

Two-Piece Secondary Containment Pipe & Fittings

Installation Instructions

Important - Read This First

Read and understand the following precautions before starting to assemble the secondary pipe system.

These instructions are for secondary pipes. For primary pipe assembly, refer to the correct manual:

- INS1000, for matched tapered joints
- INS1010, for socket joints

All bonding surfaces must be freshly sanded, clean, and dry with a factory fresh appearance before applying adhesive. Bonding surfaces stored in direct sunlight will weather and result in loss of bond strength.

Severely weathered pipe spigot ends may require re-scarfing.

Use approved field scarfing tools to obtain proper scarf dimensions and fit. During set up of the scarfing tool, dry fit a scarfed pipe end to ensure the two halves of the fittings close together completely on both sides (Figure 7). Refer to specific scarfing tool user instructions for further details.

Do not move secondary containment joints prior to adhesive cure.

Introduction

These installation instructions are for secondary containment systems using two-piece fittings. The primary carrier piping systems contained are Red Thread™ HP16, Green Thread™ HP16, Centricast™ CL, RB, and Z-CORE™.

Assembly procedures common to both primary and secondary systems, such as cutting, handling, adhesive mixing, etc., are in product specific primary piping installation manuals (INS1000 and INS1010).

The secondary containment piping system consists of special two-piece clam shell type fittings. The two-piece fittings ship with washer head bolts and preinstalled threaded inserts for quick assembly in the field. Lateral fittings are shipped with standard nuts, bolts and washers.

Three types of adhesive (PSX-34, Weldfast™ ZC-275 and 8069) are available for assembly. The 8069 adhesive requires a filler kit. The pre-packaged filler kit is required to increase the mixed adhesive viscosity for two-piece fitting assembly.

NOTE: When Red Thread HP16 or Green Thread HP16 primary tapered sleeve couplings are used in the containment piping do not use filler in the 8000 series adhesive.



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 (RT, 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
GT = Green Thread HP

CL = Centricast CL
RB = Centricast RB

ZC = Z-CORE

⁽¹⁾ Bolt sizes:

3 - 6 in. Secondary Containment = ¼ - 20 x ¾ in.

8 - 16 in. Secondary Containment = ⅝ - 18 x 1 ¼ in.

⁽²⁾ When using 2, 3, or 4 in. sweep fittings, use containment pipe and fittings that are two diameter sizes larger than the primary.

⁽³⁾ When using 8 in. 90° elbows, 12 in. containment elbows may be required. Contact the factory representative for recommendations.

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

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

NOTE: Standard primary saddles and tapered sleeve couplings may be used with containment piping systems.

C. Adhesive for Secondary Containment Piping

When installing RT and GT secondary containment systems use 8069 adhesive with filler or PSX-34 adhesive. When installing Centricast RB, CL and Z-CORE secondary containment systems, use ZC-275 or PSX-34 adhesives.

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 Manuals No. INS1000 and INS1010.

B. Containment Piping – Pipe joined to two-piece fittings requires scarfed pipe ends. Pipe joined to tapered sleeve couplings requires tapered spigot ends. The procedures for tapered pipe are in Manual No. INS1000.

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. NOV Fiber Glass Systems supplies two types of centralizers shown in Figure 3. Thermoplastic snap-on centralizers are used for sizes 1 to 6 in. primary piping. Double sided foam tape ⅛ in. thick placed inside the thermoplastic centralizers is used to hold them in place. Primary pipe sizes greater than 6 in. use bond-on fiberglass centralizers. The primary pipe O.D. must be sanded before attaching bond-on centralizers with adhesive.

NOTE: Thermoplastic centralizers will be very stiff in cold weather. Prewarm to 70°F-90°F (21°C-32°C) before attempting installation in cold weather.

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:

- Determine the distance from the edges of the containment fittings.
- 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.
- 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	
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	7⅞	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	¾	44
12	300	21½	546	26	660	26¼	667	17	432	37½	953	22½	572	¾	44
14	350	21½	572	27	686	28	711	29	737	43½	1,105	28½	724	¾	44
16	400	21½	572	29	737	32	813	31½	800	47½	1,207	32	813	¾	44

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

View of Fitting Illustrations

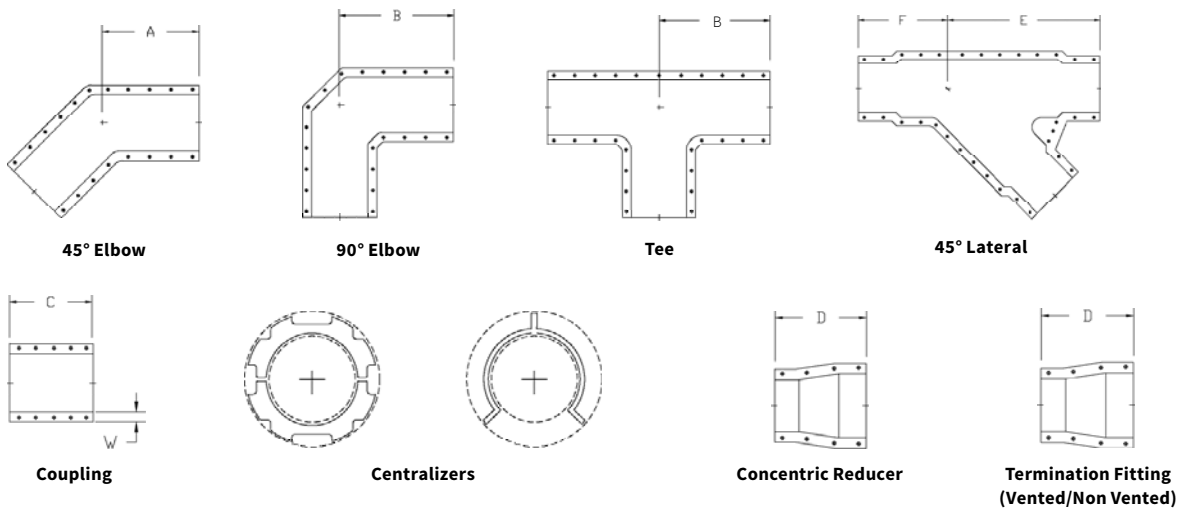


Table 3

Minimum Bond Length for Secondary Containment Fittings

Containment Size		Minimum Bond Length (L _B)	
in.	mm	in.	mm
3	80	2¾	70
4	100	2¾	70
6	150	2¾	70
8	200	3	76
10	250	4	102
12	300	4½	114
14	350	4½	114
16	400	4½	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 in. containment pipe over 14 in. primary pipe. When laid out, the distance from the edges of the containment fittings is 12 ft 3 in.

Solution:

X = 12 ft 3 in.

LB = 4½ in. (minimum for 16 in. containment joint)

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

LP = 12 ft 3 in. + 2(4½ in.) - 2(¾ in.)

LP = 12 ft 3 in. + 9 in. - 1½ in.

LP = 13 ft - 1½ in. = 12' 10½ in.

Section 3

Pipe Preparation

Scarfig

A. Pipe scarfig – Bonding surfaces of containment fittings are sanded in the factory. The containment pipe must be scarfig before assembling with containment fittings that have a socket joint. The scarfig (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. Scarfig Tools – For RT/GT, tools normally used to taper 3 in. through 12 in. RT/GT pipe can be used to scarf 3 in. through 12 in. containment pipe with the addition of a scarfig adapter kit.

Scarfig kits and instructions must be specified when ordering the containment system components. The scarfig adapter kits contain special zero degree (0°) blade holders, special cutting (scarfig) blades, and set-up gauges for the 2-6 in. tool. The 8-12 in. tools will have a special blade holder, diameter tape, and instructions. The 8-16 in. taper/scarfig tool does not require a scarf kit.

Containment pipe in 8 in. through 16 in. sizes can be scarfig 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 scarfig 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).

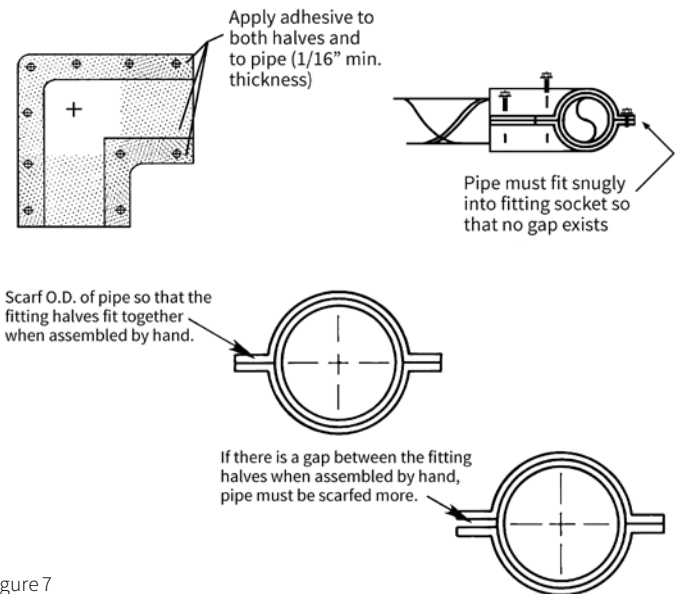


Figure 7

Table 4

Secondary Containment Pipe Scarfig Dimensions

Pipe Size		Scarfig Diameter ⁽¹⁾		Minimum Length		Circumference ⁽²⁾	
in	mm	in	mm	in	mm	in	cm
3	80	3.48	88.4	3	76	10 ¹⁵ / ₁₆	26.7
4	100	4.48	113.8	3	76	14 ¹ / ₁₆	35.8
6	150	6.615	168.0	3	76	20 ³ / ₁₆	52.8
8	200	8.57	217.7	4	102	26 ¹⁵ / ₁₆	68.4
10	250	10.57	268.5	5	127	33 ³ / ₁₆	84.0
12	300	12.55	318.8	5	127	39 ⁷ / ₁₆	100.1
14	350	14.41	366.0	5	127	45 ¹ / ₄	115.0
16	400	16.41	416.8	5	127	51 ⁹ / ₁₆	130.9

⁽¹⁾Tolerance ±0.010" (0.25mm) ⁽²⁾ Using regular tape measure: ± ¼ in. (6.4mm)

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	PSX-34	8069/ ZC-275	PSX-34	8069/ ZC-275	PSX-34	8069/ ZC-275	PSX-34	8069/ ZC-275	PSX-34	8069/ ZC-275	PSX-34
3	80	1	1 ½	1	1½	1	1½	1	1½	-	-	1	1½
4	100	1	1 ½	1	1½	1½	2	1	1½	1	1½	1½	2
6	150	1½	2	1½	2	2	2½	1½	2	1½	2	2	2½
8	200	2	2 ½	2	2 ½	3	4	2	2½	2	2½	3	4
10	250	3	4	3	4	4	5	3	4	3	4	4	5
12	300	4	5	4	5	5	6½	4	5	4	5	5	6½
14	350	5	6 ½	5	6 ½	7	9	5	6½	5	6½	6	7½
16	400	6	7 ½	6	7 ½	8	10	6	7½	6	7½	7	9

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. PSX-34 and ZC-275 adhesives do 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 ¼ in. 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 in. sizes require a ¾ in. socket; 8 in. and larger sizes require a ½ in. 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 in. section of 2 or 3 in. pipe and place inside the foil. Place heat gun in the end of the pipe. Do not place heat gun any closer than 12 in. 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) 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 Fig. 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 or INS1010. 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.

Containment Pipe Size	3-8in.	10-16 in.
Pressure, psig	15	10

Read This Carefully

Maximum Allowable Air Test Pressures

Safety Precautions

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

Terminating with the Termination Fitting (Straight)

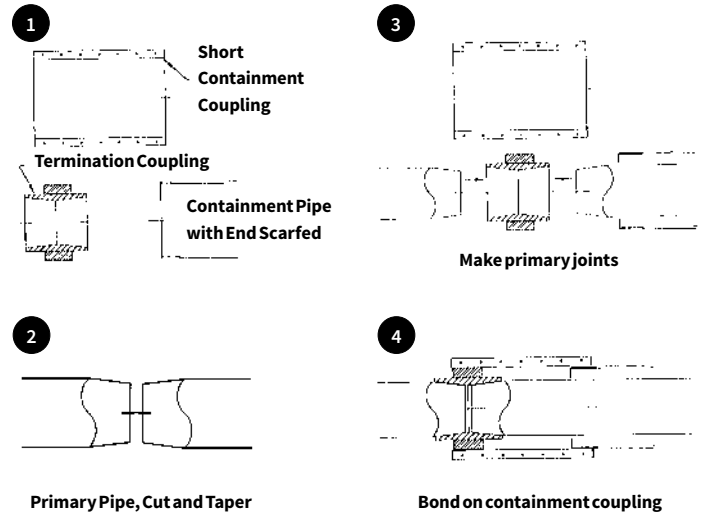
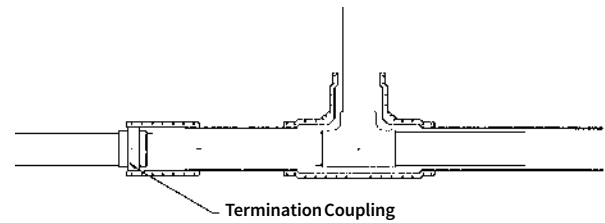


Figure 9

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

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.

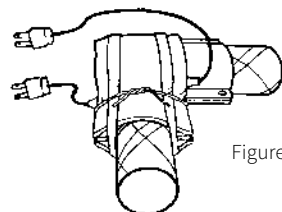


Figure 8

Section 7

Supports, Anchors & Guides

A. Centralizers, Supports, and Guides – Primary pipe centralizers are recommended for systems that undergo large thermal expansion and/or contractions. Spacing of centralizers can be determined from the support spacing information in Manual No. ENG1000 (Engineering & Design Guide). DO NOT put centralizers inside the containment fittings. The centralizers should be positioned 6-12 in. away from the end of the containment fittings.

Above grade secondary containment pipe support span lengths should be based on the maximum design temperature of the piping system. Design practices are provided in NOV Fiber Glass System's Engineering & Piping Design Guide, ENG1000.

B. Supports Anchors and Guides – 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 with special risers machined to match the containment pipe scarf diameter. The containment pipe is joined at anchors using a special short coupling shown in Figure 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 elevation 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.

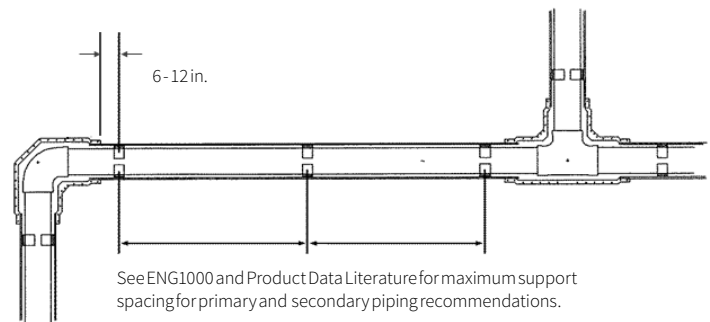


Figure 10

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 or INS1010 for repairing pipe wall damage.
- 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 in. beyond both edges of the fitting, i.e. overwrap starts 4 in. on one side of the fitting and continues to 4 in. 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.

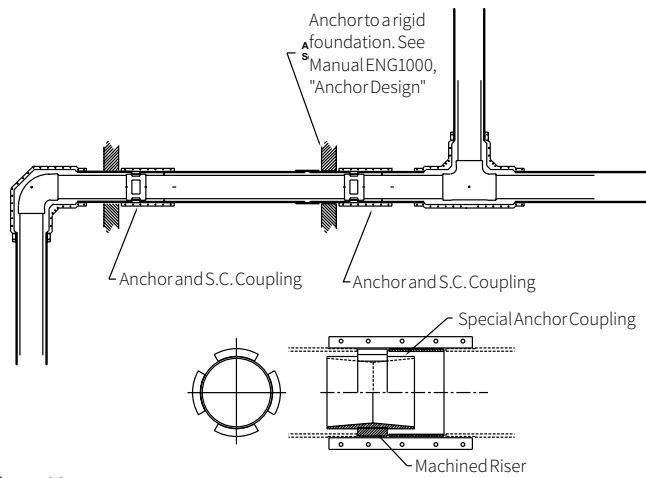


Figure 11

- 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.

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 in. 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 in. 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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