Rovanco® Piping Systems
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Above Ground FRP Containment with Promoted Resin Installation Instructions

INS-FRP

Revised 03/13/24

This instruction manual will give you all the information needed in terms of techniques, tools, and accessories required to install ROVANCO FRP Containment system. If you follow the instructions carefully, the end result will be a high quality, pressure testable conduit 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

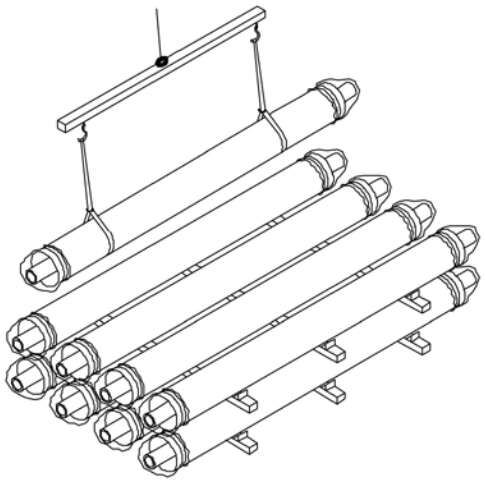
Inspect all shipments on receipt. Examine all pipe and accessories as they are unloaded. Check to insure that every item on the packing list is received. Check the contents of the cartons to insure that the materials have arrived safely. Do not throw the cartons from the vehicle. Handle all materials 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 FRP Containment system.

UNLOADING

ROVANCO FRP containment 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 polyethylene jacket. Do not use chains or chokers in direct contact with the polyethylene jacket. Do not drop spool pieces because this can damage the insulation or the polyethylene jacket.

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

All carrier pipes must be hydro-tested and containment must be air tested per the specifications prior to pouring thrust blocks or backfilling the system. Failure to comply with these procedures voids warranty.

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: Pull Rope Instructions

Fig. 1.1

Fig. 1.2

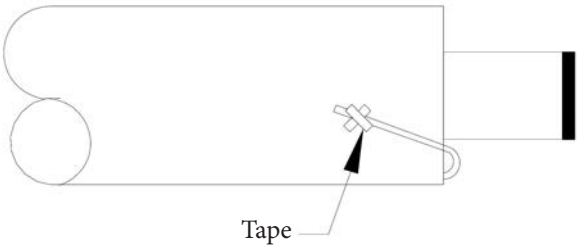


Fig. 1.3

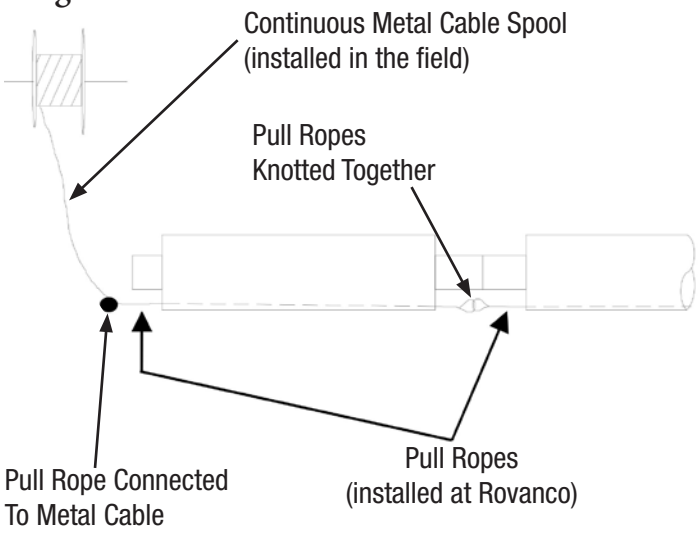
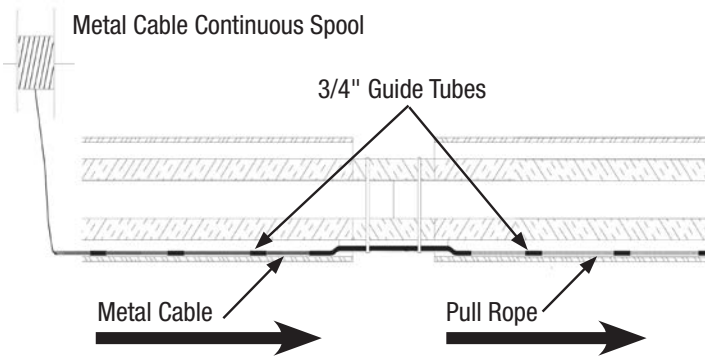


Fig. 1.4



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 1.1**

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 1.2**

   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 1.3**

   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 4.** 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 1.4**

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

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

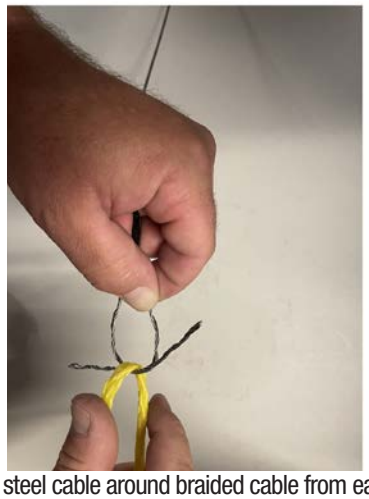
Open up hollow braid approximately 12-14 inches from end to insert taped point into the braiding.

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

Loop should look like this.

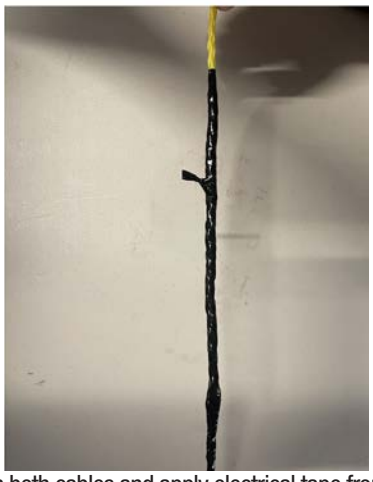
Use Scotch 33+ electrical tape to wrap section where point was inserted into the braid tightly.

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. 1.5

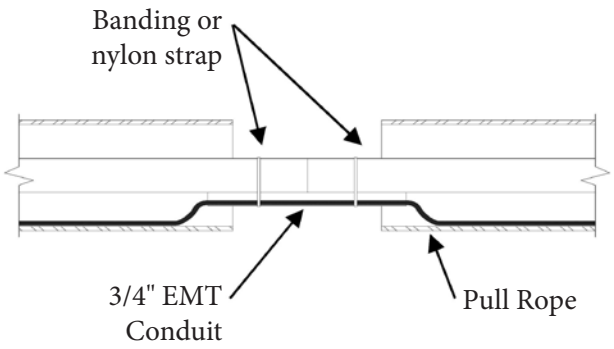


Fig. 1.6

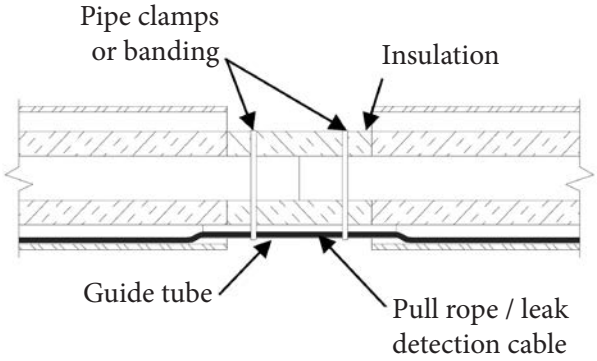
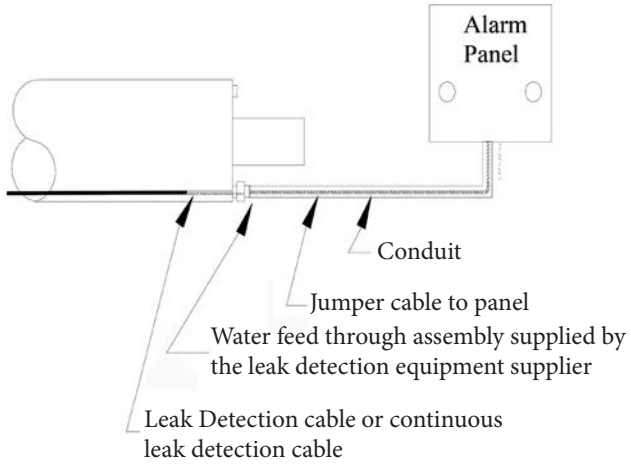


Fig. 1.7



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 1.5**

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

7. After the continuous cable is pulled and properly positioned in the joint area, begin the containment connector bands process. **See Figure 1.6**

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.

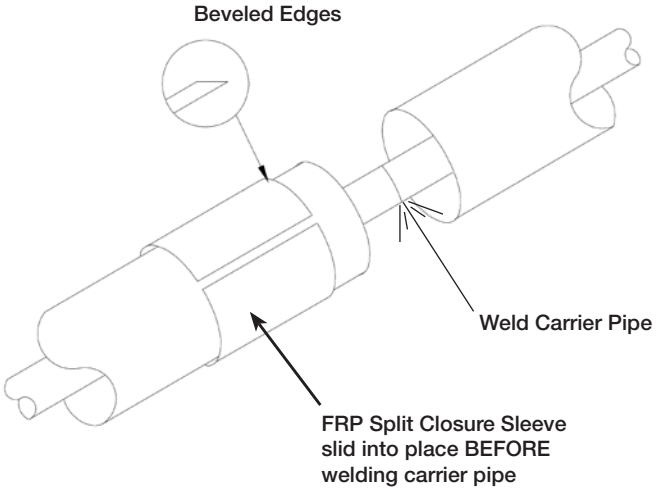
It is extremely important to pull the Leak Detection cable and test it prior to backfilling! See Figure 1.7

Section 2: 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 3: Welding of Carrier Pipe

Fig. 3.1



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.***

Read all instructions thoroughly before starting work.

Remove any packaging materials present that may have been used to secure the carrier pipe during shipping.

A split closure sleeve is provided and should be tapered then slid over one end of the containment pipe before making carrier pipe joint. **See Figure 3.1**

A filler piece is also provided for the longitudinal sleeve seam. Weld or otherwise connect all carrier pipes and test as per the job specifications. Adjust the jacket spacing to the approximate dimensions on the site plan.

Section 4: Preparation

ROVANCO recommends the use of a two or three man 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 5: 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
- l/2" x 3" Fiberglass Bristle Roller*
- 3" Wide Throwaway Paint Brushes
- Auxiliary Heat, No Flame (cold weather)
- Cleaning Solvents, Such as Replaceatone*
- 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) l/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	

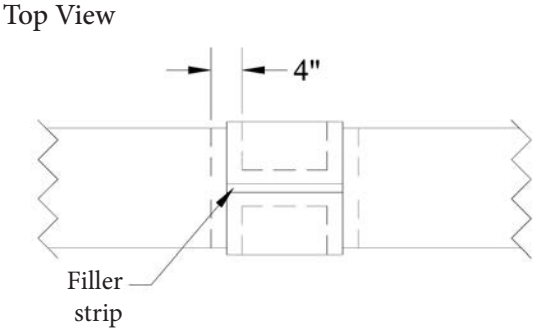
Section 6: Joint Assembly Hand Layup

Read all instructions thoroughly before starting work.

1. **Refer to the chart on page 10** 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. 6.1



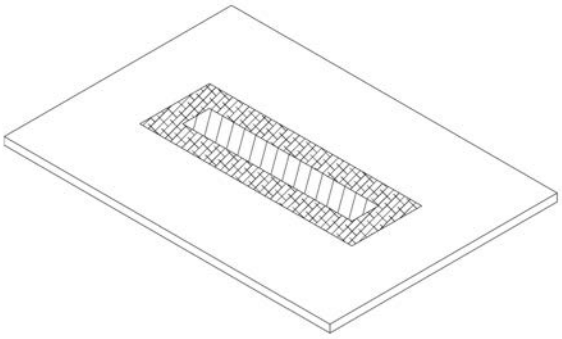
2. Prepare the pipe and coupling to be bonded within two hours of fiber-glassing the joint to prevent accidental contamination. Preparation should be done with a 4 1/2" grinder with a 36 grit abrasive wheel. Make sure to wear the required safety equipment. Properly prepared surfaces will be uniformly 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 6.1**.

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 contaminates that may affect its performance. **Set up tools, rollers, solvent, pails, disposable gloves and the required safety equipment.**

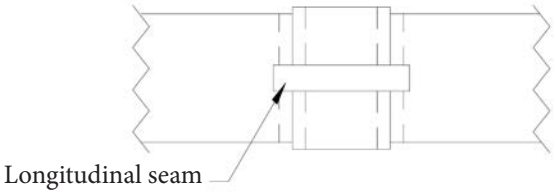
4. Add 5-8 cc of catalyst to one 32 ounce cup of resin and mix thoroughly with a mixing stick. You will have approximately ten minutes to work before the resin starts to harden. Use 10 cc on cold days when rapid setting is required. Use 4 cc on hot days to slow down the cure time.

Fig. 6.2



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 6.2**

Fig. 6.3

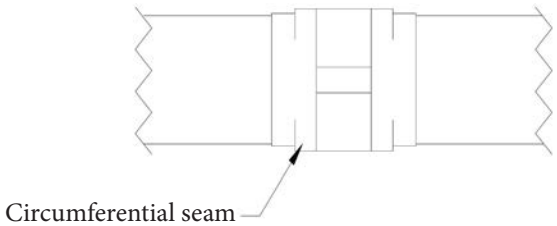


7. Roll out the layers forcing air bubbles and forming a translucent sandwich between the matting and bi-ply. Make sure all layers are aligned and centered.

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 6.3**

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 6.4**

Fig. 6.4

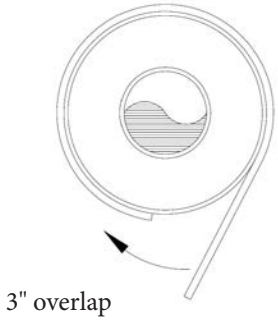


Center the layers at the top so that the overlap ends up at the bottom. Be sure to have at least a 3" overlap where the fiberglass wraps meet. **See Figure 6.5**

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

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.

Fig. 6.5



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.

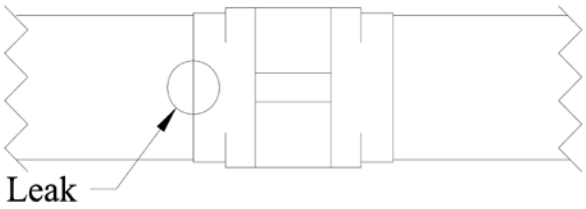
Note: Excessive air pressure, over 10 psi, could present a dangerous situation.

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 7: Repairing Containment Joint Leaks

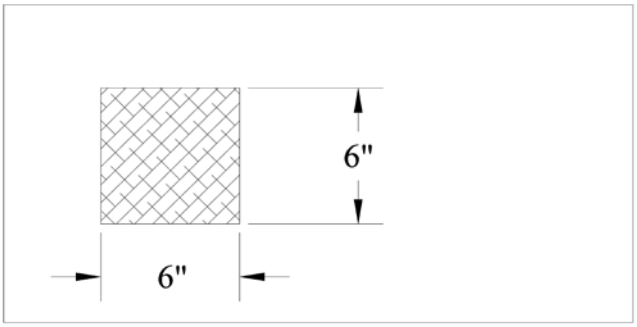
Fig. 7.1



1. First, locate the leak with a soap and water test. Then, circle the leak area with a marker. **See Figure 7.1** Check all field joints so that all leaks can be repaired at once. Depressurize the system after all leaks have been found.

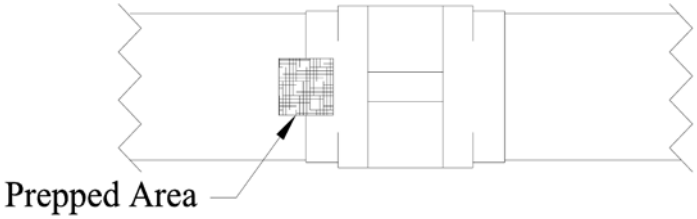
2. Cut the material needed to make the repair. You should use a minimum 4 layers of matting six inches by six inches. **See Figure 7.2** If the leak is too large to be covered by the patch, please contact Rovanco's customer service for further repair instructions.

Fig. 7.2



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 7.3**

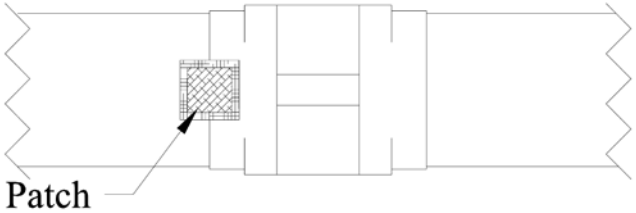
Fig. 7.3



4. Wet out the patch and apply in accordance with the assembly instructions outlined earlier in this manual. **See Figure 7.4**

5. Make sure the resin has hardened before re-testing. Soap the joints to be sure that the leaks have been sealed.

Fig. 7.4



Section 8: Hot Patching

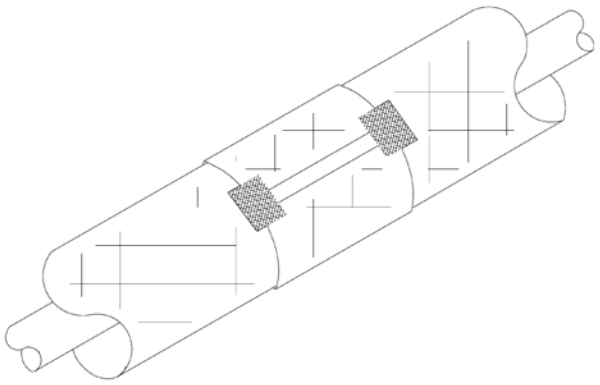
Fig. 8.1

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 8.1 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 8.2**

Fig. 8.2



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 9: 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.

Two-Piece Secondary Containment Pipe & Fittings

Installation Instructions

CHEMICAL & INDUSTRIAL

Important - Read This First

Before beginning actual assembly procedures, read to assure all individuals involved in the installation thoroughly understand the following suggestions and precautions:

You must use Manual No. INS1000 or INS1010 with these instructions.

In all cases, the bonding surfaces must be clean and dry before applying adhesive. All bonding surfaces must be factory fresh in appearance. When machined ends have been stored in direct sunlight, surfaces will weather and result in loss of bond strength. When surfaces are weathered, sand or re-scarf spigots and sand sockets to achieve a factory fresh appearance.

Use of approved field scarfing tools is recommended to obtain a uniform scarf dimension and a snug fit. During set up of the scarfing tools, dry fit to make sure the two halves of the fittings close together completely on both sides (see Fig. 6).

Do not move secondary containment joints prior to adhesive cure.

The instructions for assembling the primary piping are shown in Manual No. INS1000 which must be used with these instructions for containment systems.

Introduction

These instructions cover only the assembly of the secondary system. Manual No. INS1000 must be used for primary installation instructions. Procedures common to both systems, such as cutting, handling, adhesive mixing, etc., are presented in Manual No. INS1000 and INS1010.

These installation instructions are for low pressure (drain) secondary containment systems. All references to secondary containment systems in these instructions are related only to low pressure, gravity drain systems. The secondary containment system is designed for use with Red Thread™ HP, Green Thread™ HP, Centricast™ CL, RB, and Z-CORE™ primary pipe.

The secondary containment piping system consists of the next larger pipe size (as a minimum) and special two-piece fittings. Fitting manufacturing process is by either the compression molding process, or the contact molding process. Contact molding includes spray-up and/or hand lay-up process.

The washer head bolts and threaded inserts required for assembling the fittings are supplied, with the inserts mounted in the fittings. One exception: Laterals are supplied with nuts, bolts, and washers because the parts are not mirror-image. Two types of adhesive (8000 series and Weldfast ZC-275) are available for assembly. The 8000 series adhesives require filler kits containing pre-weighed amounts of filler to increase the viscosity of the mixed adhesive when used with two-piece fittings.

NOTE: When standard primary sleeve coupling is used in the containment piping, do not use filler. These piping systems are recommended for corrosion services over a broad pH range. Consider the chemical recommendations for Red Thread HP (epoxy pipe) for a conservative evaluation. Refer to Bulletin No. ENG1030 for chemical resistance/operating temperature recommendations. Contact NOV Fiber Glass Systems when necessary for a more detailed recommendation.

Two-Piece Secondary Containment Pipe & Fittings

Section 1

Secondary Containment Piping Components

A. Containment Piping - Secondary containment piping sizes are as follows:

Primary Pipe Size		Minimum Containment Pipe (RTII, GT)		Minimum Containment Pipe (RB, CL, ZC)	
in	mm	in	mm	in	mm
1	25	-	-	3	80
1½	40	-	-	3	80
2	50	3[2]	80	3[2]	80
3	80	4[2]	100	4[2]	100
4	100	6[2]	150	6[2]	150
6	150	8	200	8	200
8	200	10	250	10[3]	250
10	250	12	300	12	300
12	300	14	350	14	350
14	350	16	400	16	400

RT = Red Thread HP **CL = Centricast CL** **ZC = Z-CORE**
GT = Green Thread HP **RB = Centricast RB**

[1] Bolt sizes:
3"-6" Secondary Containment = 1/4 -20 x 3/4"
8"-16" Secondary Containment = 5/16-18 x 11/4"
[2] When using 2", 3", or 4" sweep fittings, use containment pipe and fittings that are two diameter sizes larger than the primary.
[3] When using 8" 90° elbows, 12" containment elbows may be required. Contact the factory representative for recommendations.

B. Containment Fittings - Secondary containment fittings and components are as follows:

NOTE: Some standard primary fittings such as saddles, tapered sleeve couplings, etc., may be used with containment piping systems.

Component	Use
45° elbow	Contain primary 45° elbow
90° elbow	Contain primary 90° elbow
Tee	Contain primary tee or outlet saddle
Coupling	Contain primary coupling
Lateral	Contain primary lateral
Concentric Reducer	Contain primary concentric reducer
Termination Fitting	Terminate containment on primary pipe
Anchor Assembly	Anchor primary to containment pipe
Centralizer	Support primary pipe in containment

C. Adhesive for Secondary Containment Piping – For RT and GT secondary systems, use 8000 series adhesive with filler. Because of the quantity of adhesive required for secondary containment fittings, fillers are supplied for the larger (8069) size adhesive kits only. For CL, RB and ZC secondary systems, use ZC-275 adhesive. Filler not required for this adhesive.

Table 1

Number of bolt[1] holes in containment fittings

Size in	45° Elbow	90° Elbow	Tee	Lateral	Conc. Red.	Cplg.
3	9	10	11	13	-	10
4	9	10	11	13	6	10
6	9	10	11	14	8	10
8	15	17	19	16	10	14
10	19	21	27	32	8	12
12	25	29	38	42	10	12
14	26	30	39	50	18	14
16	26	31	39	54	18	14

Refer to Tables 1 and 2 for bolt hole and dimensional data

Adhesive kit

Section 2

System Layout

A. Primary Piping – Assemble primary piping according to the installation instructions in Manual No. INS1000 or INS1010.

B. Containment Piping – In some cases, the procedures for tapered joints from Manual No. INS1000 are required for assembling secondary containment joints. Pipe ends joined to containment fittings must be scarfed, while pipe ends joined to tapered couplings must be tapered spigots.

Containment pipe is placed over the primary pipe during assembly of the primary joints. As the primary pipe is assembled, centralizers are bonded to or snapped on the primary pipe depending on size. NOV Fiber Glass Systems supplies two types of centralizers (see Fig. 1). Thermoplastic snap-on centralizers are used for smaller sizes—up to 6" primary. Bond-on centralizers are used on larger sizes. Use 1/16" thick double-sided foam tape inside the thermoplastic centralizers to hold them in place. Sand the primary pipe O.D. before attaching bond-on centralizers.

NOTE: Thermoplastic centralizers will be much stiffer in cold weather. Treat similar to adhesive; prewarm in cold weather before attempting installation.

Careful planning of the pipe layout will allow inspection of the primary joints by moving the secondary containment pipe along the primary pipe. During the layout planning, it may be necessary to include a two-piece secondary containment coupling in the layout to allow additional clearance for inspecting the primary joints. It is a good practice to obtain a few extra two-piece

couplings for the containment system in case it is necessary to provide clearance for inspecting the inner pipe.

NOTE: Coupling placement must be planned before positioning of containment pipe, because the pipe must have scarfed ends. Additional consideration may be necessary for various types of leak detection systems.

C **Calculating Lengths for Containment Piping** – To determine the length of the containment piping, you must first dry fit the primary joints. Make sure that the tapered primary joints are fit tightly together, and place the bottom half of the containment fittings under the primary fittings.

Use a tape measure to determine the distance from the edge of the two containment halves placed under the primary fittings. Check Table 3 to determine the insertion depth of the containment pipe (minimum bond length).

Refer to Section 10 on Close Tolerance Piping in Manual No. INS1000 to determine the "make up" dimension for the primary piping. The adhesive acts as a lubricant during insertion of the spigot when bonding the primary system. This results in additional insertion length ("make up") when bonding the joints. Make allowances for the "make up" length when calculating the length of the containment pipe. The calculation procedure is as follows:

a. Determine the distance from the edges of the containment fittings.

b. Add the minimum bond lengths for both containment joints (shown in Table 3). This will provide pipe for insertion into the sockets of the containment fittings.

c. Subtract the "make up" dimensions for the primary joints (from Section 10 of Manual No. INS1000). This will allow for the decrease in overall length of the primary piping when assembled.

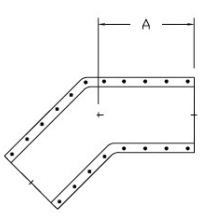
Table 2

Dimensional data for containment fittings

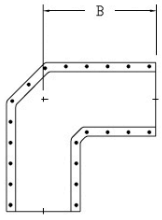
Containment Size		A		B		C		D		E		F		W	
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
3	80	6	152	7	178	14	356	-	-	11	279	7	178	1½	38
4	100	7½	191	8	203	14	356	6	152	13	333	7⅛	181	1½	38
6	150	8	203	9	229	16	406	11	279	15	381	8	203	1½	38
8	200	11	279	13	330	20	508	12	305	23¼	591	13	330	1½	44
10	250	18	457	21½	546	24	610	15	381	32½	826	19	483	1¾	44
12	300	21½	546	26	660	26¼	667	17	432	37½	953	22½	572	1¾	44
14	350	21½	572	27	686	28	711	29	737	43½	1,105	28½	724	1¾	44
16	400	21½	572	29	737	32	813	31½	800	47½	1,207	32	813	1¾	44

For RT/GT, contact NOV Fiber Glass Systems for recommendations on anchors and terminations.

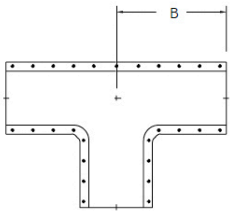
View of Fitting Illustrations



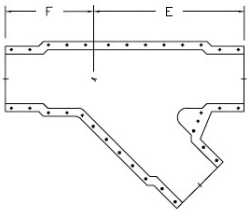
45° Elbow



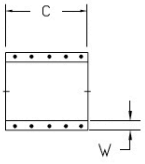
90° Elbow



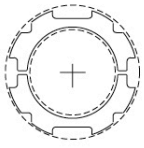
Tee



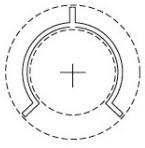
45° Lateral

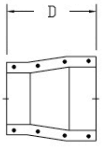


Coupling

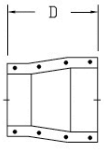


Centralizers





Concentric Reducer



Termination Fitting (Vented/Non Vented)

Table 3

Minimum Bond Length for Secondary Containment Fittings

Containment Size		Minimum Bond Length (L_B)	
in	mm	in	mm
3	80	2 ¾	70
4	100	2 ¾	70
6	150	2 ¾	70
8	200	3	76
10	250	4	102
12	300	4 ½	114
14	350	4 ½	114
16	400	4 ½	114

In equation form:

RT/GT: LP = X + 2LB – 2M

CL/RB/ZC: Lp = X + 2LB

Where:

LP = Containment pipe length, ft.

X = Distance from edge of one containment fitting to the edge of the next containment fitting

LB = Minimum bond length for containment joints

M = Make up dimension for primary joints from Manual No. INS1000

Sample problem:

Given: 16" containment pipe over 14" primary pipe. When laid out, the distance from the edges of the containment fittings is 12' 3".

Solution:

X = 12' 3"

LB = 4 ½" (minimum for 16" containment joint)

M = ¾" (14" pipe, Manual No. INS1000, Section 10)

LP = 12' 3" + 2(4 ½") – 2(¾")

LP = 12' 3" + 9" – 1 ½"

LP = 13' – 1 ½" = 12' 10 ½"

Section 3

Pipe Preparation

Scarfing

A. **Pipe scarfing** – Bonding surfaces of containment fittings are sanded in the factory. The containment pipe must be scarfed before assembling with containment fittings that have a socket joint. The scarfed (machined) surface of the pipe must be uniform and free of resin-rich areas. Note: For containment pipe connections to tapered fittings, such as tapered sleeve couplings (bell x bell), refer to Manual No. INS1000 and corresponding tapering tool instructions.

B. **Scarfing Tools** – For RT/GT, tools normally used to taper 3" through 12" RT/GT pipe can be used to scarf 3" through 12" containment pipe with the addition of a scarfing adapter kit. Scarfing kits and instructions must be specified when ordering the containment system components. The scarfing adapter kits contain special zero degree (0°) blade holders, special cutting (scarfing) blades, and set-up gauges for the 2"-6" tool. The 8"-12" tools will have a special blade holder, diameter tape, and instructions. The 8"-16" taper/scarf tool does not require a scarf kit.

Containment pipe in 8" through 16" sizes can be scarfed with a tapering tool by setting the taper angle to zero degrees.

Field gauges can be made from a short section of pipe (or other type of spacer) to set the depth of cut as long as the scarf dimensions match the scarf diameter and minimum scarf length shown in Table 4.

NOTE: Check the set up of the scarfing tools with a two-piece fitting on a regular basis. The containment fitting must be free to close around the pipe, and the flange (flat) areas of the containment fitting must fit together tightly on both sides (see Fig. 7).

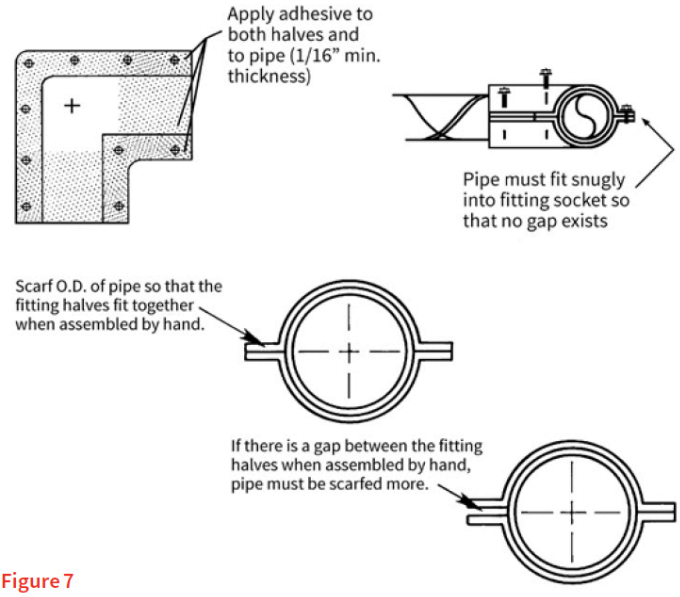


Figure 7

Table 4

Secondary Containment Pipe Scarfing Dimensions

Pipe Size		Scarf Diameter	Minimum Length	Circumference[1]
in	mm	in	in	in
3	80	3.480 ± .010"	3	-
4	100	4.480 ± .010"	3	-
6	150	6.615 ± .010"	3	-
8	200	8.570 ± .010"	4	26 15/16
10	250	10.570 ± .010"	5	33 3/16
12	300	12.550 ± .010"	5	39 7/16
14	350	14.410 ± .010"	5	45 ¼
16	400	16.410 ± .010"	5	51 9/16

[1] Using regular tape measure: ± 1/16"

Table 5

Quantity of Adhesive Kits Required per Containment Fitting

Containment Size		45° Elbow		90° Elbow		Tee		Termination Fitting & Coupling		Concentric Reducer		Lateral	
in	mm	8069	ZC-275	8069	ZC-275	8069	ZC-275	8069	ZC-275	8069	ZC-275	8069	ZC-275
3	80	1	-	1	-	1	-	1	-	-	-	1	-
4	100	1	-	1	-	1 ½	-	1	-	1	-	1 ½	-
6	150	1 ½	-	1 ½	-	2	-	1 ½	-	1 ½	-	2	-
8	200	2	5	2	5	3	6	2	4	2	3	3	6
10	250	3	5	3	5	4	7	3	4	3	4	4	7
12	300	4	6	4	6	5	8	4	4	4	5	5	8
14	350	5	7	5	7	7	10	5	5	5	5	6	10
16	400	6	9	6	9	8	11	6	7	6	6	7	12

Section 4

Assembly

Bonding

A. **Adhesive requirements** – All bonding surfaces must be clean and dry before applying adhesive. If the surfaces have been contaminated with oil, grease, etc., they must be cleaned as described in the instructions for primary joints (Manual No. INS1000 and INS1010).

The two-piece fittings require a greater amount of adhesive than the primary (tapered bell and spigot) joints. Adhesive mixing procedures for containment joints are the same as those for primary joints, except that a filler must be added to 8000 adhesive. The adhesive and hardener must be completely mixed before adding the entire contents of the filler kit. The filler kits must be ordered as separate items in quantities matching the number of adhesive kits required for containment joints. Quantity of adhesive kits required is as shown in Table 5. ZC-275 does not require a filler kit.

B. **Assembly** –The thickened (filled) adhesive may be applied with either the brush or stir stick provided in the adhesive kit. Use a small amount and apply pressure to "wet out" the machined surfaces, then apply a minimum 1/16" thick layer of mixed adhesive to all machined surfaces (including the flange areas of the fitting, the socket areas of the fitting, and the scarfed areas of the spigot).

Using the bolting materials, assemble the two-piece fittings over the primary system. The bolts can be tightened with a box wrench or impact wrench. Three-inch through 6" sizes require a 3/8" socket; 8" and larger sizes require a 1/2" socket. Alternate from side to side and end to end while tightening. Do not tighten from one end or one side in a manner that could cock the fitting to one side.

NOTE: If the pipe has not been scarfed to the proper dimension, the two halves of the containment fitting will not properly seal, resulting in a weak joint.

Make sure the scarfed pipe ends are inserted into the sockets of the fittings for a length equal to the minimum bond length shown in Table 3. Note: Be careful not to over-insert on the large end of secondary containment concentric reducers.

Do not disturb the assembled joint until the adhesive is completely cured. Cure times and curing procedures for secondary containment joints are the same as procedures for primary joints (refer to the adhesive instructions).

NOTE: Electric heating collars will not cover secondary containment fittings completely. However, you can use several heating collars under, around, and above the containment fittings if all bonded areas are covered (see Fig. 8) or you may wrap the fitting in heavy-duty foil and cure with a heat gun.

Industrial Heat Gun

A. An industrial heat gun and heavy duty aluminum foil may also be used to create a mini oven around the clam shell secondary containment fitting. Wrap foil around the fitting and cinch the ends down. Cut a 10" to 12" section of 2" or 3" pipe and place inside the foil. Place heat gun in the end of the pipe. Do not place heat gun any closer than 12" from the fitting. Cure time is approximately 15 minutes. For a proper cure, maintain the temperature between 250° and 400°F.

Section 5

Termination

Termination Procedure

A. Termination Fitting (Straight) Termination fitting (straight) consists of two pieces: a special coupling with a ring bonded to the O.D. (the "termination coupling") and a special short containment coupling (see Figs. 1 and 9). The O.D. of the ring is the same as the scarf diameter of the secondary pipe. The primary pipe is bonded with the special termination coupling. After testing, the special short containment coupling is bonded (see Fig. 9). Where required, the secondary containment coupling used in the termination fitting can be supplied with a threaded outlet. Contact your NOV Fiber Glass Systems representative.

Section 6

Testing the Containment System

NOTE: Local codes or other engineering considerations may dictate changes.

Primary pipe should be tested according to the procedures in Manual No. INS1000 or INS1010. Testing of the primary piping must be completed before the secondary containment is bonded and tested. This is to allow inspection of the primary joints.

A. NOV Fiber Glass Systems Products recommends hydro testing the secondary containment piping system with water to 15 psig. A hydro test is preferred for finding leaks in any part of the containment piping system. Air tests show leakage only where a soap solution is applied. Wear eye protection. If a hydro test is impractical, refer to paragraph B below.

B. **Air Test** – Compressed gas (air) tests can be dangerous unless the air test pressure is low. Wear eye protection during inspection of soaped areas. The following low, maximum allowable test pressures (by diameter) make this air test a safe procedure if normal safety precautions are followed:

THESE PROCEDURES MUST BE FOLLOWED IN ORDER TO AVOID SERIOUS PERSONAL INJURY OR PROPERTY DAMAGE. FAILURE TO DO SO WILL RESULT IN LOSS OF WARRANTY, AND BUYER, INSTALLER, OR ANY EMPLOYEE, AGENT, OR REPRESENTATIVE THEREOF, ASSUMES THE RISK OF ANY DAMAGE OR INJURY TO PERSON OR PROPERTY.

Installed NOV Fiber Glass Systems Products pipe systems should be tested prior to use to assure soundness of all joints and connections. In testing, sudden pressure surges must be avoided, as in some instances, surge or hammer can produce pressures of several times the rating of the pipe and fittings.

TESTING WITH AIR OR GAS CAN BE EXTREMELY DANGEROUS. REVIEW SAFETY PRECAUTIONS BEFORE STARTING THE TEST AND FOLLOW ALL TESTING PROCEDURES.

C. **Fixtures** – Saddles with threaded outlets can be attached to the containment pipe to perform the air test. The installation procedures for containment saddles are the same as for primary saddles in Manual No. INS1000. Leave the hose clamps in place.

D. **Leakage Checks** – Wear eye protection. During the air test, use soap solutions to check the joint for leaks. During the hydro test, watch the gauge pressure and inspect the joint for leaks. Make sure the gauges are accurate.

Read This Carefully

Maximum Allowable Air Test Pressures

Containment Pipe Size	3"-8"	10"	12"-16"
Pressure, psig	15	10	5

Safety Precautions

As in any system where pressure is employed, adequate safety precautions should be exercised.

EXERCISE DUE CARE IN INSTALLING AND TESTING THE PIPING SYSTEM TO REDUCE THE RISK OF INJURY OR PROPERTY DAMAGE.

Terminating with the Termination Fitting (Straight)

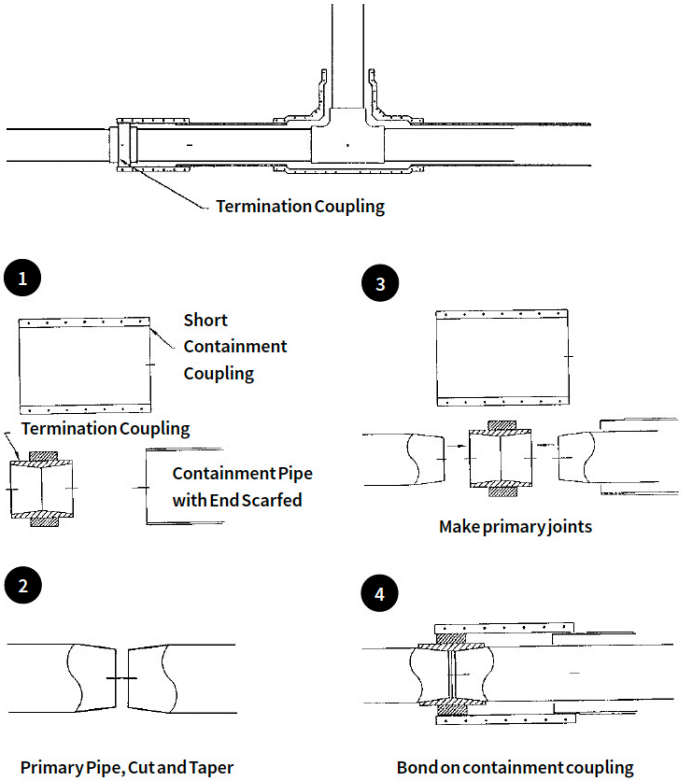


Figure 9

In buried applications, it is suggested that long pipe runs be partially backfilled at various points to secure them in place. All joints and connections should be left exposed for inspection.

In exposed pipe systems, standard pipe guides and hangers will normally be sufficient to restrain the pipe during testing.

Note: The light weight, flexibility, and elasticity of fiberglass pipe create different conditions than are present with steel pipe. If a failure should occur while testing fiberglass pipe with air or gas, the system will be subject to considerable whipping and other shock-induced conditions due to the sudden release of stored energy. The violent energy release can cause personal injury or death to personnel in the area and can also cause damage to the pipe or other property.

NOV FIBER GLASS SYSTEMS' PRODUCTS SHALL NOT BE LIABLE UNDER ANY WARRANTY, CONTRACT, OR IN TORT FOR ANY RESULTING INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, PIPE, OR OTHER PERSONAL PROPERTY, FOR FAILURE TO FOLLOW THE PROCEDURES AND COMPLY WITH THE PRECAUTIONS SET FORTH.

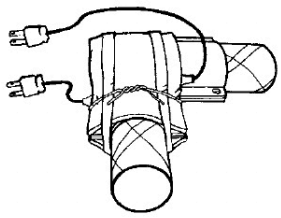


Figure 8

Section 7

Supports, Anchors, & Guides

A. Centralizers, Supports, and Guides – Primary centralizers (and anchors) are required for systems with thermal expansion and/or contraction (see Para. B, Anchors). Spacing of centralizers can be determined from the support spacing information in Manual No. ENG1000 (Engineering & Design Guide). DO NOT put centralizers under the containment fittings. The centralizers should be positioned 6"-12" away from the end of the containment fittings.

For above-ground installations, with or without centralizers, the support spacing for the containment pipe should be based on the larger (containment) pipe. The design temperature change should be the greater of the two pipes (primary or secondary). Use the support and guide spacing values from Manual ENG1000

B. Anchors – Containment anchors consist of making a positive connection between the primary and containment pipe, then anchoring the containment pipe to a rigid foundation.

Containment anchors are made up of a special primary pipe coupling and fittings with support risers machined to match the containment pipe scarf diameter. The containment pipe is joined with a special short coupling (see Fig. 11).

a. Installation Procedure –

1. Bond the coupling or fitting into the primary pipe line.
2. Apply adhesive to all machined areas.
3. Use the bottom half of the containment coupling for alignment.
4. Use bolts to assemble the top half of the containment coupling.

b. Anchor Locations –

Anchors are used to control pressure and temperature induced expansion and contraction of the primary piping inside the secondary pipe.

Pressurized piping systems designed for elevated or low temperature services must be anchored to restrain excessive movement of the primary within the secondary piping. In this case, anchors will be required at directional and elevations changes. Anchoring at pipe size changes, and connections to other materials is typically beneficial. Due to the complexity of these systems, engineered system modeling is recommended to optimize system design.

Ambient temperature gravity drain systems typically do not require anchors.

Support and anchoring of the secondary piping system is accomplished by the methods in Manual No. ENG1000.

Section 8

Repairs

Contact NOV Fiber Glass Systems for recommendations for leaking fittings and fittings joints

A Repairing Minor Pipe Damage – Follow the procedures in Manual No. INS1000 for repairing pipe wall damage.

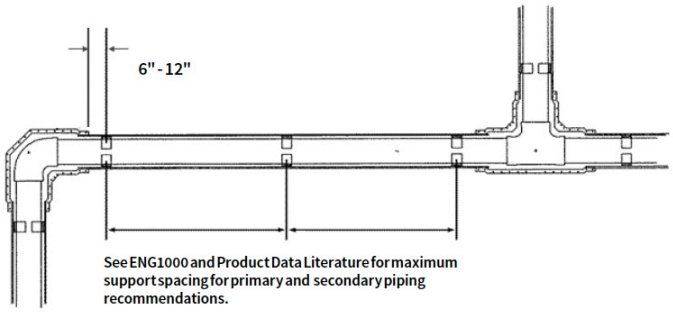


Figure 10

B. Repairing Extensive Pipe Damage – Containment sleeve couplings have a space in the center between the socket joints. Therefore, adding a sleeve coupling to the system will increase the total length and/or make up for removed sections of pipe. In some cases, more than one sleeve coupling may be required to replace a damaged pipe section. To prepare the scarf nipples for installing sleeve couplings, refer to the following section for replacement of fittings.

C. Repairing Leaking Containment Fittings – Bond leaks may be repaired by overwrapping the fitting with glass cloth and adhesives provided in the 8088 epoxy adhesive maintenance kit from NOV Fiber Glass Systems. The overwrap procedures are similar to those for overwrapping a leaking joint as shown in Manual No. INS1000. Exceptions to Manual No. INS1000 are as follows:

- Overwrap for containment fittings must cover 4" beyond both edges of the fitting, i.e. overwrap starts 4" on one side of the fitting and continues to 4" on the other side.
- Overwrap must never be made over uneven surfaces such as the step at bell ends and tabs (flanges) on the sides of containment fittings. All tabs (flanges) must be cut off, and the sides must be sanded to form a rounded surface. Wrapping over projections will create sharp breaks in the glass pattern. This practice will create voids (weak areas) in the overwrap. For a reliable overwrap, small pen grinders with rounded cutting heads are recommended for bevels at the end of bells and for rounding of tabs.
- Refer to Manual No. INS1000 for glass application procedures, keeping in mind that the glass cloth must be overlapped from side to side when covering the entire fitting and pipe.

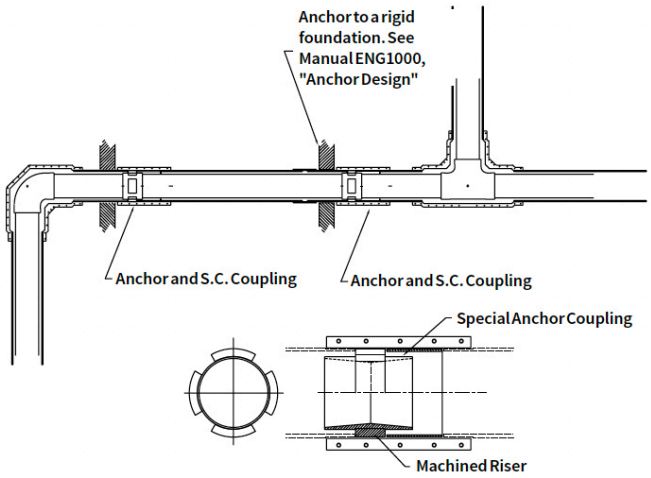


Figure 11

Table 6

Differential Expansion and Contraction Allowance

Containment Size		Maximum Allowable Expansion/Contraction	
in	mm	in	mm
3	80	0.05	1.3
4	100	0.05	1.3
6	150	0.08	2.0
8	200	0.10	2.5
10	250	0.15	3.8
12	300	0.20	5.1
14	350	0.25	6.4
16	400	0.30	7.6

Section 9

Other Considerations

A. Leak Detection – Several methods of leak detection can be used with the containment system. The type of detection system may dictate the size of the containment pipe and also the types and quantities of fittings for detection wells or pull points. The decision for type of detection should be made early in the design phase, and the manufacturers of leak detection systems should be contacted for the design parameters required for their systems.

The simplest system slopes back to a low point where fluid from a leak will collect. Leaks can then be detected with a sight glass or drain valve for above ground systems. For below ground systems, wells or sumps should be constructed at the low points. Leaks to these wells can be detected visually with removable covers on the wells or electronically with detectors in the well. Several types of detectors are available. The type chosen will dictate the size and type of piping required for installing the detectors. For large systems and for ease of locating leaks, several detection points may be used.

The most sophisticated system is the continuous monitoring cable systems that can detect leaks within about 12" of the failure. Systems using monitoring cables require clearance for the cable along the bottom of the annulus. A common dimension is a minimum of 3/4" clearance for cable connections. Pipe is typically assembled with pull ropes to pull the cable in after the piping is tested. Electrical fish tapes can be used as an alternate to pull the cable. This requires pull points be designed into the system.

B. Burial – Since two-piece fittings are designed to meet minimum stiffness required by AWWA M45 (American Water Works Association), burial instructions for secondary systems are the same as for primary systems.

C. Static Electricity - Refer to Manual No. ENG1000, Section 5, Paragraph E, with consideration that the primary pipe will not be in contact with the ground. When handling non-conductive fluids at high velocities, considerable static electricity can be generated in the piping and it may be necessary to ground the primary piping system. This can be accomplished by coating the exterior surface of the primary piping with an electrically conductive coating and attaching grounding wires at suitable locations along the length of the system. Installing grounded metal components (such as commercial static eliminators) that make contact with the fluid stream may also aid in removing static electricity charges. Using threaded saddles to obtain access to the grounding devices in the primary piping system is practical for this type of application.

D. Water Hammer – Systems with fluid (water) hammer surges significant enough to produce movement in the primary pipe must be anchored to prevent impact against the containment fittings. Refer to Manual No. ENG1000 for additional information concerning fluid hammer.

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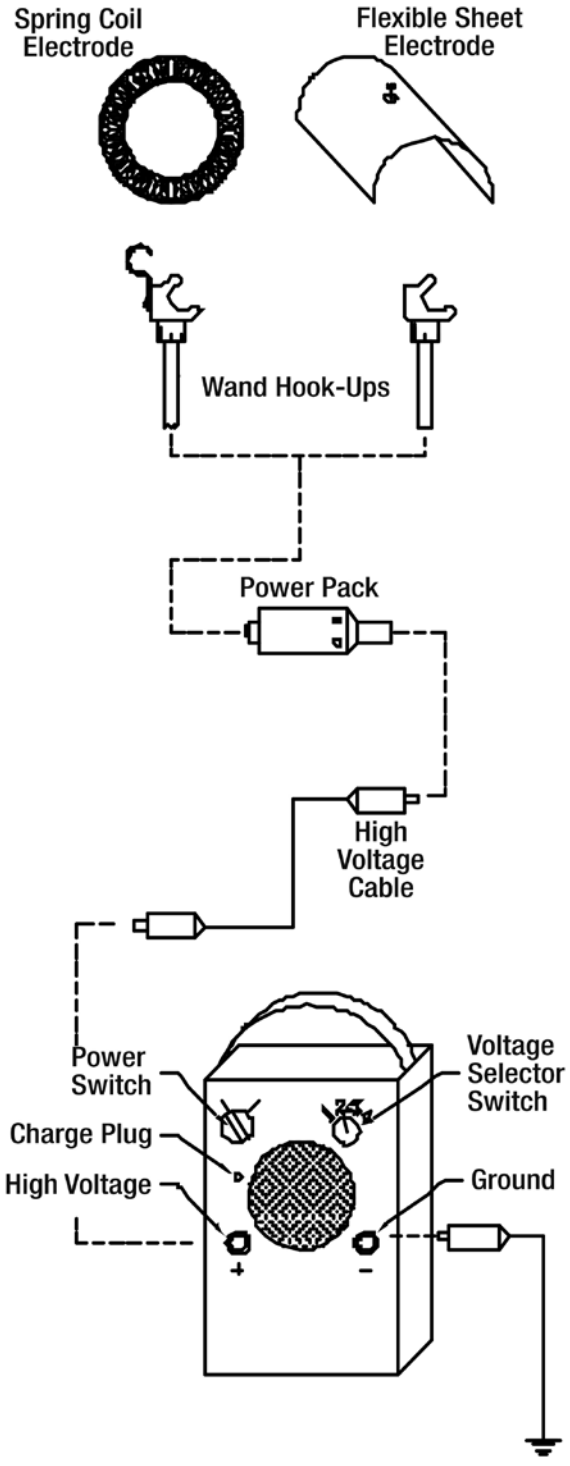
Section 11: Containment Coating Testing

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 back 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

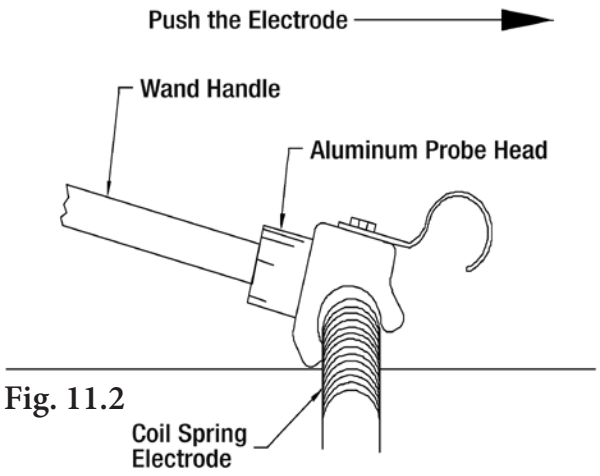


Fig. 11.2

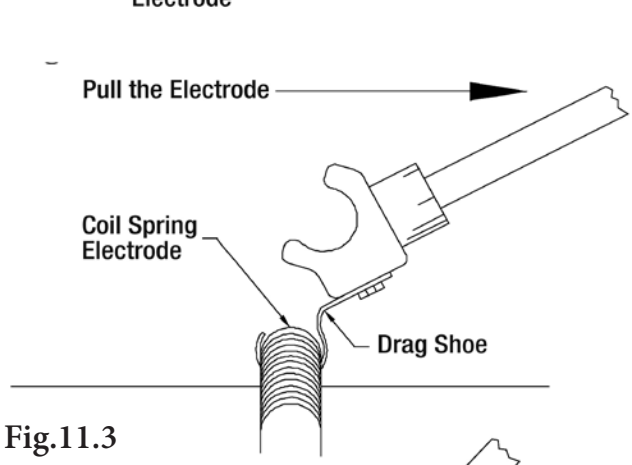
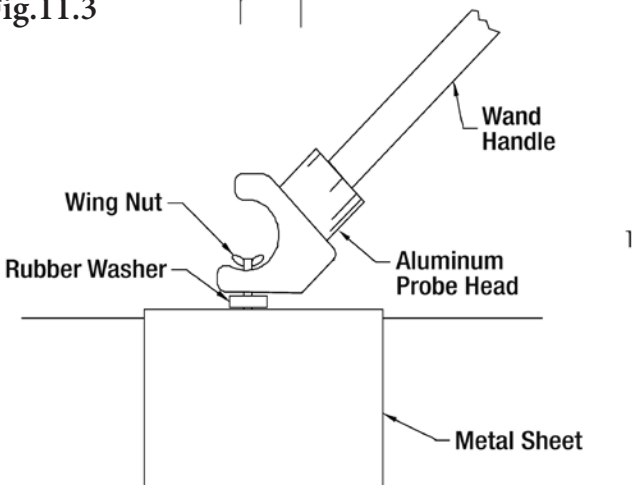


Fig.11.3



4. Operating Checks:

a. 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.

b. 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

a. 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**

b. 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**

c. 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.

D. Instrument Servicing Repair

1. **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:

a. Adjust the 4-position signal sensitivity switch through the porthole provided on the back panel in the belt recess.

b. 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.

c. Check for parted connector in wand and ground wire.

4. No Signal with Spark Discharge:

a. Check the position of the signal sensitivity switch.

b. 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.

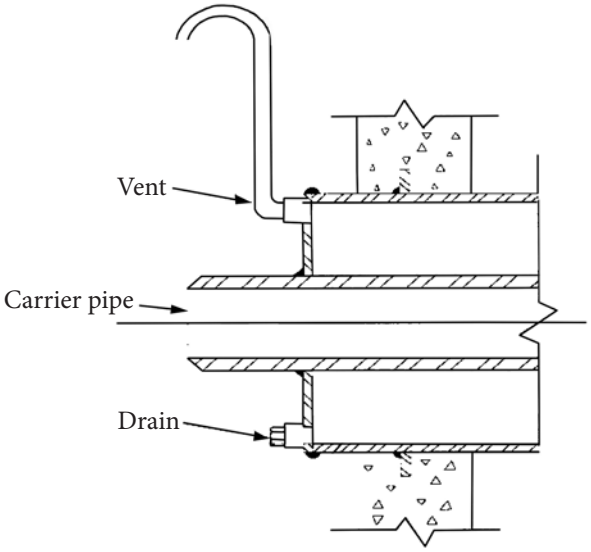
1. Use battery charger provided. Part Number 031-5
2. Recharge the battery in the instrument. Ventilation holes in front and back of the instrument case should be kept open.
3. Plug charger into polarized receptacle of instrument. Note: The battery cannot be tested or charged when the instrument power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

F. Battery Maintenance Information

1. 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.
2. Store at normal room temperature when not in use.
3. 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: Operation & Maintenance for Containment

Annual: Remove the drain plugs to check for the presence of water in the air space yearly. When removing the drain plug, 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 when entering steam manholes and opening vents and drains.

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. Warranty will void if this is not done and logged year to year.

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 2' section of pipe should be removed and replaced. The carrier pipe should then be hydrostatically tested at 1½ times it's operating pressure, not to exceed 500 psig. Re-insulate the carrier pipe as specified. Repair the inner containment casing using a split sleeve, similar to the connector band used in assembling the field joints. Air test the inner containment casing, then insulate as specified. Cover with a polyethylene sleeve and seal with a wrap around shrink sleeve.

Insulation: If insulation within the conduit 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 Shutdown: 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 be fore 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.

Manholes: Automatic sump pumps, if any, should be thoroughly inspected for proper operation annually. Steam traps, if any, should be routinely inspected and/or replaced, based upon the recommendations of the manufacturer. All flanges should be checked for leakage and tightened if necessary. Any evidence of groundwater leakage should be investigated and repaired. Gland seals, end seals, and the inside wall of prefabricated steel manholes should be routinely inspected for leaks and/or corrosion. Sand and repaint any corrosion to match the existing coating. Check valves routinely for leaks and repack when necessary. Insulation and jacketing of internal piping and equipment should routinely be checked and replaced when necessary. Warranty will void if manholes flood over Rovanco's piping systems.

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 Hi-Temp Insul-8 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, at rovanco.com, or email us at marketing@rovanco.com

Section 14: 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 break-down 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 filed 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.