

Rovanco® Piping Systems

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Joliet, IL 60431
(815) 741-6700

Insul-8 Double Wall Containment with FRP Wrap Installation Instructions

INS-CTF

Revised 03/13/24

GENERAL

This instruction manual will give you all the information needed in terms of techniques, tools, and accessories required to install ROVANCO Insul-8 Steel Containment System. If you follow the instructions carefully, the end result will be a high quality, pressure testable containment piping system. Thank you for showing your confidence in ROVANCO by purchasing its products. We sincerely appreciate your business and we will provide you with quality products with a fair price and “great” service to deserve your future business. Please consult your local ROVANCO Manufacturer’s Representative for information about all of the products provided by ROVANCO.

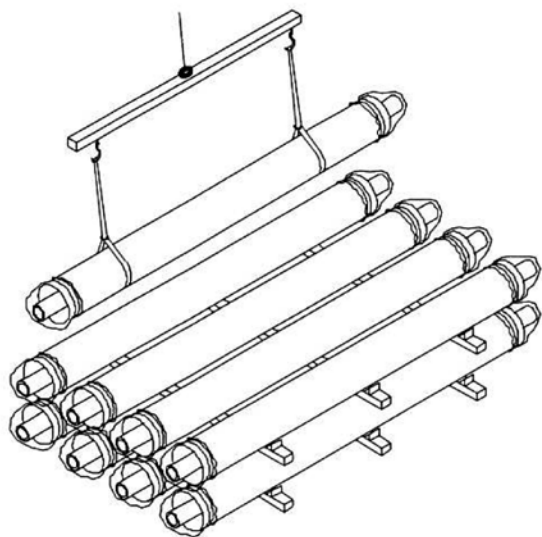
INSPECTION

Inspect all shipments on receipt. Examine all pipe and accessories as they are unloaded. Check to insure that every item on the packing list is received. Check the contents of the cartons to insure that the materials have arrived safely. Do not throw the cartons from the vehicle. Handle all materials carefully. Have the freight carrier make out a damage or short receipt if any discrepancies are found. Keep a signed copy of this receipt and notify ROVANCO immediately. All spool pieces shipped have individual part numbers labeled on each end. Refer to your packing list to be sure you have all spool pieces shown. With your paperwork, you will receive two copies of the installation drawings. These drawings will show the location of each piece of ROVANCO Containment.

UNLOADING

ROVANCO Insul-8 systems are manufactured to withstand normal field handling but, like any piping material, damage can occur from careless handling. The spool pieces should be unloaded from the truck using a cherry picker or other suitable equipment. Lift the pieces with nylon slings and spreader bars so as not to damage the epoxy coating. Do not use chains or chokers in direct contact with the epoxy coating. Do not drop spool pieces because this can damage the insulation, the epoxy coating or the containment.

STORAGE



Use dunnage material under the pipe and between successive layers to protect the casing from foreign objects. Do not stack more than four layers high to avoid excessive weight on the bottom layer. Prior to installation cover the pipe ends with a white tarp or white visqueen to keep out water, excessive dust and debris. If the pipe will be stockpiled in direct sunlight or at temperatures exceeding 90°F, cover the entire system with a white tarp or white visqueen. Do not use opaque, clear or any other color other than white. If these steps are not taken, warranty will be void. There should be a layer of wood dunnage between the pipe and visqueen. Cartons of material (i.e. glue, foam kits, fiberglass adhesives, etc.) should be stored in a dry area at 60° to 80°F. Liquid foam has a shelf life of 6 months after delivery. Freezing or high temperatures may affect the product’s ability to perform their functions. IF these steps are not taken, warranty will be void.

TESTING

All carrier pipe must either be air or hydro tested per specifications prior to insulating and pouring thrust blocks around anchors or backfilling the system. Failure to comply with testing procedures will void warranty. Plastic carrier pipe must be hydro tested only, do not air test.

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Testing

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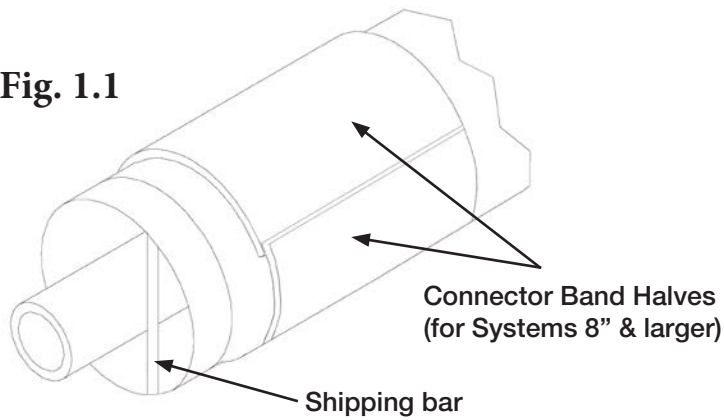
ROVANCO's products and processes are covered under various US patents, including, but not limited to 4,084,842 - 4,484,386 - 4,221,405 - 3,793,411.

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For Leak Detection Installation Instructions, contact Rovanco for INS-RAT

Section 1: Installation of Spool Pieces

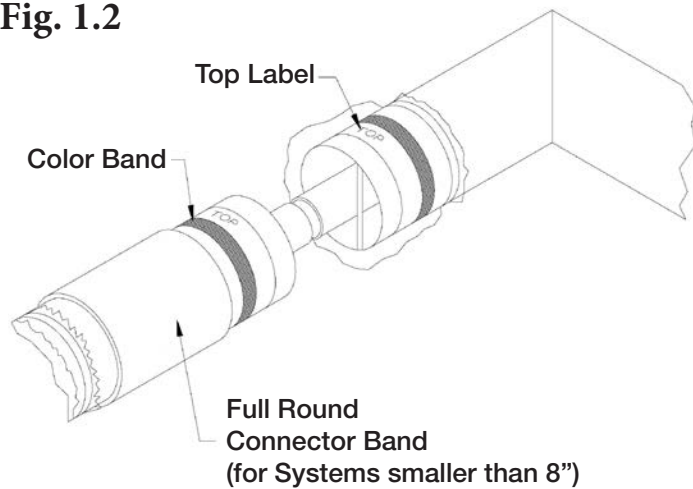
Fig. 1.1



* Note: Shipping bar needs to be removed prior to installation

After the ditch has been opened, the spool pieces should be installed in accordance with the installation drawings bearing the latest revision number. Each spool piece has its own part number which will match the drawing showing its approximate length. There should be a full round connector band (if less than 8" system) over one end of each spool. If not, the connector bands halves (8" and larger system) will come in a crate. It is important that if full round connector bands included that one be on the containment at each joint before welding carrier pipes together. **See Figure 1.1**

Fig. 1.2



If the containment is not going to be installed immediately, leave the plastic bag over the end of the pipe. Plastic garbage bags with the bottoms cut out or plastic sheeting can be taped over the connector band to help prevent water from entering the system should the trench flood. Test cans can be used at the open ends of the systems to prevent water from entering the system. It is very important that the insulation is kept dry during installation!

Fig. 1.3



ROVANCO suggests that you dig bell holes for field welding before lowering the pieces in the ditch. Lower the containment into the trench, using a spreader bar and nylon slings. As pieces are lowered into the ditch, make sure that the trench bottom is free of sharp objects or rocks. If no bedding is specified, ROVANCO recommends 6" of sand or other clean granular material 1/4" or smaller. At no time is wood allowed to be buried as a pipe stand in the ditch. That is a potential failure point on all containment systems. Bags of sand should be used.

Fig. 1.4

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Piping systems, inc.

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-- THE LEADER IN PRE-INSULATED PIPING SYSTEMS --

SHOP ORDER NUMBER:		
PART NUMBER:		INSPECTED BY:
MATCH THIS END TO PART NUMBER:		

Notice that there are colored bands located on the end of some spool pieces. This band is to match an identical colored band of the adjacent piece at the field joint location. **See Figure 1.2**

This is to ensure that expansion pipe supports are located in the proper areas. Also note that straight lengths coming off an expansion loop or elbow have a ROVANCO label marked TOP on the containment end. This designates that these spool pieces have a top. This must be at the 12 o'clock position before the pipe is welded. This insures that the service pipe can move laterally within this special support. **See Figure 1.3**

See Figures 1.4 for example labels.

Section 2: Pull Rope Instructions

Fig. 2.1



Fig. 2.2

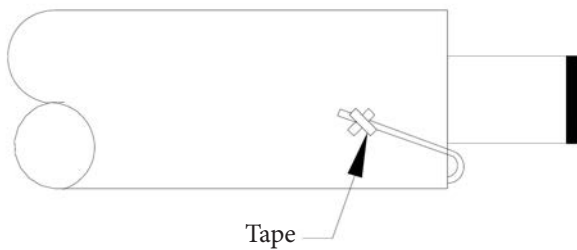


Fig. 2.3

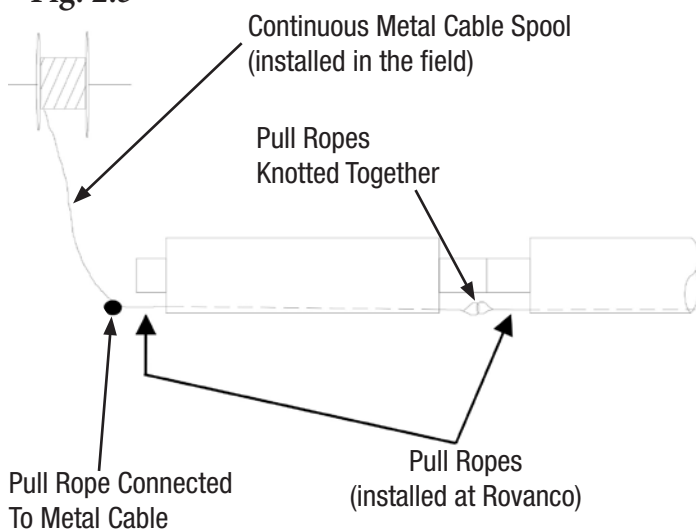
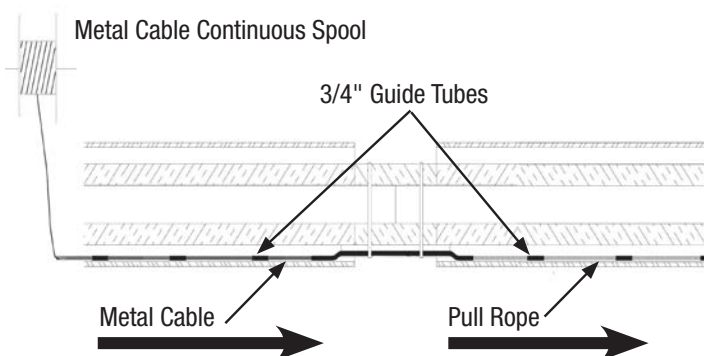


Fig. 2.4



Preparation – Before Carrier Pipe Welding

1. Each piece of pipe will be supplied with its own pull rope which has been threaded through a series of semi-flexible 3/4" guide tubes that are positioned at intervals inside the length of pipe. The end of the rope is taped to the carrier pipe at both ends. Do not cut the rope loose until the pipe is in the trench and carrier pipe is ready to be joined.

See Figure 2.1

2. Once the pipe is in the trench and carrier is ready to be joined, carefully cut the tape loose and tape the rope back to the jacket so the rope does not get burned when welding and free of glue, epoxy or resin on PVC or fiberglass systems. **See Figure 2.2**

Proceed with joining the carrier pipe. If the joints are to be exposed overnight or for any period of time, use a white tarp or white visqueen to seal the joints.

Preparation – Before Pulling Metal Cable

3. Once all of the carrier pipe joints are welded and tested, you are ready to connect the pull rope from one pipe length to the pull rope of another. Use a loop or slip knot to connect pull ropes. Use electrical tape to flatten down any loose ends and to secure knot so the two rope do not pull apart during pulling process.
4. Set up the spool of metal cable at one end of the system. Then connect the pull rope end to the cable. **See Figure 2.3**

The pipe has centering supports with sections of 3/4" containment guides for the pull ropes and metal cable to run through. Make sure the pull rope/metal cable connection does not get bound up in these guides, **it is strongly recommended to tie the pull rope end to the continuous metal cable using the procedure shown on page 5.** This method will minimize issues during the pulling process.

5. Once rope and cable are connected at one end, pull the opposite, loose end of the rope so the continuous metal cable is pulled the full length of the pipe section and follows the rope through the 3/4" guide tubes. The continuous metal cable needs to be pulled enough to move the rope out of the joint area prior to welding containment connector bands. **See Figure 2.4**

TT-Aircraft to TT-PR (Pull Rope) Connection Installation Instructions



Wrap approximately 4 inch end of TT-PR with electrical tape forming a point.



Open up hollow braid approximately 12-14 inches from end to insert taped point into the braiding.



Insert entire taped portion of pull rope end into the braiding.



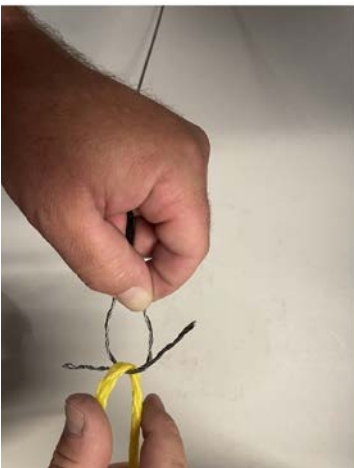
Loop should look like this.



Use Scotch 33+ electrical tape to wrap section where point was inserted into the braid tightly.



Uncoil steel aircraft cable into 2 halves approximately 5 inches long and tape at base of this "V" with electrical tape ("V" hidden under top thumb in this photo). Insert braided loop between these sections.



Loop steel cable around braided cable from each end in opposite directions twisting steel cable end around itself at least 2 times on each side forming a steel cable loop.



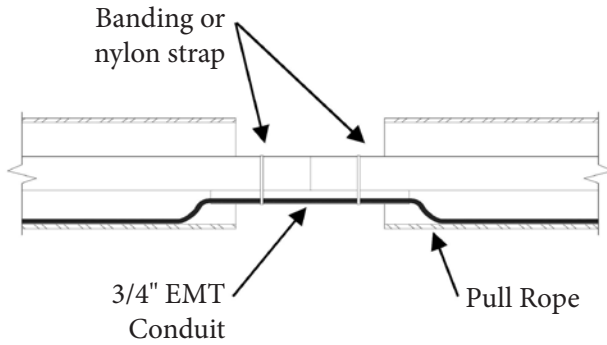
Use pliers to pinch steel cable loop.



Stretch both cables and apply electrical tape from one end to the other, then back to starting point. Note: While wrapping electrical tape, pull to make this tight in order to lower the profile of the section for ease of pulling.

NOTE: Steel aircraft cable to be pulled prior to welding 10 gauge. After 10 gauge has been welded and tested per spec, then the leak detection cable can be pulled.

Fig. 2.5

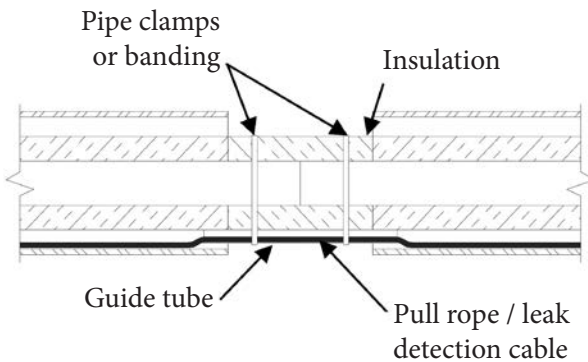


6. The center 15" of the guide tube is flexible. Use banding or nylon strap to position that portion of the guide tube system away from the edges of where the connector bands will be welded. **See Figure 2.5**

Make sure the cable is not stuck or bound up by pulling it in each direction at least 20-ft. If the cable does not move freely check all guide tubes to see if you can find where the issue is and make necessary adjustments.

NOTE: Do not pull the actual Leak Detection Cable through until the connector band welding is complete and system has been tested. This is to prevent the possibility of damage or contamination to the leak detection cable.
Preparation – Before Pulling Leak Detection Cable

Fig. 2.6



7. After the continuous cable is pulled and properly positioned in the joint area, begin the containment connector bands process. **See Figure 2.6**

NOTE: Refer to the pipe installation instruction section for details associated with that procedure. Any other procedures such as fitting, end seal and outer jacket insulating & coupling are covered in their respective sections in the instructions.

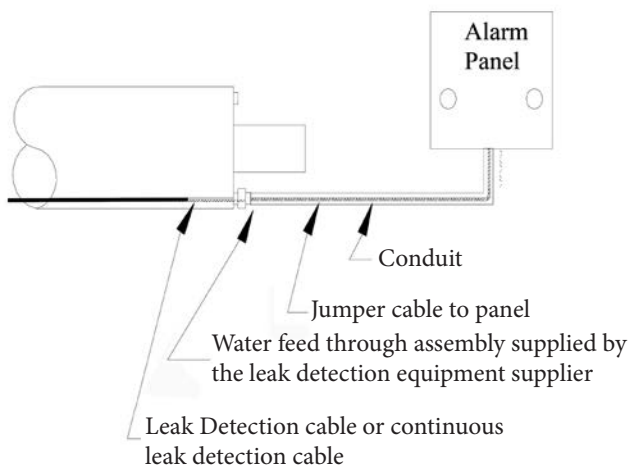
8. After containment connector bands are fully welded and tested, move cable back & forth again to be sure it is still free. Then connect end of metal cable to leak detection cable. You can utilize the same connection process suggested for connecting pull rope to metal cable on **page 7**.

Pull metal cable, now attached to leak detection cable, through the system. This is to be done before insulating and making the outer jacketing joints.

It will depend on the pipe run as to whether you pull leak detection the entire length of a straight pipe run or to a pull port. See specs for details.

It is extremely important to pull the Leak Detection cable and test it prior to backfilling! See Figure 2.7

Fig. 2.7

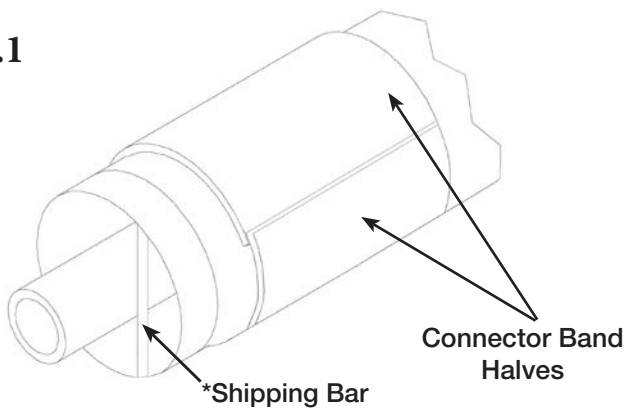


Section 3: Field Alteration of Spool Pieces

Although the ROVANCO spool pieces have been fabricated in accordance with contractor field measurements, sometimes obstructions or errors can require field alteration. Prior to making any field alterations, contact ROVANCO's Customer Service Department in Joliet, Illinois (815) 741-6700, so that we can instruct you in this process and insure that the resulting layout will function properly. This prior notification will also maintain the ROVANCO warranty.

Section 4: Welding of Carrier Pipe

Fig. 4.1



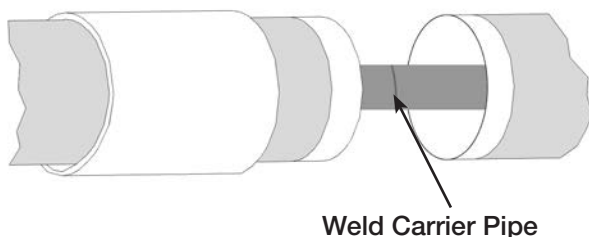
* Note: Shipping bar needs to be removed prior to installation

NOTE: Prior to any carrier field welds, pipe ends must be prepped in the field by contractor.

NOTE: During the welding process do NOT use anti-splatter or any type of lubricant IF your system has leak detection. These materials can cause the leak detection to fail.

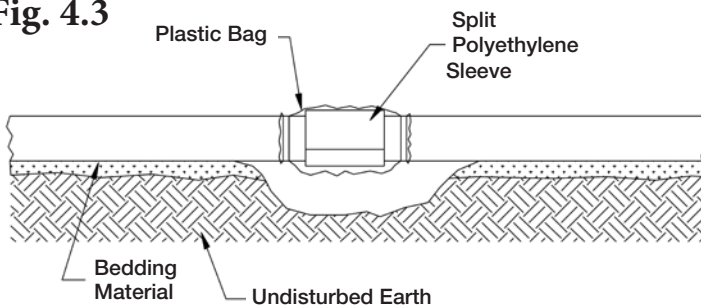
Prior to the welding of the carrier pipe, remove the shipping bar attached between the carrier pipe and outer containment and clean up any remaining weld debris on it. **The shipping bars have been put there to keep the pipe from sliding out of the containment during transit, unloading, and lowering into the trench. These bars must be removed to allow the service pipe to expand during operation. See Figure 4.1.**

Fig. 4.2



After removing the shipping bar, you will find it easier to align the inner pipe. Align and weld the carrier pipe. **See Figure 4.2**

Fig. 4.3



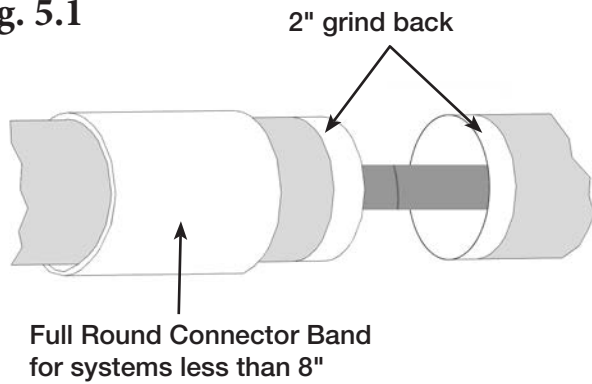
If the carrier pipe is not welded immediately, slide the connector band(s) over the joint, and cover the entire joint with a plastic bag or sheeting as described in Section 1. **See Figure 4.3**

If a hydrostatic test of the carrier pipe is not specified in the contract, ROVANCO recommends that a hydrostatic test be run on the internal pipe at 1½ times the job working pressure. This test should be done prior to insulating the field joints and welding the connector bands closed, to allow inspection and repair of welds if necessary.

If the installing contractor or owner does not want to conduct a hydrostatic pressure test then Rovanco will not be responsible for the cost to excavate and repair any carrier pipe leaks in the system regardless of who made the weld (Rovanco or the installing contractor).

Section 5: Welding and Air Testing of Connector Bands

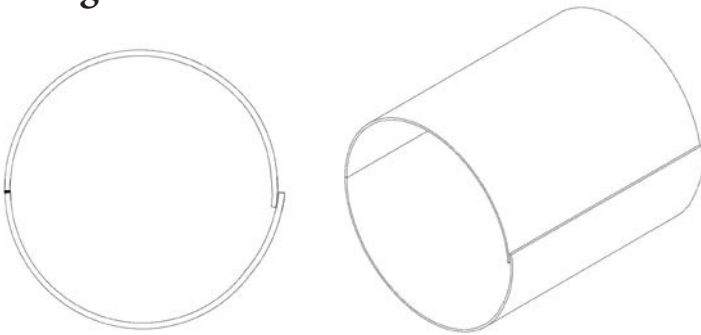
Fig. 5.1



During the welding process do NOT use anti-splatter or any type of lubricant IF your system has leak detection. These materials can cause the leak detection to fail.

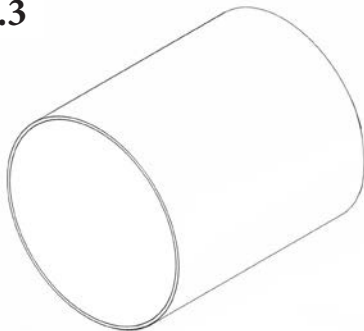
NOTE: It is the responsibility of the contractor to grind back both ends of the joint by 2" before installing the connector bands.

Fig. 5.2



Ends should be ground to clean, bare metal that is free of any coatings to allow the welding of the connector bands. **It is suggested the grinding of the ends be done BEFORE lowering pipe into trench. See Figure 5.1**

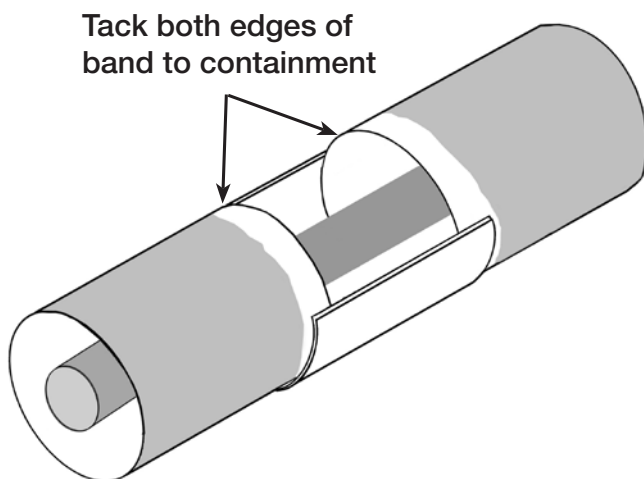
Fig. 5.3



The length of each connector band is 15" to allow an overlap on your 12" joint area. The connector band is supplied in 2 equal length halves so there is no top or bottom half. Once the two bands are in place, centered over the joint, please note that one seam will be a butt fit and the other seam will be an overlap fit. This is the intended fit of the connector band. **See Figure 5.2**

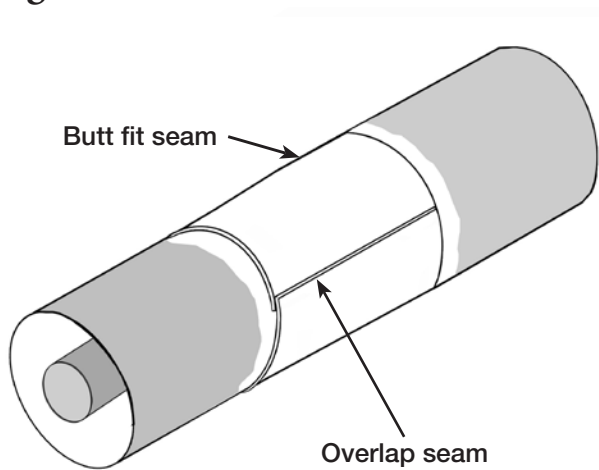
NOTE: If the system is 4" or 6" containment, you will receive full round connector bands that will arrive banded to spools. **See Figure 5.3**

Fig. 5.4



To start (on 8" & larger systems), center one half over the bottom of the joint area. Tack that half in place with a couple quick tacks on each side of the connector band half along the same edge so it is semi-secured to the containment. **See Figure 5.4**

Fig. 5.5

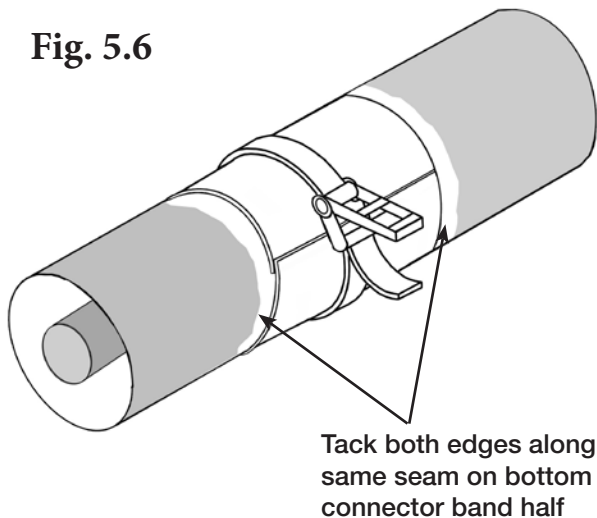


Place the other half of the connector band on top. Remember, one seam will butt fit and the other will overlap. The top half should fit inside the bottom half on the side that overlaps as shown. **See Figure 5.5**

Apply a ratchet tool or chain grips and tighten both halves of the connector band at once until they are pulled tight against the outer containment. Tack top half in place with welds until the whole connector band is secure and will not move. **See Figure 5.6**

Now fully weld the butt fit and overlap seams on the connector band as well as the full perimeter on both ends of the connector band where it meets the containment. When done welding, joint should be air tight. **See Figure 5.7**

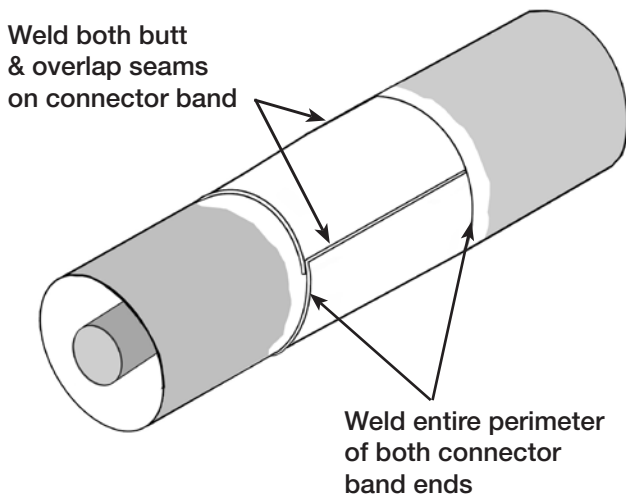
Fig. 5.6



If it is a 4" or 6" system with full round connector band, slid band so centered over joint, apply ratchet tool or chain grips to secure and tack weld in several spots so band will not move. Then weld the full perimeter on both ends of the connector band. There will be no seams to weld.

NOTE: Connector bands DO NOT come coated. They are sent bare unless otherwise stated in specifications. If system is coated, use Rovanco supplied material to coat connector bands after fully welding them. Otherwise, shrink wrap will serve as protection for the connector band.

Fig. 5.7



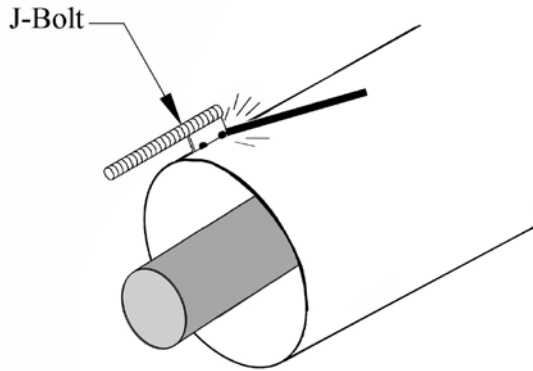
After all connector bands are fully welded, a 15 psi air test should be put on the inner casing prior to pouring thrust blocks or backfilling the system. Each connector band, gland seal, and testing apparatus should be checked for leaks with a soap and water test. If bubbles appear, a leak exists.

NOTE: Depressurize prior to repairing leak. If you try to repair with the pressure still on the system, you are subject to blowing a larger hole at the leak area. After leak is repaired, retest that area by re-soaping the repaired joint to ensure the leak has been fixed.

If possible, air test system as you install. ROVANCO can provide test cans in case you need to do an air test on only part of the system or on a watershed.

Section 6: Test Can Applications

Fig. 6.1

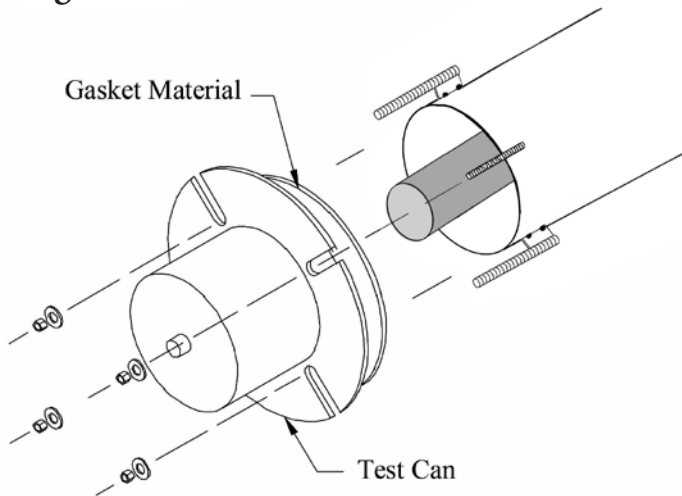


After Rovanco receives a release to manufacture, Rovanco's customer service will email test can purchase form to customer. Test cans need to be ordered before the first truck ships so they can ship with the job to save money on freight.

Remove any burrs on conduit ends that may have been caused by removing the shipping bar to ensure a proper seal. J bolts are then welded to the outer edge of the containment. **See Figure 6.1**

The test can butts up to an open end unit, is sealed with a gasket, and tightened down with bolts. Attach a safety chain around the test can and to other end of conduit. **See Figures 6.2 and 6.3**

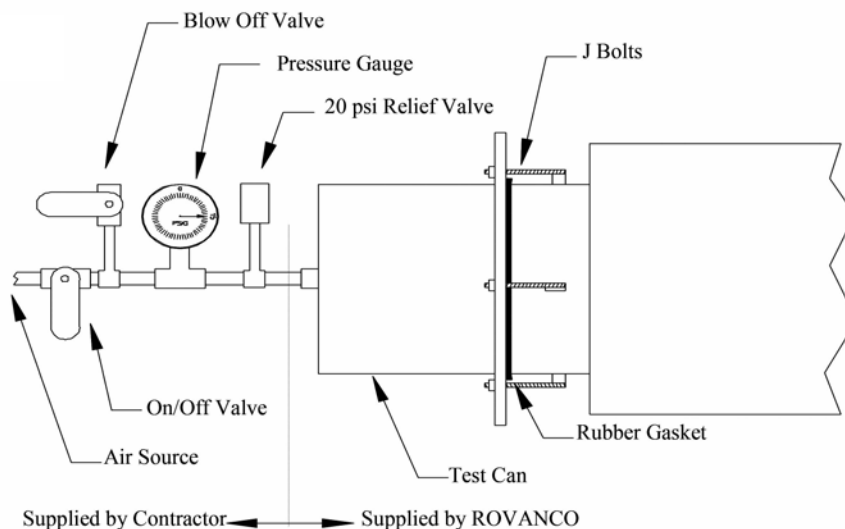
Fig. 6.2



CAUTION: No one in the area is to step in front of the test can during pressurization.

After testing is complete, remove the test can and gasket and cut the J bolts off of containment and grind or file down any burrs.

Fig. 6.3



Section 7: FRP Wrapping the Joint

ROVANCO recommends the use of a two or three person work team to perform field joints efficiently. At least one of the three should have some previous experience or training with fiberglass. Before starting work on the field joint, make sure to have the necessary materials, tools, and safety equipment available. In addition the technicians should assess that there will be proper ventilation and sufficient space to work and wet out matting.

Section 8a: Materials and Supplies

Tools and Safety Supplies:

(To be supplied by installing contractor)

- Powder Suits
- OSHA Approved Dust Respirators
- Face Shields or Safety Glasses
- Portable Eyewash Station
- 4 1/2" Grinder with 36 Grit Sanding Disk
- 1/2" x 3" Fiberglass Bristle Roller*
- 3" Wide Throwaway Paint Brushes
- Auxiliary Heat, No Flame (cold weather)
- Cleaning Solvents, Such as Replacatone*
- 32 Ounce No-Wax Mixing Cups
- Scissors or Cutting Wheels

Bill of Materials:

(To be supplied by Rovanco)

- Catalyst for Resin
- 1.5 Ounce Matting
- Bi-Ply
- (2) 1/2 "x 3" Fiberglass Bristle Rollers*
- 50 ml Graduated Cup
- Catalyst Dispenser

* **Note:** Rovanco supplies 2 courtesy fiberglass rollers to get the job started. If additional rollers are needed, they may be purchased through the supplier listed below:

Description	Part Number
Handles with 3/4" x 3" fiberglass bristle rollers	ES790-075-300
Replacement fiberglass bristle rollers	3SHORT
Replacement cleaner	
Riber-Tech Industrial Composites 1-800-237-8486	

Section 7b: Joint Assembly

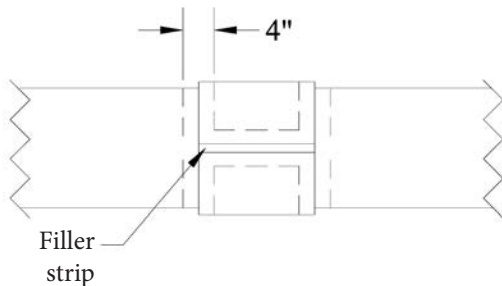
Read all instructions thoroughly before starting work.

1. **Refer to the chart on page 14** and pre-cut layers of fiberglass and bi-ply. Layers for the longitudinal seam should be cut 15" in length.

Note: On pipe sized 10" and above, it is recommended to apply fiberglass in half wraps. In this case, add 4" to the overall length of the wrap.

Fig. 7b.1

Top View

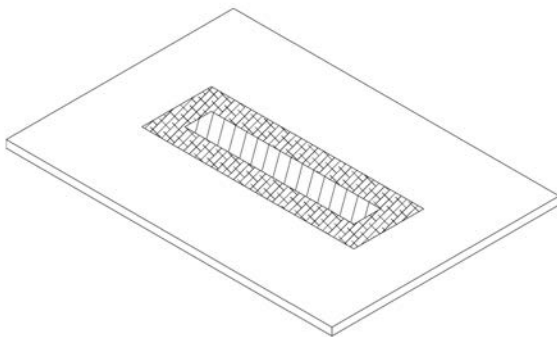


2. Prepare the pipe and coupling to be bonded within two hours of fiber-glassing the joint to prevent accidental contamination. Preparation should be done with a 4 1/2" grinder with a 36 grit abrasive wheel. Make sure to wear the required safety equipment. Properly prepared surfaces will be uniformly dull with no shiny resin surfaces visible. Surfaces should be sanded back from the edge of the jacket and the closure sleeve approximately 2" wider than the widest matting. **See Figure 7b.1.**

Align jacket ends and slide closure sleeve in place over the joint area. Prep the filler strip and place it in the seam of the closure sleeve. The seam should be aligned at the top of the pipe.

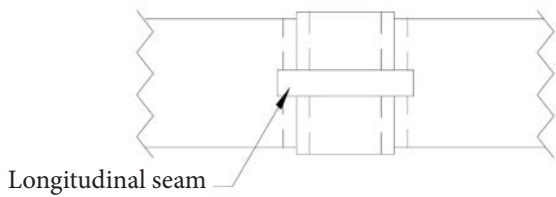
3. Provide a clean flat surface, heavy cardboard, plywood or a sturdy table for wetting out and rolling the fiberglass. Set up several 32 ounce no-wax cups filled with 24-28 ounces of resin. Be sure to keep the resin free of moisture or any contaminants that may affect its performance. **Set up tools, rollers, solvent, pails, disposable gloves and the required safety equipment.**
4. Add 5-8 cc of catalyst to one 32 ounce cup of resin and mix thoroughly with a mixing stick. You will have approximately ten minutes to work before the resin starts to harden. Use 10 cc on cold days when rapid setting is required. Use 4 cc on hot days to slow down the cure time.

Fig. 7b.2



6. The lay-up procedure should be started with the layers for the longitudinal seam, covering the filler piece. Lay the largest piece of matting on work surface and wet out thoroughly. Center the next largest layer on top of the first layer and wet out in the same manner. Layers should be applied in the order that they appear on the chart. Repeat these steps until all layers of matting and bi-ply have been used. **See Figure 7b.2**

Fig. 7b.3

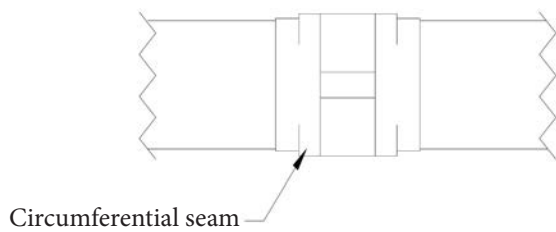


7. Roll out the layers forcing air bubbles and forming a translucent sandwich between the matting and bi-ply. Make sure all layers are aligned and centered.

8. Peel the layers up together and place them on the longitudinal seam of the coupling with the smallest layer facing down on the pipe. **See Figure 7b.3**

Roll the fiberglass flat onto the pipe and roll out air bubbles and wrinkles. Next apply the layers to cover the circumferential seams. **See Figure 7b.4**

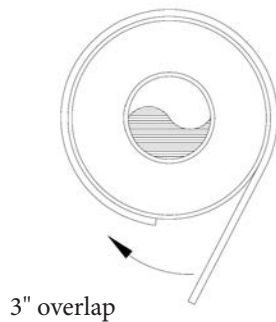
Fig. 7b.4



Center the layers at the top so that the overlap ends up at the bottom. Be sure to have at least a 3" overlap where the fiberglass wraps meet. **See Figure 7b.5**

Do not bump or move the pipe until resin is completely hardened.

Fig. 7b.5



9. If all the layers cannot be put on at the same time, divide the layers in half and perform the lay-up in a two wrap procedure. The first layer must be allowed to cure before starting on the second layer. This procedure should not be necessary on sizes up through 24" if you use the half wrap procedure from step #2.

Completed joints should be allowed to cure for 17 to 24 hours before testing, moving or backfilling. Below 50° F, provide auxiliary heat with no flame, such as kerosene or electric heater, for at least one hour after the lay-up is completed.

Clean up tools and the table. Rinse out the rollers in the solvent until clean. Throw away all gloves and hardened brushes. After all the joints have been cured and the ends have been sealed, the containment pipe should be air tested.

Extreme caution should be taken when air testing any plastic pipe. ROVANCO recommends air testing at 3-5 psi. However, check the contract specifications for the required air pressure.

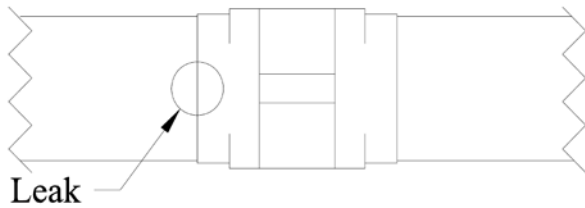
Note: Excessive air pressure, over 10 psi, could present a dangerous situation.

Containment Size	Nominal Layup Thickness	Number of Piles per Seam	Width	Length for Circumferential Wrap
4"	5/16"	2 matting	4"	17"
		1 Bi-ply	4"	
		2 matting	6"	
6"	5/16"	2 matting	4"	24"
		1 Bi-ply	4"	
		2 matting	6"	
8"	5/16"	2 matting	4"	30"
		1 Bi-ply	4"	
		2 matting	6"	
10"	5/16"	2 matting	4"	37"
		1 Bi-ply	4"	
		2 matting	6"	
12"	5/16"	2 matting	4"	43"
		1 Bi-ply	4"	
		2 matting	6"	
14"	5/16"	2 matting	4"	72"
		1 Bi-ply	4"	
		2 matting	6"	

Containment Size	Nominal Layup Thickness	Number of Piles per Seam	Width	Length for Circumferential Wrap
16"	5/16"	2 matting	4"	54"
		1 Bi-ply	4"	
		2 matting	6"	
18"	5/16"	2 matting	4"	60"
		1 Bi-ply	4"	
		2 matting	6"	
20"	5/16"	2 matting	4"	66"
		1 Bi-ply	4"	
		2 matting	6"	
22"	5/16"	2 matting	4"	72"
		1 Bi-ply	4"	
		2 matting	6"	
24"	5/16"	2 matting	4"	78"
		1 Bi-ply	4"	
		2 matting	6"	

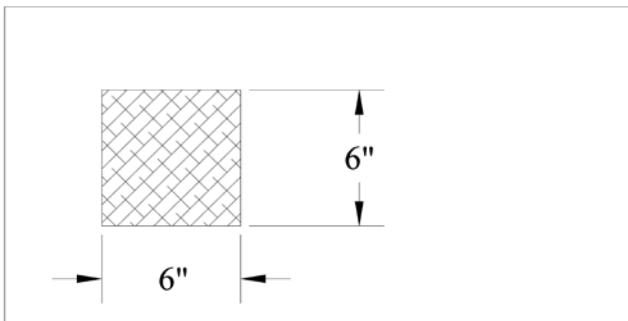
Section 8: Repairing Containment Joint Leaks

Fig. 8.1



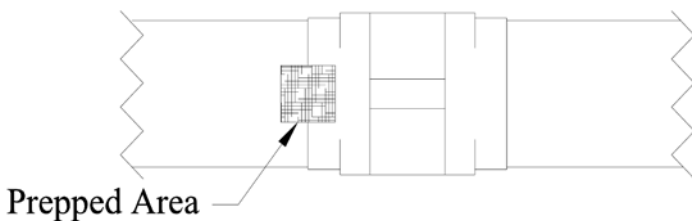
1. First, locate the leak with a soap and water test. Then, circle the leak area with a marker. **See Figure 8.1** Check all field joints so that all leaks can be repaired at once. Depressurize the system after all leaks have been found.

Fig. 8.2



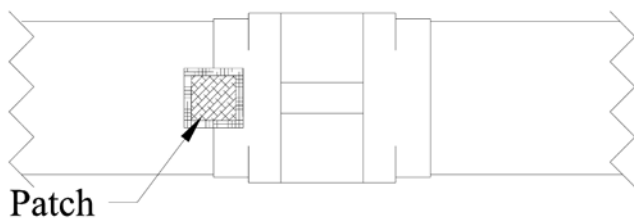
2. Cut the material needed to make the repair. You should use a minimum 4 layers of matting six inches by six inches. **See Figure 8.2** If the leak is too large to be covered by the patch, please contact Rovanco's customer service for further repair instructions.

Fig. 8.3



3. Next, prep the area around the leak using a grinder and 36 grit abrasive wheel. Prep the area one inch wider than the patch. It should be approximately seven inches by seven inches. **See Figure 8.3**

Fig. 8.4



4. Wet out the patch and apply in accordance with the assembly instructions outlined earlier in this manual. **See Figure 8.4**
5. Make sure the resin has hardened before re-testing. Soap the joints to be sure that the leaks have been sealed.

Section 9: Hot Patching

Fig. 9.1

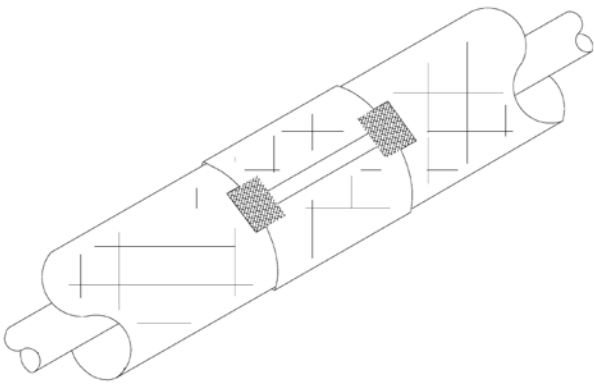
Pipe Size	Hot Patch
2" thru 10"	2" x 2"
12" thru 16"	3" x 3"
18" & larger	4" x 4"

Pressure must be applied to the fiberglass roller while rolling the fiberglass onto the area being bonded. It is important that the surfaces being bonded together remain in a fixed position during the application of the resin and glass. If the two materials being bonded together cannot be held in a rigid position, then they should be temporarily attached to each other with what is known as a "hot patch".

See Table 9.1 for hot patch sizes. The number of hot patches will be determined by how many it takes to keep the articles secure in position. Ordinarily, a sleeve joint would only require two patches, one on each end.

See figure 9.2

Fig. 9.2



If you are fabricating a tee or a "Y", it may take as many as four or more hot patches to hold the items rigid for fabrication. It is up to the installer to determine how many they require for a particular project. You are welcome to call Rovanco's Customer Service Department for assistance if there are any questions regarding the number of hot patches required.

It is not necessary to wait for the full cure of a hot patch. Hot patches are usually made with a hotter mix for a faster cure time than the standard joint lay-up. This hotter mix is achieved by adding additional catalyst to the mix, i.e. increasing the amount of hardener put into the mix of resin. It is important to make sure that the parts are immovable prior to performing the final lay-up.

In general, within 45 minutes of applying a hot patch, the material has cured enough to allow the parts to be tested for movement. Try to move the parts away from each other using a normal amount of hand force. If the pieces remain together, the hot patch has cured sufficiently to allow for completion of the joint. The curing of the hot patch has cured sufficiently to allow for completion of the joint.

The curing of the hot patch may be accelerated by using an electric hot air gun, which will only take five to ten minutes. Make sure to rough up the hot patch before applying the final lay-up.

Section 10: Weather Conditions

Temperature is important to the curing process of fiberglass resin. It is very difficult to use hand layed-up fiberglass in inclement weather such as rain, wind storms, humidity, or extremely hot or cold weather. When mixed together, the fiberglass resin and catalyst create an exotherm necessary for the curing process. It is apparent that in very cold weather this heat will be quickly dissipated unless measures are taken to prevent it. This can be done by A) Bringing the work inside where possible or B) Tenting the area and heating it to raise the temperature of the materials and the ambient area around the work being done. Also, keep the fiberglass resin and catalyst as close to 72° F as possible.

Although it is impractical to do the reverse during extremely hot weather, tenting or otherwise covering the work area with tarps is advisable. High temperature (85°F or more) may affect the workman's ability to handle the material with enough time to "roll out" the resin and mat prior to the material taking its initial set. Even though a tent will not reduce the ambient temperature, it will reduce the surface temperature of the materials being worked on by eliminating the heat caused from direct sunlight. It is also possible to use fans or portable cooling units.

It is impossible to cover every instance and situation that could occur. We strongly suggest that the installer applying the fiberglass be trained in the skill and be supervised by managers who have a fiberglass lay-up skill.

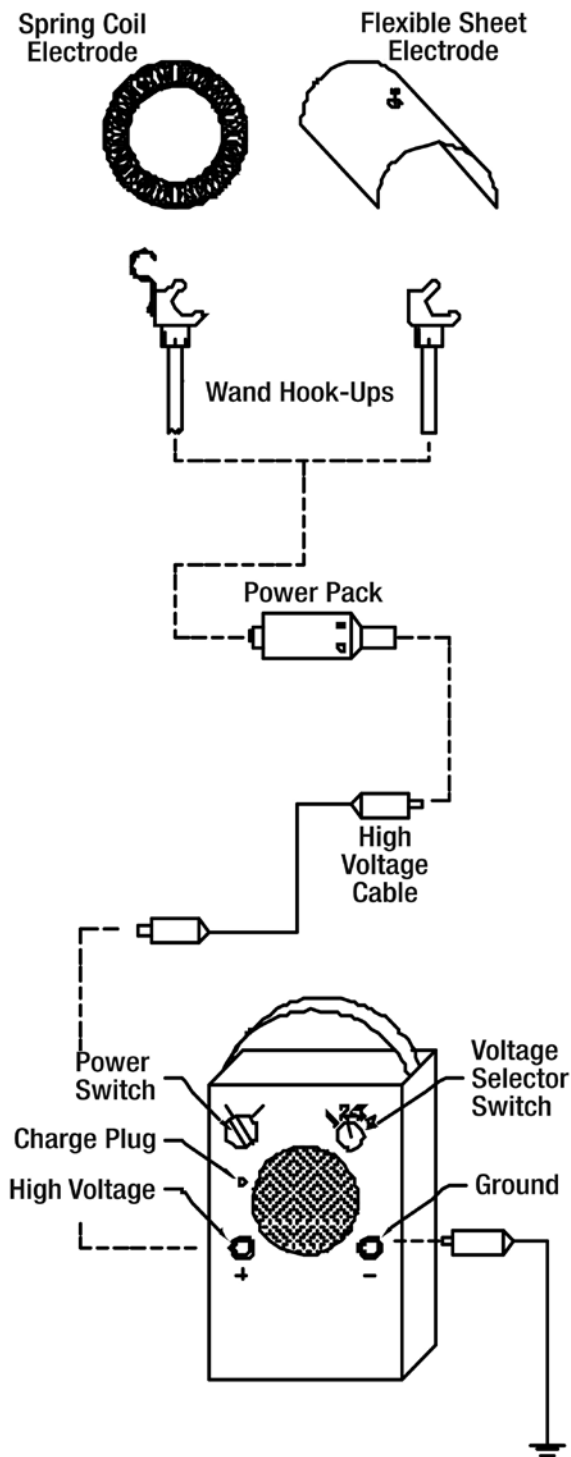
When portable heating or cooling units are used, it is important to cover any open ends of pipe that are not yet connected to eliminate the possibility of a chimney effect, pulling hot or cold air into the interior of the pipe or work area, affecting the ability to raise or lower the temperature of the pipe being worked on. Of course, you must make sure to remove whatever material is used to create the blockage prior to putting the system into service.

Section 11: Containment Coating Testing

If required in the specifications, ROVANCO can supply a containment coating tester for rental, credit card payment required. This tester will allow you to inspect the containment coating for damaged areas. These damaged areas are called holidays. ROVANCO's Holiday Detectors are portable, all purpose electrical inspection instruments. They are adaptable for use on both large and small diameter containment. The detector works on damp or dry surfaces.

A. Upon opening the carrying case, notice where the various components are located; repack them in the same manner when not in use. Then remove all components from the carrying case. Inspect them upon receipt. If damage has occurred, contact Rovanco. Check components against packing slip to be sure nothing is missing.

B. Equipment assembly



1. Ensure that the holiday detector ON-OFF switch is in the OFF position.
2. Using the battery tester, insert the test plug, on the battery tester, into the holiday detector charge plug receptacle. If the red LED indicator lights up, then the battery is okay, if not, then the battery needs to be recharged. Remove the tester from the battery.
3. Turn the output voltage selection switch on the detector to desired voltage. Voltages are listed on the individual power packs in ascending order, left-to-right. Use #4, 2,500 volts, for testing 20 mil Epoxy Coated Insul-8 containment. NOTE: Higher settings or voltages will damage the epoxy coating.
4. Insert leather belt into side loops on back of detector if belt-mounted method is to be used.
5. Uncoil the ground wire and plug connector into detector port marked ground. The ground wire will trail on bare earth or be attached to the containment being tested.
6. Attach wand to the threaded male end of the power pack. Insert power pack cable (female connector) into male connector of power pack. Insert other end of power pack cable into High Voltage port on detector.
7. Assemble the desired electrode and apply to the containment. The electrode should always make an intimate contact with the surface to be inspected.
8. Turn the ON-OFF switch to the ON position. Note that when the switch is in the ON position, a buzzing sound may be heard coming from the detector. The detector is now ready to operate.

A. Operating Methods

1. Grounding: A good ground return system will always give the best and most reliable inspection.

The containment must be grounded to earth at some point. If individual lengths of containment are to be inspected, each will have to be grounded separately.

2. Inspection: The containment should be inspected just prior to backfilling.

3. Inspection Speed: The speed of the electrode travel over the containment surface should be moderate, about 40 feet per minute. Moving the electrode at an excessive speed can result in an inaccurate inspection.

Caution: Do not test the same area twice, unless it is a repaired area, or let the electrode rest in one spot. Either may damage the coating on the containment.

Fig. 11.1

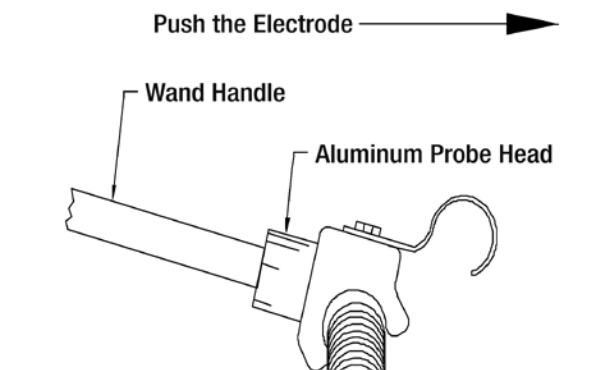


Fig. 11.2

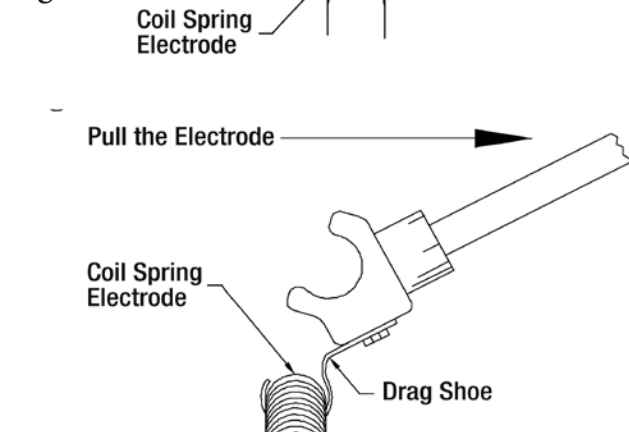
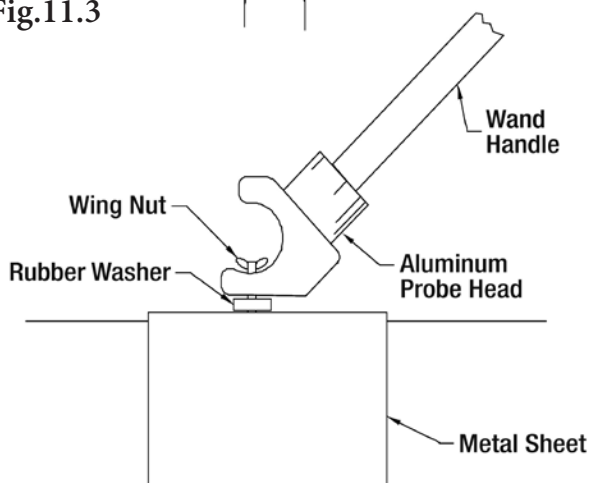


Fig. 11.3



4. Operating Checks:

- Occasional checks of the detector can be made if no holidays are being found. Move the inspection electrode to an area where there is bare metal. A spark and a signal should both occur.
- If the signal does not sound when the spark jumps, the ground return resistance is exceptionally high. For example, sandy, very dry soil or a large diameter pipe. To improve the ground, make a direct connection between the containment metal under inspection, and the detector's ground wire.

5. Inspection Methods

- If the spring coil electrode is used, then use the standard cast aluminum probe head to push the coil spring electrode. This method of propelling the electrode is most effective for small pipe diameters. **See Figure 11.1**
- For larger diameter pipes and particularly for over-the-ditch coating, use the drag shoe to pull the coil spring electrode. The shoe is attached onto the probe head with a cap screw that can be adjusted for lateral movement. A quick twisting motion will release the shoe from the spring. **See Figure 11.2**
- If using the flexible metal/rubber sheet, first remove the drag shoe if necessary. Then attach as per **Figure 11.3**, making sure to insert the rubber washer, and bend the metal/rubber sheet to conform to the containment outer-diameter.

1

D. Instrument Servicing Repair

- Cleaning:** Keep instrument clean and dry. Clean instrument case with a soft cloth dampened with kerosene or mineral spirits, then wipe dry. Do not use solvents such as lacquer thinner, MEK, etc.

2. Voltage output Checks:

a. Low Output Voltage:

- Check position of voltage selection switch. It should be on #4, 2,500 volts.
- Check battery conditions using battery tester.
- Check for parted conductor in wand and ground wire.

a. No Output Voltage:

- Check battery condition using battery tester.
- Check battery leads and the power switch for open circuit. Proper input current is .7 to .9 amps.
- Contact ROVANCO for further information.

3. False Signal Indication Check:

- Adjust the 4-position signal sensitivity switch through the porthole provided on the back panel in the belt recess.
- Electrical load conditions vary greatly through pipe sizes, coating thicknesses, and climatic conditions. The far counter-clockwise position, or Position 1, is the most signal sensitive. In most cases it is best to start out using Position 2.
- Check for parted connector in wand and ground wire.

4. No Signal with Spark Discharge:

- Check the position of the signal sensitivity switch.
- Adjust the signal sensitivity switch mentioned above.

E. Battery Charging Instructions

Caution: The detector ON-OFF switch must be in OFF position while charging battery.

- Use battery charger provided. Part Number 031-5
- Recharge the battery in the instrument. Ventilation holes in front and back of the instrument case should be kept open.
- Plug charger into polarized receptacle of instrument. Note: The battery cannot be tested or charged when the instrument power switch is in the ON position.
- Plug AC power cord into any 120 volt 60 Hz outlet.
- Charge battery for 14 hours. Charge at temperatures above 45° F for best results.
- If charger pilot light is out it indicated that the charger is not operating.
 - Check the position of the power switch.
 - Check for a shorted battery cell.
- Disconnect charger from battery and AC outlet when not in use.

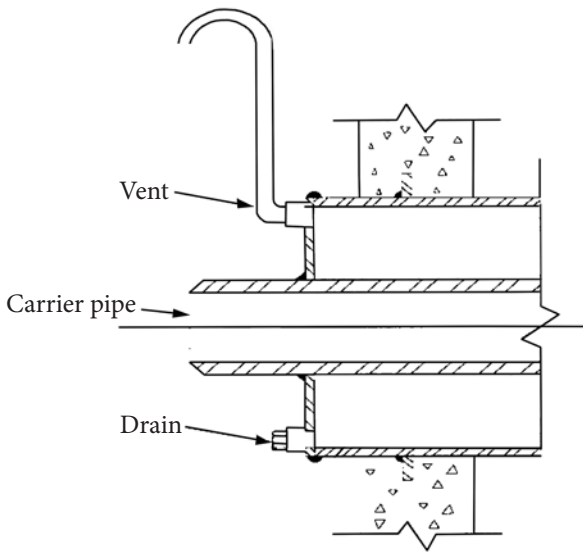
F. Battery Maintenance Information

- When the instrument fails to operate in a normal manner, battery is fully discharged. Recharging before this occurs can extend the useful life of the battery considerably.
- Store at normal room temperature when not in use.
- If the battery has not been used for six months or more, recharge for 14 hours.

Note: If the detector fails to operate in a normal manner, the first step is to test the battery condition.

Section 12: Manhole or Building Entries

Fig. 12.1



See Figure 12.1 for the proper building entry or manhole entry detail. Also, as mentioned in the previous section, be sure before turning the job over to the owner that the vent on each end of the system is piped up above any potential water level and goose necked for venting. This is done so that water can not get high enough to enter the system. The drains should remain closed. It is recommended that at least 2" of containment enter through the wall before our system ends.

Section 13: Pouring Concrete Anchors (for Below Ground Systems)

Please see detail (Figure 13.1) below for minimum size requirements. Contact engineer of record for specific size requirements.

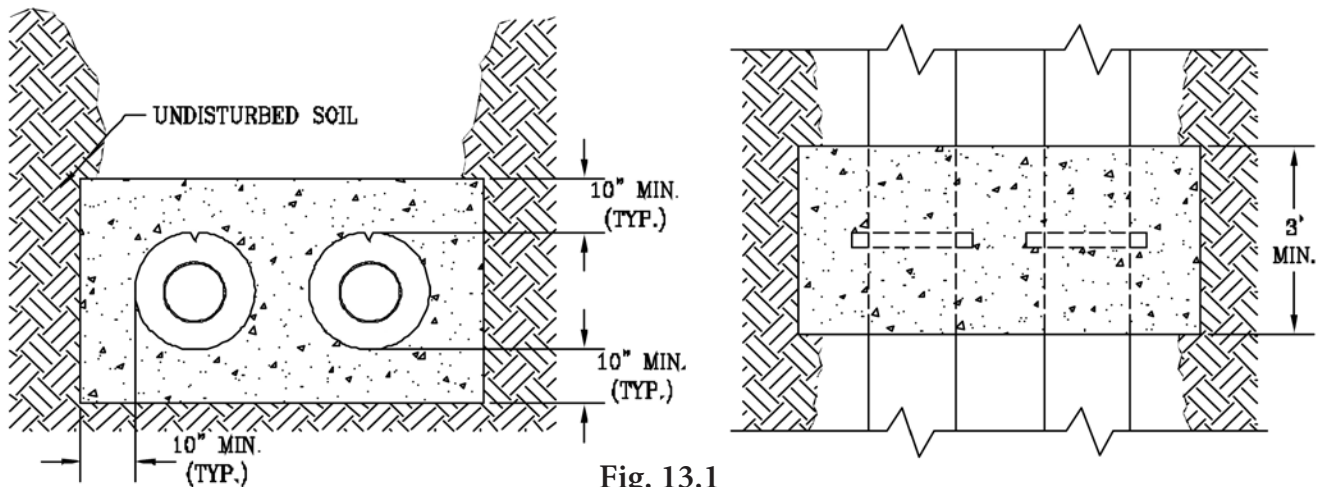


Fig. 13.1

Section 14: Backfilling the System (for Below Ground Systems)

The first foot of backfill must be free of frozen soil, rocks or other debris. ROVANCO recommends the use of clean backfill material without sharp stones. If the project specifications require a specific backfill material, we recommend the installer follow the specification. Hand tamp in 6" layers to one foot above the containment. After this, a mechanical tamper may be used. **See Figure 14.1**

Note that you need 30" of cover tamped to 95% compaction to obtain H-20 traffic load conditions. However, this is not adequate for railroad crossings. In that case, contact our Engineering Department in Joliet, Illinois. If 30" is not obtainable, put 6" of 95% compacted sand above the pipe, and then a 4" to 6" reinforced concrete pad. The pad should overlap the edges of the trench by 1'. **See Figure 14.2**

Fig. 14.1

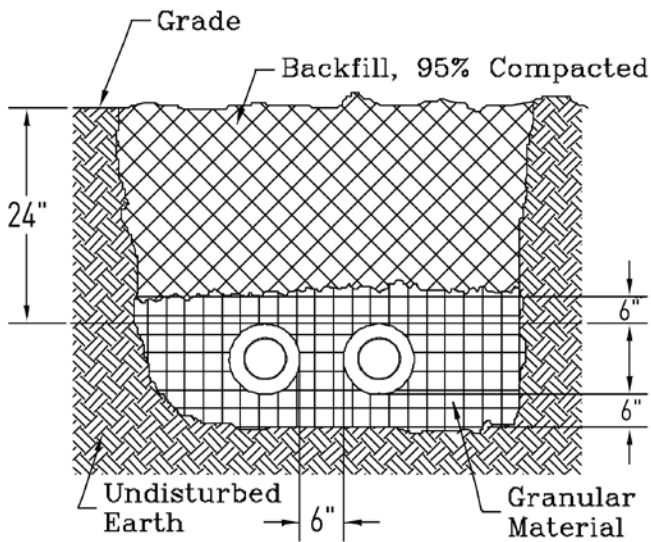
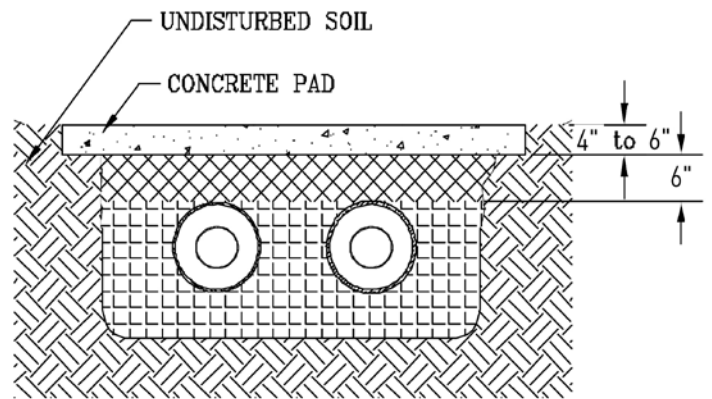
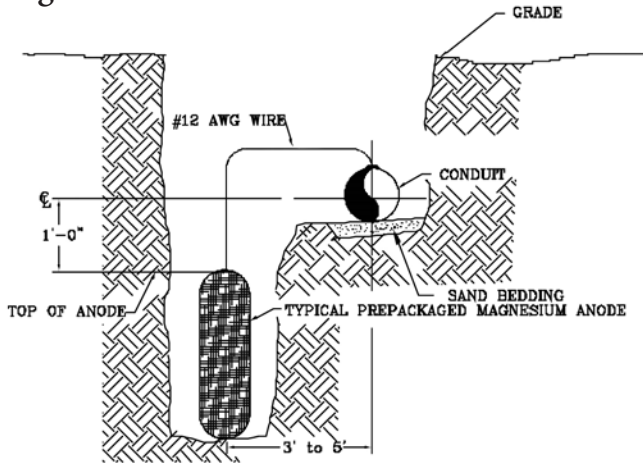


Fig. 14.2



Section 15: Cathodic Protection (for Below Ground Systems)

Fig. 15.1



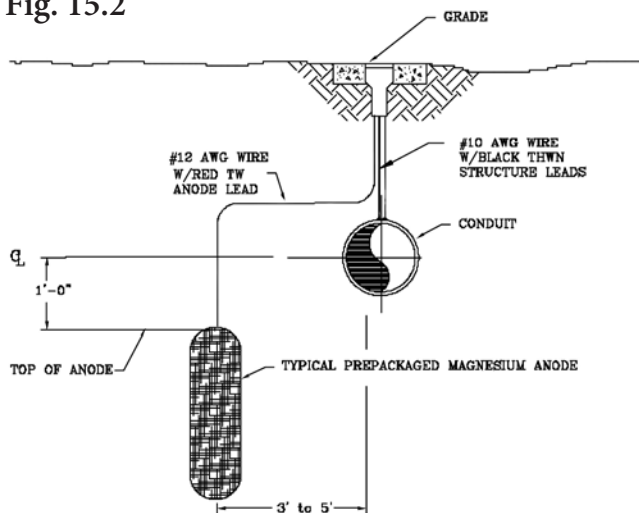
To install a cathodic protection system to the containment, first check the installation drawings for the locations of the anodes. Dig the holes for the anodes at the appropriate locations. The anodes should be 3' to 5' from the containment, and about 1' lower than the containment. The anode should be backfilled with 12" of native soil only. Next, string the wire, making sure that the #12 AWG wire is securely connected to the anode. Make sure to leave plenty of slack in the wires, especially in a test station.

See Figures 15.1, 15.2 and 15.4 for appropriate wiring diagrams and locations.

See Figure 15.3 for two pipe detail.

See Figure 15.4 for the test station wiring diagram.

Fig. 15.2



To activate the anodes: the anodes must be saturated with a minimum of 5 gallons of water prior to backfilling. If anodes are not activated properly, the test results could be lower than required.

Fig. 15.3

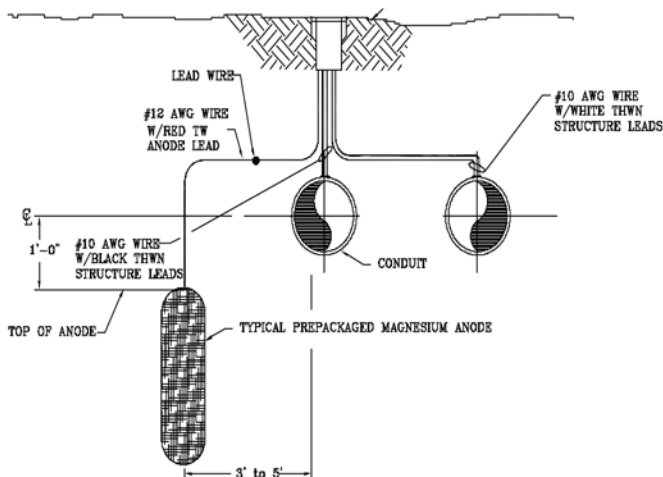


Fig. 15.4

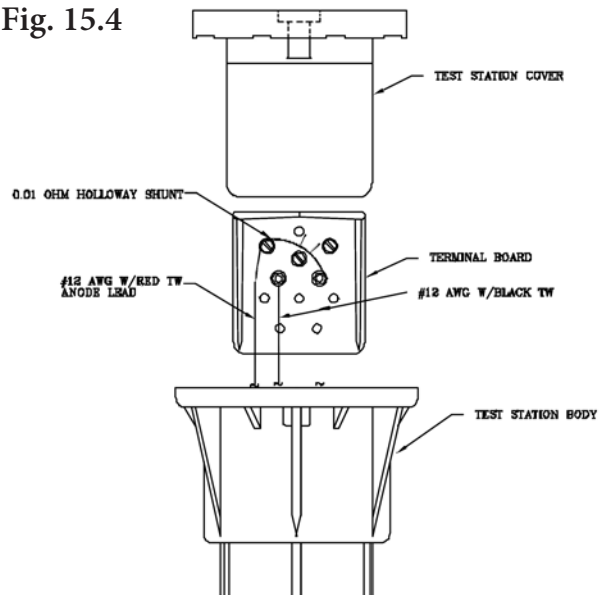


Fig. 15.5

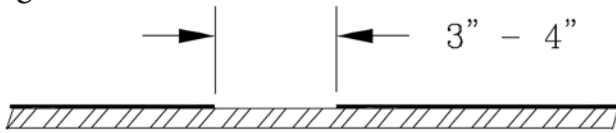


Fig. 15.6

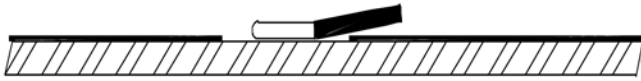


Fig. 15.7

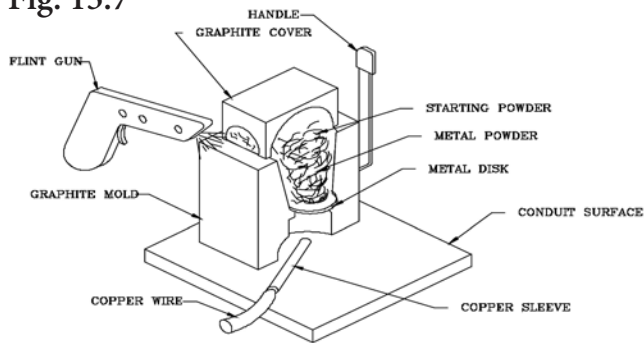


Fig. 15.8

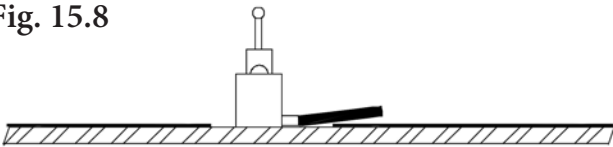


Fig. 15.9

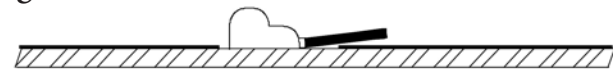
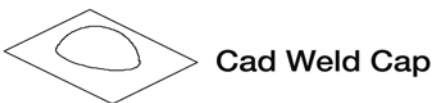


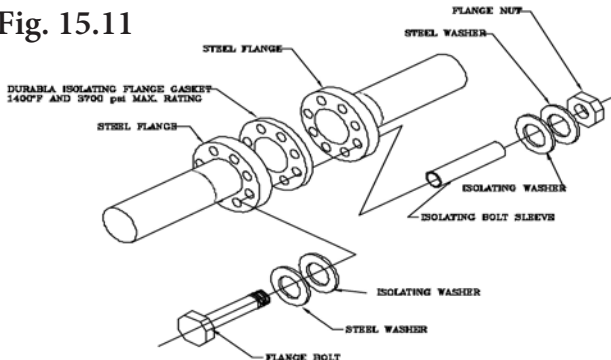
Fig. 15.10



Cad Weld Cap



Fig. 15.11



NOTE: This detail is for informational purposes only. Rovanco is not supplying the materials shown.
 NOTE: Isolating flange may be inserted at flanged valve location when available

To attach the wire to containment:

1. Grind off the epoxy coating in a 2" or 2" square, down to white metal. Clean surface, and dry.
See Figure 15.5
2. Strip 1" of insulation from the end of the wire, slip on a copper sleeve, and crimp it. Place the wire against bare containment.
See Figure 15.6
3. Prepare the welder by placing the metal disk in the bottom pocket of the cad welder. Be sure that two disks are not stuck together. Then open the powder cartridge, and dump out the powder into the pocket. The starting powder sticks in the base of the powder cartridge. Squeeze the base of the cartridge and dump out the starting powder on top of the regular powder. Close cover and place over wire.
See Figure 15.7

CAUTION: Keep all unused powder cartridges away from sparks or open flame.

4. Hold welder firmly in place while making connection. Apply spark to side of welder.
See Figure 15.8

CAUTION: Use protective eye wear. Powder will flare up when ignited.

5. After the weld cools, remove excess slag with a hammer.
See Figure 15.9

6. Coat the connection with a coal tar compound. Make sure to fully coat the bare containment, the inside of the cad weld cap, and the wire connection. Then place a cad weld cap over the connection.
See Figure 15.10

It is the responsibility of the installing contractor to isolate the underground containment system from the building or above grade piping, reinforcing steel in buildings, manhole walls, foundations, and any other metallic structures. The contractor must provide high temp isolating flange kits sufficient to isolate our pipe from pipe connected to ours. Flange sets when required will be provided by others. Refer to the installation drawings for isolating flange locations.
See Figure 15.11

If the specifications allow, dielectric couplings or unions can be used in place of flanges for smaller pipes.

Note: Flanges, flange gaskets, nuts, bolts, washers, and sleeves are not supplied by ROVANCO.

Section 16: Operation & Maintenance of Cathodic Protection Systems

Introduction: Corrosion is mitigated when the anodic corrosion current leaving a structure is appreciably reduced. Cathodic protection is a method of corrosion-control which minimizes anodic dis-solution by reducing the potential difference between the anodic and cathodic sites on a structure ex-posed to an electrolyte. Theoretically corrosion of the structure will be eliminated when the open circuit potentials of the cathodic sites are polarized to the open circuit potentials of the anodic regions of a structure. The entire structure becomes cathodic relative to an anode material installed within the structure's electrolyte.

There are generally two methods of applying cathodic protection. One of these methods uses anodes which are energized by an external DC power source. The second method makes use of galvanic anodes, which have an electrical difference in potential with respect to the structure to be protected. The anodes are fabricated from a material, such as magnesium or zinc, which is anodic with respect to the protected structure. The anodes are usually connected directly to the structure.

Cathodic Protection System Maintenance

Cathodic protection systems must be properly maintained in order to operate effectively. Periodic inspecting and testing should be performed to insure continued beneficial performance and realization of the estimated design life of the system.

Monthly Monitoring

Monitoring shall be referred to as a more frequent spot-check of the cathodic protection system. Monthly monitoring of the cathodic protection system is recommended at selected test locations. The following procedures should be followed during the monthly cathodic protection system inspection:

1. Read and record the structure-to-soil potentials at selected permanently installed test stations located along the underground structure. These test stations include:
 - Foreign line crossings
 - Bonds to foreign structures
 - Metallic casings a road crossings
 - Buried insulation joints
2. If the readings are acceptable, no further work is required. If the readings are not acceptable, a troubleshooting procedure will be required to resolve the problem, either performed by the owner or a qualified corrosion consultant contracted by the owner.

Annual Maintenance

Maintenance shall be referred to as the detailed annual inspection and testing of the cathodic protection system. Annual maintenance should be performed by the owner of the system or a qualified corrosion consultant contracted by the owner.

A detailed annual survey should be conducted on the cathodically protected underground structures to include the following:

1. Measurement of the structure-to-soil potentials at all test stations and/or points where the structure is physically accessible.
2. Inspection of each accessible electrical isolator for effectiveness.
3. Measurement of current drained to or from the cathodically protected structure through existing electrical bonds.
4. Measurement of structure-to-electrolyte potential on intersecting structure and structures in the immediate vicinity.
5. Report any indications of interference current flow by appropriate notations. Interference currents are detectable by unusual uncycled fluctuations while observing potential measurements. Interference may tend to depress potentials of a metallic structure without the usual fluctuations. Any deviation in potentials to a less negative value for no apparent reasons should be noted and reported.

Test Equipment

A portable high impedance voltmeter (20 mega-ohms minimum), a portable saturated copper/copper-sulfate reference electrode, assorted test leads, and a reel of insulated small gauge (No. 18 or No. 22 AWG) wire are required to perform testing of the cathodic protection system.

The voltmeter should be maintained in good operating condition and checked periodically for accuracy as recommended by the manufacturer.

Cathodic Protection Criteria

The recommended practices established by the National Association of Corrosion Engineers (NACE) in Standard RO-01-69 (1983) and RP-02-85 list five criteria for cathodic protection of buried metallic structures. These criteria are as follows:

- A negative (cathodic) voltage of at least 0.85 volts as measured between the structure surface and saturated copper/copper-sulfate reference electrode contacting the electrolyte with protective current applied.
- A minimum negative (cathodic) voltage shift of 300 milli-volts produced by the application of protective current. The voltage shift is measured between the structure surface and a stable reference electrode contacting the electrolyte. This criterion of voltage shift applies to structures not in contact with dissimilar metals.
- A minimum (cathodic) polarization voltage shift of 100 milli-volts measured between the structure surface and a stable reference electrode contacting the electrolyte. This polarization voltage shift is to be determined by interrupting the protective current and measuring the polarization decay. When the current is initially interrupted, an immediate voltage shift will occur. The voltage reading after the immediate shift shall be used as the base reading from which to measure polarization decay.
- A structure-to-electrolyte voltage of at least as negative (cathodic) as that originally established at the beginning of the Tafel segment of the E-log-I curve. This structure-to-electrolyte voltage shall be measured between the structure surface and a stable reference electrode contacting the electrolyte at the same location where voltage measurements were taken to obtain the E-log-I curve.
- A net protective current from the electrolyte onto the structure surface as measured by and earth current technique applied at predetermined current discharge (anodic) points along the structure.

Section 17: Operation & Maintenance of Containment

Annual: Remove the drain plugs to check for the presence of water in the air space yearly. When removing the drain plug on a hot system, be alert for a possible steam flash. If water is found follow the repair procedure outlined below. The drain plugs must be replaced after the inspection to insure water does not inadvertently enter the air space from a flooded manhole or mechanical room.

CAUTION: Extreme caution must be exercised if entering manholes and opening vents and drains on hot systems.

Also do an air test of the containment yearly. Using an air compressor, pressurize the air space to 15 psig and hold for one (1) hour. If the pressure can not be maintained, see the repair procedure below.

Repair: If a leak in the casing is found, it should be repaired, tested, coated, and backfilled as it was originally installed.

If a leak in the carrier pipe is found, at least a 1' section of pipe should be removed and replaced. The carrier pipe should then be hydrostatically tested at 1 ½ times it's operating pressure, not to exceed 500 psig. Repair the casing using a rolled sleeve, similar to the connector band used in assembling the field joints. Then coat the repaired connector band.

If insulation within the containment becomes wet, then force ventilate the air space in the system at a rate of not less than 3 cubic feet per minute, and apply heat through the internal piping. Introduce the air through the system's high point vent, and force out the low point drain. **Caution personnel regarding the possibility of a steam flash out of the low point drain while air is being forced through the system.** Place a cool mirror at the exhaust point for a short time at appropriate intervals and position to indicate maximum fogging due to moisture. Continue ventilation until the mirror exhibits no visible fogging.

System Shut Down: If the system is shut down for any length of time, seal the system vents by plugging the goose neck or removing it and installing a plug. Purge with dry nitrogen before sealing system. The vents must be opened and the goose neck replaced before the system is turned on again. This will prevent moisture entry during shutdown.

If you have any questions about anything in this instruction manual, or have any difficulty in completing the work please feel free to contact ROVANCO's Customer Service Department at our main office in Joliet, Illinois (815) 741-6700.

Thank you once again for showing your confidence in ROVANCO by purchasing our Insul-8 containment products. We want you to know that we have a full line of pre-insulated and pre-fabricated piping systems for almost any temperature, pressure or site condition.

If you are not familiar with our complete product line and you would like to know more about our product or would like to have our local Manufacturer's Representative call on you, call ROVANCO at (815) 741-6700 or visit us at www.rovanco.com.

Section 18: Parameters For Properly Installing & Operating Systems

Rovanco's pre-insulated and pre-fabricated products are carefully engineered to function as intended. If these products are properly installed, fully-tested, maintained and operated within the parameters for which they were designed, these systems should provide the user with years of trouble-free, efficient operation.

Refer to Rovanco's Installation Instruction(s) and the associated documentation from Rovanco's Engineering Department for important information and instructions that will carefully detail installation, testing, operating, and maintenance procedures. If needed, you are always welcome to contact Rovanco for assistance.

Failure to comply with the procedures as outlined in the Installation Instructions and Engineering support documentation could result in product damage, reduced product service life, costly repairs due to product failure, hazardous conditions which could result in injury to people, property and/or equipment. In addition, it will void Rovanco's warranty.

If any Rovanco product does not perform as it is intended to, please inform Rovanco immediately.

Some problems and their potential causes are listed below. Although this list is not all-inclusive, you may be able to find additional information in Rovanco's Installation Instruction(s) and/or the Engineering Department documentation.

General Piping System Care:

- Wet insulation does not perform as intended and causes the premature failure of the system. Therefore, it is important the system's insulation is kept dry at all times. This includes during storage, installation and when system is operating.
- Our systems have been engineered to operate within a specific temperature & pressure range and under appropriate environmental conditions. Therefore, do not install or put our systems into service if these parameters are not within the product's specifications.
- If you find it is necessary to alter a Rovanco piping system, review the planned alterations with Rovanco or a qualified piping system designer before making any changes.
- Maintenance plays an important role in assuring you get the full service-life out of the system. Rovanco systems are designed to provide years of trouble-free operation, but changing conditions can affect that. So, systems should be inspected regularly to verify they are in good operating condition and functioning as intended. If repairs are required, make them promptly.

Pre-Insulated Foam Systems:

- Piping systems must be kept dry. Moisture of any amount can corrode carrier pipe and prematurely breakdown insulation. This will shorten piping system service-life and/or prevent it from operating properly. Keep all piping system dry during storage, installation and when it is operating.
- Assure field joints are completed correctly. This includes the proper field insulating and enclosing the outer jacket in the joint area. Improper completion of field joints could result in water ingress effecting carrier pipe and/or insulation.
- Damage to jacketing must be repaired immediately. Failure to do so could allow moisture to reach the insulations and/or carrier pipe.
- When installing piping systems designed for underground use that require external expansion pads, you must assure these expansion pads are properly installed according to specifications. Proper installation will allow for associated thermal expansion. Improperly installed expansion pads will put unwanted stress on a piping system that could damage it.

Conduit & Containment Systems:

- Moisture negatively affects a systems functionality and shortens its service-life. Moisture will corrode carrier, conduit & containment piping, leak detection or pull cables and it will degrade insulation. It is important that the air space in these systems is kept dry. If any type of moisture is detected, it must be dried immediately so system is returned to a dry state during installation and operation.
- A combination of moisture in the air space and high operating temperatures will accelerate the destruction of piping, its coating and any insulation. This can result in costly repairs, system damage and possibly system failure. Therefore, do not ever operate these systems under the negative conditions of moisture presence and high temperatures.
- Gland seals provide a seal against a service pipe while still allowing that service pipe to have axial movement. Therefore, it is important all gland seals are adjusted properly to these conditions are met and there is no binding of the service pipe.
- End seal vents and drain piping play an important role in keeping the air space dry. They allow the annular air space to vent and drain as well as prevent moisture ingress. So it is important end seal vents and drain piping is installed properly. This will allow them to function as intended.
- One important detail that will help keep the air space dry and drainable is to assure the piping system is installed with the proper slope so any moisture can drain as intended.

Systems Intended For Underground Installation:

- Plan for adverse weather conditions prior to installation. If trenches gather water, they must be drained prior to the installation of the piping.
- Inspect all steel piping that will be buried prior to backfilling using a Holiday tester. Any holidays or damage to coating must be repaired in accordance with Rovanco's installation instructions prior to backfilling. Failure to repair voids or damage to coating will promote premature corrosion and effect system performance and length of service.
- Prior to backfilling, all carrier pipe, conduit and containment piping must be tested. If piping system integrity is not tested prior to backfilling, it will result in costly excavating and will not be Rovanco's responsibility.
- Cathodic protection system must be installed with thin-coated steel conduit or containment that will be direct buried. The cathodic protection will prevent the premature corrosion of thin-coated steel piping system.
- Line trench accordingly before piping installation. Backfill and compact post-installation in accordance with Rovanco's installation instructions. If these procedures are performed properly, it will help prevent damage to the system when the ground settles.
- Manholes must be kept dry at all times. Installing sump pumps, keeping end seals above water levels and not installing manholes in low points will help prevent water from draining into them.