

PLIDCO®

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PLIDCO® SPLIT+SLEEVE INSTALLATION INSTRUCTIONS

!! WARNING!!

IMPROPER SELECTION OR USE OF THIS PRODUCT CAN RESULT IN EXPLOSION, FIRE, DEATH, PERSONAL INJURY, PROPERTY DAMAGE AND/OR HARM TO THE ENVIRONMENT.

Do not use or select a Plidco Split+Sleeve until all aspects of the application are thoroughly analyzed. Do not use the Plidco Split+Sleeve until you read and understand these installation instructions. If you have any questions, or encounter any difficulties using this product, please contact:

**PLIDCO “DEPARTMENT 100” at 440-871-5700
toll free U.S. & Canada at 800-848-3333**

READ CAREFULLY

The person in charge of the repair must be familiar with these instructions and communicate them to all personnel involved in the repair crew.

Safety Check List

Pipeline repairs can be made with the pipeline in operation or shutdown.

- 1. Read and follow these instructions carefully. Follow your company’s safety policy and applicable codes and standards.
- 2. The Plidco Split+Sleeve should never be used to couple pipe unless sufficient end restraint is provided such as with a Plidco Clamp+Ring. The Plidco Split+Sleeve has no end restraint rating in its unwelded condition, and if so utilized could result in EXPLOSION, FIRE, DEATH, PERSONAL INJURY, PROPERTY DAMAGE AND/OR HARM TO THE ENVIRONMENT.
- 3. Observe the working pressure and temperature on the label of the Plidco Split+Sleeve. Do not exceed the maximum working pressure or temperature as indicated on the unit.
- 4. When repairing an active leak, extreme care must be taken to guard personnel. Severe injury or death could result.
- 5. If the pipeline has been shut down, repressuring should be done with extreme caution. Repressuring should be accomplished slowly and steadily without surges that could vibrate the pipeline and fitting. Industry codes and standards are a good source of information on this subject. Except for testing purposes, do not exceed the design pressure of the Plidco Split+Sleeve. Personnel should not be allowed near the repair until the seal has been proven.

Pipe Preparation

1. Remove all coatings, rust and scale from the pipe surface where the circumferential seals of the Plidco Split+Sleeve will contact the pipe.
2. The seal can tolerate minor surface irregularities up to $\pm 1/32$ inch.
3. Ensure the pipe is round where the circumferential seals will contact the pipe. Repositioning the Plidco Split+Sleeve or the use of a different length Plidco Split+Sleeve may be required.

Installation

Careless handling can damage the seals and GirderRings. Lifting devices such as chains, cables or lift truck forks should not be allowed to contact the seals or GirderRings. Contact can result in the seals being pulled from their grooves. (See Figure 1)

1. Coat all exposed surfaces of the seals with a lubricant. The chart below lists the lubricants that are recommended for the various seals. The customer must determine if the lubricant is compatible with the product in the pipeline.

Petroleum based lubricants	= A
Silicone based lubricants	= B
Glycerin based lubricants	= C
Buna-N	A, B, C
Viton	A, B, C
Silicone	C
Neoprene	B, C
Aflas	A, B, C
Hycar	A, B, C
Teflon	A, B, C
Kevlar	A, B, C

2. Clean and lubricate all studbolts and nuts, and prove free and easy nut running prior to the installation.
3. Assemble the Plidco Split+Sleeve around the pipe making sure the yellow painted ends are matched and that the fitting is centered over the leak and/or damaged area as much as possible. Sometimes it is helpful to loosely assemble the Plidco Split+Sleeve to one side of the leak, than reposition it centered over the leak
4. All studbolts and nuts should be uniformly torqued as indicated by the Plidco Torque Chart located on the back cover. The best results are obtained by maintaining an equal gap all around, between side bars, while tightening the studbolts. Ensure a minimum of 1/4 inch of studbolt extends beyond the nut.
5. To complete assembly, ALL studbolts should be rechecked at the recommended torque. Keep in mind; an increase in torque on one studbolt can cause a decrease in torque on neighboring studbolts.
6. The side bars are gapped approximately 1/8 inch when the Plidco Split+Sleeve is fully tightened.

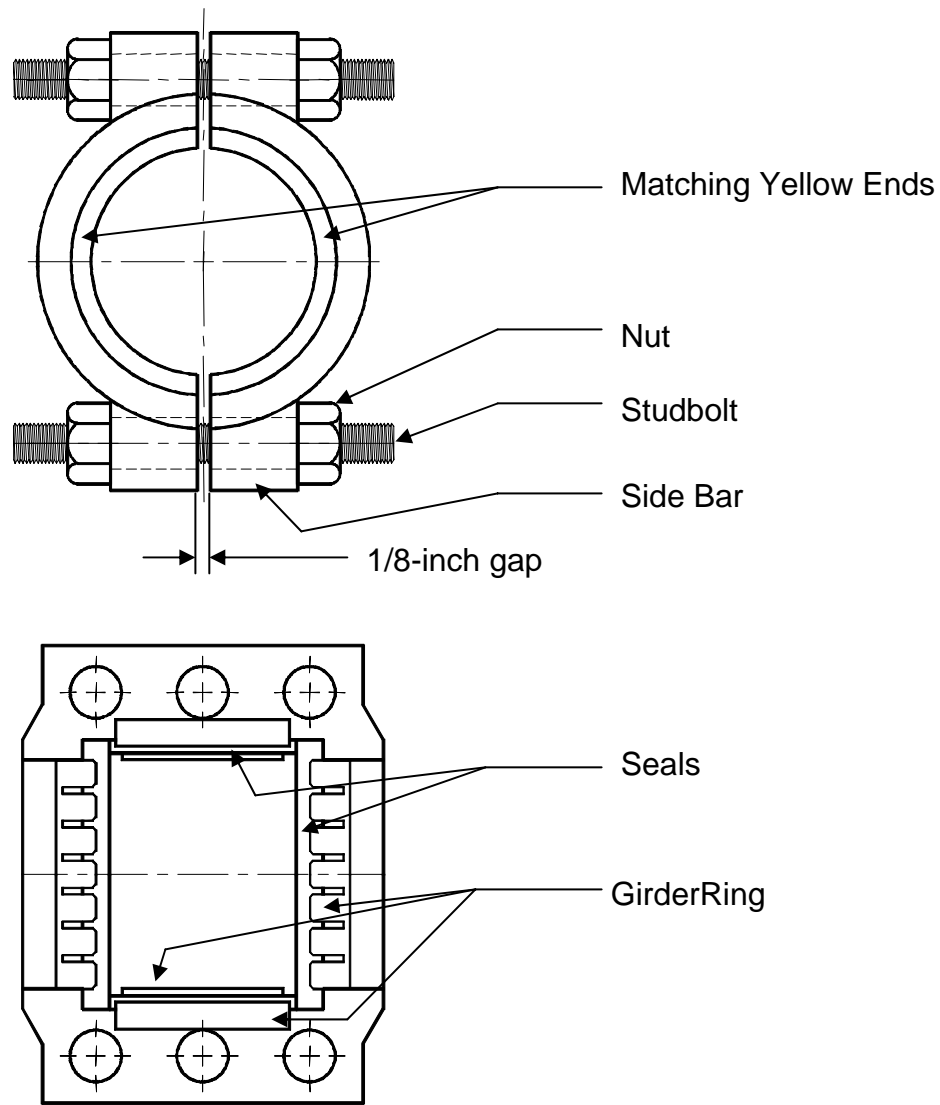


Figure 1

Repressuring and Field Testing

If the pipeline has been shut down, repressuring should be done with extreme caution. Repressuring should be accomplished slowly and steadily without surges that could vibrate the pipeline and fitting. Industry codes and standards are a good source of information on this subject. Except for testing purposes, do not exceed the design pressure of the Plidco Split+Sleeve. The Plidco Split+Sleeve can be field tested up to 1½ times its design pressure. Personnel should not be allowed near the repair until the seal has been proven.

Field Welding Instructions

Failure to follow field welding instructions could result in explosion, fire, death, personal injury, property damage and/or harm to the environment.

PIPELINE SHOULD BE FULL AND UNDER FLOW

Use weld material with equal or greater tensile strength than the pipe. Carefully control the size and shape of the circumferential fillet welds. The size of the fillet weld should be at least 1.4 times the wall thickness of the pipe. This assumes a 1.0 joint efficiency. You may need to select a different joint efficiency based on your level of inspection. Strive for a concave faced fillet weld, with streamlined blending into both members; avoid notches and undercuts. The smoother and more streamlined the weld, the greater the resistance to fatigue failure. The worst possible shape would be a heavy reinforced convex weld with an undercut. Improper weld shape can lead to rapid fatigue failure, which can cause leakage, rupture or an explosion with attendant serious consequences.

Welders and weld procedures should be qualified in accordance with API Standard 1104, *Welding of Pipelines and Related Facilities*, Appendix B, *In-Service Welding*. We strongly recommend the use of a low hydrogen welding process such as GMAW or SMAW using low hydrogen electrodes (E-XX18) because of their high resistance to moisture pick-up and hydrogen cracking. These are also the preferred welding process for seal welding the studbolts and nuts. SMAW electrodes must be absolutely dry.

It is very important that the field welding procedure closely follow the essential variables of the qualified procedure so that the quality of the field weld is represented by the mechanical tests performed for the procedure qualification.

We do not recommend the use of thermal blankets for pre-heating. Thermal blankets can generate hot spots and reduce the ability of the Plidco Split+Sleeve to dissipate welding heat in the vicinity of the seals. We recommend a small torch, such as a cutting torch, being careful not to aim the flame directly into the gap between the Plidco Split+Sleeve and the pipe towards the seals. The flame from a preheat torch is helpful in burning off oils and other contaminants. Do not use a large torch, commonly called a rosebud, because of the difficulty controlling the size of the area being preheated.

Monitor the heat generated by welding or preheating, particularly near the area of the seals, by using temperature crayons or probe thermometers. If the heat generated approaches the temperature limit of the seal material, which is indicated on the label, welding should be discontinued or sequenced to another part of the fitting so that the affected area has a chance to cool.

Seal welding the grade B-7 studbolts of the Plidco Split+Sleeve is the most difficult phase of field welding. They are made of AISI 4140 steel with a high carbon equivalence. By using a low hydrogen welding process with preheat, the problem of hydrogen cracking and pinholes can be reduced. The preheat will dry out any moisture, oil dampness or thread lubricant that may be present in the weld area. If the studbolt lengths need to be cut back, allow at least 1/4 inch of studbolt beyond the nut for the fillet weld.

Welding Sequence

1. Caution should be observed so that welding does not overheat the seals. Sequence the welding so that the heat is not concentrated in one area. It will be necessary to re-torque the studbolts and nuts periodically during field welding because weld contraction causes them to loosen.
2. Fillet weld ends to pipe. (See Figure 2)
3. Seal Weld side openings.
4. Re-torque studbolts and nuts.
5. Seal weld nuts to side bars.
6. Seal weld nuts to studbolts.

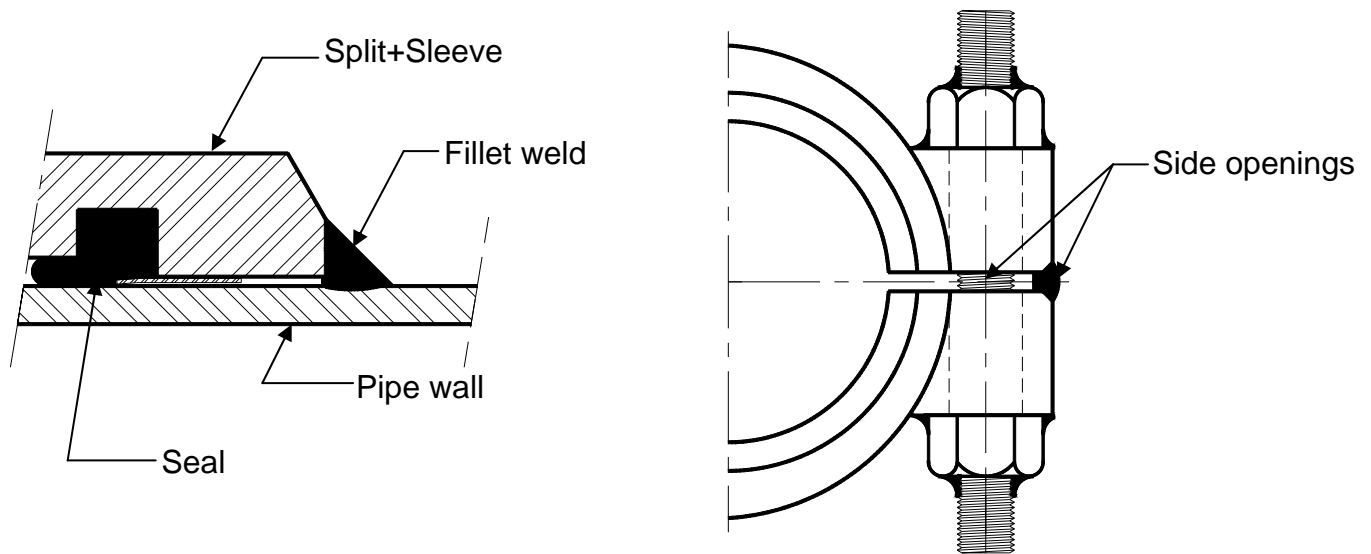


Figure 2

Storage Instructions

Plidco Split+Sleeves should be stored in a dry environment to prevent the unpainted surfaces from rusting. Storage temperatures should not exceed 120°F (49°C). Cover with dark polyethylene to keep the direct sunlight from the packing. It is best to exclude contamination, light, ozones and radiation. Improperly stored Plidco Split+Sleeves can cause the seal material to become cracked and brittle and lose its ability to seal.

Plidco Torque Chart

Nominal Diameter of Studbolt (inches)	Wrench Opening Across Flats (inches)	Torque Values			
		0.08 C_f		0.15 C_f	
		ft-lbs	Nm	ft-lbs	Nm
25,000 psi pre-stress					
5/8--11	1-1/16	33	45	56	76
3/4--10	1-1/4	57	77	98	133
7/8--9	1-7/16	91	123	156	212
1--8	1-5/8	135	183	233	316
1-1/8--8	1-13/16	197	267	342	464
1-1/4--8	2	274	372	480	651
1-3/8--8	2-3/16	370	502	651	883
1-1/2--8	2-3/8	485	658	857	1162
1-5/8--8	2-9/16	617	837	1096	1486
1-3/4--8	2-3/4	782	1060	1394	1890
1-7/8--8	2-15/16	968	1313	1730	2346
2--8	3-1/8	1180	1600	2116	2869
2-1/4--8	3-1/2	1695	2298	3053	4140
2-1/2--8	3-7/8	2340	3173	4231	5737
23,000 psi pre-stress					
2-3/4--8	4-1/4	2880	3904	5224	7083
3--8	4-5/8	3785	5133	6885	9336
3-1/4--8	5	4826	6545	8799	11931
3-1/2--8	5-3/8	6043	8194	11037	14967
3-3/4--8	5-3/4	7447	10099	13626	18477
4--8	6-1/8	9055	12278	16590	22497
18,800 psi pre-stress					
4-1/4--8	6-1/2	8891	12057	16313	22120
4-1/2--8	6-7/8	10569	14331	19413	26324
4-3/4--8	7-1/4	12444	16874	22882	31028
5--8	7-5/8	14530	19703	26743	36263
5-1/4--8	8	16837	22830	31014	42055
5-1/2--8	8-3/8	19375	26272	35717	48433
5-3/4--8	8-3/4	22156	30044	40873	55425
6--8	9-1/8	25191	34160	46504	63059

Studs: ASTM A193 Grade B7 - Nuts: ASTM A194 Grade 2H

Torque values shown in the table represent two different coefficients of friction (C_f); 0.08 and 0.15. When C_f equals 0.08, it is assumed the studs and nuts are clean, free running, free of obvious flaws and lubricated with a high-grade graphite-oil thread lubricant. When C_f equals 0.15, it is assumed the studs and nuts are clean, free running, free of obvious flaws and lubricated with a light weight machine oil. The torque values are safe minimums and represent approximately the bolt pre-stress values.