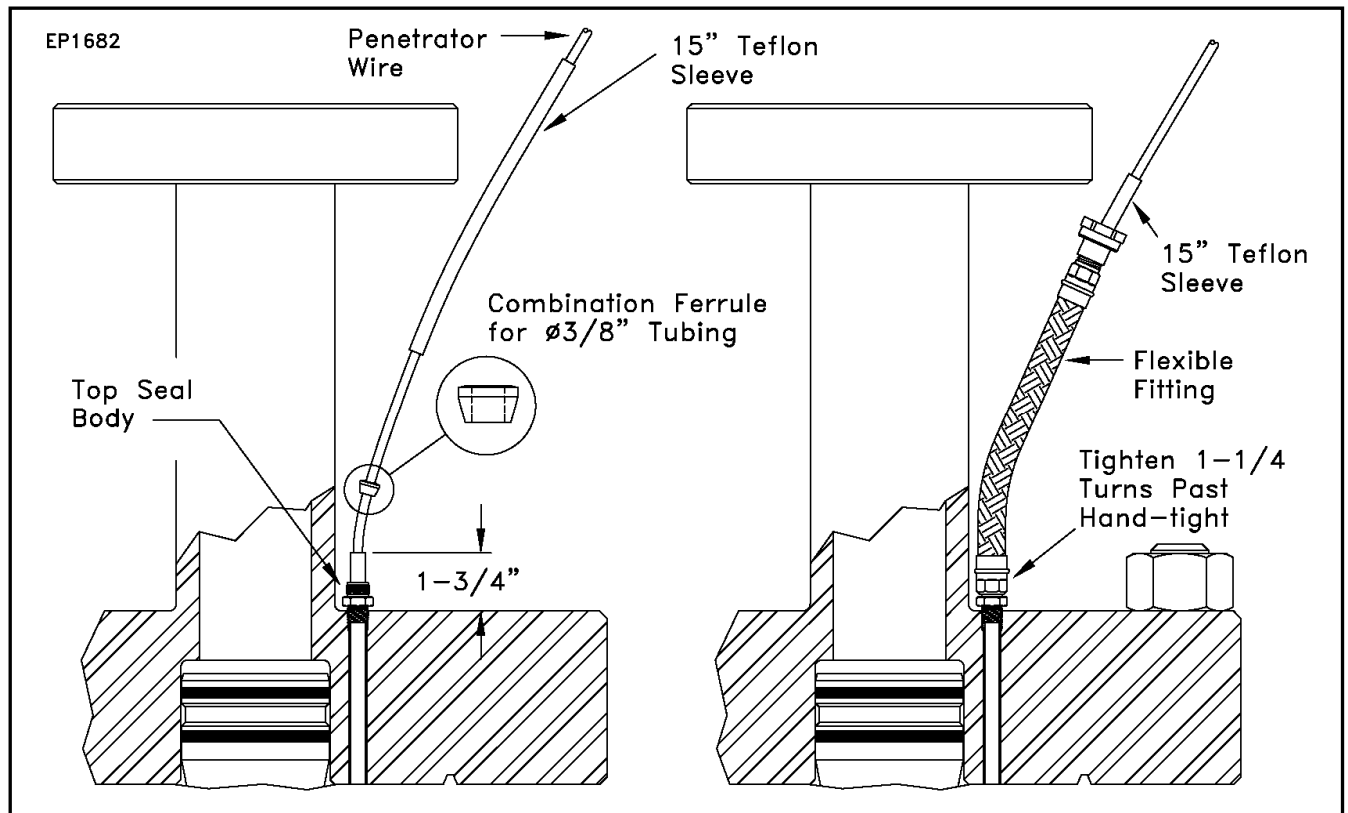
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25. Make-up Flexible Fittings – Pressure Test Void

- A. After the Tubing Head Adaptor is made up tight, at least 1-3/4" of Penetrator Tube should be sticking up above the flange so that the Top Seal Fittings can properly seal off on the Penetrator Tube.
- B. Apply anti-seize compound on the pipe threads of a Top Seal Fitting (3/8" pipe x 3/8" tube Swagelok). Tighten the fitting with an 11/16" wrench on the middle Penetrator wire of the tubing head adaptor.
- C. Place a Combination Ferrule for 3/8" tubes (2WA) over the middle Penetrator wire and seat it on the Top Seal (the taper end should go down).
- D. Slide a 15" long Teflon Sleeve over the Penetrator wire and shoulder it on the end of the Penetrator Tube. The Teflon Sleeve will protect the wire insulation while the Flexible Fitting is installed.
- E. Apply anti-seize compound on the straight threads of the Top Seal Fitting.
- F. Install a Flexible Fitting (4JA) over the middle Penetrator wire and make it up 1-1/4 turns past hand-tight into the Top Seal Fitting.
- G. Repeat for the other 2 wires. After all 3 hoses are made up, pressure test the ring gasket, tubing hanger seals, void, etc.



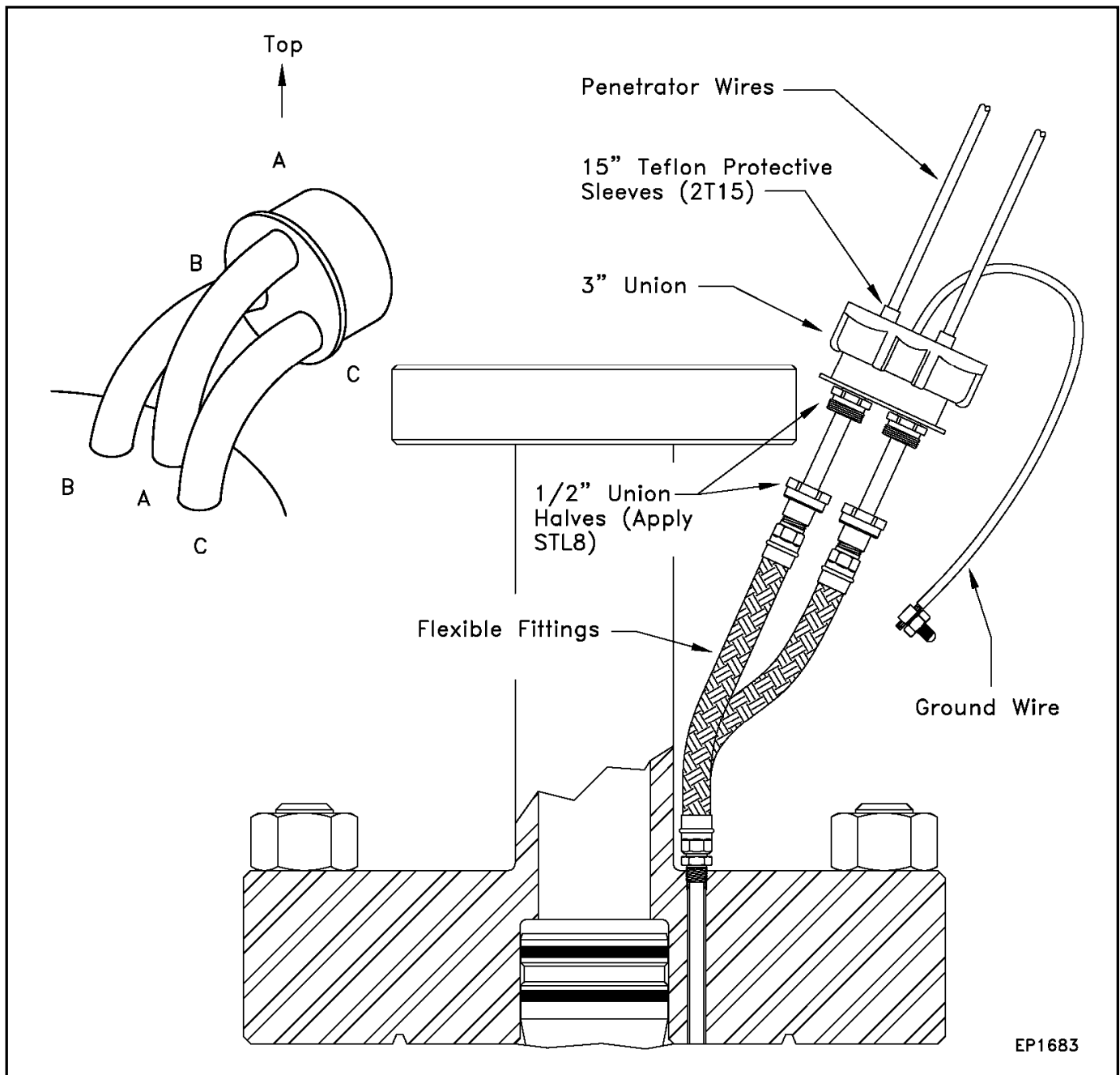
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26. Install 3" Union

- A. Apply STL8 Screw Thread Lubricant to the threads on all three 1/2" union assemblies.
- B. Feed the 3 pump cable wires through the 3" Union and make up the 1/2" Union halves up tight with small channel lock pliers. **NOTE: THE CENTER FLEXIBLE FITTING GOES IN THE TOP 1/2" UNION.**



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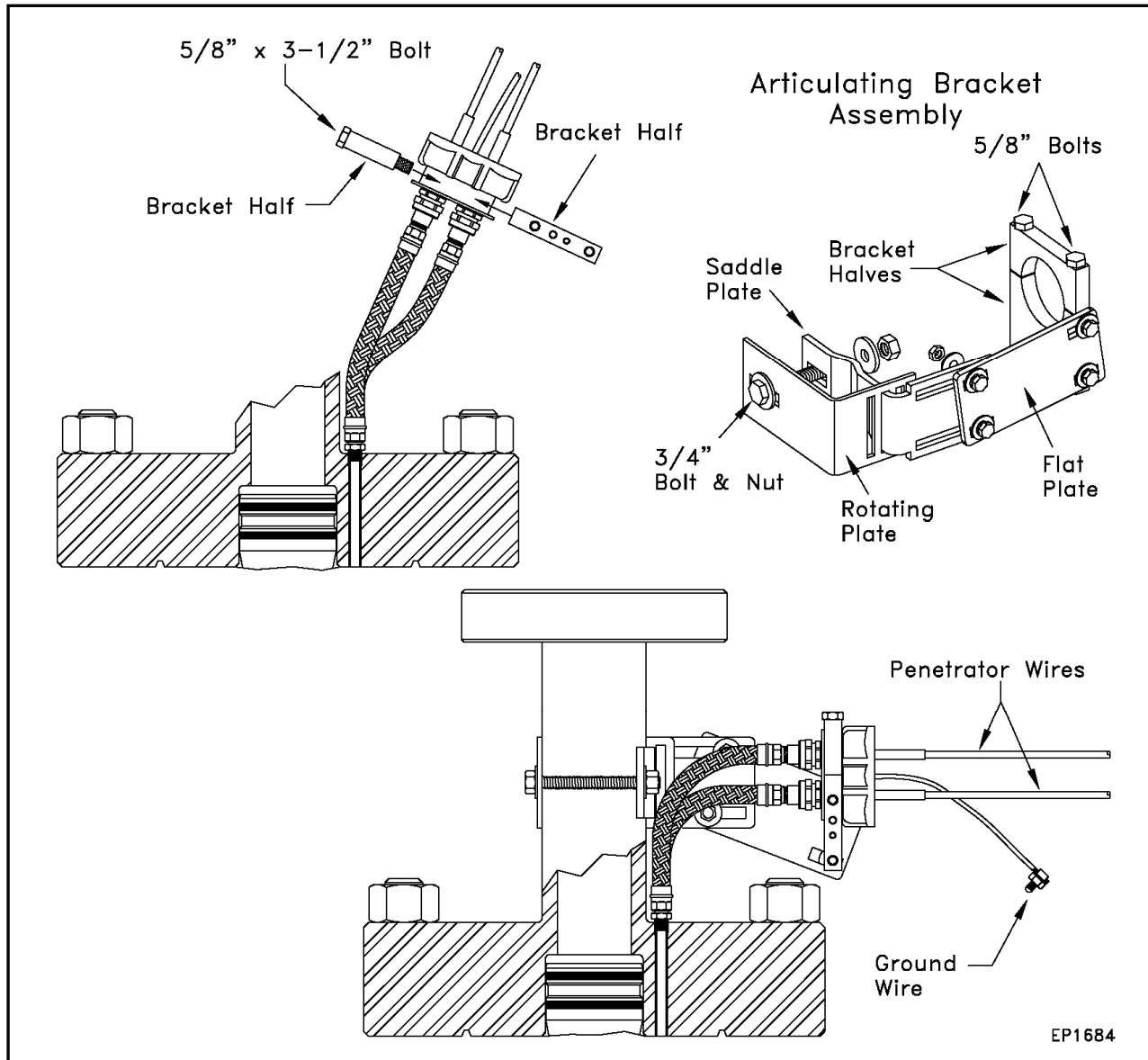
QUICK CONNECTORS INCORPORATED

P5000 PENETRATOR INSTALLATION
Generic For Flat Leaded Pump Cable

PROCEDURE: S-63
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27. Install Articulating Bracket Assembly

- A. Take the 2 Bracket Halves and fit them around the 3" Union as shown. Tighten the two 5/8" x 3-1/2" bolts tight with a crescent wrench. Make sure the nut on the 3" Union can rotate.
- B. Install the Rotating Plate and Saddle Plate around the neck of the Tubing Head Adaptor. Tighten the 3/4" bolt provided to secure the (2) pieces.
- C. Attach the Flat Plate to the Saddle Plate using the 1/2" bolts provided.
- D. Bend the Flexible Fittings over 90 degrees so that the 3" Union and wires are horizontal. Use the 1/2" x 1-1/2" bolts and their washers to make up the Bracket Halves to the Flat Plate.
- E. The wellhead Penetrator procedure is now complete. Follow the appropriate conduit instructions to make up the surface assembly.



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