Conley Composites
an ANDRONACO INDUSTRIES company

INSTALLATION & FABRICATION MANUAL

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May
2023

IMPORTANT NOTICE

 Fiberglass Reinforced Plastic Piping products have unique characteristics and must be installed using sound, proven procedures. To avoid serious personal injury it is imperative that all installers / fabricators familiarize themselves thoroughly with the information contained in this Installation & Fabrication Manual material before fabricating the product. It is imperative that all installers / fabricators strictly follow the fabrication and testing procedures set forth in this manual, paying particular attention to all safety warnings, cautions and procedures. All installers / fabricators must read and thoroughly familiarize themselves and follow all instructions, cautions and warnings addressing heat tapes, adhesive kits or any Conley manufactured products, and on any other tools or products used. Improper installation may cause serious injury to person and property. Follow all general safety practices and procedures that include proper use of protective clothing, cleanliness of the work area, surfaces tools, etc., and maintain proper ventilation.

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INSTALLATION & FABRICATION MANUAL

I. GENERAL GUIDELINES

- **UPON ARRIVAL OF A SHIPMENT OF CONLEY PIPE AND FITTINGS, IMMEDIATELY INSPECT ALL PIPE AND FITTINGS FOR INTERNAL AND EXTERNAL DAMAGE.**
- **GENERALLY, SEVERE EXTERNAL SHIPPING DAMAGE INDICATES INTERNAL DAMAGE.**
- **BEFORE UNLOADING & ACCEPTING THE PRODUCT, VISUALLY INSPECT FOR DAMAGE. NOTE ANY DAMAGE ON THE BILL OF LADING. DAMAGED PRODUCT MUST NOT BE USED.**

1. UNLOADING PIPE AND FITTINGS

- FIBERGLASS REINFORCED PLASTIC (FRP) is lightweight; normally two people can easily unload the pipe.
- CAREFULLY LIFT and handle the pipe to prevent excessive bending. Do not drop or impact the pipe
- STORE THE PIPE off the ground and support evenly to avoid point loading.
- FOR SUPPORT, wooden 2x4 boards spaced every 5 ft. will supply an adequate bearing surface. Ensure that no sharp edges contact the pipe.
- COVER THE PIPE to avoid contamination.
- WITH LIFTING EQUIPMENT, use a sling rigged to two (2) points on the pipe.
- DO NOT USE FORKS OR LIFT POLES IN THE END OF THE PIPE.
- DO NOT USE CHAINS OR CABLES TO LIFT THE PIPE.
- DO NOT DROP OR THROW PIPE OR FITTINGS
- COVER THE FITTINGS to avoid contamination and protect from falling objects.
-  DO NOT POINT LOAD THE PIPE AND FITTINGS.

2. HANDLING PIPE AND FITTINGS

- Cut off any damaged section of pipe BEFORE use.

3. TOOLS REQUIRED FOR CONLEY FABRICATION

Figure 1 Typical tools required for fabricating

 ACCEPTABLE CUTTING TOOLS

(1). Circular saw with abrasive blade--(aluminum oxide, carbide or diamond tipped blade)

(2). Band Saw / Portable or Stationary (16 to 22 teeth/inch with a speed less than 600 ft/min. (Make sure the band saw is operated dry and free of lubrication)

(3). Hack saw with 22-28 teeth/inch

(4.) Reciprocating Saw with 16-22 teeth/inch

. PREPARATION EQUIPMENT AND SUPPLIES

(1). 4 ½" angle grinder with rubber backing pad and 36 grit disk or segmented style

(2). Flapper wheel for fittings sockets only (less than 100 grit)

MIXING OF ADHESIVE--TOOLS

(1). Flat mixing board-preferable 3 ft x 3 ft, any metal which is clean & oil free

(2). 3" stiff putty knife for mixing part "A" (Part 1) and part "B" (Part 2)

(3). 1" flexible putty knife for scrub-in and application of adhesive

(4). Wooden paint sticks to remove adhesive from containers and to apply adhesive to large diameter pipe

DO NOT USE THE SAME STICK USED FOR MIXING TO APPLY THE ADHESIVE

 SAFETY EQUIPMENT– IN ADDITION TO FOLLOWING OSHA AND JOBSITE SAFETY REGULATIONS

(1). Wear safety glasses or face shield when cutting and grinding pipe and mixing adhesive.

(2). Wear dust masks for cutting and grinding operations.

(3). Wear vinyl gloves for mixing and applying adhesive.

(1). POST CURE IS REQUIRED ON ALL JOINTS.

(2). *See "Conley Heat Tape Adhesive Cure Characteristics" chart for cure settings and times. (TABLE 1, page 8)*

4. PIPE AND FITTING PREPARATION

ABRADING—SANDING—GRINDING

(1). Measure the required length and cut the pipe with hack saw, circular saw, reciprocating saw or band saw.

 DO NOT CRUSH THE PIPE if clamping to hold. Particularly use caution when using a chain vice. Chain vices can easily point load fiberglass pipe. Use a pipe vise and protect the pipe surface from point loading.

(2). Prepare pipe ends, fittings and flanges for joining. Sand both pipe ends removing all gloss at least ½" beyond where the socket will end. When sanding the OD you want to sand down until you can see the glass strands that are almost woven together/ carbon fiber for conductive pipe, see picture.

Also make sure to sand the ends of the pipe to create a good surface for bonding. Prepare socket by sanding the inside diameter, the pipe stop and the face of the fitting. You will want to sand the fitting surfaces until no glossy surface remains.

Verify the fitment of the pipe to socket, you want an even gap all the way around the joint. If fitment is an issue, between a fitting socket and pipe end, sand the pipe OD until they fit together well. If fitment is an issue between a pipe end and a flange, sanding the OD of the pipe and ID of the flange socket is allowed.

Note: Never sand more than 1 hour before making a joint due to airborne contaminates that may foul sanded ends.

Avoid touching sanded ends with bare skin as this will prevent a proper bond. Once pipe and fittings are sanded wipe sanded areas with 99% isopropyl alcohol on a clean, lint-free rag to remove any oils or contamination.

. **Figure 2 Remove exterior glaze 1/2" longer than socket depth. Conley recommends using the 4½" grinder (illustrated).**

5. ADHESIVE MIXING

IMPORTANT NOTES

 Note 1: ADHESIVE KITS ARE PRECISION WEIGHED TO PROVIDE ACCURATE QUANTITIES FOR MAXIMUM STRENGTH AND OPTIMUM CHEMICAL RESISTANCE.

 DO NOT ATTEMPT TO RATIO SMALLER QUANTITIES FROM THE KIT.

 ALWAYS REMOVE ALL OF PART A AND PART B OR PART 1 AND PART 2 FROM THE CONTAINERS AND PLACE ONTO THE MIXING BOARD.

 Note 2: IN LOW AMBIENT TEMPERATURES, WARM THE ADHESIVE BEFORE MIXING. SEE COLD WEATHER CONDITIONING. *(Section 9)*

 Note 3: USE THE CORRECT ADHESIVE. CHECK THE LABELS FOR ADHESIVE KIT SIZE MATCH.

(Part A and Part B or Part 1 and Part 2 MUST MATCH.) C-WELD FOR EPOXY PIPING, VE-WELD FOR VINYL ESTER PIPING.

 Note 4: REFER TO TABLE 4 SECTION 12 TO MATCH THE KIT SIZE TO THE NUMBER AND SIZE OF JOINTS TO BE FABRICATED. Safety Data Sheets are supplied with each shipment and are also available on request.

. USE A FLAT SQUARE MIXING BOARD

(24" to 36") placed on a firm, flat surface. It helps to anchor the mixing board.

(1) (A). C-Weld and E-Plus Adhesive mixing directions.

Mix Part A to fully disperse any liquid that may have separated during storage.

Remove Part A from the container and spread out on flat mixing surface.

Add entire contents of Part B to the Part A spread out on the mixing surface.

Immediately start mixing Part A and Part B together for a minimum of 2 minutes until the color is consistent throughout.

After mixing is completed, spread the mixed adhesive on the mixing surface to remove any thick areas.

Bulked adhesive will create more heat and shorten the usable pot life of the adhesive.

(1) (B). VE Weld and Conductive VE Weld Adhesive mixing directions.

Mix Part A to fully disperse any liquid that may have separated during storage.

Remove Part A from the container and spread out on flat mixing surface.

Add 1/3 of the contents of Part B to the Part A spread out on the mixing surface.

Immediately start mixing Part A and Part B together for a minimum of 2 minutes until the color is consistent throughout.

Repeat spreading out the adhesive and adding 1/3 of the content of Part B and mixing until all the contents of Part B are used.

After mixing is completed, spread the mixed adhesive on the mixing surface to remove any thick areas. Bulked adhesive will create more heat and shorten the usable pot life of the adhesive.

Note: Conley vinyl ester adhesives Part B are small tubes of red MEKP. Conley epoxy and E-Plus adhesive Part B come in twist top jars.

6. APPLICATION OF ADHESIVE AND JOINT FABRICATION

 SCRUB-IN – The “Scrub-In” procedure works the adhesive into the abraded surface to provide maximum adhesion which is critical to fabrication of a strong mechanical bond. Scrub-in maximizes joint strength and chemical resistance. Scrub-in applies to the joint surfaces inside the fitting and outside the pipe including the end of the pipe and the bottom of the socket. Scrub-in also applies to any cut surface including the hole for a saddle branch. (See Fig 8, 9, 10 and 11)

 IMPORTANT NOTE
Scrub-in seals the end of the pipe or cut edges. Sealing the cut end of the pipe will prevent wicking of the fluid which could have a negative effect pipe structural integrity and ability to hold fluid under pressure.

(1). Using a small amount of adhesive, spread a thin layer over all the prepared area of the pipe, including the cut edge of the pipe. Using the side edge of the putty knife, scrape the prepared area. Scrub-in is best accomplished on the pipe by moving the knife in the direction of the length of the pipe. (See Fig 8 & 9)

Figure 8 Scrub the end of the pipe

Figure 9 Scrub the sanded surface of the pipe

(2). The first application of adhesive to the socket must be as a thin layer.
Adhesive must be worked into the pores of the fitting socket surface including the bevel (scrub-in). Use the edge of the stick or putty knife to scrub in the adhesive. (See Fig. 10). Seal the face of the fitting (See Fig. 11).

Figure 10 Scrub the socket of the fitting

Figure 11 Seal face of the fitting

 ADHESIVE APPLICATION BUTTERING

(1). Apply a thin even coat of adhesive in the fitting socket and on the face of the fitting (See Fig. 12).

 Note 1: Nominal adhesive thicknesses for fitting sockets is 1/16” for fittings 3” and smaller and 1/8” for 4” through 20”, and 1/4” for 24” and 30”.

Figure 12 Even coat of adhesive in the socket

(2). Apply a heavy coat of adhesive on the scrubbed area of the pipe. This layer should be a minimum of 3/8” thick and should exceed the tolerance between the pipe and fitting. Any excess will be pushed out to the end of the fitting where you will pull your fillet. Smooth and slightly taper the adhesive to help center the alignment as shown in Figure 13.

Figure 13 Applying adhesive

Figure 14 Connect fitting

 CONNECTION OF PIPE & FITTINGS

(1). Push the pipe into the fitting or the fitting onto the pipe (See Fig. 14 & 15). DO NOT withdraw pipe after insertion. DO NOT twist as you would with PVC. Any back movement or withdrawal may draw air into the glue line and cause leakage. Make any slight adjustments for plumb and level.

Figure 15 Do not twist pipe or fitting

Figure 16 Checking level

Figure 17 Checking plumb

Figure 18 Pulling a fillet

(2). Scrape excess adhesive "squeeze in" from the interior of the joint (usually possible in larger diameter piping). In small diameter piping a small even bead of adhesive must be visible. (See Fig. 19)

(3). Make sure you see a complete "Ring" (squeeze out) of adhesive at the end of the socket. If you do not, remove the fitting and start over, beginning with the ADHESIVE APPLICATION – "BUTTERING" on page 6. The inside of the fitting must have a small ring of adhesive uniformly filling the bevel area but not thick enough to cause flow restrictions.

Figure 19 Visually inspect for the correct amount of adhesive, a small even bead

(4). Use the excessive adhesive "squeeze out" on the pipe exterior to make an attractive fillet, and then remove the additional material. (Fig. 18 & 20)

Figure 20 A clean smooth fillet gives the joint a professional appearance.

7. SWABBING PROCEDURE FOR CONLEY PIPE

- WHEN FIELD FABRICATING SMALL DIAMETER CONLEY PIPING SYSTEMS (1½" and smaller), it may be necessary to pull a cleaning swab through the assembly to remove excessive adhesive.

- INSTALL A PULL CORD DURING ASSEMBLY of the pipe and fittings to insure a continuous length for the segment. This length will vary depending on the complexity of the segment, the number and type of fittings used, and the length of the straight runs.

- ONCE THE SEGMENT IS TOGETHER, tie a cleaning swab to the pull cord and pull it through before the adhesive hardens. Depending on the complexity and length, it may be necessary to pull the cleaning swab through in one direction; attach a new swab, and pull it back through. For this reason, it is best to initially attach a return pull cord to the cleaning swab.

- WHEN PULLING THE SWAB THROUGH, do not allow the joints to move.

8. ADHESIVE CURING & USE OF HEAT TAPES

Proper cure of Conley Adhesives requires the use of a Conley Heat Tape.

. Wrap the Conley Heat Tape around the pipe and fitting at the joint.

. You may begin the curing process while the joint is semi-cured or wait until several joints have hardened under ambient conditions and use the heat tape to cure multiple joints at the same time.

. However, if the ambient temperature is below 70° F always use the heat tape, on low heat, to achieve B-Stage (hard to the touch) and full cure.

Do not overlap heat tap.

Figure 21 Do not overlap heat tape.

TABLE 1 CONLEY HEAT TAPE ADHESIVE CURE CHARACTERISTICS

Joint Curing

Heat Tape must be used for all Conley adhesives. Use heat tape (LOW-MED.) to harden the fabricated joint until it is tack-free (Gel Time). Then apply heat tape, maximum of 225 °F for the cure time listed in the chart below.

Before moving pipe spool, the adhesive must be Stage B or tack-free. DO NOT install pipe spool into service until completely cured as listed on chart below.

Pot life and cure times of adhesive

Adhesive Temp °F	Pot Life (Min.)	Gel Time (Min.)
70-80	25-30	30-40
81-90	15-25	20-30
91-100	10-15	15-20
Under High Heat	Cure Time	Minutes
	1-6”	60
	8”	90

*** 12” and above will need more than one heat tape for full coverage**

- **Note 1:** Temperature conditions above 90°F necessitate lowering of the initial setting to avoid adhesive overheating which could cause air channeling and leakage.

- **Note 2:** Exposure to direct sunlight may shorten the setting and cure time.

- **Note 3:** Exposure to cool or cold wind will lengthen setting and cure time.

- **Note 4:** While these values are a good representation of the behavior of Conley adhesive, changes in humidity, exposure to sunlight, and exposure to wind (cooling) cause variations from these curing times. THESE APPROXIMATE CURING TIMES ARE GIVEN AS A GUIDE ONLY. You cannot over-cure a joint, so when in doubt – opt for a longer cure time.

9. COMPENSATION FOR TEMPERATURE VARIATIONS

All thermosetting adhesives are sensitive to temperature variations, not only in their curing time, but also in their behavior and workability. In the temperature range of 75°-90°F, Conley adhesive should appear as a stiff but workable paste. Although it is recommended that all fabrication work occur within this temperature range, various measures may be taken to effectively compensate for temperature variation.

- COLD WEATHER CONDITIONS: Cooler temperatures, less than 75°F, can cause components of the adhesive to stiffen. This will cause extreme difficulty in mixing the adhesive and "wetting" the surfaces to be glued.

(1). If possible place the adhesive kits in a warm area for approximately 8 hours before use. If this is not possible gently warm the individual containers (of Part 1 or Part A only) in an oven or with a heat tape. This will lower the viscosity sufficiently to permit proper mixing and application of the adhesive. Avoid overheating, as this will cause the adhesive viscosity to drop excessively. Overheating will also shorten the adhesive pot life.

(2). Warm the pipe and fittings before application of the adhesive to help insure a good "wet in" of the surface. Warm surfaces accept the adhesive much more readily than cold surfaces.

(3). Do not attempt to cure a joint too quickly. After the adhesive joint is made, it should remain immobile until the adhesive fillet is hard to the touch.

Allow the adhesive to "B Stage" using a Conley Heat Tape on Low setting. The joint must be allowed to reach "B Stage" (hard to the touch) prior to post curing with the heat tape. Rushing the process will result in adhesive percolation or boiling and render the glue unstable. This will cause the joint to fail!

(4). After reaching "B Stage", turn the heat tape to Max for at least 1 ½ hours.

- **Note 1:** For examples of common cure characteristics at given temperatures, see TABLE 1 Conley Heat Tapes. Fig. 21 illustrates proper heat tape application.

- **Note 2:** Although the glue on the outside of the fillet area may be hard, it does not necessarily mean that the adhesive on the inside of the joint is cured. The insulating properties of fiberglass fittings and pipe cause the "glue line" to cure more slowly than the outside fillet area.

- **Note 3:** Use the heat tape with insulation or an insulating reflective Mylar® blanket (space blanket) to hold heat in cold environments. Wrap the heat tape edge to edge with no gaps (DO NOT OVERLAP HEAT TAPE). Cover the ends of the pipe to stop the air flow.

- WARM WEATHER CONDITIONS:
- To extend the pot life of the adhesive in warm weather conditions, AVOID working directly in the sun. If fabrication in direct sunlight is un-avoidable, remember to spread the mixed adhesive thinly on your mixing board to extend pot life. (See Fig 7, page 5).

Bulking the adhesive on your mixing board for any length of time will decrease the pot life.

 CONDITIONS OF EXTREME HUMIDITY: Avoid fabricating outdoors in rain, fog, snow, or mist. Moisture on the surface of the pipe and fittings will prevent the proper bonding of adhesive. If fabricating is necessary under these conditions the pipe and fittings must be sheltered and thoroughly dried before, during, and until a fully cured joint is made.

Please read and follow all safety procedures.

10. BOLTING CONLEY FLANGES

- Conley flanges are fiberglass and will not withstand the torque that a metal flange will take.
- Use the Conley torque chart when bolting Conley flanges (TABLE 3).
- DO NOT OVER-TORQUE THE FLANGES. This will crack the flange, and the nuts and bolts will cut into the face of the flange, be sure to use washers.
- Use a cross torque pattern to tighten flange bolts. Snug the first bolt; snug the second bolt on the opposite side of the flange. Continue to snug the bolts in this cross fashion until all bolts are snug.
- Next, starting with the first bolt, torque in 5 ft-lb increments using the sequence shown in Fig. 22 until the specified torque is reached.

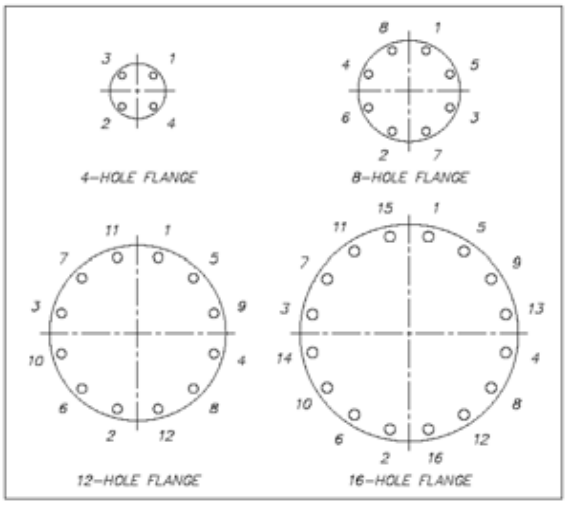

Figure 22 Flange Bolt Torque Sequence

- On flanges 10” and above, start the bolt torque at one half the recommended value and continue in 5 ft-lb increments using the sequence shown in Fig. 22 until the specified torque is reached.
- GASKETS ARE TO BE 1/8” FULL FACE, 50-70 DUROMETER ON SHORE A SCALE.

TABLE 2 CONLEY FLANGE TO CONLEY FLANGE

Conley Schedule 40 Flange Bolting, 150 PSI				
Flange Size	Holes	Hole Size	Bolt Size	Bolt Length
1”	4	5/8”	1/2”	3 1/4”
1 ½”	4	5/8”	1/2"	3 1/4”
2”	4	3/4”	5/8”	3 7/8"
2 ½”	4	3/4”	5/8”	4”
3”	4	3/4”	5/8”	3 7/8"
4”	8	3/4”	5/8”	4 5/8"
6”	8	7/8”	3/4"	4 1/2"
8”	8	7/8”	3/4"	4 3/4”
10”	12	1”	7/8”	5 1/8”
12”	12	1”	7/8”	6”
14”	12	1 1/8”	1”	6 3/4”
16”	16	1 1/8”	1”	7 3/8”
18”	16	1 1/4”	1 1/8”	7 7/8”
20”	20	1 1/4”	1 1/8”	8 5/8”
24”	20	1 3/8”	1 1/4”	9 ¾”
30”	Contact Conley for information			
Bolts: hex head with SAE flat washers on each side				

Note1: Washers are required on all nuts and bolts.
Note2: For 3”-8” Sch 30 Flanges please refer to Fitting’s Specification.

TABLE 3

Bolt Torque* ft-lbs (lubricated threads)					
Nom Size	1-2”	2½”-4”	6”	8-20”	24-30”
*cross torque	20	25	30	35	50

11. HYDROTESTING

Testing Recommendations & Procedures

 RECOMMENDATIONS

(1). Test Conley Fiberglass Piping Systems before use to help insure that the system is properly installed. **All joints must be post cured prior to line testing.**

(2). For above-ground systems, all pipe supports, guides and anchors must be in place and secured prior to testing.

(3). Never stand in the direct flow path or in front of a pressurized joint or fitting.

(4). Buried lines should be partially backfilled or weighted at intervals sufficient to secure the system prior to testing. Be certain to leave joints exposed for inspection and verification of soundness.

(5). Conley recommends that piping systems be tested in short sections during fabrication to verify the quality of installation as work proceeds.

CAUTION: WHEN TESTING FIBERGLASS PIPING SYSTEMS, SUDDEN SURGES IN PRESSURE KNOWN AS "WATER HAMMER" SHOULD BE AVOIDED. SUDDEN SURGES CAN CREATE VERY HIGH PRESSURES THAT OFTEN EXCEED THE PRESSURE RATING OF THE PIPE AND RESULT IN JOINT OR COMPONENT FAILURE.

Note 1: Monitor cold weather testing closely to prevent the possibility of freezing the liquid in the system.

WARNING: TESTING WITH AIR OR GAS IS EXTREMELY HAZARDOUS AND SHOULD NOT BE DONE DUE TO THE NATURE OF PLASTICS. A FAILURE DURING TESTING WITH AIR WILL CAUSE EXTREMELY DESTRUCTIVE WHIPPING OF THE PIPE AS WELL AS OTHER SHOCK INDUCED REACTIONS. THESE OCCURRENCES WILL LIKELY RESULT IN DAMAGE TO PROPERTY AS WELL AS INJURY OR DEATH TO PERSONNEL.

Conley will not assume any liability under any warranty, contract or in tort for any damage to property or equipment or injury to personnel that results from testing with air or gas.

In the event testing must be conducted using air, please contact Conley for suggestions that will help reduce the considerable risk involved. Notwithstanding Conley's suggestions, testing with air is entirely at the risk of the tester and/or those responsible for the testing.

 TEST PROCEDURES

Note 1: Always check local codes as they may dictate modifications to Conley's test procedures, or may require a different procedure.

CONLEY RECOMMENDS FOLLOWING THESE PROCEDURES VERY CLOSELY IN ORDER TO ELIMINATE THE POSSIBILITY OF SERIOUS PERSONAL INJURY OR PROPERTY DAMAGE. FAILURE TO FOLLOW THESE PROCEDURES WILL RESULT IN THE LOSS OF THE WARRANTY. THE BUYER, INSTALLER, ANY EMPLOYEE AGENT OR REPRESENTATIVE THEREOF ASSUMES THE RISK OF ANY PERSONAL INJURY OR PROPERTY DAMAGE CAUSED BY TESTING AND USER/TESTER, ASSUMES ALL RISKS ASSOCIATED WITH TESTING AND AGREES TO HOLD CONLEY AND ITS OFFICERS, DIRECTORS AND EMPLOYEES HARMLESS FROM ANY DAMAGES OF ANY TYPE THAT RESULT FROM TESTING.

The normal recommended testing procedure is to perform a hydrostatic test, either cyclic or static at 1 ½ times the design operating pressure. The duration and choice of static or cyclic will be a decision of the design engineer.

(1). FILLING THE PIPE FOR TESTING

- Slowly fill the system with water from the lowest point with the high point vents fully opened to allow air to purge. If high point vents are not being used, break loose the highest flange connection to allow for the removal of air.

- Insure that all high point loops are opened so that the line is able to properly purge.

- Once water begins to escape from the highest point, allow this process to continue for several minutes to clear the system of air. While water and air are coming from the highest points, slowly close all of the vents or flange connections.
DO NOT ALLOW PRESSURE TO BUILD AT THIS TIME.

(2). INSPECT THE LINE

- Inspect the line and check for leaks at glue lines or joint connections. If a leak is discovered at a flange connection, carefully tighten the flange.

- DO NOT OVER TORQUE THE FLANGE AS THIS WILL CAUSE THE FLANGE TO CRACK. LEAKS AT FLANGES ARE OFTEN THE RESULT OF A PINCHED GASKET OR DIRT ON THE SEALING FACE OF A FLANGE.

(3). BUILDING TO TEST PRESSURE.
Test pressure is usually 1.5 times the operating pressure.

After inspection of the system, slowly increase the pressure in small increments not to exceed 25-30 PSI. Repeat this process several times until the desired test pressure is achieved. Hydrostatic test duration is usually from 1-8 hours and is designated by the end user or specifying engineer.

12. PIPELINE REPAIRS

13. If a weep is discovered in the pipe wall, it is generally the result of impact damage or inadequately sealed pipe ends. Locate the source of the leak and cut out the damaged area and repair with new pipe and couplings, be sure to seal the end of the pipe.

14. If no obvious crack is found, there can be weeping caused by improper fab, not sealing the cut pipe end. The media can move around the corrosion barrier and “wick” into the cage (structural wall). Call Conley Composites for assistance and technical advice.

15. If the leak appears in the wall of the fitting, cut it out and inspect the interior carefully for impact damage. Replace with a new fitting**. Do not attempt to remove pipe from the fitting sockets or attempt to reuse the fitting.**

16. If a leak appears in the adhesive joint, cut out the joint and repair with a coupling or fitting.

17. Special overwrap procedures for temporary repair of lines are available. CONSULT WITH A FACTORY TECHNICAL REPRESENTATIVE BEFORE PERFORMING THIS REPAIR. FACTORY OVERWRAP KITS ARE AVAILABLE.
FOR ASSISTANCE PLEASE CALL CONLEY COMPOSITES AT 918-299-5051. solutions@conleyfrp.com

13. ADHESIVE INFORMATION

TABLE 4

SIZE	NOTE: # OF JOINTS PER 1 CUP KIT
1”	14
1 ½”	10
2”	7
2 ½”	5
3”	4
4”	2
6”	1

SIZE	NOTE: # OF 2 CUP KITS PER JOINT
8”	1
10”	2
12”	2
14”	2
16”	3
18”	3
20”	4
24”	4
30”	5

TABLE 5

Ultimate Pullout Strength C-weld, Esterweld, Furex	
SIZE	STRENGTH
1”	10,900 lbs
1 ½”	15,700 lbs
2”	23,000 lbs
2 ½”	37,000 lbs
3”	44,000 lbs
4”	74,000 lbs
6”	144,000 lbs
8”	202,000 lbs
10”	268,000 lbs
12”	364,000 lbs
14”	445,000 lbs
16”	569,000 lbs
18”	717,000 lbs
20”	875,000 lbs
24”	1,100,000 lbs
30”	1,700,000 lbs

ADHESIVE PROPERTIES

- Tensile Shear--1100 PSI
- Shelf Life--2 years at room temp
- Chemical Resistance: See Chemical Resistance Chart
- Pot Life after Mixing at 80°F: 30 Min (1/4” thick)

14. SADDLE INSTALLATION PROCEDURE

If the line is in service, drain and or depressurize the line prior to saddle installation.

- LOCATE THE SADDLE per drawing or field location. Dry fit the saddle in the desired location. With the saddle in place, trace around the outside of the saddle on the existing pipe with a marker. (Soapstone is not recommended). Also trace the I.D. of the branch socket before removing the saddle.

Figure 23 Locating the saddle

- USE A DRILL MOTOR and appropriate hole saw to drill the branch hole in pipe sizes up to 4”. For larger diameter branches, a reciprocating saw is recommended. Drill several holes just inside the drawn branch circle as the starting point for the reciprocating saw.

Figure 24 Drilling the branch hole

- **Note1:** When drilling holes in FRP use a high quality, sharp, metal bit. Do not force the bit through the wall of the pipe. Let the weight of the drill motor penetrate the pipe. If the bit is forced through the wall, damage to the inner corrosion liner could result.

- AFTER DRILLING the branch hole, use a 4 ½" angle grinder with a rubber backing pad and 24-60 grit sanding disc to abrade the exterior wall of the pipe within the marked area and about 1" beyond the line. Lightly sand the underside of the saddle. Dry fit the saddle to make sure the holes are properly aligned as well as the sanded area. If everything is acceptable, remove the saddle and degrease the O.D. of the pipe and underside of the saddle.

Figure 25 Sanding the pipe

Figure 26 Sanding the saddle

Figure 27 Check fit

- MIX THE CORRECT TYPE AND PROPER AMOUNT of adhesive and scrub into the prepared area of the pipe O.D. and the underside of the saddle. **Remember to seal (scrub-in) the cut edge of the hole in the pipe wall.** Apply a ¼" thick layer of adhesive on both the pipe O.D. and the saddle underside. Press the saddle onto the pipe and use a banding tool or hose clamps to tighten the saddle onto the pipe. Tighten the clamps to squeeze out the excess adhesive. As the adhesive is forced out, remove all but enough to form a neat fillet around the edges of the saddle. Remove the excessive adhesive on the inside of the saddle. Form a smooth transition from the pipe I.D. into the branch.

Figure 28 Scrubbing in the pipe surface

Figure 29 Sealing (scrubbing-in) the branch hole

Figure 30 Scrubbing in the saddle

- **Note 2:** If installing saddles with female pipe threads, closely watch the adhesive at the branch and remove the excess adhesive as it builds up to avoid coating the threads. Acetone or degreaser may be used to clean the threads while the adhesive is soft. Best option is to place tape over the threads prior to fabrication. Remove the tape after the joint is completed.

- **Note 3:** On large diameter branches, use a piece of cardboard or plastic to catch the excessive adhesive. Remove and discard the excess adhesive.

Figure 31 Setting the saddle

Figure 32 Securing the saddle and squeezing the adhesive

- FINALLY, HEAT TAPE THE SADDLE, see TABLE 1, page 8. Clamps or bands should be left in place.

Figure 33 Heat tape curing

15. CONLEY LARGE DIAMETER (24" & 30") PIPE FIELD JOINT FABRICATION PROCEDURE

- LARGE DIAMETER PIPE AND FITTINGS use the same straight socket joining system as all Conley Piping Products. The pipe and fitting joint preparation and dry-fit procedures are exactly the same for all sizes. Due to the volume of adhesive required, three mixing boards and three mixers should be available to mix and apply the material.

- SHADE THE PIPE AND FITTINGS from direct sunlight to keep the material as cool as possible. Have both the pipe and fitting in position with the necessary equipment to push the pipe into the fitting or the fitting onto the pipe.

- BEGIN MIXING the adhesive per instructions with three mixers working with five 2-cup kits. Have two of the workers mix (2) kits and one of the workers mix (1) kit. The single mixer will finish first and can begin the "scrub-in" process. When the other two mixers finish they will begin applying the thick layer of adhesive.

- ONCE SCRUBBED IN, apply the adhesive liberally to the outside of the pipe but only about ¼" in thickness to the inside of the socket of the fitting. Use all the adhesive that is mixed. Apply any excess to the outside of the pipe.

- PUSH THE PIPE STRAIGHT INTO FITTING (or fitting straight onto pipe), without twisting. Lock the joint into place with pulling equipment and immediately make a fillet or bevel. Reach inside the fitting (if possible) and remove any excess adhesive. Leave the pulling equipment in place until the adhesive is fully cured to avoid hydraulic "push-out" between the pipe and fitting.

- Refer to curing times in Table 1, page 8

- THE KEY TO LARGE JOINT FABRICATION IS to move quickly and keep any mixed adhesive spread thinly on the mixing board before application.

16. CONLEY SERIES 90M FABRICATION PROCEDURE

Conley Series 90M materials are typically used for off-shore piping systems where fire resistance is required. They can, however, be used anywhere a customer desires fire protected pipe and fittings.

- FABRICATION PROCEDURES. The fabrication procedures differ very little from standard systems. Those differences are:

(1). The fire protective coating must be removed to a distance 1" greater than the socket depth before removing the "glaze" from the exterior of the pipe. Refer to Section 4 Conley Installation & Fabrication Manual.

(2). The fire protective coating must be removed from the face of the fitting. Then lightly abrade the fitting face as stated in Section 4 Conley Installation & Fabrication Manual.

(3). Once the joint is properly fabricated and cured using standard fabrication methods, a field fire protective coating must be applied. This material is to be applied per Section 17.

- It is important to stress that the 90M FABRICATION PROCEDURES ARE THE SAME AS OTHER CONLEY SYSTEMS EXCEPT FOR REMOVAL OF FIRE PROTECTIVE COATING prior to fabrication and the recoating of the joints after fabrication and post curing.

17. CONLEY SERIES 90M, LLOYD'S & ABS TYPE APPROVED JOINT COATING KIT/FIELD PROCEDURES FOR FIRE PROTECTION COATING (FPC)

MATERIAL PREPARATION: Surface must be clean and dust free for proper bonding.

- THE ADHESIVE GLUE LINE must be lightly sanded to ensure a good bonding surface for the coating material.

- THE SANDED AREA must be wiped clean using alcohol or acetone.

- JOINT COATING is to be applied to a clean and dry surface by brushing. Use the brush supplied in the FPC Kit, or a similar type brush. Make sure to apply the coating past the glue line and onto the existing factory fire coating material to maintain the fire protection integrity of the piping system.

- COATING THICKNESS for the joint must be a minimum of 60 mils applied in two coats of 30 mils each. This is approximately 1/16 of an inch.

- THE COATING MUST BE ALLOWED TO AIR CURE. Cure time will depend on weather conditions. The coating must be protected from the elements until cured.

TABLE 6

FPC Kit Table			
Size	Approx. Fillet Area sq. in.	Kit Size	Approx. # Fillets Coated
1"	4	2 Cup	12
1 ½"	6	2 Cup	8
2"	8	2 Cup	6
3"	12	2 Cup	4
4"	15	2 Cup	3
6"	32	1 Cup	3
8"	41	1 Cup	2
10"	51	1 Cup	2
12"	82	1 Cup	1
14"	95	1 Cup	1
16"	108	1 Cup	1
18"	120	1 Cup	1
20"	136	2 Cup	1

Note: Kit size recommended is an approximation. This product has a relatively short pot life, and use of excess material is not recommended.

18. FABRICATION PROCEDURES FOR CONDUCTIVE PRODUCT

The following procedures must be followed when Fabricating Conductive Pipe and Fittings:

- FIRST, THE PIPE ENDS MUST BE GROUND to expose the conductive filament. The conductive filament strand will have a shiny appearance. Next, prep the end of the pipe by grinding and exposing the conductive filament string. Also, lightly abrade approximately 1" of the inner liner to ensure that the liner is clean.

- **Note:** If fabricating 90MC product, refer to Section 16, regarding the fire protective coating.

- THE SOCKETS OF ALL FITTINGS must be lightly abraded to ensure a good mechanical bonding surface for the adhesive. Also, lightly abrade the bevel area of the fitting to ensure that the conductive inner liner is clean.

- Grounding lugs are shipped (loose) independently from the pipe and flanges. Before beginning to fabricate,

pre-size the appropriate ground lugs for each joint size.

- **Note 1:** Between each flanged joint a gasket is used to prevent leakage. This gasket interrupts the conductivity of the piping system which makes using the stainless steel grounding lugs a necessity. Proper use and installation of this grounding lug is shown in Fig. 34 & 35.

- **Note 2:** Do not over-tighten the clamp. Leave a layer of adhesive between the strap and the pipe. Leave the grounding lug exposed.

Where conductive piping is required, the resistance per unit length of the pipe, fittings, elbows, tees, reducers, fabricated spools with branch connections, etc., should not exceed 88.4 KOhms/foot (2.9×10^5 Ohms/meter). Conductive piping not meeting this requirement may be used only in non-conductive applications.

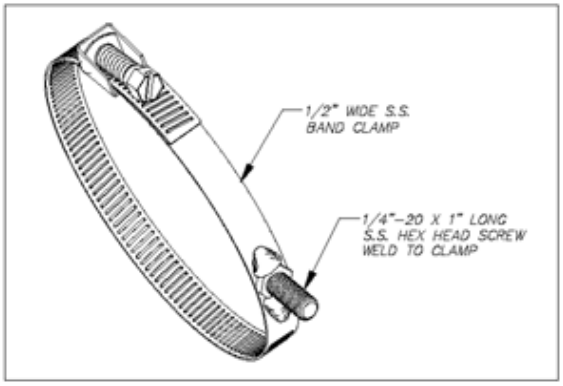

Figure 34 Ground Strap

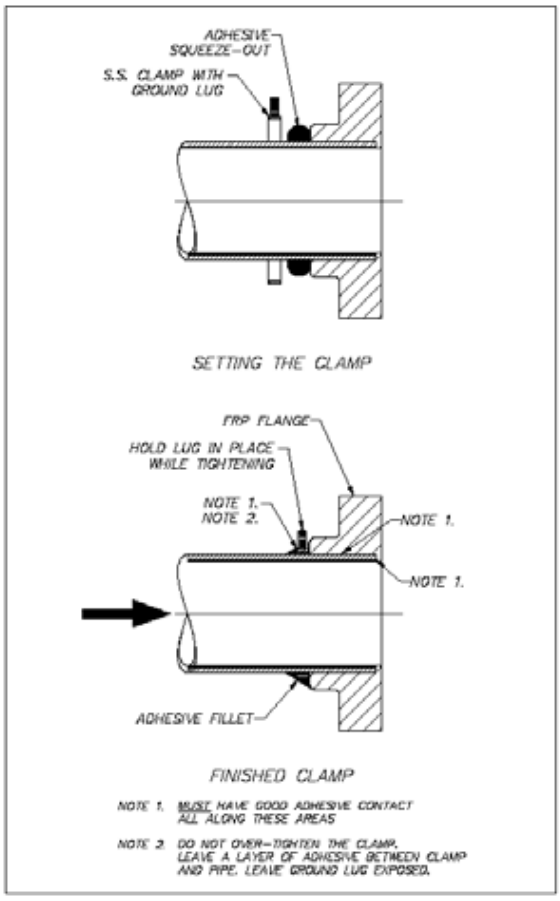

Figure 35 Grounding

Each side of a flange connection requires a grounding lug clamp. This permits the continuity to pass through or around a flanged joint connection. **A qualified electrician should provide the grounding strap or wire lead of suitable gauge to connect from one grounding lug clamp to the other.**

CONLEY CAN FURNISH THE STAINLESS GROUNDING LUG CLAMP with conductive adhesive for field installation. The grounding lug is ¼"–20 UNC threads.
FOR A DETAILED INSTRUCTION MANUAL COVERING RESISTANCE TESTING, CONTACT CONLEY (solutions@conleyfrp.com).

19. CONLEY DOUBLE CONTAINMENT PIPING INSTALLATION INSTRUCTIONS

 DOUBLE CONTAINMENT PIPE AND FITTINGS (FRP carrier and FRP containment); use our standard straight socket joining system. The carrier joints should be completed first and the containment pipe moved out of the way.

Figure 36 Double containment

 WHERE INTERLOCKING UNIONS ARE REQUIRED, locking rings should be slipped over the carrier pipe prior to assembly. One locking ring will be located on either side of the carrier coupling. The containment pipe should be trimmed shorter than the carrier pipe by a distance equal to the thickness of the locking ring plus one half the carrier coupling length. This step should be done on both ends of the containment pipe to allow the bridge coupling to fit with the correct overlap.

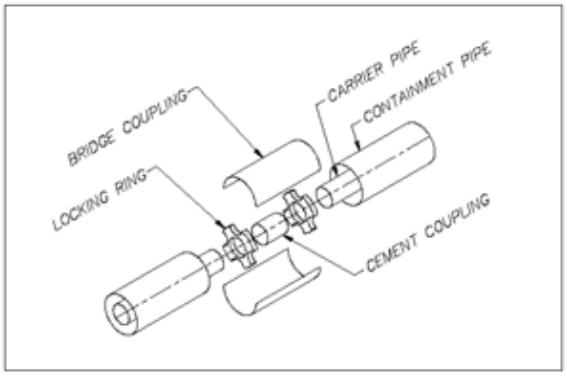

Figure 37 Interlocking Union

 GLUE THE CARRIER COUPLING onto the carrier pipe, making sure it “traps” the locking ring between the end of the containment pipe and the end of the coupling.

 SLIP THE REMAINING LOCKING RING over the connecting carrier pipe before applying adhesive. Glue the coupling onto the connecting pipe making sure it rests against the locking ring and “traps” it between the containment pipe and the end of the coupling. Since the locking rings are not bonded to the carrier pipe any leakage or seepage can still be detected during hydrotesting. Do not assemble the outer section or bridge coupling over the locking rings until the carrier system has passed hydrotest.

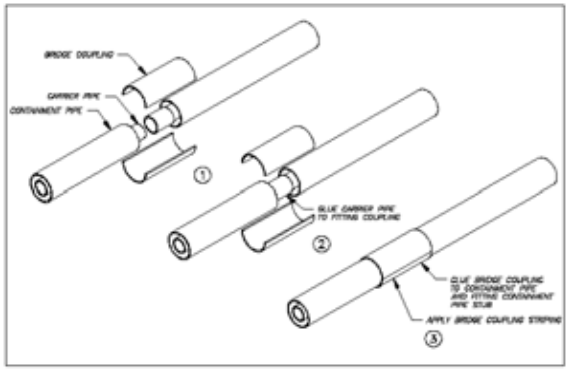

Figure 38 Double Containment Assembly

 WHEN ALL THE CARRIER JOINTS in a section or area have completely cured, the piping should be hydro-tested to 1.5 times the working pressure or rated pressure, whichever is lower. Test the carrier according to the Conley hydrotest joint procedure in Section 11.

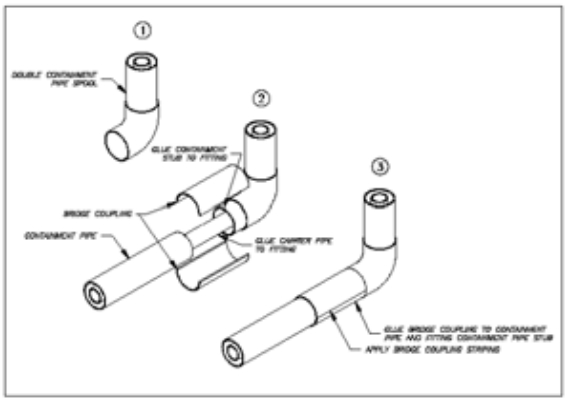

Figure 39 Double Containment Assembly

- AFTER THE CARRIER PIPE IS TESTED and all the joints are examined; the containment pipe joints may be completed. The bridge couplings may now be used to close the containment system. The containment pipe may also be tested for joint integrity. This is usually done with 5 to 10 psi vacuum.

CAUTION: DO NOT EXCEED THE MAXIMUM VACUUM RATING FOR THE SIZE AND SCHEDULE PIPE BEING TESTED See PRODUCTS Section for vacuum ratings.

20. CONNECTING CONLEY PIPING TO OTHER PRODUCTS

Follow the recommended gasketing and bolting requirements in Section 10, Fig. 22, Table 2 & Table 3.

- FLANGED CONNECTIONS--Flanged connections including flat face, raised face, etc.

Flange bolt connections must be tight enough to slightly compress the gasket and make a good seal without bending or adding excessive stress on the flanges. Maximum allowable misalignment in any direction is 1/16". Maximum angular allowable misalignment is 1/32". Suitable washers must be used between the bolt head/nut and flange surface. Bolts must be tightened with a torque wrench in suitable increments and in alternating sequence. Use lubricated bolts and recommended bolt torques from Table 3 in Section 10. ***Do not exceed the recommended flange bolt torque***.

Flange alignment must be achieved prior to tightening the bolts. **Any attempt to draw together or fix misalignment by tightening the bolts may result in cracking of the flange and hub.**

(1). Flat face flanges: Conley fiberglass flanges can be bolted directly to any matching flat face flange. **Conley flanges should never be pulled into alignment and never allowed to be pulled together, to close a gap.** Follow the recommended gasketing and bolting requirements in Section 10, Fig. 22, Table 2 & Table 3.

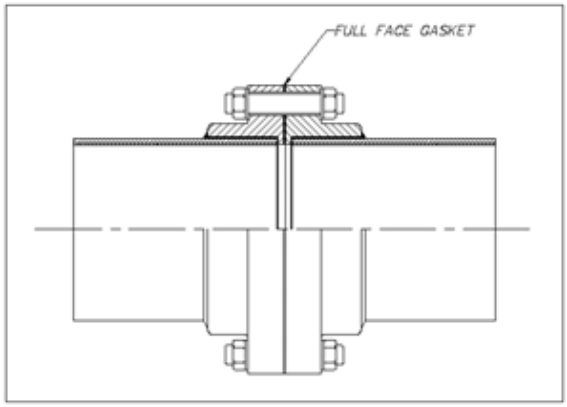

Figure 40 Flange Joint

(2). Raised face flanges: If a raised face flange cannot be machined flat, a spacer ring must be added to achieve a flat face. ***Do not exceed the recommended flange bolt torque in Section 10***. Follow the recommended gasketing and bolting requirements in Section 10, Fig. 22, Table 2 & Table 3. Steel backing rings may be used with Conley flanges to increase the flange stiffness.

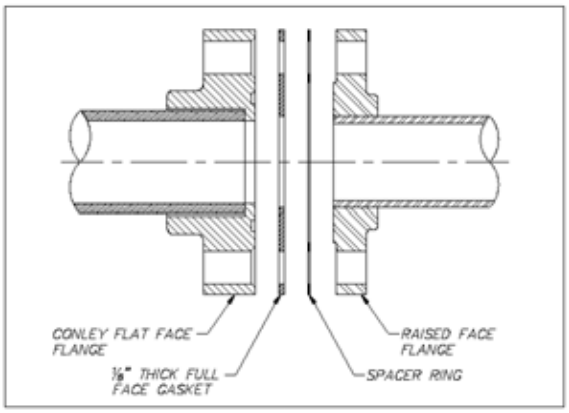

Figure 41 Raised Face Flange

(3). Valves and other components

a. Do not allow fiberglass pipe to support the weight of the valve or component.

b. Flanged valves: ***Do not exceed the recommended flange bolt torque.***. Follow the recommended gasketing and bolting requirements in Section 10, Fig. 22, Table 2 & 3. Steel backing rings may be used with Conley flanges to increase the flange stiffness.

c. Wafer body design and lug style valves: Refer to Figure 43 and 44 ***Do not exceed the recommended flange bolt torque***. Follow the recommended gasketing and bolting requirements in Section 10, Fig. 22, Table 2 & Table 3.

d. Threaded joints require TEFLON paste. DO NOT USE TEFLON TAPE

Figure 42 Conley diaphragm valve

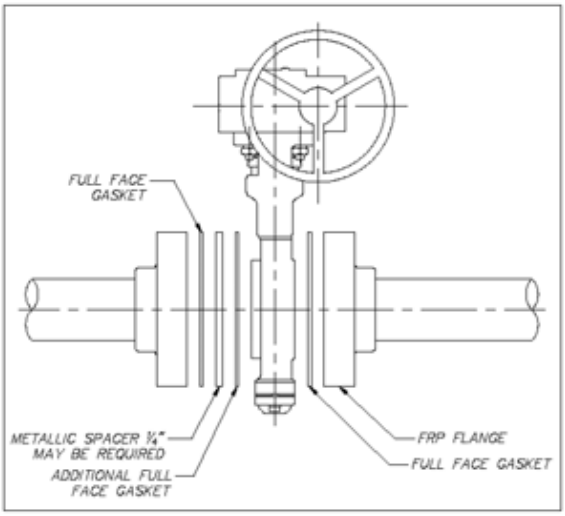

Figure 43 Lug Valve

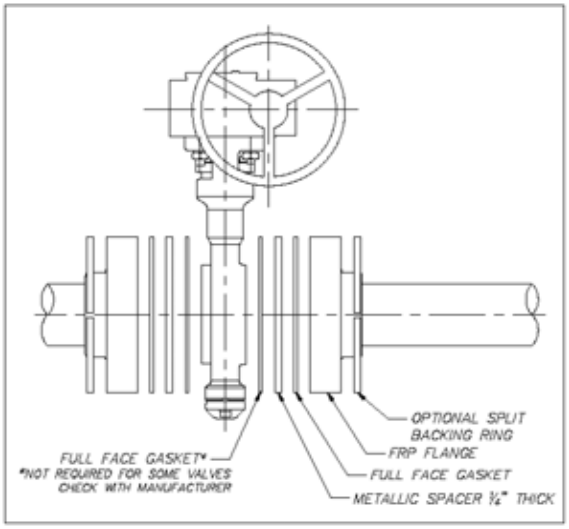

Figure 44 Wafer Valve

d. Threaded joints require special attention. The pipe or fitting should be threaded together "hand tight". Using a strap wrench *only*, tighten the joint an additional ½ to 1-½ turns past hand tight. Tightening beyond this point may cause excessive stress that may result in joint failure.

(4). Lined valves and piping connections

a. Special consideration is required for connecting to FRP flanges. Please consult the valve manufacturer for additional information.

b. ***Do not exceed the recommended flange bolt torque in Section 10***. Follow the recommended gasketing and bolting requirements in Section 10, Fig. 22, Table 2 & Table 3.

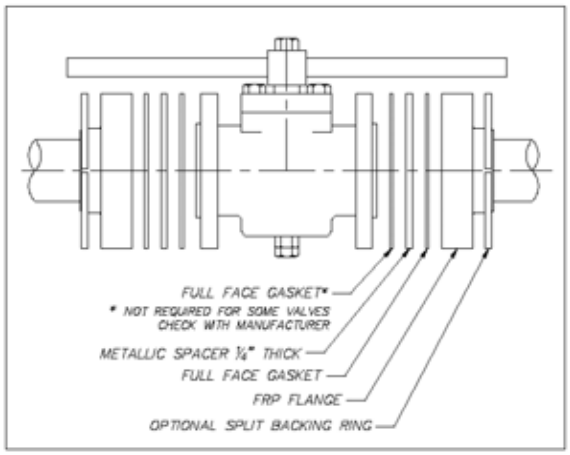

Figure 45 Lined Valve

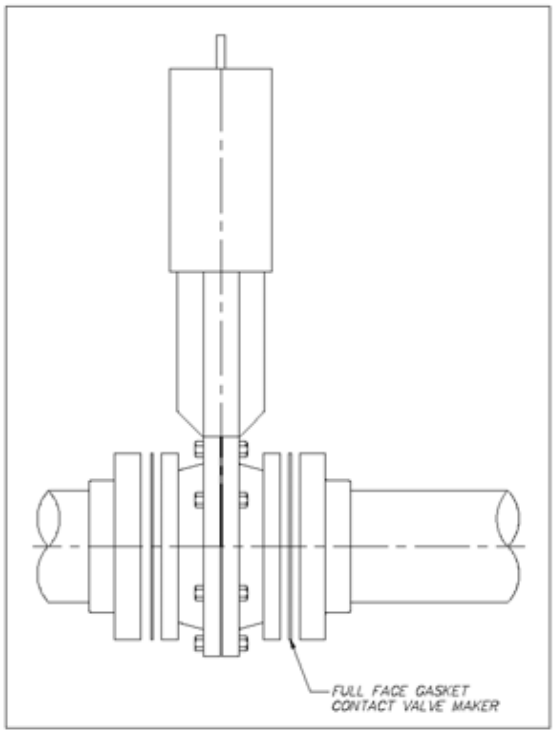

Figure 46 Knife Gate Slurry Valve

II. FABRICATION TRAINING SERVICES

Proper fabrication is critical to a successful installation. Conley Training Services are designed to provide the installation crew with the knowledge, skill and confidence to properly install and test Conley Materials.

Conley Training options available are:
1. Conley Standard Fabrication Training and Certification Program
2. Conley ASME B31.3 Training and Certification Program
3. Conley ABS Type Approval Bonder Training and Certification Program

Note: The ABS Program is designed to satisfy the fabrication / training requirements for Offshore Projects where ABS, DNV, Lloyd's are the surveyors of record.

1. Conley Standard Fabrication Training and Certification Program

This Training Program includes a classroom secession where the trainees review the Conley Installation & Fabrication Manual for All Type Approved Products And Conley Standard Products.

The classroom session is followed by a fabrication demonstration by a Conley Certified Trainer. Once each Trainee has demonstrated the proper fabrication techniques and completed the fabrication checklist, he or she will receive a Certification Card and Certificate.

2. Conley ASME B31.3 for Process Piping Training and Certification Program

This training program includes a classroom format where the trainees review the Conley Installation & Fabrication Manual for All Type Approved Products and Conley Standard Products.

Also, this program is built upon the ASME rule that the trainee is not only learning the written manual but must complete and witness a test of a spool they have independently fabricated.

The following information is listed in the ASME Code B31.3, Chapter VII, Nonmetallic Piping, para. A328 Bonding of Plastics.

ASME B31.3 requires a formal process of developing, documenting and qualifying bonding procedures and personnel performing the bonding.

The first step is to have a documented bonding procedure specification (BPS). The specification must document the procedures for making the joint, as set forth in para. A328 as follows:

- **BONDING RESPONSIBILITY**
  Each employer is responsible for the bonding performed by his personnel and shall conduct the required performance qualification tests to qualify bonding procedure specifications (BPS), and bonders or bonding operators.

- ***Note 1:*** *The information listed above can be found in ASME B31.3, para. A328.*

- ***Note 2:*** *The Conley Field Fabrication Certified Trainer will be responsible for completing the Training/Certification per the BPS. The Conley Bonding*

Procedures (BPS) consist of the Conley Installation & Fabrication Manual.

BPS REQUIRED SPECIFICATIONS

The BPS is required to specify at least the following:

- All materials and supplies (including storage requirements)
- Tools and fixtures (including proper care and handling)
- Environmental requirements (e.g. temperature, humidity and method of measurement)
- Joint preparation
- Dimensional requirements and tolerances
- Cure time
- Protection of work
- Tests and examinations other than those required by ASME B31.3 para. A328.
- Acceptance criteria for the completed test assembly

SIZE REQUIREMENTS

To qualify the BPS, at least one of each joint type covered by the BPS must be included in the test(s). With respect to size, if the largest joint is NPS 4 (100mm) or smaller, the test assembly is required to be the largest size to be joined. If the largest pipe to be joined is greater than NPS 4 (100mm), the size must be NPS 4 (100mm) or 25% of the largest pipe to be joined, whichever is greater.

QUALIFICATION RECORDS

The bonding procedure must be qualified by test to be used by the organization for which the bonder works. The BPS and records of the BPS qualifications must be maintained by the employer and be available for review by the Owner or Owner's agents and the inspector.

QUALIFICATION TEST

The qualification test is the same for the bonding procedure and the bonder. The bonder must fabricate an assembly and pressure test it. Testing shall be in accordance with para. A328.

General Notes from Conley:

- ***Note 1:*** Production joints shall be made only by qualified bonders or bonding operators who have appropriate training and experience in the use of the applicable BPS and have satisfactorily passed a performance qualification test that was performed in accordance with a qualified BPS.
- ***Note 2:*** Each qualified bonder and bonding operator shall be assigned an identification symbol. Each pressure containing bond or adjacent area shall be stenciled or otherwise suitably marked with the identification symbol of the bonder or bonding operator.
- **Note 3:** Please note that this is a summary only of the ASME Code requirements for B31.3, para. A328, Bonding of Plastics. Conley will follow the requirements of the project specification as it relates to the current edition of the code which must be in force and applicable.

3. CONLEY ABS TYPE APPROVAL BONDER TRAINING AND CERTIFICATION PROGRAM

This training program includes a classroom session to assist reviewing the Conley Installation & Fabrication Manual for All Type Approved Products and Conley Standard Products.

This program also is built upon the ABS rule that the trainee is not only learning the written manual but must complete and witness a test of a spool they have independently fabricated.

Typically, an ABS Surveyor whose time and scheduling are the responsibility of the contractor will be present to witness, at a minimum, the test of each individuals spool.

BONDING OPERATOR QUALIFICATION

Each bonder and each bonding operator are to make up test assemblies, the size and number of which are to be as required below.

TEST ASSEMBLY

A test assembly (spool) is to be fabricated in accordance with the Conley Qualified Joint Bonding Procedure for Type Approved Products and it is to consist of at least one pipe-to-pipe joint and one pipe-to-fitting joint.

When the test assembly (spool) has been cured, it is to be subjected to a hydrostatic test pressure at a safety factor of 2.5 times the design pressure for not less than one hour. No leakage or separation of joints is allowed. The test is to be conducted so that the joint is loaded in both the longitudinal and circumferential direction.

PIPE SIZE

Selection of the pipe used for the test assembly must be in accordance with the following:

When the largest pipe size to be joined is 8 in. (200 mm) nominal outside diameter, the size of the test assembly (spool) is to be either 8 in. or 25% of the largest piping size to be joined, whichever is greater. For Conley Type Approved Products through 20 in. diameter, the test assembly (spool) pipe size is to be 8 in. and fabricated in accordance with the drawing “ABS 8” TEST SPOOL DIMENSIONS”.

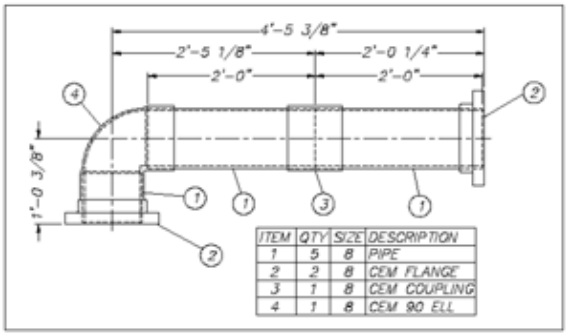

Figure 47 Test Specimen

To schedule on-sight fabrication training for your project contact:

Email: *solutions@conleyfrp.com*

Conley Composites

Broadmoor Ave. SE,
entwood, MI 9 12 SA
Phone: 1 . 12.
ax: 1 . 12. 1

III. FABRICATION TRAINING SERVICES:

Items required for on-site fabrication training

Items to have available for on-site training:

- ☐ Clean work table (example: 4' x 8' sheet of plywood on sturdy sawhorses, etc.).
- ☐ 2 ft x 2ft piece of clean plywood, particle board, or like material to be used for mixing adhesive.
- ☐ 3" Stiff putty knife.
- ☐ 1" Flexible putty knife.
- ☐ 4 ½" angle grinder.
- ☐ 4 ½" rubber backing pad and sanding discs (24 to 60 grit). OR
- ☐ 4 ½" one piece "flapper style" sanding pads (24 to 60 grit).
- ☐ Drill Motor.
- ☐ 60 grit sanding drum to fit in drill motor.
- ☐ Clean Rags.
- ☐ One gallon of Acetone or Denatured Alcohol.
- ☐ 60 to 80 grit sand cloth.
- ☐ Other standard pipe fitting equipment (level, square, pipe stands, etc.)
- ☐ XL latex "surgical" style rubber gloves.
- ☐ Power supply, extension cord, etc.
- ☐ Dust Masks.

Cold Weather (below 60 degrees F)

1. Portable forced air heater.
2. Heat tent.
3. Heated area to keep fittings and adhesive warm.

Hot Weather (above 80 degrees F)

1. Shaded area for mixing adhesive.
2. Cool area for storing adhesive.

To schedule on-sight training for your project contact:

Email: *solutions@conleyfrp.com*

Conley Composites
Broadmoor Ave. SE,
entwood, MI 9 12 SA
Phone: 1 . 12.
ax: 1 . 12. 1

CONLEY COMPOSITES
FABRICATION SEMINAR TRAINEE SIGN-OFF SHEET

INITIAL FOR PREPARATION OF CONLEY PIPE & FITTINGS

_____ 1. Proper cutting of Conley Pipe.

_____2. Glaze must be removed before cementing to a distance 1" greater than the socket depth.

_____ 3. Use a 24-60 grit abrasive sanding disc on a 4 ½" angle grinder with rubber backing pad.

_____ 4. Clean the fitting sockets with emery cloth (sand cloth) or a flapper wheel to abrade the surface of the socket and remove any potential contamination. (Grit must be 100 or less)

_____5. Surface must be cleaned using Acetone or Denatured Alcohol. Surface must be clean, dry and free of contamination.

_____ 6. Both pipe and fitting surfaces need to be clean and dry. They must also be dust, dirt, grease, and glaze free for a good adhesive bond.

INITIAL FOR MIXING PROCEDURE

_____ 1. Empty the entire contents of adhesive and hardner onto a throw-away cardboard surface or A permanent mixing station which is cleaned after each mix.

_____ 2. The two components must be mixed thoroughly. All color streaks must disappear. Take extra care when mixing color coded adhesive.

_____ 3. Unmixed portions will cause uncured spots that will cause leakage.

_____ 4. Using partial adhesive kits for any joint is strictly prohibited.

INITIAL FOR ADHESIVE BONDING OF CONLEY PIPE

_____1. A thin layer of adhesive must be scrubbed into the socket of the fitting.

_____2. Apply an even layer of adhesive to the fitting socket. Do not overload the socket It will cause excessive "push in". Appropriate thickness is 1/16" for fittings 3" and smaller, and 1/8" for 4" and larger.

_____3. Seal the cut end of the pipe with a coating of adhesive.

_____4. Apply a thin coating of adhesive to the exterior of the pipe. Scrub the adhesive into the surface of the pipe.

_____ 5. Apply a generous coat of adhesive to the scrubbed area of the pipe. This layer should be a MINIMUM of 3/8" thick and should exceed the tolerance between the pipe and fitting.

_____ 6. Lack of adhesive can cause trapped air in the socket that will cause leakage. While pushing the parts together, make sure there is a complete ring of "squeeze out" around the end of the fitting.

_____ 7. If possible, remove excess adhesive from the interior of pipe and fitting.

_____ 8. Use excess adhesive on the Exterior surface to form an attractive filet.

_____ 9. Do not move the joint until the adhesive has hardened.

_____ 10. Heat tapes must be used on ALL joints.

INITIAL FOR WEATHER CONDITIONS

_____1. Cooler temperatures can cause adhesive to stiffen causing difficulty in mixing.

_____ 2. In cooler weather, if possible, place adhesive in a warm room for eight (8) hours before use.

_____ 3. Do not overheat the adhesive.

_____4. Do not attempt to cure the joint too quickly

_____5. Spread the adhesive thinly after mixing

_____6. Do not fabricate outdoors in the rain, fog, snow or mist.

INITIAL FOR BOLT-UP AND TORQUE

_____1. Do not over-torque the bolts, this will cause the flange to crack.

_____2. Do not torque to maximum until flanges are drawn together.

_____ 3. Use a cross torque technique

_____ 4. Use washers on all nuts and bolts. SAE work best due to their small O.D.

_____5. Gasket materials need to be 1/8" full face and have a durometer of 50-70 Shore A. Teflon gaskets are not recommended due to the high seating stress and excessive bolt torque required.

_____6. When bolting a Conley flange to a valve or pump with a raised face, a spacer ring must be used to fill the gap; if not used, cracking of the flange and or glue line can occur.

_____ 7. Threaded lug body and wafer body valves may require special considerations for use with Conley flanges such as spacers and backing rings and the allowable bolt torque for Conley flanges should not be exceeded.

_____8. Consult Conley Engineering for assistance with information on spacers and backing rings. Conley does not manufacture flange spacers or backing rings.

Conley Trainer_____

Job_____

Date_____

Customer_____

Employee_____

Trained_____

Customer Supervisor _____

CONLEY ENGINEERING DESIGN MANUAL
CONVERSION FACTORS

To Convert	To	Multiply by
Length		
inches	millimeters	25.4
inches	centimeters	2.54
inches	feet	0.0833
feet	inches	12
feet	centimeters	30.48
feet	meters	0.3048
millimeters	inches	0.03937
centimeters	inches	0.3937
centimeters	feet	0.0328
meters	inches	39.37
meters	feet	3.281
mils	inches	0.001
mils	microns	25.4

To Convert	To	Multiply by
Area		
square inches	square centimeters	6.452
square inches	square feet	0.006944
square feet	square inches	144
square feet	square centimeters	929.034
square feet	square meters	0.09290
square centimeters	square inches	0.15499
square centimeters	square feet	1.0764×10^{-3}
square meters	square inches	1550
square meters	square feet	10.76

To Convert	To	Multiply by
Volume		
cubic inches	cubic centimeters	16.39
cubic inches	ounces	0.55441
cubic inches	cubic feet	0.0005787
cubic feet	cubic inches	1728
cubic feet	cubic centimeters	28317.016
cubic feet	cubic meters	0.02832
cubic feet	U.S. gallons	7.481
cubic feet	liters	28.31625
cubic centimeters	cubic feet	3.5314×10^{-5}
cubic centimeters	ounces	0.03381
cubic centimeters	U.S. gallons	2.6417×10^{-4}
cubic meters	cubic feet	35.31
liters	quarts	1.057
quarts	liters	0.9463
U.S. gallons	cubic feet	0.1337

To Convert	To	Multiply by
Weight		
ounces	grams	28.35
pounds	grams	453.6
pounds	kilograms	0.4536
pounds	short tons	0.0005
pounds	long tons	0.0004464
pounds	metric tons	0.0004536
tons (short)	pounds	2000
tons (long)	pounds	2240
tons (metric)	pounds	2205
grams	ounces	0.03527
grams	pounds	2.205×10^{-3}
kilograms	ounces	35.27
kilograms	pounds	2.205
kilograms	short tons	1.102×10^{-3}
kilograms	long tons	9.839×10^{-4}
tonnes (metric tons)	kilograms	1000

To Convert	To	Multiply by
Density		
pounds per cubic foot	grams per cubic centimeter	0.01602
grams per cubic centimeter	pounds per cubic foot	62.42
grams per cubic centimeter	kilograms per cubic meter	1000
kilograms per cubic meter	grams per cubic centimeter	0.001

To Convert	To	Multiply by
Pressure		
psia	atmospheres	0.0680
psia	inches of water	27.67
psi	kilopascals	6.8948
inches of water	psia	0.03614
feet of water	kilopascals	2.989
atmospheres	psia	14.70
bar	kilograms per square centimeter	1.020
bar	atmospheres	0.9869
kilograms per square centimeter	psia	14.22
kilopascals	psi	0.14505
kilopascals	feet of water	0.33456

To Convert	To	Multiply by
Flow		
cubic feet per second	U.S. gallons per minute	448.9
cubic feet per second	cubic meters per second	0.028317
U.S. gallons per minute	cubic feet per second	0.002228
U.S. gallons per minute	liters per minute	3.7854
liters per minute	U.S. gallons per minute	0.26417
cubic meters per second	cubic feet per second	35.315

To Convert	To	Multiply by
Velocity		
feet per second	meters per second	0.3048
meters per second	feet per second	3.2808

To Convert	To	Multiply by
Liquid Measure and Weight		
pound of water	U.S. gallon	0.11995
pound of water	cubic inch	27.708
pound of water	cubic foot	0.016035
pound of water	liter	0.45404
pound of water	cubic meter	0.000454
U.S. gallon	pound of water	8.337
U.S. gallon	cubic inch	231.0
U.S. gallon	cubic foot	0.13368
U.S. gallon	liter	3.785
U.S. gallon	cubic meter	0.003785
cubic inch	U.S. gallon	0.004329
cubic inch	pound of water	0.3609
cubic inch	cubic foot	0.000578
cubic inch	liter	0.016387
cubic inch	cubic meter	0.0000164
cubic foot	U.S. gallon	7.4805
cubic foot	pound of water	62.365
cubic foot	cubic inch	1728.0
cubic foot	liter	28.316
cubic foot	cubic meter	0.028314
liter	U.S. gallon	0.26418
liter	pound of	2.202
	water	
liter	cubic foot	0.035315
liter	cubic inch	61.025
liter	cubic meter	0.0010
cubic meter	U.S. gallon	264.2
cubic meter	pound of water	2202.6
cubic meter	cubic foot	35.3183
cubic meter	cubic inch	61030.0
cubic meter	liter	999.97

To Convert	To	Multiply by
Pressure and Head		
psi	kilogram per square centimeter	0.070307
psi	inch water	27.726
psi	feet water	2.3106
psi	bar	0.06895
kilogram per square centimeter	psi	14.2233
kilogram per square centimeter	inch water	394.27
kilogram per square centimeter	feet water	32.864
kilogram per square centimeter	bar	0.9807
inch water	psi	0.03607
inch water	kilogram per square centimeter	0.00254
inch water	feet water	0.08333
inch water	bar	0.00249
feet water	psi	0.43278
feet water	kilogram per square centimeter	0.03043
feet water	inch water	12.0
feet water	bar	0.02984
bar	psi	14.5038
bar	kilogram per square centimeter	1.0197
bar	inch water	402.1
bar	feet water	33.51

GLOSSARY

adhesive – a two-part material, one part is resin, one is hardener, used to join pipe to fittings.

adhesive joint

B-stage – the degree to which a thermoset resin has crosslinked. Three stages, in order of increasing crosslinking include A-stage, wet; B-stage, or hard to the touch; and C-stage is fully cured.

buttering – applying a layer of adhesive and the action of working or scrubbing the adhesive into the prepared surface to be joined by adhesive bonding.

cage – structural wall.

conductive – having the ability to conduct electricity as in conductive pipe, fittings, or adhesive.

cure – the hardening of a thermoset resin system by addition of a hardener and the chemical reaction, completed with heat (post-curing).

FRP – fiberglass reinforced plastic

fillet – the tapering or angle of excess adhesive on the outside of an adhesive bonded joint normally to create an attractive appearance.

hardener – chemicals added to thermoset resin systems which are required for the curing process to occur, also known as cross-linking.

heat tape – an electric strip or tape used to heat a fabricated joint to full cure (crosslinking), C-stage.

hydrostatic test – a pressure test of the completed fabrication section to confirm integrity of the piping system.

joining – a method for connecting two separate components of a piping system together including straight socket, bell and spigot, threaded, flanged, coupled, etc.

joint – a term used to describe and individual length of pipe or the actual joining of a pipe to fitting, adhesive bonded, threaded, flanged, coupled, etc.

liner – the interior surface of the pipe or fitting. Generally, liners are resin-rich areas from 0.060 to 0.100 in. thick, reinforced with Nexus veil, that provide the corrosion

protection for chemical service. Liners can also contain abrasive resistant materials for erosion protection from abrasive services.

lug style butterfly valve – a butterfly valve with threaded holes on both sides of the body for installing between two flanges using bolts WITHOUT nuts.

part 1 – the resin component of a two-part thermoset resin system.

part 2 – the hardener, catalyst or curing component of a two-part thermoset resin system.

part A – the resin component of a two-part thermoset resin system.

part B – the hardener, catalyst or curing component of a two-part thermoset resin system.

pot life – the time available to use thermoset adhesives after the reactive materials have been mixed.

push-out – the excess adhesive from an adhesive bonded joint.

saddle – a fitting which is bonded to the exterior of a pipe to make a branch connection.

scrub-in – the action of working or scrubbing the adhesive into the prepared surface to be joined by adhesive bonding.

shelf life – the storage time for a material until it becomes unusable.

socket joint – a joining system in which two straight cylindrical surfaces come together (male to female and bell and spigot) and bond with adhesive.

squeeze out – (see squeeze in) the excess adhesive from an adhesive bonded joint that remains on the inside of the joint. Sometimes called an adhesive doughnut or ring.

thermoset – a polymeric resin cured by chemical reaction and heat. Once cured, a thermoset resin becomes infusible, (cannot be re-melted) and insoluble.

wafer style butterfly valve – a butterfly valve installed between two flanges and kept in place by using the bolts or studs and nuts from flange to flange centering the valve from the outside of the valve body.

water hammer – pressure surges in a piping system caused by sudden operation of a valve, pump, or other component.

wet in – the action of coating the prepared surfaces of an adhesive bonded joint with adhesive. Also see buttering and scrub-in.

wetting – the action of coating the prepared surfaces of an adhesive bonded joint with adhesive. Also see buttering and scrub-in.

wicking – The longitudinal flow of liquid in the pipe wall due to capillary action.

veil – surfacing mat of porous fabric made from filaments and used to provide reinforcement for a resin rich layer or liner.

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Note: *f*. indicates figure; *t*. indicates table

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